Test&Measurement

YOKOGAWA

All Products Guide

Vol.3

Precision Making

Yokogawa Meters & Instruments Corporation

Catalog YMI130-EN

Main Products Line up

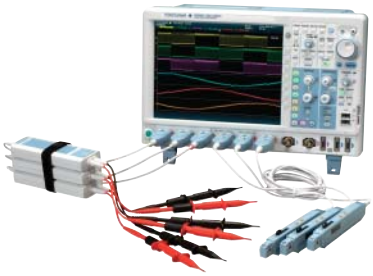
Oscilloscopes

new

ScopeCorder
DL850E/DL850EV

High-Speed Data Acquisition Unit
SL1000

Mixed Signal
Oscilloscopes
DLM2000 Series



Mixed Signal Oscilloscopes
DLM4000 Series

Digital Power Analyzer

Precision Power Analyzer
WT3000

new

Precision Power Scope
PX8000

Precision Power Analyzer
WT1800

Power Analyzer
WT500

Digital Power Meters
WT300 Series

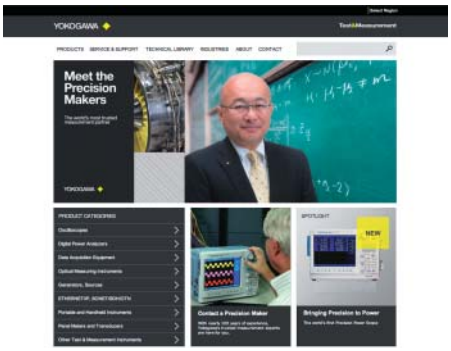
Generators, Sources, Manometers etc.

DC Voltage /
Current Source
GS200

AC Voltage
Current Standard
2558A

Internet Website

http://tmi.yokogawa.com



The Yokogawa website offers not only product and technical information but also campaign information, user registration, document download, free software download, e-mail news subscription, catalog request, price inquiry, and lots of other content.

Optical Measuring Instruments

new

Optical Spectrum Analyzer
AQ6370 Series

Optical Wavelength Meter
AQ6150 Series

Multi Application Test System
AQ2200 Series

Optical Time Domain
Reflectmeter
AQ7275

Optical Loss Test Set
AQ1100

Multi Field Tester
OTDR
AQ1200 Series

1G/10G Ethernet Tester
AQ1300 Series

AQ2170
Series

AQ2180
Series

AQ4280
Series

Handy size
Optical Power Meter
/ Light Source

Calibrator

CA700


CA150


CA71


CA450

Data Logger


XL120 Series

Clamp-on Power Meter


CW240


CW120 Series


CW10

Digital Multimeter


TY700 Series


TY500 Series


732 Series


73101

Clamp-on Tester


CL100 Series


CL200 Series


CL300 Series


30031A 30032A


CL420

Insulation Tester


MY40


MY10 Series


2406E Series


3213A Series

Earth Tester


EY200

Leakage Current Tester


3226

Illuminance Meter


510 Series

Thermometer


TM20


TX10 Series

Precision Measuring Instruments


279301


276910

Meters Products


201314


204102


205206

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2011～2042, 2051～2053, 2241～2243, 2261,
2215～2217, 2222～2223

CE Products with this mark conform to the EMC standards (regulations on electromagnetic interference) of European Community.

Oscilloscopes

Waveform Measuring ScopeCorder Series Selection Guide (*1)

■ The ScopeCorder series can be used to capture single-shot or infrequently recurring signals.
They can also execute computations on repetitive waveforms, and automatically extract waveform parameters.
The ScopeCorder series offers an extensive selection with large-capacity memories, powerful triggering functions, and internal printers. It also can save and load data to and from internal or external media.
SL1400 can provide big paper output capability for many applications in the field.

Item \ Model		DL850E/DL850EV  …P8	SL1400  …P10 Note: SL1400 is scheduled to be discontinued in June, 2014.
Features		• Powerful mobile data acquisition recorders • Measure & analyze dynamic behavior of electromechanical systems • Flexible modular inputs for voltage, current, sensors and CAN/LIN bus • Trend & Trigger on electrical power calculations (optional)	• Compact, 16 ch isolated inputs (8 module slots) • Eleven kinds of plug-in input modules • Web server functions • A4 (210 mm) Big Printer • Probe power connectors
Max. sampling rate		100 MS/s (*2)	10 MS/s (*2)
Bandwidth		20 MHz (*2)	3 MHz (*2)
Number of analog input channels		128 ch max (when using eight 720220 modules)	Plug-in module: 16 ch (isolation)
Logic input		128 bits max (when using eight 720230 modules)	St'd: 16 (8 bits × 2)
Max. vertical sensitivity (1:1)		100 µV/div (*2)	1 mV range
Vertial axis resolution		16 bit (*2)	Max. 16 bits (*2)
Max. sweep sensitivity		100 ns/div (*2)	100 µs Setting
Max. record length	St'd	250 Mpts (MW) max/10 Mpts (MW) (16 ch)	50 MW max/2.5 MW (16 ch)
	Optional	2 Gpts (GW) max / 100 Mpts (MW) (16 ch)	—
Internal media drive	selectable	SD memory card slot	PC card
Internal HDD	Optional	Internal 500 GB or external HDD	40 GB
Interface	St'd	USB2.0/ Ethernet (1000BASE-T)	USB/GP-IB/RS232/SCSI
	Optional	GPIB	Ethernet
Internal printer		112 mm width (optional)	210 mm width (st'd)
Others	Optional	• 17 types of plug-in modules • IRIG interface • GPS interface • User-defined math function • Real time math function • Probe power (4-output) • Power math function • DC 12V Power drive (DL850EV only)	• Probe Power Connectors
Display (TFT LCD)		10.4-inch color XGA	10.4-inch color, SVGA
External dimensions W × H × D (mm)		355 × 259 × 180	355 × 250 × 225
Weight (kg)		Approx. 6.5 (*3)	Approx. 8.0 (*3)

*1: See each product catalog for more detaled specifications *2: Depends on input module *3: Plug-in modules are not included

Plug-in Module Selection Guide[*1]

Input	Model No.	Sample Rate	Resolution	Bandwidth	Number of Channels	Isolation	Maximum Input Voltage (DC+ACpeak)	DC Accuracy	Note
Analog Voltage	720210	100 MS/s	12-Bit	20 MHz	2	Isolated	1000 V[*2] 200 V[*3]	±0.5%	High speed · High voltage · Isolated Max. four (4) modules can be installed in a main unit.[*6]
	701250[*5]	10 MS/s	12-Bit	3 MHz	2	Isolated	600 V[*2] 200V[*3]	±0.5%	high noise immunity
	701251	1 MS/s	16-Bit	300 kHz	2	Isolated	600 V[*2] 140 V[*3]	±0.25%	High sensitivity range (1mV/div), low noise (±100 µVtyp.), and high noise immunity
	701255[*5]	10 MS/s	12-Bit	3 MHz	2	Non-Isolated	600 V[*4] 200V[*3]	±0.5%	non-isolation version of model 701250
	701267	100 kS/s	16-Bit	40 kHz	2	Isolated	850 V[*3]	±0.25%	with RMS, and high noise immunity
	720220	200kS/s	16-Bit	5 kHz	16	Isolated(GND-terminal) non-isolated (CH-CH)	42V[*3]	±0.3%	16CH voltage measurement (Scan-type)
Temperature	701261	100 kS/s (Voltage), 500 S/s (Temperature)	16-Bit (Voltage), 0.1: (Temperature)	40 kHz (Voltage), 100 Hz (Temperature)	2	Isolated	42 V	±0.25% (Voltage)	thermocouple (K, E, J, T, L, U, N, R, S, B, W, iron-doped gold/ chromel)
	701262	100 kS/s (Voltage), 500 S/s (Temperature)	16-Bit (Voltage), 0.1: (Temperature)	40 kHz (Voltage), 100 Hz (Temperature)	2	Isolated	42 V	±0.25% (Voltage)	thermocouple (K, E, J, T, L, U, N, R, S, B, W, iron-doped gold/ chromel), with AAF
	701265	500 S/s (Voltage), 500 S/s (Temperature)	16-Bit (Voltage), 0.1: (Temperature)	100 Hz	2	Isolated	42 V	±0.08 (Voltage)	thermocouple (K, E, J, T, L, U, N, R, S, B, W, iron-doped gold/chromel), high sensitivity range (0.1mV/div), and low noise (±4 µVtyp.)
	720221[*8]	10 S/s	16-Bit	600 Hz	16	Isolated	42 V	±0.15% (Voltage)	16-CH voltage or temperature measurement (scan method) Thermocouple (K, E, J, T, L, U, N, R, S, B, W, Au-Fe-chromel)
Strain	701270	100 kS/s	16-Bit	20 kHz	2	Isolated	10 V	±0.5% (Strain)	Supports strain NDIS, 2, 5, 10 V built-in bridge power supply
	701271	100 kS/s	16-Bit	20 kHz	2	Isolated	10 V	±0.5% (Strain)	Supports strain DSUB, 2, 5, 10 V built-in bridge power supply, and shunt CAL
Analog Voltage, Acceleration	701275	100 kS/s	16-Bit	40 kHz	2	Isolated	42 V	±0.25% (Voltage) ±0.5% (Acceleration)	built-in anti-aliasing filter, Supports built-in amp type acceleration sensors (4 mA/22 V)
Frequency	701280	25 kS/s	16-Bit	resolution 50 ns	2	Isolated	420 V[*2] 42 V[*3]	±0.1% (Frequency)	Measurement frequency of 0.01 Hz to 200 kHz, Measured parameters (frequency, rpm, period, duty, power supply frequency, distance, speed)
Logic	720230	10 MS/s	—	—	8-bit x 2 ports	non-isolated	depend on logic probe used.	—	(8-bit/port) x 2, compatible with four-type of logic probe (sold separately)
CAN	720240	100 kS/s	—	—	(60signalsx2) port	Isolated	10 V	—	CAN Data of max. 32-bit allowable It is available for DL850EV only. Max two (2) modules can be installed in a main unit.[*5 *7]
CAN, LIN	720241	100 kS/s	—	—	(60signalsx2) port	Isolated	10 V (CAN port) 18 V (LIN port)	—	CAN port x 1, LIN port x 1 Available for DL850EV only, up to 2 modules[*6 *7]

*1: Probes are not included with any modules. *2: In combination with 10:1 probe model 700929 *3: Direct input *4: In combination with 10:1 probe model 701940
*5: Some of the models 701250/701255 shipped on or before July, 2007 may require factory rework. *6: Any other modules can be installed in the remaining slots.
*7: Up to two CAN Bus Monitor Modules (720240) or CAN & LIN Bus Monitor Modules (720241) in total can be used on a single main unit. *8: The 16-CH Scanner Box (701953) is required for measurement.

Compatibility of the plug-in modules with the main units.

Plug-in Module		Main Unit			
Model	Name	DL850E	DL850EV	SL1000	SL1400
701250	High-speed 10 MS/s 12-Bit Isolation Module	available	available	available	available
701251	High-speed 1 MS/s 16-Bit Isolation Module	available	available	available	available
701255	High-speed 10 MS/s 12-Bit non-Isolation Module	available	available	available	available
701261	Universal Module	available	available	available	available
701262	Universal Module (with Anti-Aliasing Filter)	available	available	available	available
701265	Temperature/high-precision voltage Module	available	available	available	available
701267	High-voltage 100 kS/s 16-Bit Isolation Module (with RMS)	available	available	available	available
701270	Strain Module (NDIS)	available	available	available	available
701271	Strain Module (DSUB, Shunt-CAL)	available	available	available	available
701275	Acceleration/Voltage Module (with Anti-Aliasing Filter)	available	available	available	available
701280	Frequency Module	available	available	available	available
720210	High-speed 100 MS/s 12-Bit Isolation Module	available	available	available	NA
720220	Voltage Input Module (16 ch)	available	available	NA	NA
720221	Temperature/Voltage Input Module (16 ch)	available	available	NA	NA
720230	Logic Input Module	available	available	NA	NA
720240	CAN Bus Monitor Module	NA	available	NA	NA
720241	CAN & LIN Bus Monitor Module	NA	available	NA	NA

Note 1: The firmware versions indicated below are required for using the 701267 module.
SL1400: version.6.56 or later
SL1000: version.2.10 or later
Note 2: Max. four 720210 modules can be installed in a DL850E/DL850EV main unit.
Max. eight 720210 modules can be installed in a SL1000 main unit.
Note 3: The use of a 720221 module always requires the External Scanner Box (model 701953).
Note 4: Up to two 720240 or 720241 modules in total can be installed in a single DL850EV main unit.

Oscilloscopes

ScopeCorder DL850E/DL850EV

Powerful data acquisition enables the research of dynamic behavior within your application

DL850EV CE

DL850E CE

3-Year Warranty

Overview

A ScopeCorder is a powerful portable data acquisition recorder that can capture and analyze both transient events and trends up to 200 days. Using flexible modular inputs it combines the measurements of electrical and physical (sensor) signals, such as from CAN, LIN, and Serial buses and is also able to trigger on electrical power related calculations in real-time.

Flexible Inputs with Built-in Signal Conditioning

Choose from up to 17 input modules and gain a thorough insight into any application by synchronizing the measurement of multiple parameters.

- **Voltage & Currents**
- **Sensor Outputs**
- **Temperature, Vibration / Acceleration, Strain, Frequency**
- **Logic Signals & CAN / LIN**

Basic Specifications

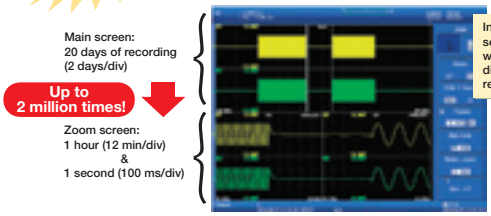
Max. sampling rate	100 MS/s (720210)(*1)
Frequency bandwidth	20 MHz (720210)(*1)
Number of channels	Max. 128 ch, Number of slots for the plug-in module: 8
Logic input	Max. 128 bits (When using eight 720230 modules)
A/D conversion resolution	16 or 12 bits (1*)
DC accuracy	±(0.5% of 10 div) (701250 and 701255)(*1)
Time axis setting	100ns/div to 20-day/div
Time axis accuracy	±0.005%
Max. record length	Standard 10 Mpts (MW)/ch, total 250 Mpts (MW) (with /M2 option) 100 Mpts (MW)/ch, total 2 Gpts (GW)
Channel-to-channel calculation function	Definable math waveforms 8
Automatic measurement of waveform parameters	Maximum number of measured parameters 32
Cycle statistical/historic process	Maximum number of cycles 64,000 Maximum number of parameters 64,000
Internal media drive	SD memory card slot (standard) 500 GB internal hard drive (option) External hard drive can be connected (option)
Communication interface	USB 2.0 (standard)/1000BASE-T Ethernet (standard) GP-IB (option)
Built-in printer(option)	112-mm width, A6 thermal printer
Other options	IRIG interface GPS interface User defined computation Real time math computation Power math computation Four probe power outputs DC 12V power drive (DL850EV only)
Display	10.4-inch TFT color LCD monitor
Display resolution	1024 × 768 pixels (XGA)
External dimensions	355 (W) × 259 (H) × 180 (D) mm (excluding handle and protrusions)
Weight	Approx. 6.5 kg to 9 kg (varies depending on the types and the number of modules used)

(*1): Varies depending on the module.

● Large (2 GPoint) memory offers long duration measurement and two instantaneous zoom locations – 2 GPoint memory (/M2 option) –

Comes standard with 250 MPoints of memory, expandable with 1 or 2 GPoint options.
Large capacity memory does not only simply provide longer durations of measurement, but also higher sampling rate at the same measurement time or multi-channel at the same sampling rate.

Zoom to 2 locations instantaneously
GIGAZoom2 ENGINE



Long memory does not guarantee better efficiency if the memory handling and display engine is slow. Our faster than ever GIGAZoom 2 Engine instantaneously zooms into two locations.

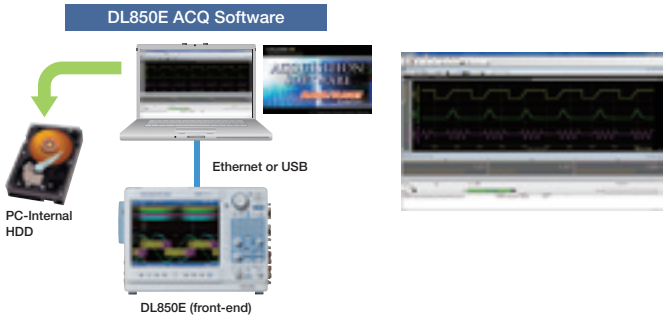
● Long duration, continuous saving of waveforms – Hard disk recording (/HD0, /HD1 option) –

Measured data can be streamed directly to a built-in 500 GB hard disk (/HD1 option)*1 or through the external HDD interface (/HD0 option)*1. With long periods of evaluation testing, measurements can be performed at 100 kS/s on 16 channels simultaneously for 10 hours*2.

*1 The /HD0 and /HD1 options cannot be specified together.
*2 It depends on the external hard disk connected when using the /HD0 option.

Continuous data recording for durability test and/or surveillance test

Intuitive, user-friendly acquisition software comes standard. Continuous data recording into a PC Hard Disk Drive(HDD) can be performed by "free-run mode" with no restriction of recording time and file size. The Wizard automatically recognizes any connected DL850E and its' plug-in modules. Just click the Start button to start measuring right away--no complicated settings to enter.



Time synchronization for accurate measurements – GPS interface (/C30 option) –

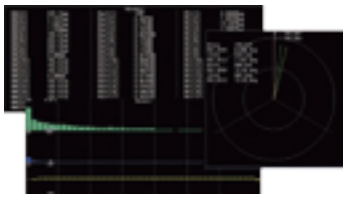
A GPS antenna can be directly connected to the DL850E side panel. The DL850E time clock and the sampling clock can be adjusted accordingly.

Note: This option can be provided only for a nation that is not prohibited by the Radio Law.

Trend waveform monitor for power and harmonic parameters in real time – /G5 option –

Max. 126-type power parameter can be calculated. The calculation results of these parameters can be displayed in DL850E screen as trend waveforms in real time. The raw signal waveforms along with calculated parameters(waveforms) can be displayed as trend waveforms with maximum data updating rate of 100 kS/s.
Trend waveforms of each orders of harmonics, bar-graphs and vector displays can be displayed.

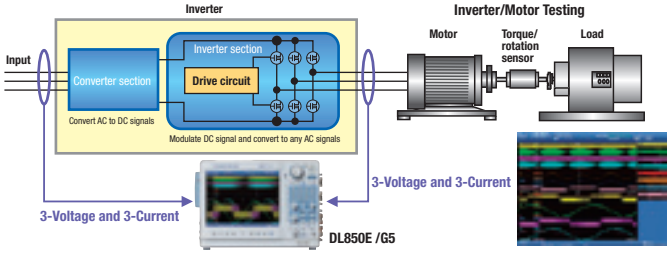
[Power parameter trend display example]



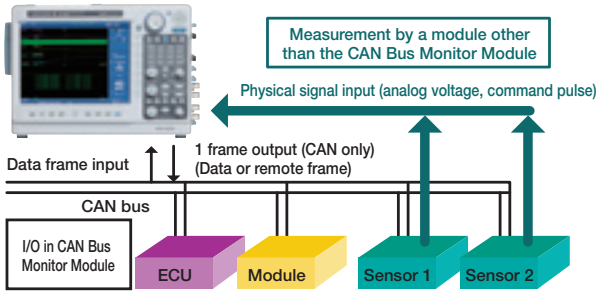
[Harmonic analysis example]

Once the "Analysis" key is pressed on the front panel, the dedicated set-up menu will appear on the screen which enables to setup easily.

For example, 6-input(3-voltage and 3-current) waveforms for 2-line, which are total 12 raw signal waveforms, can be monitored simultaneously along with max. 126-parameter/1-line (or 54-parameters/2- line) can be calculated.



[Example of comparison and verification of a measured signal and CAN bus signal]



Note: There is a certain restriction when using the 720240 and/or 720241 modules together with the /G5 option. Please contact our sales representative.

Support for both AC and DC power (/DC option, DL850EV only)

■Low power consumption of 60 - 120VA (typ.)

■Low noise compared to using an external inverter

• Can be driven by external DC power such as the vehicle's battery
12 V DC (10 – 18 V)

• Can also be driven by AC power.
100 V AC (100 – 120 V)
200 V AC (200 – 240 V)

Model Number and Suffix Codes

Models and Suffix Codes

Model	Suffix Codes	Description
DL850E		DL850E main unit, 250MPts(W) memory*1
DL850EV		DL850EV main unit, 250MPts(W) memory*1
Power Cord	-D	UL and CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS standard
	-H	GB standard
	-N	NBR standard
Languages	-HE	English menu and panel
	-HJ	Japanese menu and panel
	-HC	Chinese menu and panel
	-HK	Korean menu and panel
	-HG	German menu and panel
	-HF	French menu and panel
	-HL	Italian menu and panel
	-HS	Spanish menu and panel
Options	/B5	Built-in printer (112mm)*5
	/DC	DC12 V power (10-18 V DC) (can be specified for DL850EV only)*5
	/M1	Memory expansion to 1GPts(W)*2
	/M2	Memory expansion to 2GPts(W)*2
	/HD0	External HDD interface*3
	/HD1	Internal HDD (500GB)*3
	/C1	GP-IB interface*4
	/C20	IRIG and GP-IB interface*4
	/C30	GPS interface*4, *7
	/G2	User-defined math function
	/G3	Real time math function*6
	/G5	Power math function (with including Real time math function)*6
	/P4	Four probe power outputs

*1: The main unit is not supplied with a plug-in module.
*2, *3, *4, *5, and *6: When selecting these, specify one of them.
*7: The /C30 option can be provided only for a nation that is not prohibited by the Radio Law.

Oscilloscopes

ScopeCorder LITE **SL1400**

Easily & Quickly Saves Data to Memory and Paper

SL1400

Note: SL1400 is scheduled to be discontinued in June, 2014.

A perfect fit for manufacturing and maintenance departments!

The SL1400 Key Application Areas

- ☐ Maintenance (steel plants, power plants, co-generation systems)
- ☐ Heavy machinery (industrial machinery, robotics, semiconductor manufacturing equipment)
- ☐ Multichannel on-site observations (automobiles, automobile parts)
- ☐ On-board testing for railroads and other vehicles
- ☐ Power supply quality monitoring (power line monitoring)

Overview

A plug-in module type chart recorder with a large built-in A4 sized high-resolution thermal printer

Features

- Easy-to-operate
- Standard high resolution A4 size thermal printer
- Effective print width is 200 mm (1600-dot resolution)
- Compact body and isolated 16 analog channels, 8 slots and 16-bits logic input
- Eleven kinds of plug-in modules offers high accuracy and low noise measurement and also offer various measurement, Voltage/ Current/Temperature/Strain/Vibration/Frequency
- 50MW large memory and 30 days observation
- Cycle statistical calculation
- Many Ethernet functions (Web server/FTP server/E-mail)
- Various communication interface USB/Ethernet/GP-IB/RS-232/ SCSI
- PC card drive is available
- 40 GB internal hard drive
- USB storage function is available

Real-Time Hard Drive Recording (with the /C8 Option)

With the optional internal hard drive, you can record measurements to the hard drive in real time. This makes it easy to manage and analyze data using a PC.
Maximum data capacity: 1 GW
Maximum sampling rate: 100 kS/s
(using 1 channel only)

PDF Output for Printing A4-Sized Reports

Color PDF Output

When performing on-site measurements, you can print out the data and hand-write memos on the paper. Since the SL1400 simultaneously stores data to internal memory while printing, you can keep electronic and hard copy records with just a single action. (Remember that with thermal-sensible paper, it is vital to make photocopies for long-term preservation.)
The SL1400 allows you to export results to files in PDF format, making it easy to save data for long periods of time, transfer the data to distant locations, or load them onto a PC. It is also easy to create reports since waveform data can be converted to an A4-size layout.

Basic Specifications

Input
- Type: Isolated plug-in module
- Slots: 8 (16 channels)
- Logic inputs: 16 (8 bits × 2)

Sweep time: 100 us to 30 days

Display: 10.4-inch color TFT liquid crystal display

Built-in printer
- Printing method: Thermal line-dot printing
- Paper width: 210 mm (Effective print width 200 mm)

Communication interface: GP-IB, USB peripheral equipment jacks (USB keyboards and USB printers), USB (compiles with Rev. 1.1, for connection to PC), Ethernet (complies with 100 BASE-TX and 10 BASE-T; with /C10 option), serial (RS232), and SCSI

Internal media drives: PC card or Drive less (choose one), and 40GB hard drive (with /C8 option)

External dimensions: 355(W) × 250(H) × 225(D) mm

Weight: Approx. 8.0 kg (main unit with full options, including C8, C10 and P4)
Approx. 10.3 kg (main unit and eight 701250 modules)

Model Number and Suffix Codes

Model	Suffix Code	Description
701240		SL1400 main unit (16 isolated Channels, 8 slots + 16-bit logic)[1] 210 mm width A4 thermal printer built-in
Power cord[2]	-D	UL/ CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS standard
	-H	GB standard (Complied with CCC)
Internal media drive[2]	-J0	non Drive
	-J3	PC card drive
Language[2]	-HE	English, Panel in English
	-HJ	Japanese, Panel in Japanese
	-HC	Chinese, Panel in English
	-HG	German, Panel in English
	-HF	French, Panel in English
	-HL	Italian, Panel in English
	-HK	Korean, Panel in English
	-HS	Spanish, Panel in English
Other specifications	/C8	Internal 40 GB HDD (FAT32)
	/C10	Ethernet option
	/P4	Probe power (4-output)

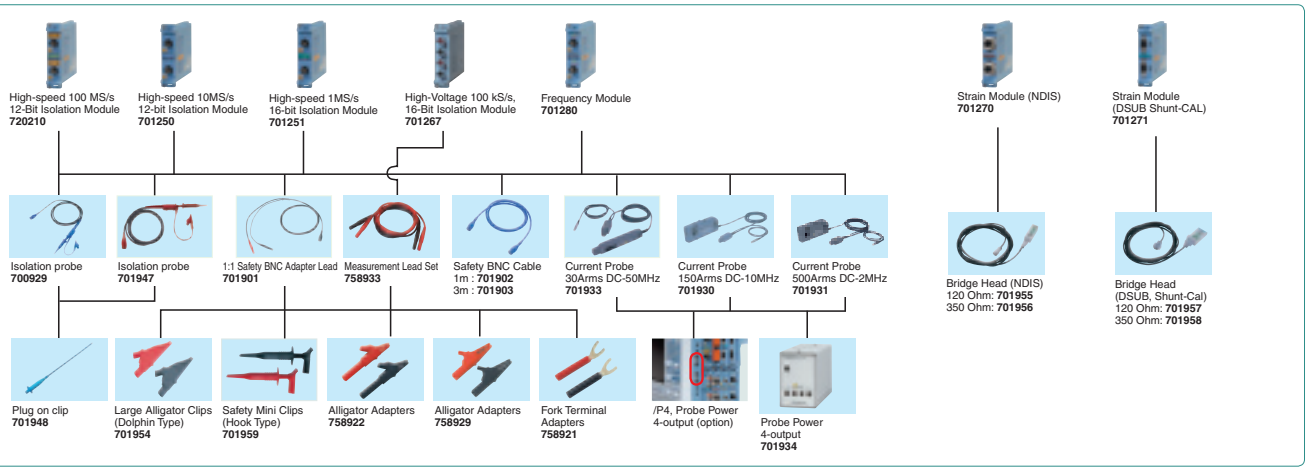
1. Plug-in modules are not included.
2. Choose only one.

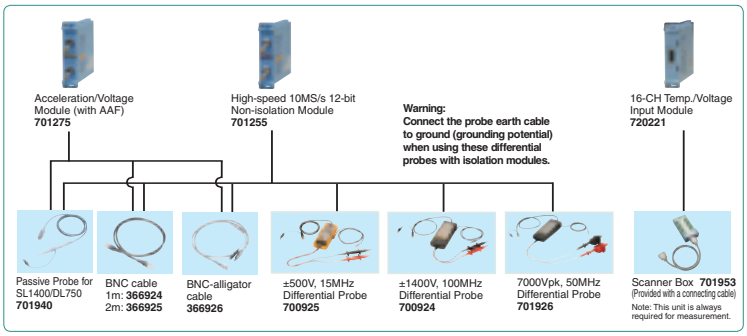
Waveform Measuring ScopeCorder Accessories

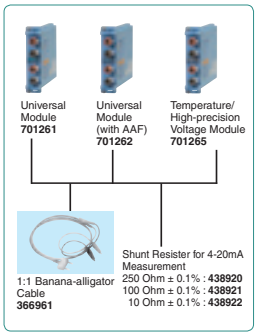
Product	Model No.	Description*1	
Differential Probe	700925	DC to 15 MHz, 1/10-1/100 selector switch, max. allowable differential voltage ±500 V (DC + ACpeak)	
Differential Probe	700924	DC to 100 MHz, 1/100-1/1000 selector switch, max. allowable differential voltage ±1400 V (DC + ACpeak) or 1000 Vrms (1/1000 range)	
Current Probe	701933	30 Arms, DC to 50 MHz, supports probe power	
Current Probe	701930	150 Arms, DC to 10 MHz, supports probe power	
Current Probe	701931	DC to 2MHz, , 500Arms	
Current Probe	701932	DC to 100MHz, 30Arms	
Probe Power Supply	701934	Supply (4 outputs),large current output, external probe power	
10:1 Probe (for Isolated BNC Input)	700929	1000 Vrms-CAT II	
1:1 Safety BNC Adapter Lead (in combination with followings)	701901	1000 Vrms-CAT II	
Safety Mini-Clips (Hook type)	701959	1000 Vrms-CAT II, 1 set each of red and black	
Large Alligator-Clips (Dolphin type)	701954	1000 Vrms-CAT II, 1 set each of red and black	
Passive Probe (10:1)*2	701940	Non-isolated 600 Vpk	
1:1 BNC-Alligator Cable	366926	Non-isolated 42 V or less, 1m	

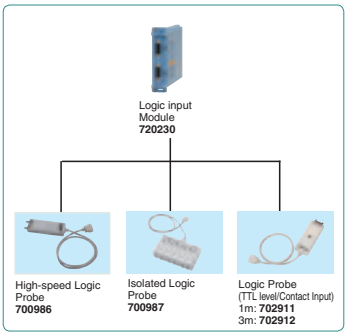
*1 Actual allowable voltage is the lower of the voltages specified for the main unit, probe and cable.
*2 42 V is safe when using the 701940 with an isolated type BNC input.

Accessories Combinations









Oscilloscopes

High-Speed Data Acquisition Unit **SL1000**

Fast Acquisition, Transfer, and Storage High-Performance Data Acquisition Unit

SL1000

GiGAZoom ENGINE

Basic Specifications

Plug & Play: Auto-recognition of units and modules
Input type: Plug-in module
(A/D converters built in to each unit)
Maximum number of input channels:
16 (One unit operation)
128 (8 units synchronous operation)
Maximum sample rate: 100 MS/s on all channels
Measuring mode: Free Run and Triggered
Clock source: Internal and external
Maximum record length (internal memory):
In Free Run mode 1 module: 32 MW/ch
2 modules: 16 MW/ch
3 to 4 modules: 8 MW/ch
5 to 8 modules: 4 MW/ch
In Single Trigger mode 1 module: 50 MW/ch
2 modules: 25 MW/ch
3 to 4 modules: 10 MW/ch
5 to 8 modules: 5 MW/ch
Measuring groups: Up to 4 groups definable with independent sample rates
Trigger mode: Normal, Single, and Single(N)
Trigger source: Input channel, External, LINE , Time
Record conditions:
For Free Run mode Immediate, abs. time, time divided, alarm, and external trigger
For Trigger mode Each trigger
Internal hard disk: 40 GB (with the /HD1 option)
Maximum real-time hard disk recording speed:
Internal hard disk 1.6 MS/s
(= 200kS/s × 8ch = 100 kS/s × 16ch)

Maximum measuring time (unit: sec) at Single triggered measurement

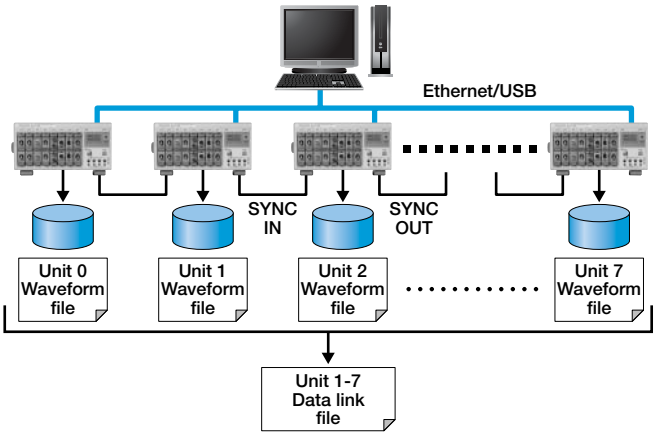
		Number of Measuring Channels			
		2ch	4ch	8ch	16ch
Sampling rate	100MS/s	0.5	0.25	0.1	0.05
	50MS/s	1	0.5	0.2	0.1
	10MS/s	2.5	1.25	0.5	0.25
	1MS/s	25	12.5	5	2.5
	500kS/s	100	50	20	10
	200kS/s	250	125	50	25
	1kS/s	50000	25000	10000	5000

Features

- **Fast Acquisition**
  - Up to 100 MS/s on all channels (10 ns sampling interval)
  - Supports parallel testing: Perform measurements with up to four simultaneously independent sample rates
- **Fast Transfer and Storage**
  - Stream data to PC via high speed USB 2.0 or 1000BASE-T Gigabit Ethernet
  - Stream data to a PC hard disk or the SL1000's internal hard disk in real time (at speeds of 1.6 MS/s = 100 kS/s × 16ch)[1]
  - Maximum 8 synchronized units

1: Speed depends on PC performance and measuring conditions.

- **Easy to use**
  - Easy to use Standard Acquisition Software
- **Max 128ch Synchronized (16ch x 8 units)**
  - Data files recorded my multiple units, in synchronized mode, are all linked together by a common LINK file, thereby facilitating batch processing. Using this LINK file, data from all units can be processed and analyzed, as one, at the same time.



- **Stand-Alone Recording**
  - Normally, SL1000 is controlled by PCs. However, SL1000 can record data even without PCs (/HD1 option is required). This stand-alone recording function is useful for the measurement in the severe environment.

Model Number and Suffix Codes

Model/Options	Suffix Code	Description
720120		SL1000 High-Speed Data Acquisition Unit*1 Including Xviewer Standard Edition (1 license)(701992-SP01)
Power cable	-D	UL and CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS standard
	-H	GB standard (Complied with CCC)
Others	/HD1	Internal 80 GB HDD
	/C10	Ethernet Interface
	/P4	Probe power (4-output)
	/XV0	Without Xviewer
	/XV1	With the Xviewer Math Edition (1 license)(701992-GP01)

*1: Plug-in modules and PC not included with the SL1000.

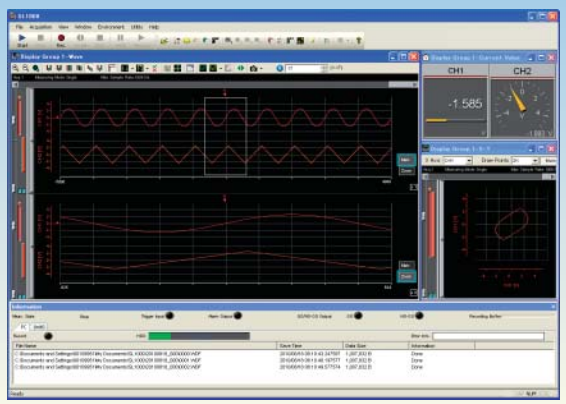
Model	Description
720210	High-speed 100MS/s 12-Bit Isolation Module (2ch)
701250	High-speed 10MS/s 12-Bit Isolation Module (2ch)
701251	High-speed 1MS/s 16-Bit Isolation Module (2ch)
701255	High-speed 10MS/s 12-Bit non-Isolation Module (2ch)
701260	High-voltage 100kS/s 16-Bit Isolation Module (with RMS, 2ch)
701261	Universal Module (2ch)
701262	Universal Module (with Anti-Aliasing Fileter, 2ch)
701265	Temparature / High-precision voltage Module (2ch)
701275	Acceleration / Volatage Module (with Anti-Aliasing Filter 2ch)
701270	Strain Module (NDIS, 2ch)
701271	Strain Module (DSUB, Shunt-CAL, 2ch)
701280	Frequency Module

Product	Model No.	Description
Synchronized connection cable	720901-01	For SL1000 (1 m)
	720901-02	For SL1000 (3 m)
Rack mounting kit	751541-E4	EIA standard
	751541-J4	JIS standard

High-Speed Data Acquisition Unit

SL1000 Acquisition Software

Easy to Use



Main Specifications of Acquisition Software

Plug and Play	Auto-recognition of units and modules
Measurement modes	Freerun and Triggered
ACQ modes	Normal, envelope, and box average
Clock sources	Internal and external
Measurement groups	Up to 4 groups definable with independent sample rates
Trigger modes	Normal, single, and single(N)
Trigger sources	CH1-CH16, LINE, Time, and External
Other trigger functions	Combination trigger, hold-off, pretriggers, and trigger delay
Save conditions	Manual operation, or based on time, or alarms
Other save functions	Manual save (file division), specify no. of saves, save all data in memory, and save simultaneously to PC's hard disk and SL1000's internal hard disk (with /HD1 option)
Save format	Binary data file (original, *.wdf)
Waveform data conversion (Xviewer)	Binary data file(s) can be converted to ASCII (*.csv) or Excel (*.xls) format
Maximum speed for saving in real time	
PC hard disk	1.6 MS/s (= 100 kS/s × 16 channels)*1
Waveform monitor	Trend display (displays measured waveforms of different sample rates simultaneously)*2, and instantaneous value displays (digital, bar graph, meter, and thermometer)
X-Y display	X-axis channel settings, selection of main or zoomed waveform (in Triggered mode), and selection of the number of data points to draw (2 K, 10 K, 100 K)
Mark display (Free run mode)	Setting of marks (up to 128 marks, each mark can display up to 16 characters), display color setting, mark editing, deletion of marks, mark list, collectively saving mark data with the same file name as the waveform data, and loading mark data into Xviewer.
Accumulation display	Accumulates T-Y and X-Y waveforms
Snapshot	Waveform that is currently being displayed can be retained on the screen as a snapshot waveform. Display color setting and snapshot waveform deletion
Display groups	Up to 4 display groups
Other display functions	History waveform, arbitrary axis divisions, and horizontal axis scaling + specifiable units (external clock)
Waveform analysis	Cursor and parameter measurement*3
Offline waveform computation (with /XV1 option)	
Max. Number of displayed waveforms (CHs)	10 waveforms (Math1 to Math 10)
Operations	+, -, ×, /, trigonometry, differentiation/integration, FFT, and others
Alarms	Channel (alarm display and alarm history analysis)*4, system alarm, and alarm output
GO/NO-GO determination*3	Waveform parameter judgment and judgment output
System requirements	
OS	Windows XP (SP2 or later) /Windows Vista (32-bit) /Windows 7 (32 bit /64 bit) /Windows 8 (32 bit /64 bit)
CPU	Core 2 Duo 2 GHz or better
Memory	1 GB or more
Hard disk	500 MB or more of free space (40 GB or more when using the auto-save function)
Communication interfaces	USB 2.0/Ethernet 1000BASE-T (with /C10 option)
Display	XGA or better, Color: 65536 colors or better
Other	CD-ROM drive and mouse

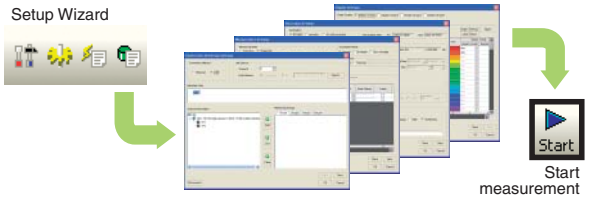
*1: Typical values. Actual values depend on PC performance and measurement conditions.
*2: When the measurement mode is Free run, the trigger mode is Single(N), and the number of measurements is Infinite, there may be a limit to the number of channels that can be trend-displayed during measurement.
*3: Triggered measurement
*4: Free run measurement

For details on 701992 Xviewer, see page 21.

Intuitive Operation

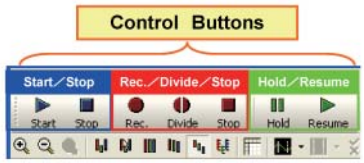
Setup Wizard Makes It Easy

The four screens of the Setup Wizard guide you easily through detailed settings for configuring the system, measuring, saving, and displaying. You can save and recall your settings at any time.



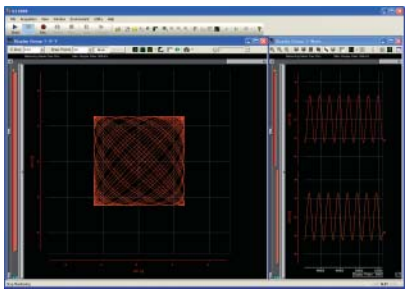
Control Buttons—Just Like Your DVD Remote

Measurement and saving can be started and stopped using the same familiar buttons found on a DVD remote control. Start using the instrument on the same day you receive it, with absolutely no programming required.



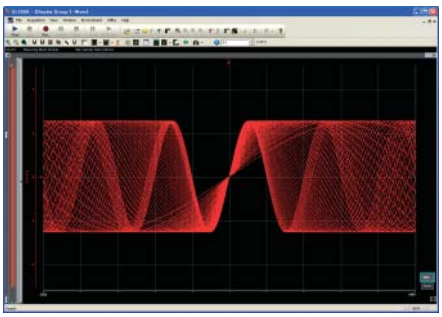
Displaying X-Y Waveforms

You can view both T-Y waveform display and X-Y waveform display. Using its fast update feature, you can evaluate data quickly and easily.



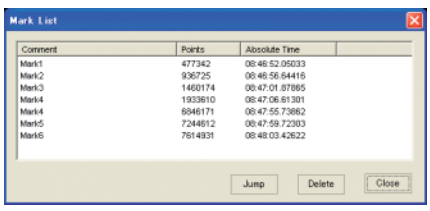
Accumulating Waveforms

Using the accumulation feature, you easily view unevenness of repetitive data.



Setting Marks

You can enter comments in the Mark area when monitoring over long periods of time (Free run mode).



Oscilloscopes

Waveform Measuring

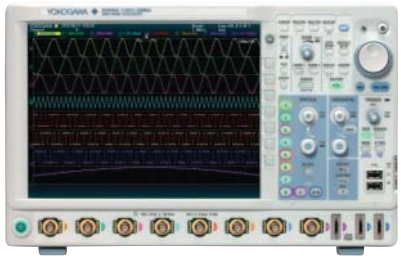
Digital and Mixed Signal Oscilloscopes Selection Guide

■ The DLM series digital oscilloscopes have high-speed sampling and a wide range of bandwidths that can be utilized for design and development of electronic devices.
They can also execute computations on repetitive waveforms and automatically extract waveform parameters.
The DLM Series offers an extensive selection of digital oscilloscopes with large-capacity memories, powerful triggering functions, unique History Memory function and built-in printers. It also can save and load data to and from internal or external media.

DLM2000

Hybrid Channel

DLM4000



Hybrid Channel

Item \ Model		DLM4000 Series ...P18	DLM2000 Series ...P16
Features		Analog 8ch/Analog 7ch+Logic 8bits Long memory UART,I²C,SPI,CAN,LIN and FlexRay bus analysis functions Power supply analysis functions Large display	Compact & lightweight Analog 4ch/Analog 3ch+Logic 8bits Long memory UART,I²C,SPI,CAN LIN and FlexRay bus analysis functions Power supply analysis functions
Max. sampling rate		2.5 GS/s	2.5 GS/s
Bandwidth		500 MHz(*2)	500 MHz(*2)
Number of analog input channels		8	DLM2022,DLM2032,DLM2052:2 DLM2024,DLM2034,DLM2054:4
Logic input	St'd	8 bits	DLM2024, DLM2034, DLM2054: St'd 8 bits
	Optional	24 bits	
Max. vertical sensitivity (1:1)		2 mV/div	2 mV/div
Vertial axis resolution		8 bits	8 bits
Max. sweep sensitivity		1 ns/div	1 ns/div
Max. record length	St'd	12.5 Mpoints	12.5 Mpoints
	Optional	125 Mpoints	125 Mpoints
Internal storage	St'd	Approx. 1.8 GB	Approx. 100 MB
	Optional	Approx. 7.2 GB	Approx. 1.8 GB
Interface	St'd	USB/Ethernet	USB
	Optional	GP-IB	Ethernet/GP-IB
Built-in printer	Optional	112 mm width	112 mm width
Others	Optional	I²C bus analysis SPI bus analysis CAN & LIN bus analysis FlexRay bus analysis UART bus analysis Probe Power Power Supply analysis functions User-defined math functions	I²C bus analysis SPI bus analysis CAN & LIN bus analysis FlexRay bus analysis UART bus analysis Probe Power Power supply analysis functions User-defined math functions
Display (TFT LCD)		12.1-inch color XGA	8.4-inch color, XGA
External dimensions W × H × D (mm)		426 x 266 x 178	226 × 293 × 193
Weight (kg)		Approx. 6.6	Approx. 4.2

*1: See each product catalog for more detaled specifications.
*2: Depends on model

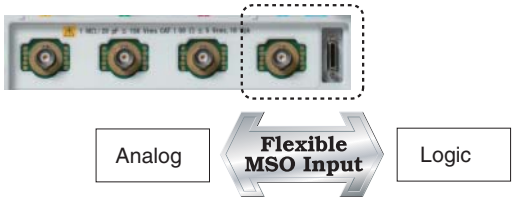
Common Features of DL/DLM Series

Multichannel

This feature meets the need to measure as many signals as possible simultaneously with one oscilloscope.

- DLM2000/DLM4000 series

  The DLM2000 (DLM4000) series usually functions as 4 (8) channel analog, and is able to switch CH 4 (8) of analog input to 8-bit logic quickly whenever the need arises.



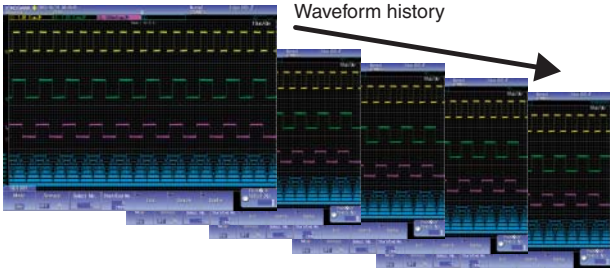
- DLM4000 series

  Up to 8 channels of analog signals can be measured.

ScopeCorder Series is available for customers that require more channels for measurement (see page 6). The DL850E supports up to 128 channel measurement.

Long Memory

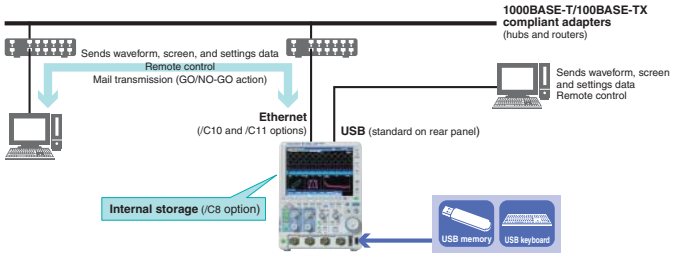
When the sample rate is increased with oscilloscopes with less memory, the observation time may run out. All of Yokogawa's oscilloscope models are equipped with large capacity memory. For example, the DLM2000/DLM4000 offers long memory of up to 125 Mpoints for measurement.
Even at a fast sample rate of 1.25 GS/s, waveforms for 0.1 seconds can be captured.
The history memory function that divides the long memory can redisplay past waveforms that have disappeared from the screen.
With the DLM2000/DLM4000 series, up to 20,000 previously captured waveforms can be saved in memory.



Since a large amount of data is also processed at high speed by dedicated hardware, the long memory can be used comfortably without sacrificing response time.

Connection with a PC

To facilitate the use of a PC, various interfaces such as USB, Ethernet, and GP-IB are available as standard or an option.
In addition, various software is available to support remote control, file transfer, and data processing on a PC.
USB memory and peripheral devices, such as keyboard and mouse, can be connected, and connecting to a PC using a USB cable enables it to be used as the external storage of the PC.



Built-in Printer

With a small built-in printer, measured waveforms can be printed to paper immediately.

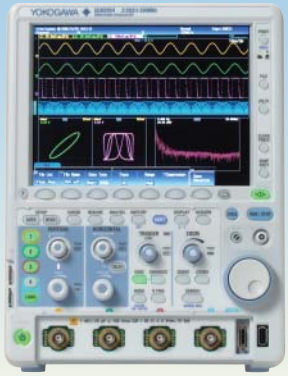
A Variety of Triggers and Analysis Functions

- **A variety of triggers capture complex waveforms**
- **Real time digital filter with optimum noise reduction**
- **Zooms into two different points simultaneously**
- **Automated measurement of waveform parameters and statistical processing function**
- **Frequency analysis by FFT computation**
- **Go/No-Go function and action on trigger function to determine abnormal waveforms and save files.**
- **Analysis functions for specific applications, such as serial bus analysis and power supply analysis**

Oscilloscopes

Mixed Signal Oscilloscope **DLM2000 Series**

Easy-to-Use, Portrait Body, Compact, and Large Screen Personal Mixed Signal Oscilloscope Offers Convenience with Logic Inputs



DLM2000

CE

Basic Specifications

Analog Signal input

Input channels	Analog input	DLM20x2: CH1, CH2 DLM20x4: CH1 to CH4 (CH1 to CH3 when using logic input)			
Input coupling setting		AC, DC, DC50 Ω, GND			
Input impedance	Analog input	1 MΩ ±1.0%, approximately 20 pF 50 Ω ±1.0% (VSWR 1.4 or less, DC to 500MHz)			
Voltage axis sensitivity setting range	1 MΩ	2 mV/div to 10 V/div (steps of 1-2-5)			
	50 Ω	2 mV/div to 500 mV/div (steps of 1-2-5)			
Max. input voltage	1 MΩ	150 Vrms (CAT I)			
	50 Ω	Must not exceed 5 Vrms or 10 Vpeak			

Frequency characteristics (-3 dB attenuation when inputting a sinewave of amplitude ±3div)*1*2

		DLM202x	DLM203x	DLM205x
1 MΩ (when using passive probe)				
	100 mV to 100 V/div	DC to 200 MHz	DC to 350 MHz	DC to 500 MHz
	20 mV to 50 mV/div	DC to 150 MHz	DC to 300 MHz	DC to 400 MHz
50 Ω				
	10 mV to 500 mV/div	DC to 200 MHz	DC to 350 MHz	DC to 500 MHz
	2 mV to 5 mV/div	DC to 150 MHz	DC to 300 MHz	DC to 400 MHz

Maximum sample rate		
Real time sampling mode	Interleave OFF	1.25 GS/s
	Interleave ON	2.5 GS/s
Repetitive sampling mode		125 GS/s
Maximum record length	2 ch model (Standard)	Repeat/Single/Single Interleave: 1.25 M/6.25 M/12.5 MPoints
	2 ch model (/M1S)	Repeat/Single/Single Interleave: 6.25 M/25 M/62.5 MPoints
	4 ch model (Standard)	Repeat/Single/Single Interleave: 1.25 M/6.25 M/12.5 MPoints
	4 ch model (/M1)	Repeat/Single/Single Interleave: 6.25 M/25 M/62.5 MPoints
	4 ch model (/M2)	Repeat/Single/Single Interleave: 12.5 M/62.5 M/125 MPoints

Logic Signal Input (4 ch model only)

Number of inputs	8 bit (excl. 4 ch input and logic input)
Maximum toggle frequency*1	Model 701988: 100 MHz Model 701989: 250 MHz
Compatible probes	701988, 701989 (8 bit input) (701980, 701981 can also be used)
Display	8.4-inch TFT color liquid crystal display 1024 × 768 (XGA)
Rated supply voltage	100 to 240 VAC
Rated supply frequency	50 Hz/60 Hz
Maximum power consumption	170 VA
External dimensions	226 (W) × 293 (H) × 193 (D) mm (when printer cover is closed, excluding protrusions)
Weight	Approx.4.2kg With no options
Operating temperature range	5°C to 40°C

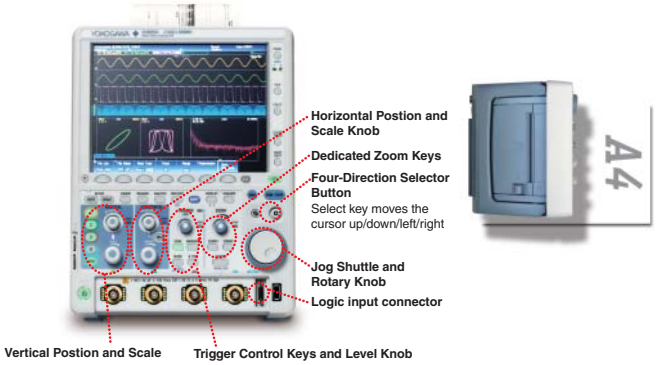
*1 Measured under standard operating conditions after a 30-minute warm-up followed by calibration.
*2 Value in the case of repetitive phenomenon.

Features

Easy-to-Use & Easy-to-See

- Easy to use. Portrait body + large screen makes display easy to see.

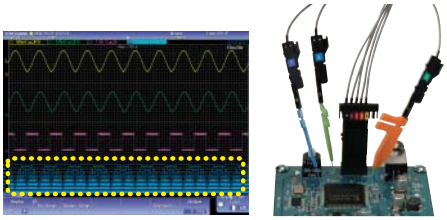
We elevated the large (8.4-inch) LCD screen up into the line of sight. Also, the portrait format saves space on the desk or test bench. A compact personal oscilloscope designed for easy viewing and ease of use.



Signal observation on 4 channels or more...

- Flexible MSO Input

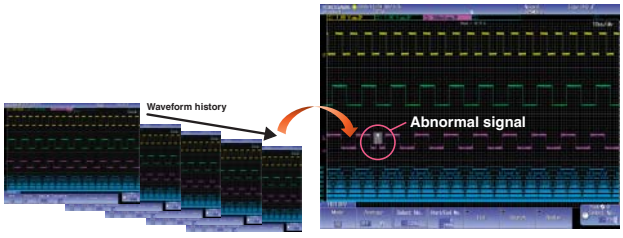
Four channels is not sufficient to view the functioning of digital control circuits. The DLM2000 series converts 4 channels of analog input to 8-bit logic, and functions as a 3 channel analog + 8-bit logic MSO (mixed signal oscilloscope).



You can replay waveforms later on, so you'll never miss an abnormal waveform

- History function

With the DLM2000 series, up to 20,000 previously captured waveforms can be saved in the acquisition memory. With the History function, you can display just one or all of the previously captured waveforms (history waveforms) on screen. You can also perform cursor measurement, computation, and other operations on history waveforms. Using the History function, you can analyze rarely-occurring abnormal signals.



Even complex waveforms can be captured

- Variety of triggers combining analog and logic inputs

The DLM2000 series comes with a variety of triggers ranging from an easy and simple Edge trigger through to sophisticated Enhanced and B triggers. In particular, its ability to freely combine analog and logic inputs is a great feature of this mixed signal oscilloscope equipped with a hybrid channel.

Edge trigger
- Edge

Enhanced triggers
- Edge OR
- Edge (qualified)
- State
- Pulse width
- State width
- Serial: (option) FlexRay/CAN/LIN/UART/I²C/SPI
  : (standard) user-defined
- TV: NTSC/PAL/SDTV/HDTV/user-defined

B triggers
- A Delay B
- A to B(n)
- Dual bus
  (combination trigger of 2 serial busses)

Optimum noise reduction

- Real time filters and filters based on MATH functions

The DLM2000 series has two types of filters, one real time processed at the input circuit and one based on MATH functions. Since the cutoff frequency can also be finely set, these filters are effective in rejecting unwanted signals and observing only the desired signals.

Waveform zoom and search functions

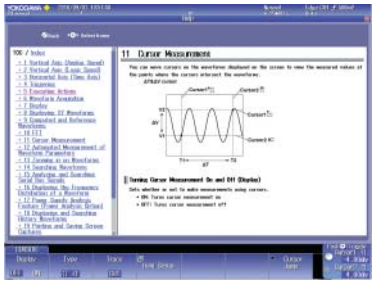
- Zoom two locations simultaneously, zoom search and history search

Because the DLM2000 series lets you set zoom factors independently, you can display two zoomed waveforms with different time axis scales at the same time. Also, using the search functions, you can search the long memory and history memory and instantaneously find desired waveforms that meet the search criteria.

Can check functions with graphical help

- Graphical online help

You can view detailed graphical explanations of the oscilloscope's functions and operations by pressing the "?" key in the lower left of the screen. This lets you get help on functions and operations on screen without having to consult the user's manual.



Analysis Functions

FlexRay/UART/CAN/LIN/I2C/SPI

- Serial analysis function options

A wide variety of trigger conditions can be set, such as ID/Data trigger combinations and combinations of serial bus triggers with normal edge triggers. Up to four busses with different types and speeds can be analyzed simultaneously and decode display can be shown in real time.

Switching loss, joule integral, SOA analysis, and harmonic current based on EN61000-3-2

- Power supply analysis option

Voltage and current waveforms can be input to the 62.5 MW (max.) long memory (/M2 models) for computation of switching loss (V(t) X i(t)). A wide variety of switching loss analyses are supported, including turn on/off loss calculation, loss including conduction loss, and loss over long cycles (50 Hz/60 Hz). Using the cycle mode, you can perform more accurate analysis by cutting out the area of integration to calculate the loss by the switching period. Various other power supply analysis functions are also available.

Models and Suffix Codes

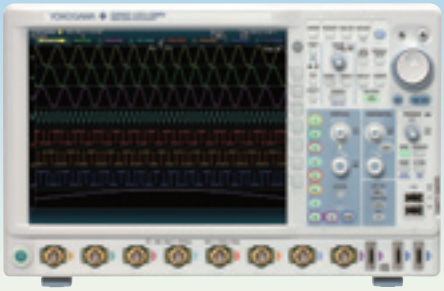
Model	Suffix code	Description
710105		Digital Oscilloscope DLM2022 2ch, 200MHz
710110*1		Mixed Signal Oscilloscope DLM2024 4ch, 200MHz
710115		Digital Oscilloscope DLM2032 2ch, 350MHz
710120*1		Mixed Signal Oscilloscope DLM2034 4ch, 350MHz
710125		Digital Oscilloscope DLM2052 2ch, 500MHz
710130*1		Mixed Signal Oscilloscope DLM2054 4ch, 500MHz
Power cord	-D	UL/CSA standard
	-F	VDE standard
	-Q	BS standard
	-R	AS standard
	-H	GB standard
Language	-HE	English Menu and Panel
	-HC	Chinese Menu and Panel
	-HK	Korean Menu and Panel
	-HG	German Menu and Panel
	-HF	French Menu and Panel
	-HL	Italian Menu and Panel
	-HS	Spanish Menu and Panel
Option	/LN	No switchable logic input (4 ch model only)
	/B5	Built-in printer
	/M1*2	Memory expansion option (4 ch model only) During continuous measurement: 6.25 Mpoints; Single mode: 25 Mpoints (when interleave mode ON: 62.5 Mpoints)
	/M2*2	Memory expansion option (4 ch model only) During continuous measurement: 12.5 Mpoints; Single mode: 62.5 Mpoints (when interleave mode ON: 125 Mpoints)
	/M1S	Memory expansion option (2 ch model only) During continuous measurement: 6.25 Mpoints; Single mode: 25 Mpoints (when interleave mode ON: 62.5 Mpoints)
	/P2*3	Probe power for 2 ch models
	/P4*3	Probe power for 4 ch models
	/C1*4	GP-IB Interface
	/C10*4	Ethernet Interface
	/C11*4	GP-IB + Ethernet Interface
	/C8	Internal storage (1.8 GB)
	/G2*5	User defined math (4 ch model only)
	/G4*5	Power supply analysis function (includes /G2) (4 ch model only)
	/F1*6	UART trigger and analysis (4 ch model only)
	/F2*6	I²C + SPI trigger and analysis (4 ch model only)
	/F3*6	UART + I²C + SPI trigger and analysis (4 ch model only)
	/F4*7	CAN + LIN trigger and analysis (4 ch model only)
	/F5*7	FlexRay trigger and analysis (4 ch model only)
	/F6*7	FlexRay+CAN+LIN trigger and analysis (4 ch model only)
	/EX22*8	Attach two 701946 probes (For 2ch, 200 MHz models)
	/EX24*8	Attach four 701946 probes (For 4ch, 200 MHz models)
	/EX52*9	Attach two 701946 probes (For 2ch, 350/500 MHz models)
	/EX54*9	Attach four 701946 probes (For 4ch, 350/500 MHz models)

*1: Logic probes sold separately. Please order the model 701988/701989 accessory logic probes separately.
*2: Only one of these may be selected at a time.
*3: Specify this option when using current probes or differential probes that don't support probe interface.
*4: Only one of these may be selected at a time.
*5: Only one of these may be selected at a time.
*6: Only one of these may be selected at a time.
*7: Only one of these may be selected at a time.
*8: The 701938 probes are not included when this option is specified.
*9: The 701939 probes are not included when this option is specified.

Oscilloscopes

Mixed Signal Oscilloscopes **DLM4000**

The world's only eight analog channel 500 MHz oscilloscope for faster and more advanced power electronics, automobile electronics, and mechatronics development.



DLM4000
Catalog: Bulletin DLM4000-00EN

CE

Features

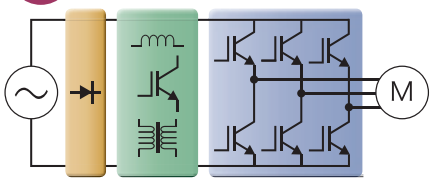
Yokogawa's proprietary new enhanced eight channel oscilloscope comes with a larger display to enable waveforms to be easily viewed and the latest functions.

- 8 analog channels or 7 analog channels + 8-bit logic input
- Optional 16-bit logic input
- Up to 2.5 GS/s
- 350 MHz or 500 MHz frequency bandwidth
- 12.1-inch large display
- Large memory of up to 125 Mpoints
- Light, slim, and compact design

Applications

8ch

Motor Control and Inverter/IPM Circuit Development



Simultaneous multi-channel measurements are a necessity for the development of control circuits, Intelligent Power Module (IPM), and inverter electronics, which are the key to more efficient, compact, and reliable high-performance motors. Up to 8-channel analog waveform measurement of the DLM4000 empowers engineers in this field.

Examples

- Simultaneous measurement of the 3-line voltage and 3-phase current of a 3-phase motor
- Simultaneous measurement of the gate control signals of 6 IGBTs within an inverter

4ch

Limitations of 4ch Scope

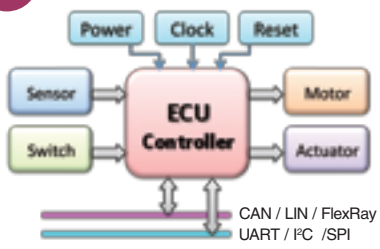
Whole-system measurement is impossible due to a lack of analog input channels when, for example, measuring the overall timing of the control signals, checking an error of the phase-to-phase balance between 3 phases, and simultaneously measuring the I/O signals of a motor driver IC.

Limitations of Two Synchronized 4ch Scopes

Eight channel measurement using two trigger-synchronized oscilloscopes is a possible solution but it does not help increase efficiency because there are various problems. For example, the data is not reliable due to the lack of guarantee of the synchronization of two oscilloscopes. Double the space is required and they are difficult to carry around. The different design and operations of each of the two oscilloscopes are cumbersome. The response is slow and handling of the measurement data is tricky.

8ch

Automobile ECU and Integrated Mechatronics Device Development



Electronic Control Unit (ECU) and controller I/O signals must be measured simultaneously at high speed. To meet this requirement, the DLM4000 offers eight analog channels, logic measurement, and protocol analysis (communication data decoding) functions such as UART (RS232), I2C, SPI, CAN, and LIN to help speed up the R&D process.

Examples

- Simultaneous measurement of controller I/O signals and serial bus signals
- Measurement of the analog behavior of logic signals and serial bus signals

4ch

Limitations of 4ch + 16-bit MSO

ECUs, controllers, and driver ICs handle many I/O signals but the 4-channel + 16-bit MSO cannot measure all the signals. Furthermore, it measures bus communication signals and digital signals using logic input so it cannot measure waveform quality and noise margin. Therefore, it is difficult to increase stability and reliability.

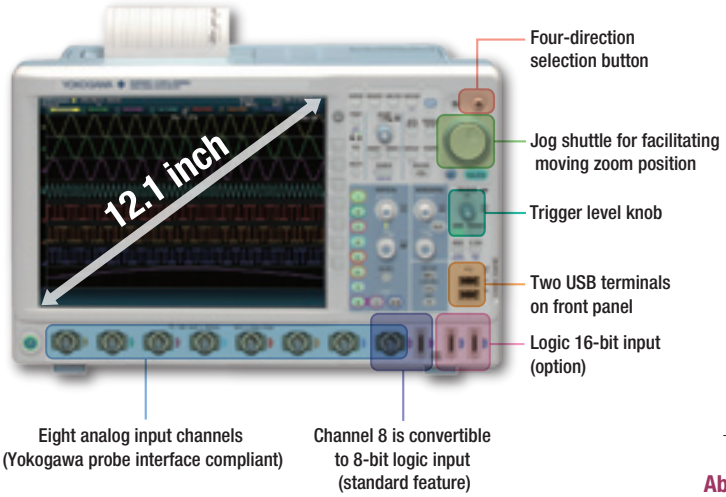
Recorder

Limitations of Memory Recorder

A memory recorder is generally suitable for long-time multi-channel measurement, but due to its low sampling rate and slow waveform update speed, its performance is not adequate for measuring high-speed signals and communication signals of CPUs and FPGAs, or detecting noise that causes problems or error signals.

The portable eight-channel DLM4000 is the daily instrument of choice. Maximum easiness of use coupled with minimum depth and weight

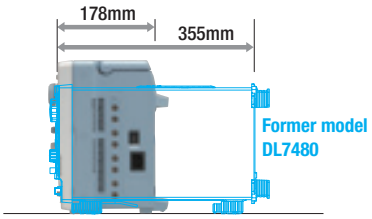
12.1-inch large LCD display enables eight waveforms to be easily viewed



Portable

Approx. 6.6 kg

Soft carrying case (sold separately) available



Modest 178 mm depth
About half of the former model DL7480

Specifications

Input Channels: 8 analog channels, or 7 analog channels + 8 logic channels (standard)
8 analog channels + 16 logic channels, or 7 analog channels + 24 logic channels (/L16 option)

Analog Input:
Frequency bandwidth: 350 MHz (DLM4038) or 500 MHz(DLM4058)
Voltage axis sensitivity setting range:
2 mV/div to 10 V/div for 1 M ohm
2 mV/div to 500 m V/div for 50 ohm
Voltage axis DC accuracy: ±(1.5% of 8 div + offset voltage accuracy)
A/D conversion resolution: 8-bit

Logic Input
Maximum toggle frequency: 100 MHz (701988) or 250 MHz (701989)
Probes that can be used: 701988 and 701989 (701980 and 701981)
Minimum input voltage: 500 mVp-p (701988) or 300 mVp-p (701989)
Input range: ±40 V (701988)
Threshold level ±6 V (701989)
Maximum non-destructive input voltage:
±40 V (DC + AC peak) or 28 Vrms (701989)
Threshold level setting range: ±40 V (701988) or ±6 V (701989)

Common Specifications
Maximum sampling rate
Real-time sampling mode: Interleave OFF: 1.25 GS/s
Interleave ON: 2.5 GS/s
Repetitive sampling mode: 125 GS/s
Time axis setting range: 1 ns/div to 500 s/div
Maximum record length: Repeat: 1.25 Mpoints, Single: 6.25 Mpoints, Single Interleave: 12.5 Mpoints (standard)
Repeat: 12.5 Mpoints, Single: 62.5 Mpoints, Single Interleave: 125 Mpoints (/M2 option)
History memory maximum data:
2,500 (record length 1.25 kPoints; standard)
20,000 (record length 1.25 kPoints; /M2 option)
Trigger modes: Auto, Auto Level, Normal, Single, N-Single
Trigger types: Edge, Edge OR, Edge Qualified, State, Pulse Width, State Width, TV, Serial Bus (I2C/SPI/UART/CAN/LIN/FlexRay/UserDefine), A Delay B, A to B (N), Dual Bus, Force
Internal storage: 1.8 GB (standard) or 7.2 GB (/C8 option)
Interfaces: USB peripheral connection terminal x2
USB-PC connection terminal x1
Ethernet (standard), GP-IB (option)
Build-in printer: 112 mm wide, monochrome, thermal
Display: 12.1-inch color TFT LCD 1024 x 768 (XGA)
Dimensions: 426 (W) x 266 (H) x 178 (D) mm
Weight: approx. 6.6 kg (with no options)

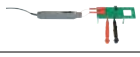
Models and Suffix Codes

Model	Suffix Code	Description
DLM4038*1		Mixed Signal Oscilloscope: 8ch, 350 MHz
DLM4058*1		Mixed Signal Oscilloscope: 8ch, 500 MHz
Power cord	D	UL/CSA standard
	-F	VDE standard
	-Q	BS standard
	-R	AS standard
	-H	GB standard
	-N	NBR standard
Language	-HE	English Message and Panel
	-HC	Chinese Message and Panel
	-HK	Korean Message and Panel
	-HG	German Message and Panel
	-HF	French Message and Panel
	-HL	Italian Message and Panel
	-HS	Spanish Message and Panel
Option	/L16	Logic 16-bit
	/B5	Built-in printer
	/M1*2	Memory expansion During continuous measurement: 6.25 Mpoints; Single mode: 25 Mpoints (when interleave mode ON: 62.5 Mpoints)
	/M2*2	Memory expansion During continuous measurement: 12.5 Mpoints; Single mode: 62.5 Mpoints (when interleave mode ON: 125 Mpoints)
	/P8*3	Eight probe power connectors
	/C1	GP-IB Interface
	/C8	Internal storage (7.2 GB)
	/G2*4	User defined math
	/G4*4	Power supply analysis function (includes /G2)
	/F1*5	UART trigger and analysis
	/F2*5	I²C+SPI trigger and analysis
	/F3*5	UART+I²C+SPI trigger and analysis
	/F4*6	CAN+LIN trigger and analysis
	/F5*6	FlexRay trigger and analysis
	/F6*6	FlexRay+CAN+LIN trigger and analysis
	/E1*7	Four additional passive probes (8 in total)
	/E2*7	Attach four 701946 probes*8
	/E3*7	Attach eight 701946 probes*8

*1: Logic probes are not included. Please order the accessory logic probe 701988/701989 sold separately.
*2: Only one of these options can be selected at a time.
*3: Specify this option when using current probes or differential probes that don't support probe interface.
*4: Only one of these options can be selected at a time.
*5: Only one of these options can be selected at a time.
*6: Only one of these options can be selected at a time.
*7: Only one of these options can be selected at a time.
*8: The 701939 passive probes are not included when this option is specified.

Oscilloscopes

Waveform Measuring Oscilloscopes Accessories

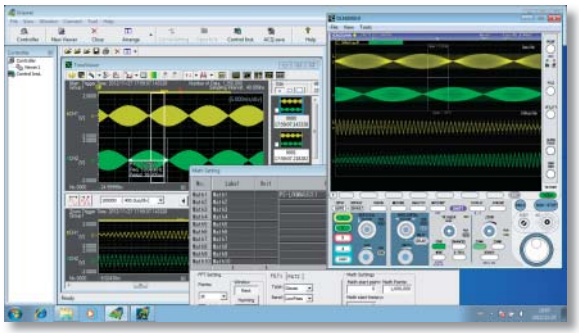
Classification	Product	Model No.	Power supply		Description	
			Probe interface terminal (front panel)(*2)	Probe power (option)/probe power supply (sold separately)		
Passive	200MHz passive probe	**701938**			DC to 200 MHz, 10:1, 1.5 meters	
	500MHz passive probe	**701939**			DC to 500 MHz, 10:1, 1.3 meters	
	500 MHz Miniature passive probe	**701946**			DC to 500 MHz, 10:1, 1.2 meters	
Passive (High-voltage)	100:1 High voltage probe	**701944**			DC to 400 MHz, 100:1, 1.2 meters	
	100:1 High voltage probe	**701945**			DC to 250 MHz, 100:1, 3.0 meters	
Active, FET	PBA2500 (2.5 GHz active probe)	**701913**	○		DC to 2.5 GHz, 10:1, 1.2 meters	
	PBA1500 (1.5 GHz active probe)	**701914**	○		DC to 1.5 GHz, 10:1, 1.2 meters	
	PBA1000 (1.0 GHz active probe)	**701912**	○		DC to 1.0 GHz, 10:1, 1.2 meters	
	900 MHz FET Probe	**700939**		○	DC to 900 MHz, 1.5 meters	
Resistance	PBL5000 (5 GHz low capacitance probe)	**701974**			DC to 5 GHz, 10:1, 20:1, 0.95 meters	
Differential	PBD 2000 (2 GHz differential probe)	**701923**	○		DC to 2 GHz, 10:1, Max. differential input voltage: ±5 V, 1.2 meters	
	PBDH 1000 1GHz differential probe	**701924**	○		DC to 1 GHz, 50:1 Max. differential input voltage: ±25V	
	PBDH 0150 150 MHz differential probe	**701927**	○		DC to 150 MHz, 50:1, 500:1 Max. differential input voltage: ±140 V (50:1), ±1400 V (500:1)	
	500 MHz differential probe	**701920**		○	DC to 500 MHz, 10:1, Max. differential input voltage: ±12 V	
	200 MHz differential probe	**701922**		○	DC to 200 MHz, 10:1, Max. differential input voltage: ±20 V	
	100 MHz differential probe	**701921**		○ (*3)	DC to 100 MHz, 10:1, 100:1, Max. differential input voltage: ±70 V (10:1), ±700 V (100:1)	
	100 MHz differential probe	**700924**		○ (*4)	DC to 100 MHz, 100:1, 1000:1, Max. differential input voltage: ±350 V (100:1), ±1400 V (1000:1)	
	50MHz high voltage differential probe	**701926**		○ (*3)	DC to 50 MHz, 100:1, 1000:1, Max. differential input voltage: 700Vpeak(100:1), 7000Vpeak(1000:1)	
	15 MHz differential probe	**700925**		○ (*4)	DC to 15 MHz, 10:1, 100:1, Max. differential input voltage: ±50 V (10:1), ±500 V (100:1)	
Current	PBC100 Current probe	**701928**	○		DC to 100MHz 30 Arms	
	PBC050 Current probe	**701929**	○		DC to 50MHz 30 Arms	
	Current probe	**701932**		○	DC to 100 MHz, 30 Arms	
	Current probe	**701933**		○	DC to 50 MHz 30 Arms	
	Current probe	**701931**		○	DC to 2 MHz, 500 Arms	
	Current probe	**701930**		○	DC to 10 MHz 150 Arms	
Logic	PBL100 (100MHz Logic probe)	**701988**			Input impedance 1 MΩ Max. toggle frequency: 100 MHz	
	PBL250 (250MHz Logic probe)	**701989**			Input impedance: 100 kΩ Max. toggle frequency: 250 MHz	
Other	De-skew correction signal source	**701936**			Voltage/current signal de-skew Supports through-type current transformers and a variety of current probes, including large current probes	
	Probe power supply	**701934**			Large current output, external probe power supply (4 outputs)	
	Probe stand	**701919**			Diameter of attachable probe ø8 to 13mm Weight : Approx. 1.5 kg	

*1: These specifications are a summary. For details, please refer to the Web site, catalog, and other documentation. *2: Available as standard for the DLM2000, DLM6000, DL6000 and DLM4000 series.
*3: Can also be battery operated. *4: A power cable (B9852MJ) sold separately is required. Can also be battery operated.
In addition to those listed above, there are other accessories available. For details, please refer to the Web site.
When using multiple current probes using the probe power of the main unit, ensure that the total power supply current of the current probes does not exceed the maximum output current of the probe power.

Oscilloscope Application Software

Xviewer/MATLAB tool kit

Instrument control & data analysis on Your PC



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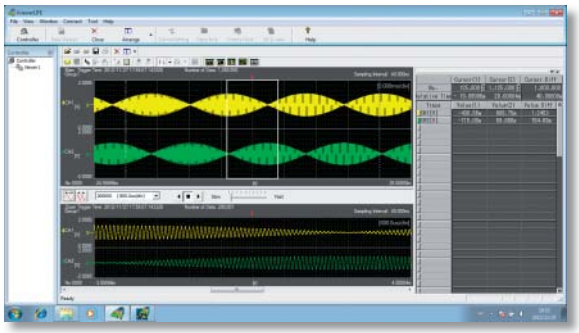
Xviewer

Xviewer is a PC software application designed to work with Yokogawa's DL/DLM Series and the ScopeCorders. Xviewer allows you to display DL-acquired waveform data (using the "Viewer" function), perform file transfers, and control DL/DLM Series from a PC.

Free data viewer

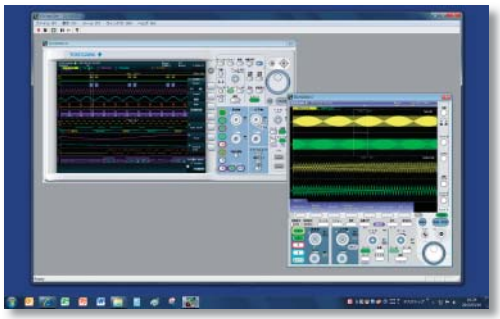


XviewerLITE

(Free software)

XviewerLITE is a free data viewer software with no restriction for period of service for DLM/DL/SL series. It allows you to display acquired ware form on a PC. Zoom, vertical cursor measuremet and CSV format conversion are possible.

Remote Control Measuring Instrument on Your PC

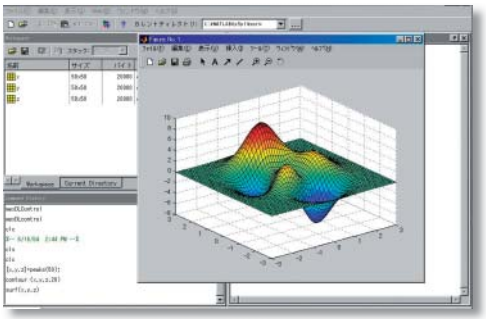


XWirepuller/Wirepuller

(Free software)

With this software, you can display the front panel of the DLM/DL/SL series on the screen of a PC, and monitor waveform signals. You can perform control from the PC using the mouse and keyboard in the same way as you operate the main unit.

Plug-in for MATLAB software



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MATLAB tool kit

The MATLAB tool kit for the DL Series is a plug-in for MATALAB software. The toolkit can be used to control supported instruments using MATLAB or to acquire data from the instruments to use in MATLAB via a communication interface (GP-IB, USB, Ethernet).

In addition to the above, various kinds of accessory software, free software, LabVIEW drivers, and LabWindows/CVI drivers, can be downloaded from our web site.

Digital Power Analyzers

Selection Guide

Digital Power Analyzer

Yokogawa's PX8000 and WT Series Power Meters and Power Analyzer:
Advanced Technology and High Reliability for a Wide Range of Power Measurement Solutions

WT Series

Models / Items	WT310/WT330  ...P28	WT500  ...P23	WT3000  ...P24	WT1800  ...P26	PX8000  ...P30
Features	New Entry Class Digital Power Analyzers 4 models line up, equipping 5 mA range (WT310), 40 A range (WT310HC), and 2 or 3 CH inputs (WT332/WT333) Standard Communication I/F and auto-ranging under integration mode	Low-Middle Class Power Analyzer Compact half rack size and easy use Max. 1000V and 40A input Simultaneous measurement U, I, P and those harmonics components External USB memory for direct data saving	Top model of Digital Power Analyzer With basic power accuracy of ±0.02% of reading, DC and 0.1 Hz-1 MHz measurement bandwidth, and up to four input elements, the model provides higher-accuracy measurement of inverter Input/Output efficiency.	Middole Class Digital Power Analyzer Up to six Input elements in one instrument (3 phase power input from two systems in one unit) 8.4-Inch XGA TFT Color LCD Wide voltage and current input range	A power analyzer with capabilities of transient power measurement and waveform parameter measurement Fast sampling up to 100 MS/s, Broad bandwidth up to 20 MHz (-3 dB), Trend measurement of each cycle, Specified period measurement by cursor
Input elements	1(WT310,WT310HC), 2 (WT332), 3(WT333)	1 to 3	1 to 4	1 to 6	Module structure, 1 to 4 power measurement element
Basic power accuracy (50/60 Hz)	0.1% of rdg + 0.1% of rng	0.1% of rdg + 0.1% of rng	0.02% of rdg + 0.04% of rng	0.1% of rdg + 0.05% of rng	0.1% of reading + 0.1% of range
Power measurement frequency range	DC, 0.5 Hz to 100 kHz (WT310HC is up to 20 kHz)	DC, 0.5Hz to 100 kHz	DC, 0.1 Hz to 1 MHz	DC, 0.1 Hz to 1 MHz	DC, 0.1Hz to 1MHz
Input voltage range (for crest factor 3)	15/30/60/150/300/600/ V	15/30/60/100/150/300/600/1000 V	15/30/60/100/ 150/300/600/1000 V	1.5/3/6/10/15/30/60/ 100/150/300/600/1000 V	1.5/3/6/10/15/30/60/100/150/300/600/ 1000 V
Input current range (for crest factor 3)	Direct input: 5 m/10 m/20 m/50 m/100 m/ 200 m/500 m/1/2/5/10/20 A (WT310) Direct input: 1/2/5/10/20/40 A (WT310HC) Direct Input: 500m/1/2/5/10/20 A (WT332,WT333) External input(option): 2.5/5/10 V, or 50 m/100 m/200 m/500 m/1/2 V	Direct input: 500 m/1/2/5/10/20/40 A External sensor input (option): 50m/ 100 m/250 m/500 m/1/2/5/10 V	Direct input: 0.5/1/2/5/10/20/30 A or 5 m/10 m/20 m/50 m/100 m/200 m/ 500 m/1/2 A External input: 50 m/100 m/200 m/500 m/1/2/5/10 V	Direct input: 10 m/20 m/50 m/100 m/200 m/ 500 m/1/2/5 A or 1/2/5/10/20/50 A External input (option): 50 m/100 m/250 m/500 m/ 1/2.5/5/10 V	Direct input: 10 m/20 m/50 m/100 m/ 200 m/500 m/1/2/5 A External sensor input: 50 m/100 m/ 250 m/500 m/1/2.5/5/10 V
Measurement parameters	Voltage, Current, Active power, Reactive power, Apparent power, Power factor, Phase angle. Peak voltage, Peak current, Frequency, Crest factor, Integration (power and current), Harmonic distortion, Harmonic components	Voltage, Current, Active power, Reactive power, Apparent power, Power factor, Phase angle, Peak voltage, Peak current, Voltage frequency, Current frequency Active power integration and Current integration for both charge/ discharge and sold/bought, crest factor, Efficiency, harmonic analysis	Voltage, Current, Active power, Reactive power, Apparent power, Power factor, Phase angle, Peak voltage, Peak current, Voltage Frequency, Current Frequency, Active power integration, Apparent power integration, Reative power integration, Current integration, Corrected power, Crest factor, Efficiency, Harmonic analysis	Voltage, Current, Active power, Apparent power, Reactive power, Power factor, Phase angle, Peak voltage, Peak current, Voltage Frequency, Current Frequency, Active power integration, Current integration, Crest factor, Form factor, Impedance, Resistance, Reactance, Corrected Power, Harmonic analysis	Voltage, Current, Active power, Reactive power, Apparent power, Power factor, Phase angle, Peak voltage, Peak current, Voltage frequency, Current frequency Transient voltage/current/power(Trend of waveform by cycle), Averaged voltage/ current/power by cursor(waveform parameters calculation)
Display	7 Segment LED, 4 displays	5.7-inch TFT color LCD	8.4-inch TFT color LCD	8.4-inch XGA TFT color LCD	10.4 inch TFT color LCD (XGA)
External dimensions (mm) (W × H × D)	213 × 88 × 379 (WT310 and WT310HC) 213 × 132 × 379 (WT332 and WT333)	213 × 177 × 408.5	426 × 177 × 459	426 × 177 × 459	355 × 259 × 180
Weight (kg)	3 (WT310), 5 (WT330)	6.5	15	15	6.5 (without any options and paper)

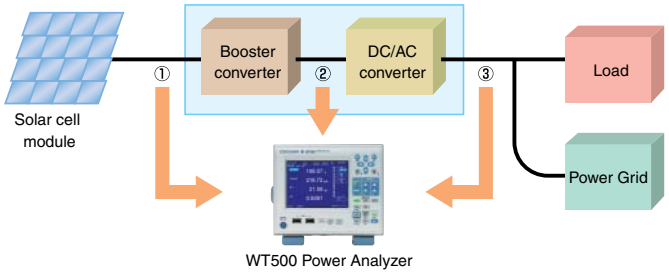
***About CW series Clamp-on Power Meters, please refer to the page 65.**

Power Analyzer **WT500**

Compact and easy to use. The Power Analyzer for the renewable energy generation

WT500

Overview of a Photovoltaic Power Conditioner



Basic Specifications

- Measurement voltage range: (for crest factor 3)
  15/30/60/100/150/300/600/1000V
- Measurement current range: (for crest factor 3)
  Direct input 500 m/1/2/5/10/20/40A
  External sensor input (option)
  50 m/100 m/200 m/500 m/1/2/5/10V
- Frequency range:
  DC, 0.5Hz to 100kHz
- Measurement Accuracy:
  Basic Accuracy (45Hz ≤ f ≤ 66Hz and DC)
  Voltage/Current/Power
  ± (0.1% of rdg + 0.1% of rng)
- USB interface to PC is standard feature
- Ethernet communication function is available (optional)
- GP-IB communication function is available (optional)
- Effective of power factor (at cos ϕ =0)
  ± 0.2% of S (apparent power)
- External dimensions:
  Approx. 213(W) × 177(H) × 408.5(D) mm
- Weight: Approx. 6.5kg (with 3-input element)

Overview

The WT500 is a low-middle class power analyzer and it features a 5.7-inch color TFT and half width racking compact body that enable s single-phase and three-phase power measurement, achieving ±0.1% of reading basic and DC accuracy, maximum input of 1000Vrms, 40Arms and a measurement bandwidth up to 100kHz.

Features

- Accurate efficiency measurement of DC and AC signals
- RMS, MEAN, DC, AC and RMEAN of voltages and currents simultaneous measurement.
- Simultaneous measurement of normal U/I/P data and those harmonic data
- As fast as 100ms data capturing and store data with all channels
- Separate integration functions for charge/discharge or bought/sold power
- Integration of power, reactive power, apparent power, and current enables you to determine a device's average power consumption
- Harmonics (DC-50th order) and Total harmonic distortion (THD) can be measured
- Saving measured data directly to external USB memory
- Measurement values can be saved as images or numerical data, and can be pasted into reports, analyzed in spreadsheet software, or used in a variety of other ways
- Easy setup with cursor keys
- GP-IB, USB and Ethernet communication are available

Model Number and Suffix Codes

Model	Suffix Codes	Description
760201		WT500 1 input element model
760202		WT500 2 input elements model
760203		WT500 3 input elements model
Power cord	-D	UL/CSA standard
	-F	VDE standard
	-R	SAA standard
	-Q	BS standard
	-H	GB standard
Options	/C1	GP-IB interface
	/C7	Ethernet interface
	/EX1	External sensor input for 760201
	/EX2	External sensor input for 760202
	/EX3	External sensor input for 760203
	/G5	Harmonic Measurement
	/DT	Delta computation (760202/03 only)
	/FQ	Add-on Frequency Measurement (760202/03 only)
	/V1	VGA Output

Note: Adding input modules after initial product delivery will require rework at the factory. Please choose your models and configurations carefully, and inquire with your sales representative if you have any questions.

Digital Power Analyzers

Precision Power Analyzer **WT3000**

Best-in-class*1 Precision and Stability with Basic Power Accuracy: ±0.06% of Total More Precise, More Bandwidth, and Simultaneous Measurement

(*1: As of March 2014, for power accuracy in a three-phase power meter as investigated by Yokogawa)

WT3000

Features

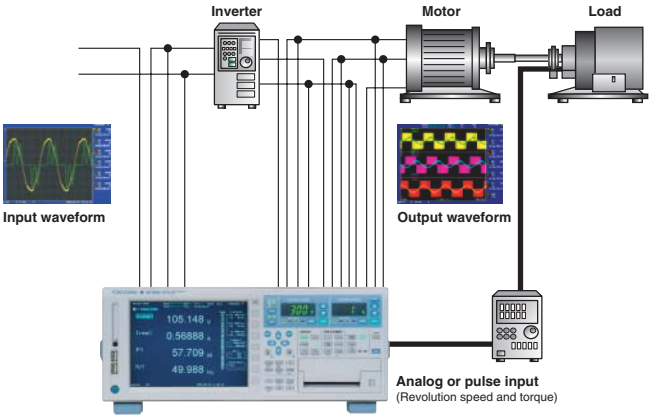
The WT3000 has the highest precision of all the Yokogawa power analyzers in the WT series. The WT3000 can be used as a reference instrument for calibration and to measure the power and conversion efficiency of power transformers such as an inverter. It helps increase efficiency in evaluation and testing.

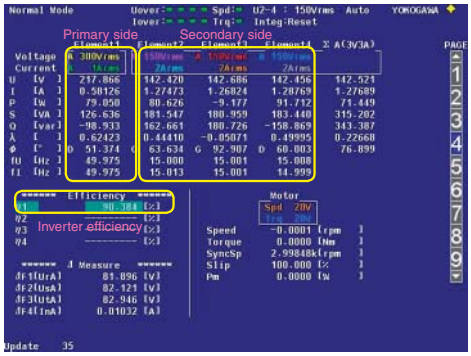
- Basic power accuracy ±0.06% of total, the highest precision of all power analyzers in the WT series
- Up to four input elements to achieve accurate measurement of input and output conversion efficiency
- Motor efficiency and total efficiency measurement of the motor version
- Simultaneous harmonic measurement without changing measuring modes (option)
- Wide bandwidth harmonic measurement between 0.1 Hz and 2.6 kHz of the fundamental waveform (option)
- USB (media, keyboard, PC connection) (option)
- Ethernet interface (option)
- Harmonic measurement compliant with IEC61000-3-2/12 and (option)
- Voltage fluctuation/flicker measurement compliant with IEC61000-3-3/11 (option)

Applications to Utilize WT3000 Precision Power Analyzer's Capabilities

High-precision measurement of motor/inverter efficiency

Growing interest in energy conservation of late increases the need to evaluate motor/inverter efficiency with high precision. The WT3000 offers up to four voltage and four current inputs and is capable of high-precision measurement of single-phase input and three-phase output to evaluate the inverter efficiency.
A motor evaluation function (option) allows you to observe changes in voltage, current, and power while at the same time observing changes in revolution speed and torque, and calculate and display mechanical power and total efficiency.
Also, you can synchronize two units and take measurements, and WTViewer software for data acquisition allows you to compare the power of the two units and calculate the efficiency.

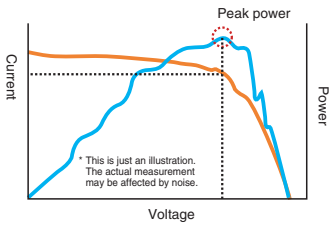




Example of measurement data display on the primary and secondary sides

Measuring instantaneous peak power in photovoltaic power generation

In photovoltaic power generation, MPPT control varies the voltage to maximize energy harvested from the solar panel. The WT3000 allows you to measure voltage, current, and power, as well as peak voltage and peak current (on the plus and minus sides, respectively). Also, the user-defined MATH allows you to measure the instantaneous peak power (on the plus and minus sides).

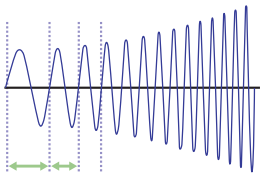


MPPT: Maximum Power Point Tracker
Example of measurement results of voltage, current, and power under control

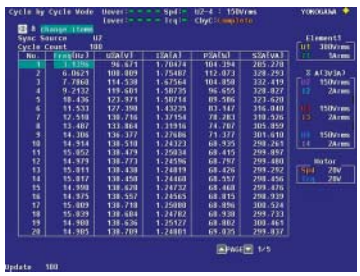
Example of power (P1) and instantaneous peak power on the plus (F1) and minus (F2) sides

Cycle-by-cycle function allows measuring voltage, current, and power for each cycle

To observe the rising characteristic of a starting motor or the like, you may want to acquire data for each cycle instead of at specified time intervals. The cycle-by-cycle measurement (/CC option) of the WT3000 allows you to measure the following parameters: voltage, current, active power, apparent power, reactive power, power factor, speed, torque, and mechanical power. Up to 3,000 periods of measurements can be taken.



Cycle-by-cycle data computation



Example of cycle-by-cycle measurement of three-phase voltage, current, active power, and apparent power

Example of LED driving circuit and measurement

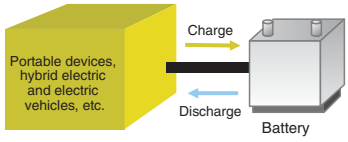
Lighting equipment is shifting from incandescent to fluorescent lamps. Furthermore, in recent years, long-life, low power consumption LEDs are attracting attention. To increase the power conversion efficiency of an LED driving circuit (drive module), it is necessary to measure the voltage, current, and power of input and output with high precision. The WT3000 provides the best-in class accuracy to measure the power conversion efficiency of input and output.

Example of DC voltage, current, and power at three points and conversion efficiency measurement.

Rear panel (4 input elements and options)

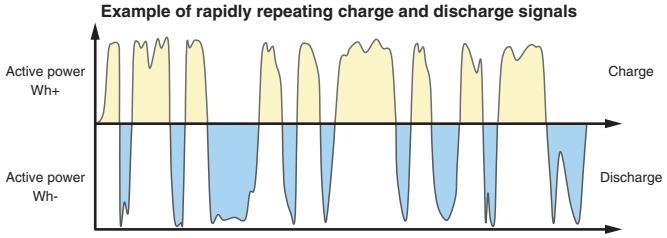
Measuring battery charge and discharge (Ah/Wh)

For battery-powered equipment such as portable devices and electric-powered bicycles, engineers must often perform short-duration charge/discharge tests under actual operating conditions. Since the WT3000 employs a digital sampling system, each rapidly changing charge/discharge current and power can be integrated without gaps. This is effective in the evaluation of ampere-hours and watt-hours for calculating battery life.



Example of display of total watt hours (on the plus and minus sides)

Example of rapidly repeating charge and discharge signals



Charge and discharge current Ah (power Wh) can be integrated respectively.

Specifications

Voltage direct input range	: 15/30/60/100/150/300/600/1000 V
Current direct input range	: 0.5/1/2/5/10/20/30 A or 5 m/10 m/20 m/ 50 m/100 m/200 m/500 m/1/2 A
Current sensor input range	: 50 m/100 m/200 m/500 m/1/2/5/10 V
Frequency bandwidth	: DC, 0.1 Hz to 1 MHz
Basic accuracy (45 Hz to 66 Hz)	(30 A input element)
Voltage/current	0.01% of rdg*1 + 0.03% of rng*2
Power	0.02% of rdg*1 + 0.04% of rng*2
Data update period	: Select from 50 ms, 100 ms, 250 ms, 500 ms, 1 s, 2 s, 10 s, and 20 s
Power factor influence:	0.03% of S (apparent power) when cos ϕ =0
A/D converter	Simultaneous voltage and current conversion, 16-bit resolution Conversion speed approx. 5 µs
Display	8.4-inch color TFT LCD monitor
Built-in printer (option)	Thermal line-dot, paper width 112 mm
PC card port, USB port (option)	
External dimensions	: Approx. 426 (W) × 177 (H) × 459 (D) mm (excluding protrusions)
Weight	: Approx. 15 kg (main unit, four input elements, options)

*1: 1 rdg: reading *2: 1 rng: range

Model Number and Suffix Code

■Precision Power Analyzer WT3000

Model	Suffix Codes		Description
760301			WT3000 1 input element model
760302			WT3000 2 input elements model
760303			WT3000 3 input elements model
760304			WT3000 4 input elements model
Element number	-01	30A input element	for 760301 model
	-02		for 760302 model
	-03		for 760303 model
	-04		for 760304 model
	-10	2A input element	for 760301 model
	-20		for 760302 model
	-30		for 760303 model
	-40		for 760304 model
Version	-SV		Standard Version
	-MV		Motor Version
Power cord	-D		UL/CSA standard
	-F		VDE standard
	-R		AS standard
	-Q		BS standard
	-H		GB standard
	-N		NBR standard
Options	/G6		Advanced Computation (IEC standard testing*, harmonic, FFT, Waveform computation)
	/B5		Built-in Printer
	/DT		Delta Calculation
	/FQ		Add-on Frequency Measurement
	/DA		20ch D/A output
	/V1		VGA Output
	/C2	Select one	Serial (RS-232) Interface
	/C12		USB port (PC)
	/C5		USB port (Peripheral)
	/C7		Ethernet function
	/CC		Cycle by Cycle
	/FL		Voltage Fluctuation, Flicker

* requires 761922 software

Note: Adding input modules after initial product delivery will require rework at the factory. Please choose your models and configurations carefully, and inquire with your sales representative if you have any questions.

For common optional accessories, please see page 35

Digital Power Analyzers

High Performance Power Analyzer **WT1800**

Broad Ranges Power Measurement with One Unit

WT1800
Bulletin WT1800-00EN

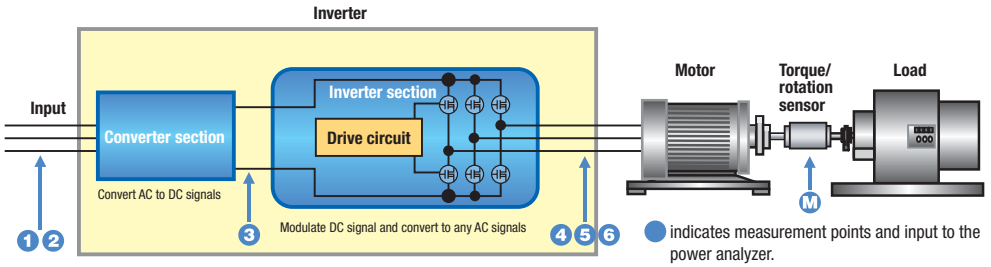
CE

Overview

The WT1800 High performance power analyzer can measure both the small currents called for by energy saving designs as well as the large currents involved in large-sized loads. As it handles voltages ranging from 1.5 V to 1000 V, it has a wide variety of uses. Since 3 phase power can be input from two separate systems (6 inputs), you only need one WT1800 to simultaneously measure Input/Output signals from inverters with normal/harmonics data as fast as 50ms.

- Basic Power Accuracy +/-0.1% of reading
- DC Power Accuracy +/-0.05% of reading
- Voltage/Current Bandwidth 5 MHz (-3 dB, typical)
  Voltage, 5A direct input, external sensor input
- Sampling Rate 2 MS/s (16-bit resolution)
- Input Element number Max. 6
- Current Measurement 100 µA to 55 Arms direct

Input/Output Efficiency Measurements of Inverters, Matrix converters, Motors, Fans, and Pumps



indicates measurement points and input to the power analyzer.
M indicates connecting the motor output to the motor signal input (/MTR) of the power analyzer

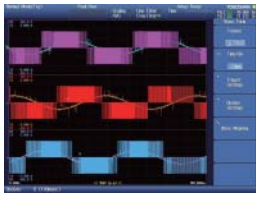
Overview The WT1800 is capable of performing up to 6 power input measurements to make it possible to perform an inverter efficiency test between the input and output in inverter evaluation. In addition, a motor evaluation function (option) makes it possible to simultaneously monitor voltage, current, and power changes, as well as rotation speed and torque changes.

Advantages of WT1800

• 5 MHz range and 2 MS/s high-speed sampling

The vertical resolution in power measurements is one of the important elements for high-precision measurements.
The WT1800 is capable of 16-bit high resolution and approximately 2 MHz sampling to make it possible to measure faster signals with higher precision.

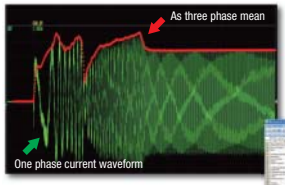
Voltage/ current range 5 MHz
Approx. 2 MS/s 16-bit



• ms response capability (/HS Option)

ms response
HS filter

The High Speed data capturing /HS option can measure ΣUrms, ΣIrms and ΣP from single phase (DC signal) and three phase devices every 5 ms (When External Synchronization is OFF) or, 1 ms to 100 ms when External Synchronization is ON (depending on the frequency of the clock signal). It outputs data in 1 s blocks to internal/external memory or to a PC through a communications interface.
The average characteristic is set using the cutoff frequency of the HS filter for measured data during 5 ms or 1 ms to 100 ms period. The cutoff frequency can be varied from 1 Hz to 1,000 Hz in 1 Hz steps.



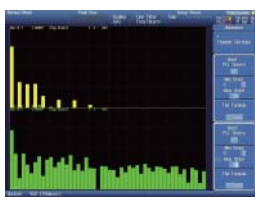
Comparison between a phase current waveform and three phase current values of every 5ms

Data analysis and graph drawing by data calculation software

• Dual harmonic measurement (/G6 option)

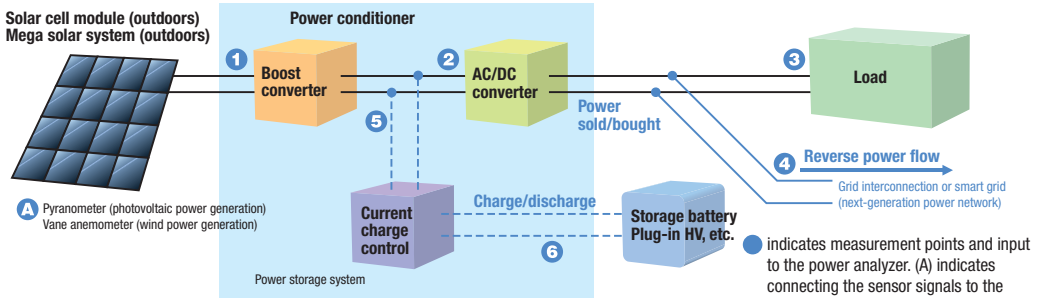
The WT1800 is capable of performing two-line simultaneous harmonic measurements with one unit for the first time in the industry.
The ability to simultaneously measure harmonics for the input and output signals not only reduces the switching time but also makes it possible to perform simultaneous data analysis for the input and output, which has not been possible with the previous models.

Dual harmonic measurement
Simultaneous input/output measurement
Up to the 500th order



The following measurements can be performed for up to the 500th order
Single harmonic measurement (/G5 option)
Dual harmonic measurement (/G6 option)

Power Generation and Conversion Efficiency Measurements in New Energy Markets, including Photovoltaic and Wind Power Generation



Power Flow of Photovoltaic Power Generation

Overview

Energy generated by photovoltaic cell modules and wind turbines is converted from DC to AC by a power conditioner. Furthermore, the voltage is converted by a charge control unit for the storage battery. Minimizing losses in these conversions improves efficiency in the overall energy system. The WT1800 is capable of providing up to 6 channels of power inputs per unit to make it possible to measure the voltage, current, power, and frequency (for AC) before and after each converter, as well as converter efficiency and charging efficiency.

Advantages of WT1800

• Max. 1000 V/50 A x 6-line direct measurement

Wide voltage/current range

Efficiency measurement

Synchronized operation

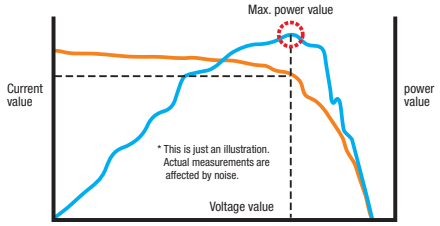
Direct input terminals in a voltage range from 1.5 V to 1000 V and current range from 10 mA to 5 A or 1 A to 50 A make it possible to perform high-precision measurements without using a current sensor. Furthermore, power conditioner evaluation requires multiple-channel power measurements, such as inputs/outputs from a boost converter, inverter, and storage battery. The WT1800 is capable of providing up to 6 channels of power inputs to make it possible to simultaneously perform power measurements at multiple points with one unit. In addition, two units can be operated in synchronization for multi-channel power evaluation.

• Maximum Power Peak Tracking (MPPT) measurement

MPPT

Maximum power peak value

In photovoltaic power generation, an MPPT control is performed to effectively utilize voltage generated by photovoltaic cells in an attempt to maximize the harvested power.
The WT1800 is capable of measuring not only the voltage, current, and power but also the voltage, current, and power peak values (plus (+) and minus (-) sides, respectively). Also, the maximum power peak value (plus (+) and minus (-) sides) can be measured.



Typical voltage, current, and power measurements in MPPT control

Basic Specifications

- Measurement Voltage range: (for Crest factor 3)
  1.5/3/6/10/15/30/60/100/150/300/600/1000 V
- Measurement Direct Current range: (for Crest factor 3)
  5 A input element
  10 m/20 m/50 m/100 m/200 m/500 m/1/2/5 A
  50 A input element
  1/2/5/10/20/50 A
- Measurement External Current Sensor range: (for Crest Factor 3)
  50 m/100 m/200 m/500 m/1/2/5/10 V
- Band width: DC, 0.1 Hz to 1 MHz
  (5A direct Current input, External Current Sensor input)
  DC, 0.1 Hz to 200 kHz (50 A direct Current input)
- Basic Accuracy: (45 Hz ≤ f ≤ 66 Hz)
  0.1% of reading + 0.05% of range
- DC Accuracy: 0.05% of reading + 0.1% of range
- A/D converter: Sampling frequency 2 MS/s
  Resolution 16 bit
- External dimensions: Approx. 426 (W) × 177 (H) × 459 (D) mm
- Weight: Approx. 15 kg (with 6-input element)

Model Number and Suffix Code

Model	Suffix codes	Description
WT1800 Single input element		
WT1801	-01	50 A
	-10	5 A
WT1800 2 input elements		
WT1802	-02	50 A, 50 A
	-11	5 A, 50 A
	-20	5 A, 5 A
WT1800 3 input elements		
WT1803	-03	50 A, 50 A, 50 A
	-12	5 A, 50 A, 50 A
	-21	5 A, 5 A, 50 A
	-30	5 A, 5 A, 5 A
WT1800 4 input elements		
WT1804	-04	50 A, 50 A, 50 A, 50 A
	-13	5 A, 50 A, 50 A, 50 A
	-22	5 A, 5 A, 50 A, 50 A
	-31	5 A, 5 A, 5 A, 50 A
	-40	5 A, 5 A, 5 A, 5 A
WT1800 5 input elements		
WT1805	-05	50 A, 50 A, 50 A, 50 A, 50 A
	-14	5 A, 50 A, 50 A, 50 A, 50 A
	-23	5 A, 5 A, 50 A, 50 A, 50 A
	-32	5 A, 5 A, 5 A, 50 A, 50 A
	-41	5 A, 5 A, 5 A, 5 A, 50 A
	-50	5 A, 5 A, 5 A, 5 A, 5 A
WT1800 6 input elements		
WT1806	-06	50 A, 50 A, 50 A, 50 A, 50 A, 50 A
	-15	5 A, 50 A, 50 A, 50 A, 50 A, 50 A
	-24	5 A, 5 A, 50 A, 50 A, 50 A, 50 A
	-33	5 A, 5 A, 5 A, 50 A, 50 A, 50 A
	-42	5 A, 5 A, 5 A, 5 A, 50 A, 50 A
	-51	5 A, 5 A, 5 A, 5 A, 5 A, 50 A
	-60	5 A, 5 A, 5 A, 5 A, 5 A, 5 A
Standard option		
Power cord	-D	UL/CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS standard
	-H	GB standard
	-N	NBR standard
Languages	-HE	Default setting English menu
	-HG	Default setting German menu
	-HC	Default setting Chinese menu
	-HR	Default setting Russian menu
Additional option		
Options	/EX1	External current sensor input for WT1801
	/EX2	External current sensor input for WT1802
	/EX3	External current sensor input for WT1803
	/EX4	External current sensor input for WT1804
	/EX5	External current sensor input for WT1805
	/EX6	External current sensor input for WT1806
	/B5	Built-in printer
	/G5	Harmonic Measurement (Select one)
	/G6	Simltaneous Dual Harmonic Measurement (Select one)
	/DT	Delta Computation
	/FQ	Add-on Frequency Measurement
	/V1	RGB output
	/DA	20-channel DA Outputs
	/MTR	Motor Evaluation Function (Select one)
	/AUX	Auxiliary Sensor Inputs (Select one)
	/HS	High Speed Data Capturing

* The numbers in the "Description" column have the following meanings.
  50 A: 50 A input element, 5 A: 5 A input element
  Elements are inserted in the order shown starting on the left side on the back.
* GPIB, Ethernet and USB communication come standard.

Note: Adding input elements after initial product delivery will require rework at the factory. Please choose your models and configurations carefully, and inquire with your sales representative if you have any questions

Digital Power Analyzers

Digital Power Meters **WT300**

New compact WT300 series for reliable power measurement

Useful in the development of home appliances and office equipment as well as in the measurement of power consumption and standby power on production line

WT310 (1ch) | WT310HC (1ch, MAX40A) | WT332 (2ch)/ WT333 (3ch)

CE

The WT300 series is the 5th generation of Yokogawa's compact power meter portfolio.

Specifications

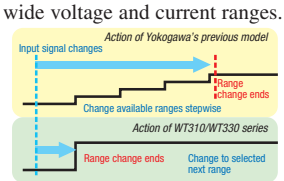
- Direct voltage input range
  15/30/60/150/300/600 V
- Direct current input range
  5/10/20/50/100/200 mA (WT310 only)
  0.5/1/2/5/10/20 A (Common for WT300 series)
  1/2/5/10/20/40 A (WT310 HC only)
- External current input range (optional)
  2.5/5/10 V or 50 m/100 m/200 m/500 m/1/2V
- Frequency range: DC, 0.5 Hz to 100 kHz
  (up to 20 kHz for WT310HC)
- Basic accuracy (45 Hz to 66 Hz)
  Voltage/current ±(0.1% of rdg*1 + 0.1% of rng*2)
  Power ±(0.1% of rdg*1 + 0.1% of rng*2)
- Influence of power factor (when cos Ø =0)
  Add ±0.2% of VA
- Data update rate: 100 m/250 m/500 m/1/2/5 s
- External dimensions
  · WT310 series: Approx. 213(W) × 88(H) × 379(D) mm
  (excluding protrusions)
  · WT330 series: Approx. 213(W) × 132(H) × 379(D) mm
  (excluding protrusions)
- Weight: Approx. 3.0 kg (WT210), approx. 5.0 kg (WT230)

*1 rdg: reading, *2 rng: range

New Functions to Improve Measurement Efficiency

● 3 First-in-class range skip (range configuration) function

The WT300 series is equipped with the range skip (range configuration) function of the high-end models, which reduces the range-change time in auto-ranging mode that is long due to the wide voltage and current ranges. This function skips the ranges other than the pre-selected range to speed up the change to the selected range in auto-ranging mode. (The included WTViewerFreePlus software is required for the setting)



● First-in-industry integration measurement auto-ranging function

This is the industry's first function to automatically change the range in response to changes of the consumption power and current values in integration mode. This function continues integration even if the level of the input exceeds the maximum of the selected range and the range is changed to a higher level as a result of a rapid change in the conditions. This function eliminates the need for repeating the test even if a range is exceeded, thus reducing the evaluation time. Furthermore, separate power integration for each polarity (±Wh), current integration (Ah), and DC integration (charge/discharge) are also available.
(The measurement accuracy depends on the input level and variation. It is recommended to set a fast data update rate.)

Features

- **Basic power accuracy: ±0.1% of reading**
- **Measurement frequency range: DC, 0.5 Hz to 100 kHz (to 20 kHz for WT310HC)**
- **Fast data update rate: 100 ms**
- **Small current measurement: 5 mA range available (WT310)**
- **40 A large current available (WT310HC)**

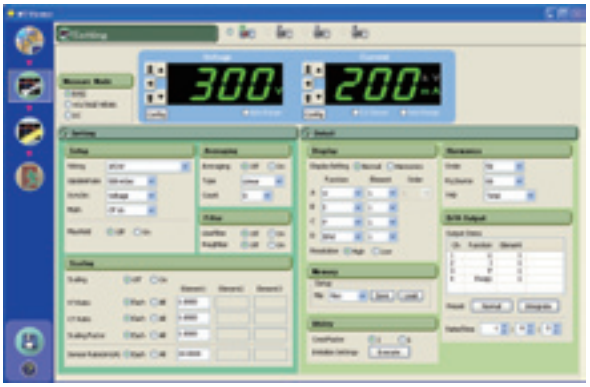
Integration power measurement auto ranging function
- Simultaneous measurement of harmonics with voltage, current, and power (mode switching is not required, but the included WTViewerFreePlus software is required)
- Multiple communication interfaces: USB, GP-IB or RS-232 and Ethernet (option)
- Compact half-rack mount size
- The included standard PC software allows you to display values, harmonic bar graph, and waveforms

Models and Suffix Codes

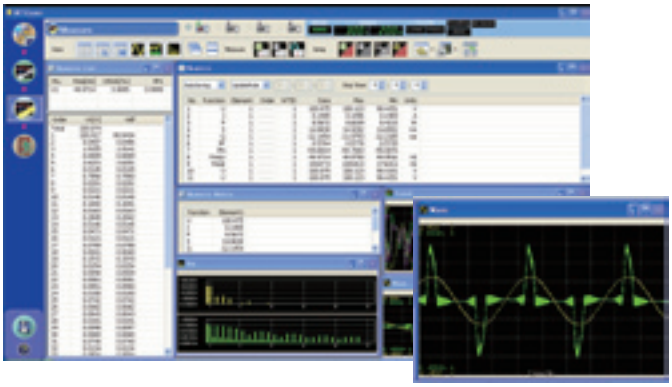
Model	Suffix Code		Description
WT310			1 Input element model
Power Cord	-D		UL, CSA standard, PSE
	-F		VDE standard
	-R		AS standard
	-Q		BS standard
	-H		GB standard
	-N		NBR standard
Communication Interface *USB is standard	-C1	select one	GP- IB
	-C2		RS- 232
Optional function	/C7		Ethernet interface
	/EX1	select one	External sensor input 2.5V/5V/10V
	/EX2		External sensor input 50mV/100mV/200mV/500mV/1V/2V
	/G5		Harmonics Measurement
	/DA4		D/A- output(4CH)
Model	**Suffix Code**		**Describe**
WT310HC			1 Input element /High current model
Power Cord	-D		UL, CSA standard, PSE
	-F		VDE standard
	-R		AS standard
	-Q		BS standard
	-H		GB standard
	-N		NBR standard
Communication Interface *USB is standard	-C1	select one	GP- IB
	-C2		RS- 232
Optional function	/C7		Ethernet interface
	/EX1	select one	External sensor input 2.5V/5V/10V
	/EX2		External sensor input 50mV/100mV/200mV/500mV/1V/2V
	/G5		Harmonics Measurement
	/DA4		D/A- output(4CH)
Model	**Suffix Code**		**Describe**
WT332			2 Input elements model
WT333			3 Input elements model
Power Cord	-D		UL, CSA standard, PSE
	-F		VDE standard
	-R		AS standard
	-Q		BS standard
	-H		GB standard
	-N		NBR standard
Communication Interface *USB is standard	-C1	select one	GP- IB
	-C2		RS- 232
Optional function	/C7		Ethernet interface
	/EX1	select one	External sensor input 2.5V/5V/10V
	/EX2		External sensor input 50mV/100mV/200mV/500mV/1V/2V
	/G5		Harmonics Measurement
	/DA12		D/A- output(12CH)

Standard accessories
Power cord(1set), Rubber foot(1set), Current input protective cover(each 1 set), Start up guide(1set), Connector (provided only with /DA4 or /DA12, each 1set), Safety terminal adapter 758931(provided two adapters in a set times input element number), CD(1piece,included the startup guide, user guide, instruction manual and the communication manual by PDF data, and Viewer Software)

WTViewerFreePlus For WT300 Series (included)



Setting Window



Measurement Window

The WTViewerFreePlus software installed on a PC uses a USB, GP-IB/RS-232, or Ethernet (optional) interface to capture, transfer, and display* five or more numeric values, bar graph of harmonic order components, trend graph of measurement data, or voltage/current waveforms that cannot be displayed on the LED display of the WT300 series. The use of this software extends the application range of the WT300 series.
With the aim of simplifying the connection and setup, the details were redesigned so that the communication function is recognized automatically, a dedicated setting window was added, and all measurement data can be displayed simultaneously.

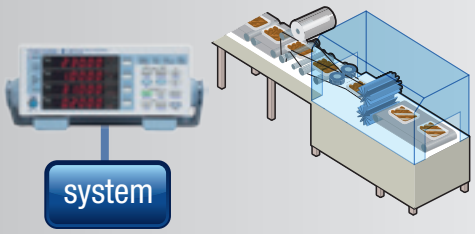
* Waveform display requires the /G5 harmonic measurement option.

WT300 Series Can Be Used for a Variety of Applications

Production line or QA testing of electric Devices

- Compact half rack mount size helps customers build smaller test systems with a better Return on Investment (ROI).
- D/A output function for data recording
- Multiple communication interfaces. USB, RS-232 or GP-IB and Ethernet capability.

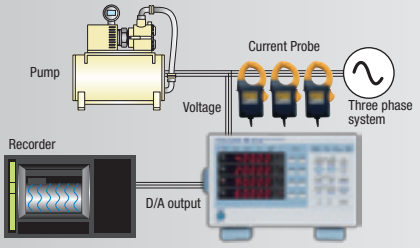
The simultaneous measurement of power consumption parameters such as U, I, P, frequency, Power Factor and Harmonics for production line or QA testing results in reduced tact times. Thus testing is faster and cheaper. The DA output and communication interfaces enable data to be remotely and flexibly captured.



Duration testing and efficiency measurement for industrial motors and rotating machinery

- Integration measurement for long period
- D/A output function for data recording
- DC, 0.5Hz to 100kHz broad bandwidth capability

The WT300 series provides reliable current integration (Ah) and Energy (Wh) measurement for up to 10,000 hours (approx. 1 year). The D/A option is used to save and monitor the measurement results (WT310/WT310HC: 4ch, WT332/WT333: 12ch). An external recorder or data logger like, a ScopeCorder, can be used to save this D/A function data along with other parameters such as temperatures, torque and rotation speed.



Comparison between WT210/230 series and WT300 series

		WT310/WT332/WT333	WT310HC	WT210/WT230
DC power measurement accuracy		0.1% of reading+0.2% of range	0.3% of reading+0.2% of range	0.3% of reading+0.2% of range
Current range (Crest factor=3)	Direct input	5m/10m/20m/50m/100m/200m/ 0.5/1/2/5 /10/20[A] (WT310) 0.5/1/2/5/10/20[A] (WT332/WT333)	1/2/5/10/20/40[A]	5m/10m/20m/50m/100m/200m/ 0.5/1/2/5 /10/20[A] (WT210) 0.5/1/2/5/10/20[A] (WT230)
	External current input	EX1: 2.5//5/10[V] EX2: 50m/100m/200m/500m/1/2[V] (OP.)	EX1: 2.5//5/10[V] EX2: 50m/100m/200m/500m/1/2[V] (OP.)	EX1: 2.5/5/10[V] EX2: 50m/100m/200m[V] (OP.)
Effective input range for voltage & current (CF=3)		1% to 130%	1% to 100% (40A range only)	1% to 130%
Maximum displaying value for voltage & current (CF=3)		1% to 140%	1% to 110% (40A range only)	1% to140%
	0<PF<1	Power reading x {power reading error + (power range / apparent power reading) + tanØ x (influence when PF = 0)} %	Power reading x {power reading error + (power range / apparent power reading) + tanØ x (influence when PF = 0)} %	Add the power reading x {tanØ x (influence when PF = 0)}%.
Simultaneous measurement of RMS, VotageMEAN & DC		Yes *1	Yes *1	No
Frequency measurement		2 channels (voltage and current)	2 channels (voltage and current)	selected voltage or current (one)
Number of display item		4 items	4 items	3 items
Sampling rate		Approximately 100 kS/s	Approximately 100 kS/s	Approximately 50 kS/s
Harmonic measurement		Yes (OP, / G5)	Yes (OP, / G5)	Yes (OP, / HRM)
THD calculation maximum order setting		Yes (OP, 1-50th)	Yes (OP, 1-50th)	No
Auto ranging of integration		Yes	Yes	No
Communication interface	USB	Yes	Yes	No
	GP-IB	Yes GP-IB or RS-232	Yes GP-IB or RS-232	Yes (OP) GP-IB or RS-232C
	RS-232	Yes GP-IB or RS-232	Yes GP-IB or RS-232	Yes (OP) GP-IB or RS-232C
	Ethernet	Yes (OP)	Yes (OP)	No
IEEE standard for GP-IB		IEEE488.2	IEEE488.2	IEEE488.1 and IEEE488.2
Comparator function		No	No	Yes
Viewer software (setting & data capturing)		Free (included)	Free (included)	Free (download)

*1: Simultaneous, mode independent measurement using the WTViewerFreePlus PC software.
*A command compatible mode for the previous WT200 series is prepared. (IEEE488.2 only)
In that mode, the WT300 series works identically to a WT200 series except for the Store (and recall operation) and the Compare functions.

Superior points
Changed points

Digital Power Analyzers

Precision Power Scope **PX8000**

Power Analyzer Capable of Measuring Waveform Parameters and Transient Power

PX8000
Detailed catalog: Bulletin PX8000-01EN/PX8000-02EN

The PX8000 is a compact sophisticated power analyzer that can incorporate up to four measurement power elements. It can calculate the transient voltage, current, and power for each cycle, the average voltage, current, and power between cursors, and measure waveform parameters.

Features

- High-speed sampling and wide range measurement
  The power of devices driven at a high frequency can be measured at a 100 MS/s sampling rate, at a 12-bit resolution, and in the 20 MHz range*1.
- Waveform measurement function
  Instantaneous power waveforms can be displayed as standard in addition to voltage and current waveforms, and power changes can be observed directly. Voltage, current, and power waveforms for each cycle can be calculated and numerical values can be displayed by cursor.
  The average voltage, current, and power values in a specified period by the cursor can be calculated.
  Acquisition memory is up to 100 M points per channel (when equipping the /M2 option), allowing for capturing and displaying detailed waveforms.
- Waveform analysis function
  Up to the 500th order harmonic components can be measured simultaneously (when installing the /G5 option).
  2-channel FFT function is available as standard.
- De-skew (phase compensation) function when using an external power sensor, etc. is available.
- Motor characteristics can be evaluated (mechanical output calculation with torque and rotation speed input, as well as analog and pulse input).

*1: Direct current input at 10 MHz (-3 dB typical)

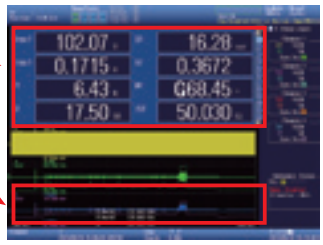
Various functions to measure transient power*2

● Simultaneous calculation and display of instantaneous power waveforms

The PX8000 calculates the instantaneous power waveform simultaneously with the voltage and current waveforms. The instantaneous waveform can be obtained as the product of the voltage and current waveforms that are sampled at the same time. This function is a standard function so no special setting is required. This instantaneous power value can be displayed using the cursor.

Waveform data in the displayed entire range can be displayed on the numerical display screen.

The instantaneous power waveform indicates the trend of power change. The value at any point in time can be displayed using the cursor.



● Trend power calculation for each cycle

Power trend waveform for each cycle can be calculated using the User Defined Computation (waveform calculation, MATH) at up to 4 M points. The captured waveforms can be used to obtain the value for a particular cycle and calculate the difference between cycles using the cursor function.

Settings of the trend calculation using the User Defined Computation (MATH) function.

The cursor (horizontal, vertical, and marker) allows you to display the numerical data of trend waveform for each cycle calculated using the User Defined Calculation (MATH).

● Power calculation in a range specified by the cursor

The average numerical values in a range specified by the cursor can be calculated. Values in the entire range of waveforms displayed on the screen can be displayed on the upper numerical display screen. The MEASURE function cursor can be used for the measurement in the specified range.

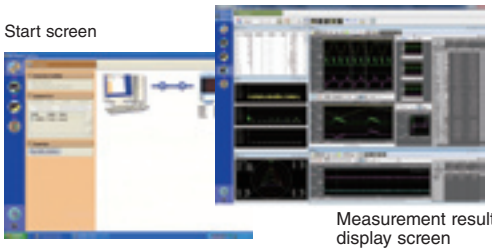
Waveform parameters to be calculated can be set in detail.

Measured values of waveforms displayed in the entire range can be displayed on the numerical display screen.

The measured value between cursors indicating the start and stop positions can be set independently from the measured value displayed on the upper numerical display screen.

● Viewer software PowerViewerPlus (coming soon)

Start screen

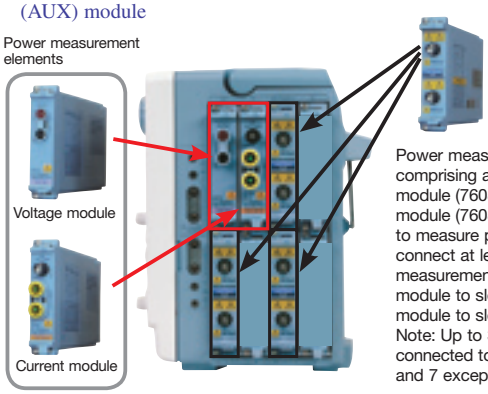


Measurement results display screen

PC application software for the PX8000 will be released soon. The 760881 PowerViewerPlus allows you to transfer measurement data of the PX8000 to a PC to display and analyze a large amount of waveform data on the PC.

*2: Accuracy is not specified for the numerical data of the measured transient power.

● Power measurement elements (voltage and current modules) and Auxiliary (AUX) module



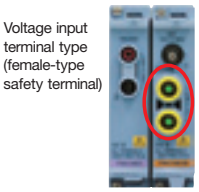
Power measurement elements comprising a pair of the voltage module (760811) and current module (760812) are required to measure power. You need to connect at least one set of power measurement element, the voltage module to slot 1 and the current module to slot 2.
Note: Up to 3 AUX modules can be connected to odd number slots 3, 5, and 7 except for slot 1.

● Functions to prevent mismatch between the voltage and current modules

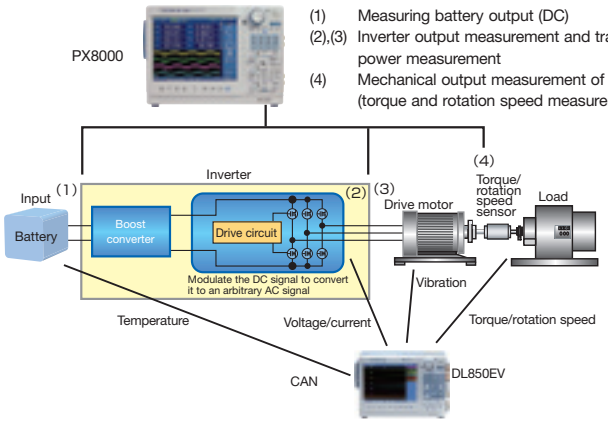
- Warning message
- Check on the overview screen '(you can check paired modules)

● Safety design

Different types of voltage input terminal and current input terminal are used to keep the user from confusing one from the other.



● Application example: Inverter evaluation using the PX8000 and DL850EV



● Overview of the evaluation with the PX8000 and DL850EV

Electric vehicles (EVs) and hybrid electric vehicles (HEV) are made of a large number of electrical and mechanical parts. To evaluate their efficiency, electrical parts and mechanical parts must be measurement simultaneously. The DL850EV is a data acquisition instrument that can measure many types of physical quantities at multiple points simultaneously. On the other hand, the PX8000 measures the efficiency of the inverter and the motor, as well as transient changes at every moment based on the electrical signals of voltage and current and the mechanical output calculated from the torque and rotation speed.

Specifications

- Voltage direct input range: 1.5/3/6/10/15/30/60/100/150/300/600/1000 Vrms
- Current direct input range: 10 m/20 m/50 m/100 m/200 m/500 m/1/2/5 Arms
- Current sensor input range: 50 m/100 m/200 m/500 m/1/2/5/10 Vrms
- Frequency range: DC to 20 MHz (-3 dB, voltage and current sensor input)
  DC to 10 MHz (-3 dB, current direct input)
- Power basic accuracy (45 Hz to 66 Hz)
  ±(0.1% of reading + 0.1% of range)
- Influence of power factor error (cos Φ = 0):
  0.15% of S (apparent power)
- A/D converter: Maximum sampling rate 100 MS/s
  Resolution 12-bit
- Acquisition memory: Standard: 10 M points per channel
  Max: 100 M points per channel (/M2 option)
- Maximum waveform viewing time:
  20 minutes (not dependent on the memory size)
- History memory: This function can save up 1,000 records of waveform data and display and calculate them as needed(when the /M2 option installed)
- Waveform display: Up to 16 waveforms can be displayed.
  Voltage and current waveforms and simultaneous power waveform can be displayed.
- Snapshot: Waveform at an arbitrary moment on the screen can be saved.
- De-skew (phase compensation) function:
  Phase difference between the voltage and current modules is compensated.
- Trend measurement (waveform measurement, MATH):
  Voltage, current, and power waveform calculation for each cycle
- Calculation in the specified period (waveform parameter calculation, MEASURE):
  Average value between cursors can be measured.
- Simultaneous harmonic measurement:
  Up to the 500th order harmonic measurement (/G5 option)
- 2-channel FFT function available as standard
- Printer: Screens can be copied (/B5 option)
- External storage: USB port (×2), SD card
- Video output: RGB analog, video output
- Display unit: 10.4-inch color TFT XGA display
- GP-IB, Ethernet, and USB communication available as standard
- IRIG function: Data measured with multiple PX8000 units can be synchronized (/C20 option)
- External dimensions: 355 (W) × 259 (H) × 180 (D) mm (excluding protrusions)
- Weight: Approximately 6.5 kg
  (main unit only, excluding paper and options)

* For common options and accessories, see Page 37.

PX8000 Model and Suffix Codes

Product name	Model	Suffix code	Description
Precision Power Scope	PX8000		Precision Power Scope main unit
		-D	UL and CSA standards (PSE compliant, 3-pole type)
		-F	VDE standard
		-R	AS standard
		-Q	BS standard
		-H	GB standard
		-N	NBR standard
		-HE	English menu language
		/B5	In-built printer
		/C20	IRIG function
		/G5	Simultaneous harmonic measurement
		/M1*1	50 M point/CH memory extension
		/M2*1	100 M point/CH memory extension
		/P4	4CH probe power output

Product name	Model	Suffix code	Description
Voltage Module	760811 *2		Necessary to order the same number as that of the 760812 Current Modules at the same time
Current Module	760812 *2		Necessary to order the same number of that of the 760811 Voltage Modules at the same time
Auxiliary (AUX) Module	760851		Can measure the sensor signals of torque and rotation speed on 2 channels

*1 Selection of both /M1 and /M2 is not available for one main frame. The standard memory length is 10 M points/CH.
*2 The power value will be calibrated using a pair of Voltage (760811) and Current (760812) modules, therefore an equal quantity of these must be ordered together.

- A test Certificate of the Voltage Module includes the test results of the voltage and power values which are calibrated with one paired Current Module. Also the test Certificate of the Current Module includes the test results of the current and power values which are calibrated with one paired Voltage Module.

<Cautions regarding the installation of modules and their location>
- The PX8000 has a maximum of 8 slots for installing modules.
- It is required to equip the PX8000 main frame with at least one Voltage Module and one Current Module in slots 1 and 2 to create one Power Measurement Element. The PX8000 can be equipped with a maximum of three additional Power Measurement Elements.
- When modules are ordered with the PX8000 main frame, the modules are factory installed in the main frame up to a combined maximum of 4 power measurement elements and auxiliary modules. Priority is given to the installation of power measurement elements.
- The location of modules can be changed by the customer. However, slot 1 must be always containing a Voltage Module and slot 2 must always contain a Current Module.
- Power values are calibrated using one Voltage Module and one Current Module, so the same number of these modules must be ordered together. In the case of service, repair or re-calibration, both modules must be sent together to the service department.
- Up to 3 Auxiliary (AUX) Modules can be installed in odd numbered slot only (3, 5 and 7). Odd numbered slots (3, 5 and 7) are also used to install additional Voltage Modules, and even numbered slots (4, 6 and 8) for additional Current Modules.

Digital Power Analyzers

AC/DC Current Sensor CT60/CT200/CT1000

Wide Variety of precision Current Sensors for broad applications

CT60/CT200/CT1000

AC/DC Current Sensors DC, up to 800 kHz, up to 1000 A peak

- Rated Current
  - CT60 DC: 0 to 60 A, AC 60 A peak
  - CT200 DC: 0 to 200 A, AC 200 A peak
  - CT1000 DC: 0 to 1000 A, AC 1000 A peak
- Frequency band width
  - CT60 DC to 800 kHz (-3 dB)
  - CT200 DC to 500 kHz (-3 dB)
  - CT1000 DC to 300 kHz (-3 dB)
- Measurement Accuracy
  DC, 50/60 Hz: ± (0.05% of reading + 30 µA)
- Power Supply Voltage ± (15 V + 5%)

Current Probe 751552

Accessory for Digital Power Meters and Power Analyzer

758917

758921

751552

Current Clamp-on Probe AC 1000 Arms (1400 A Peak)

- Measurement bandwidth: 30 Hz to 5 kHz
- Basic accuracy: ± 0.3% of reading
- Maximum allowable input: AC 1000 Arms
  1400 Apk (AC)
- Current output type: 1 mA/A

To connect this probe to the WT series, you need the Model 758921 (Fork terminal adapter) and Model 758917 (Measurement lead set) accessories sold separately. For details, please see the Power Meter Accessories Catalog (Bulletin CT1000-00E).

WT Series Accessory Software

760122 and Power Consumption Measurement Software

PC-based Control and Data Acquisition

WTViewer

760122

Main Features of WTViewer

- Numeric, waveform, harmonic, and trend displays
- Manual save function: With one click you can save only desired data at the right timing.
- Data conversion to CSV: You can save waveforms, numeric data, and screen images to a PC.
- You can control multiple WT series units of the same specifications from a PC.

  Note: The functionality differs slightly depending on the model. For details, please refer to the specifications of your desired model.

4 units synchronization

File conversion function

FTP function

Command monitor

WTViewer is a software application that allows you to load numeric and waveform data measured with the WT3000 Precision Power Analyzer, WT1800 High performance Power Analyzer, or WT500 Power Analyzer to a PC via GP-IB, serial (RS-232 for WT3000), or USB (for WT3000/WT1800/WT500) communications. It also lets you view the waveform data, and analyze and save the numeric data.

Communication functions supported by WTViewer 760122

Model number	GP-IB	Serial (RS-232)	Ethernet	USB
WT3000	○	● *1	●	● *1
WT1800	○	×	○	○
WT500	●	×	●	○
WT310	○ *2	○ *2	●	○
WT330	○ *2	○ *2	●	○

○: Supported (by WT as standard) ●: Supported (by WT as an option) ×: Not supported (by WT)

*1: With the WT, RS232 and USB port (PC) cannot be used at the same time.

*2: With the WT, RS232 and GP-IB cannot be used at the same time.

WT3000

	Maximum connections	FTP server/client function
GP-IB connection	1 to 4 units	Not available
Serial (RS-323) communication	1 unit	Not available
Ethernet communication	1 to 4 units	Available*
USB communication	1 to 4 units	Not available

WT1800

	Maximum connections	FTP server/client function
GP-IB connection	1 to 4 units	Not available
USB communication	1 to 4 units	Not available
Ethernet communication	1 to 4 units	Available

WT500

	Maximum connections	FTP server function
GP-IB connection	1 to 4 units	Not available
Ethernet communication	1 to 4 units	Available
USB communication	1 to 4 units	Not available

* A PC card or USB memory is required.

Power Consumption Measurement Software

Power Consumption Measurement Software

Free Software

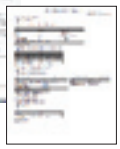
- Support for the measurement of standby power compliant with the ErP Directive Lot 6, IEC62301 standard
- Allows you to acquire the necessary data such as a power value with simple operations such as just pressing the Start button.
- Allows you to print out a report on the measurement results.

(The free software can be downloaded from Yokogawa's website)

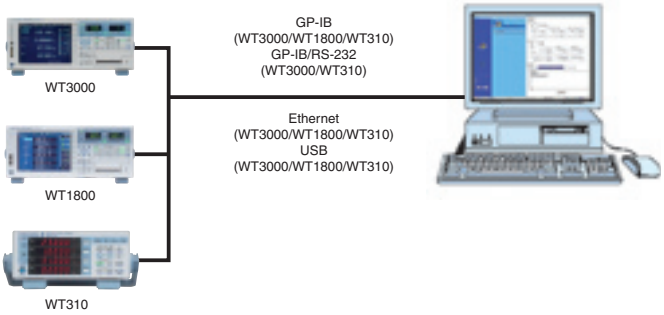
Example of an initial setup screen

Example of a screen to set the measurement conditions

Example of a measurement screen



Example of a printed report



Digital Power Analyzers

WT Series Accessory Software **761922 IEC regulation software**

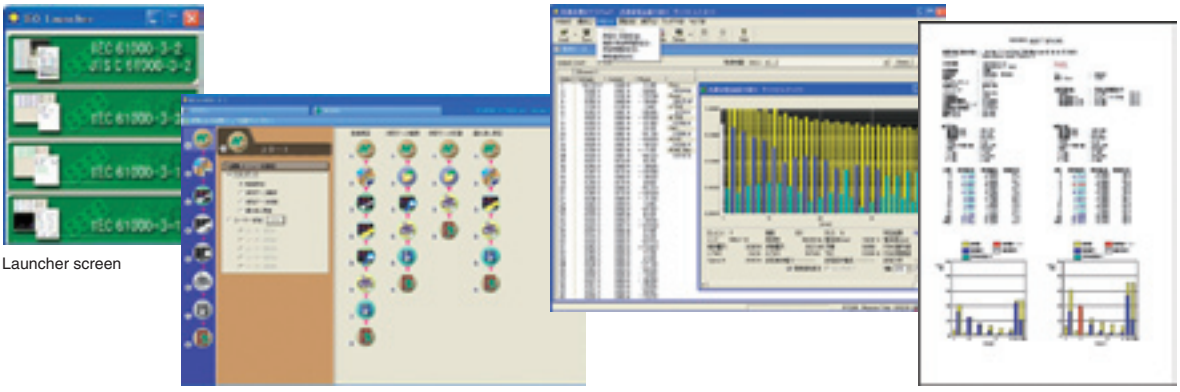
Support for IEC Standards Testing

Harmonic/Flicker Measurement Software

761922

- Allows you to judge high current equipment with input current of 16 A or more per phase (IEC61000-3-11/-3-12)
- Support for the method that does not consider interharmonics in the window of 16 cycles specified in IEC61000-4-7 1991
- Best-in-class high-precision current and voltage measurements (also allows you to calculate the limits of the standard)
- All Judgment graph display shows a list of all the measurement results in a time series by order.
- Allows you to measure harmonics for up to 24 hours, so capable of measuring equipment that needs more than one hour for one cycle.
- Continuous data acquisition at a measurement interval of 200 ms ensures continuous measurement over a long period of time with no missing data
- Support for the standard tests of single- and three-phase equipment

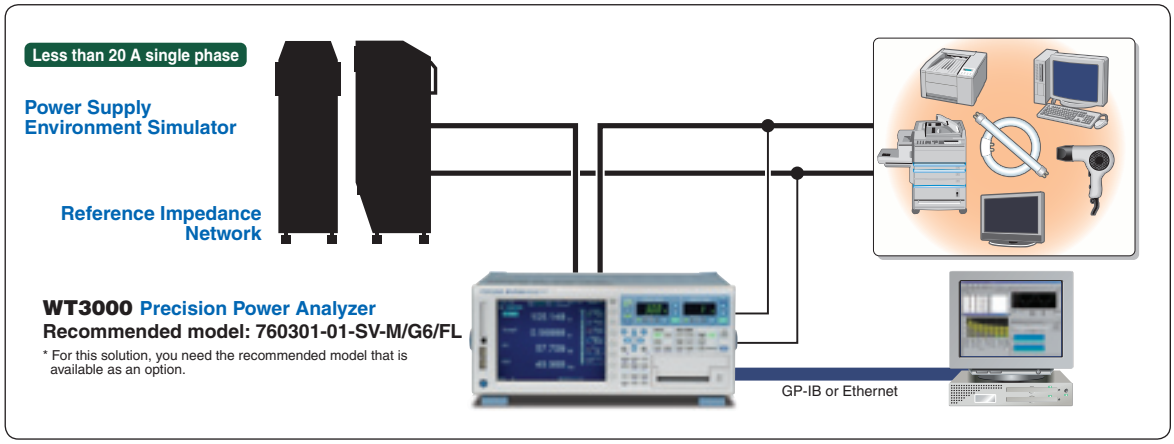
Example of a measurement screen

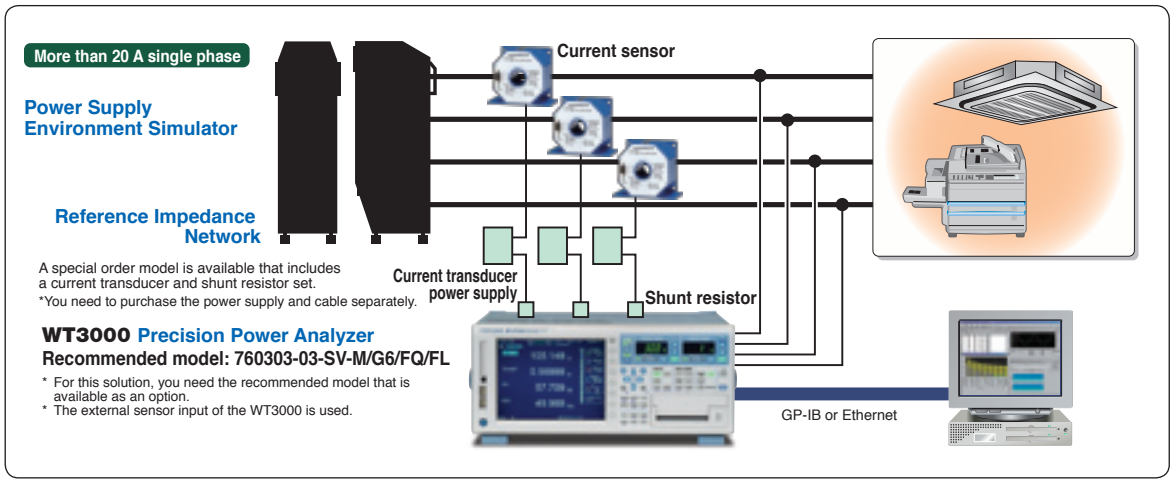


Launcher screen

Example of an initial setup screen

Example of a printed report

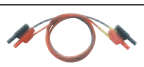




	Applicable standards
Harmonic current standard	IEC61000-3-2 Ed3.2 2009 (less than 16 A per phase) / 3-12 Ed 1.0 2004 (more than 16 A per phase)
Harmonic analyzer	IEC61000-4-7 Ed 1.0 1991/ Ed 2.0 2002 / Ed 2.0-Am1 2008
Voltage fluctuations and flicker standard	IEC61000-3-3 Ed 2.0 2008 (less than 16 A per phase /-3-11 Ed 1.0 2000 (more than 16 A per phase)
Flicker analyzer	IEC61000-4-15 Ed 1.1 2003

Digital Analyzers Accessories List

Accessories List

Product	Part No.	Description		WT3000	WT1800	WT500	WT310/WT330	PX8000
1:1 BNC safety adapter lead	701901	1000 Vrms-CAT II, 1.8 m long Safety BNC (male) to safety banana (female) use in combination with 701959, 701954, 758921, 758922 or 758929		●	●	●	●	
Measurement leads	758917	Two leads in a set. Use 758917 in combination with 758922 or 758929. Total length: 75 cm Rating: 1000 V, 32 A		●	●	●	●	●
Small alligator adapters	758922	For connection to measurement leads (758917). Two in a set. Rating: 300 V		●	●	●	●	●
Large alligator adapters	758929	For connection to measurement leads (758917). Two in a set. Rating: 1000 V		●	●	●	●	●
Safety terminal adapter set	758923	(spring-hold type) Two adapters in a set.		●	●	●	●	●
Safety terminal adapter set	B8213ZD	Screw-fastened adapters for voltage input. Two adapters in a set. 1.5 mm Allen wrench for tightening is required.		●	●	●	●	●
Safety terminal adapter set	B8213ZA	Screw-fastened adapters for current input of PX8000. Two adapters in a set. Allen wrench for tightening is required.						●
Fork terminal adapter	758921	Two adapters (red and black) to a set. Used when attaching banana plug to binding post.		●	●	●	●	
Conversion adapter	758924	For conversion between BNC and female banana plug		●	●	●	●	
Conversion adapter	366971	9-pin/25-pin conversion adapter		●				
External sensor cable	B9284LK	For the external input of the WT series. Length: 50 cm		●	●	●	●	●
BNC cable	366924	BNC cable BNC–BNC, 1 m		●	●	●		●
BNC cable	366925	BNC cable BNC–BNC, 2 m		●	●	●		●
26 pin cable	705926	For/DA4 and/DA12 option					●	
Compact instrument cart	701960	500 (W) × 560 (D) × 705 (H) mm /A: keyboard, mouse table /B: 3-prong power strip		●	●	●	●	●
Deluxe instrument cart	701961	570 (W) × 580 (D) × 893 (H) mm /A: keyboard, mouse table /B: 3-prong power strip		●	●	●	●	●
All-Purpose instrument cart	701962	467 (W) × 693 (D) × 713 (H) mm		●	●	●	●	●
Rack mounting kit	751535-E4	For EIA		●	●	●		
Rack mounting kit	751535-J4	For JIS		●	●	●		
Rack mounting kit	751533-E2	For WT310 EIA standalone installation					●	
Rack mounting kit	751533-J2	For WT310 JIS standalone installation					●	
Rack mounting kit	751534-E2	For WT310 EIA connected installation					●	
Rack mounting kit	751534-J2	For WT310 JIS connected installation					●	
Rack mounting kit	751533-E3	For WT330 EIA standalone installation					●	
Rack mounting kit	751533-J3	For WT330 JIS standalone installation					●	
Rack mounting kit	751534-E3	For WT330 EIA connected installation					●	
Rack mounting kit	751534-J3	For WT330 JIS connected installation					●	

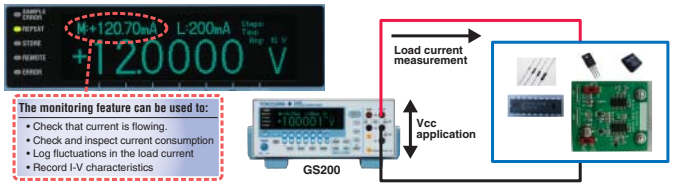
DC Voltage/ Current Source **GS200**

Higher Accuracy — The New Advanced DC Voltage/Current

Functions

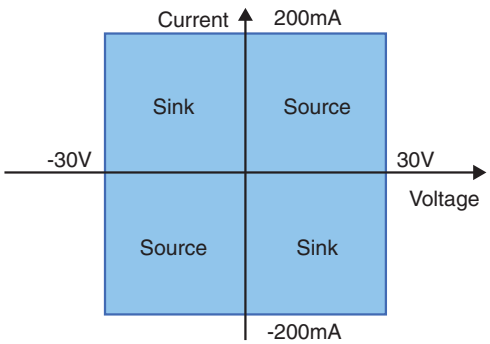
The GS200 generates high accuracy, high stability, high resolution, and extremely low-noise DC voltage and current signals that are required for many applications.

- Voltage source up to ±32 V and current source up to ±200 mA
- 5 1/2-digit, ±120,000-count output resolution
- Voltage and current simple monitoring feature (optional)
- Programmable output up to 10,000 points
- Built-in USB mass storage device
- Channel expansion through synchronous operation



Voltage and Current Source Range

The GS200 can perform four-quadrant operation by operating as a current source or a current sink in the range of ±30 V and ±200 mA. When the GS200 is sinking current, it can operate over the exact same range as when it is operating as a current source. You can use the GS200 not just as a highly accurate voltage source but also as a highly accurate constant-current electronic load.



Functions and Specifications

■ Source

- Voltage source
  - Range : 10 mV, 100 mV, 1 V, 10 V, 30 V (Use a highly accurate voltage divider at 10 mV and 100 mV ranges)
  - Maximum output : ±200 mA (at 1 V, 10 V, and 30 V ranges)
- Current source
  - Range : 1 mA, 10 mA, 100 mA, 200 mA
  - Maximum output : ±30 V

■ Monitoring (option)

- Function : Voltage (during current generation), Current (during voltage generation)
- Integration time : 1 to 25 PLC (Power Line Cycle)
- Trigger source : Internal timer (0.1 s resolution), READY, Communication and Immediate
- Delay : 0 to 999,999 ms (1 ms resolution)
- Maximum storage : 10,000 points

■ External Input and Output

- Input signal : TRIG IN, OUTPUT IN
- Output signal : TRIG OUT, OUTPUT OUT, READY OUT
- Connector : BNC connector (Select any one of the signals for both the input and output)
- Input and output level : TTL
- Minimum pulse width : 10 µs

■ Interface

- GP-IB interface
- USB interface
- Ethernet interface (option) 100BASE-TX/10BASE-T

■ General Specifications

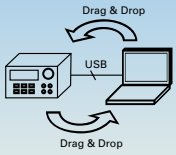
- Display : 256 × 64 dot vacuum fluorescent display
- External dimensions : Approx. 213 (W) × 88 (H) × 350 (D) mm (excluding protrusions)
- Weight : Approx. 5 kg

GS200 Model and Suffix Codes

Model	Suffix Code	Description
GS210		DC voltage/current source (front panel output terminals)
GS211		DC voltage/current source (rear panel output terminals)
Power cord	-D	UL/CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS standard
	-H	GB standard
Options	/MON	Monitoring function
	/C10	Ethernet interface function

Multi Channel Source Measure Unit **GS820**

Highly Accurate 2-Channel Voltage/Current Source Measure Unit

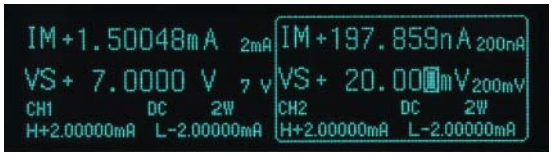


USB STORAGE

Features

The GS820 is a highly accurate and highly functional 2-channel programmable DC voltage/current source that incorporates voltage/current generation and measurement functions.

- Isolated 2-channel source and measurement function
- Source and measurement ranges: 7 V and 3.2 A or 18 V and 1.2 A
- Minute current ranges with 200-nA or 1-pA resolution
- Generate arbitrary waveforms consisting of up to 100,000 points at 100-µs intervals
- Channel expansion through master-slave synchronization link
- Fast test speeds
- 16-bit digital I/O (model 765602)

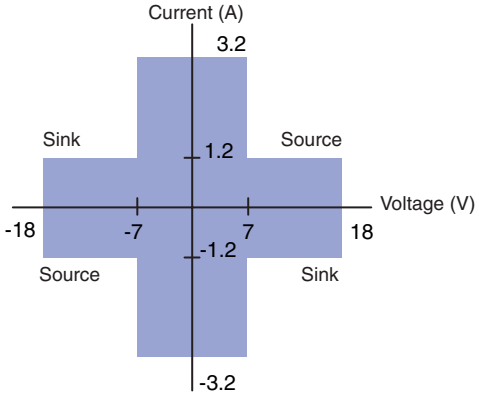


2-channel display example (256 x 64 dot matrix display)

Source and Measurement Range

Four-quadrant operation consisting of source operation (current source) and sink operation (current sink) is available with ranges up to 7 V and 3.2 A or 18 V and 1.2 A.

The output and measurement resolutions are 5.5 digits.



Functions

Source

Function:	Voltage or current
Mode:	DC or pulse (pulse width: 50 µs to 3,600 s)
Sweep mode:	Linear, logarithmic or program (up to 100,000 steps)
Trigger source:	External or internal timers 1 and 2 (period: 100 µs to 3,600 s)
Sweep start source:	External or internal timers 1 and 2 (period: 100 µs to 3,600 s)
Source delay:	15 µ to 3,600 s
Response characteristics:	Normal or stable

Measurement

Function:	Voltage, current, auto, voltmeter mode, ammeter mode or resistance meter mode
Integration time:	0.001 to 25 PLC (Power Line Cycle)
Trigger source:	External or internal timers 1 and 2 (period: 100 µs to 3,600 s)
Measure delay:	0 µs to 3,600 s
Measurement data storage:	Up to 100,000 data points
Average:	Moving average (average count: 2 to 256)
Voltage sense:	Two-wire system or four-wire system
Auto zero:	Measure the internal zero reference every measurement and correct the measured value
NULL computation:	Computes the difference with respect to the current measuredvalue or user-defined value
User-defined computation:	Computes user-defined equations in real-time
Operators:	+[addition], -[subtraction], *[multiplication], /[division], ^ [exponentiation], % [mod], | [logic OR], & [logic AND], ! [negation], < <= > >= == != [comparison], = [substitution],
Functions:	ABS() [absolute value], SQRT() [square root], LN(), LOG() [logarithm], SIN(), COS(), TAN() [trigonometric functions], ASIN(), ACOS(), ATAN() [inverse trigonometric functions], SINH(), COSH(), TANH() [hyperbolic functions], RAND() (random number generation), EDGE() [logic change extraction], TRUNC(), FLOOR() [rounding to an integer], ISINF() [infinity judgment], ISNAN [not-a-number judgment]
Conditional statement:	IF-THEN-ELSE

Communication Interface

GPIB

Electrical and mechanical specifications:	Conforms to IEEE St'd 488-1978
Functional specifications:	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0
Protocol:	Conforms to IEEE St'd 488.2-1992
Address:	0 to 30

RS232

Electrical specifications:	Conforms to EIA RS232
Connection format:	Point-to-point
Transmission mode:	Full-duplex
Synchronization mode:	Start-stop synchronization
Baud rate:	9600, 14400, 19200, 38400, 57600, 115200 bps

USB

Number of ports:	1
Connector type:	Type B connector (receptacle)
Electrical and mechanical specifications:	Conforms to USB Rev. 2.0
Protocol:	Mass storage class, USB-TMC

Ethernet

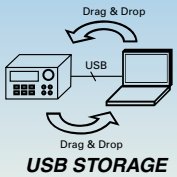
Number of Ethernet ports:	1
Connector type:	RJ-45 connector
Electrical and mechanical specifications:	Conforms to IEEE 802.3
Transmission system:	100BASE-TX/10BASE-T
Data rate:	100 Mbps or 10 Mbps
Protocol:	VXI-11 server, HTTP server, FTP server, DHCP client, and command socket

Model and Suffix code

Model	Suffix Code	Notes
765601		GS820 Multi Channel Source Measure Unit Standard Model
765602		GS820 Multi Channel Source Measure Unit Digital I/O Installed Model
Power cord	-D	UL/CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS standard
	-H	GB standard

Source Measure Unit **GS610**

Combines High Accuracy and High Speed in a Single Unit



USB STORAGE

Features

The GS610 is a highly accurate and highly functional programmable voltage/current source that incorporates voltage/current generation and measurement functions. The maximum output voltage and current are 110 V and 3.2 A, respectively. Evaluation of over a wide range of basic electrical characteristics is possible, because the GS610 can operate as a current source or a current sink.

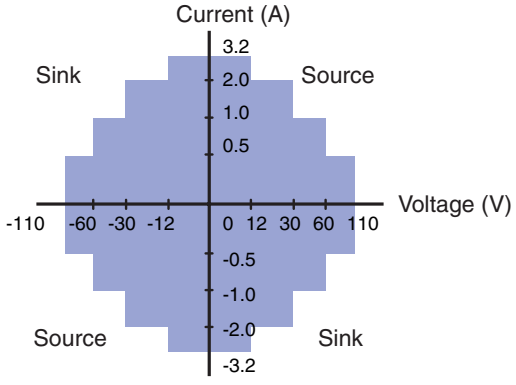
- Source and sink operation up to 110 V/3.2 A (four-quadrant operation)
- Basic accuracy: ±0.02% *1
- Sweep output at up to 100 µs intervals
- Comes with abundant sweep patterns (linear, logarithmic, and arbitrary)
- Stores up to 65,535 points of source measure data in the internal memory
- Easy file operation with the USB storage function
- Remote control and FTP using Web server function (Optional)

*1: DC voltage generation

Voltage/Current Generation and Measurement Range

Four-dimensional operation with source operation (current source) and sink operation (current sink) is possible at up to 110 V, 3.2 A, and 60 W. The output and measurement resolutions are 5.5 digits.

Voltage generation/measurement range: 200mV to 110 V
Current generation/measurement range: 20 µA to 3.2 A
Maximum output current:
±3.2 A (at an output voltage of ±12 V or less)
±2 A (at an output voltage of ±30 V or less)
±1 A (at an output voltage of ±60 V or less)
±0.5 A (at an output voltage of ±110 V or less)



Functions

■ Function

- Generation
  Generation function : Voltage or current
  Generation mode : DC or pulse
  Sweep mode : Linear, logarithmic or program (up to 65,535 steps)
- Measurement
  Measurement function : DC voltage, DC current and resistance
  Measurement data storage : Up to 65,535 data points
  Average : Block average or moving average (Specified count: 2 to 256)
- Trigger
  Trigger mode : Internal, external and immediate
- Time setting
  Pulse width : 100 µs to 3,600 s, 1 µs resolution
  Period time : 1 ms to 3,600 s, 1 µs resolution (during source and measure operation)
  100 µs to 3,600 s, 1 µs resolution (during source-only operation)
  Source delay : 1 µs to 3,600 s, 1 µs resolution
  Measurement delay : 1 µs to 3,600 s, 1µs resolution
  Integration time : 250 µs, 1 ms, 4 ms, 16.6 ms/20 ms,100 ms, 200 ms (auto detect from the power supply frequency when the power is turned ON for 16.6 ms/20 ms)
- Computation function
  Operators: +[addition], -[subtraction], *[multiplication], /[division] and ^ [exponentiation]
  Functions: ABS(), EXP(), LN(), LOG(), SQRT(), SIN(), COS(), TAN(), ASIN(), ACOS(), ATAN(), SINH(), COSH(), TANH(), RAND()

■ External Input/Output

- Synchronization signal input/output (TRIG, SWEEP, CTRL IN and OUT) (BNC)
- External input/output (D-Sub 15-pin)
- GP-IB interface
- RS-232 interface
- USB interface
- Ethernet interface (option) 100BASE-TX/10BASE-T

■ Internal memory

ROM : 4 MB Area for storing setup and output pattern files
RAM : 4 MB Area for storing the measured results (cleared when the power is turned OFF)

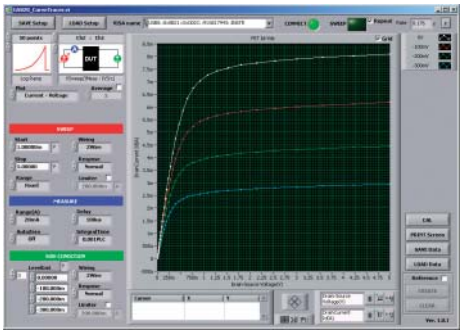
■ Display : 256 × 64 dot vacuum fluorescent display
■ External dimensions : Approx. 213 (W) × 132 (H) × 400 (D) mm (excluding protrusions)
■ Weight : Approx. 7 kg

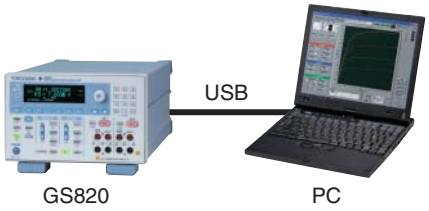
Model and Suffix code

Model	Suffix Codes	Description
765501		GS610 Source Measure Unit
Power cord	-D	UL/CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS standard
	-H	GB standard
Option	/C10	Ethernet interface

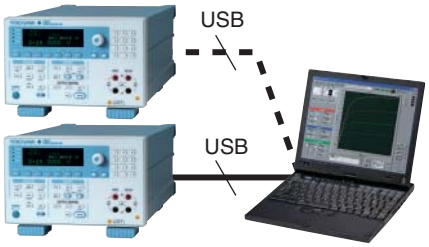
GS Series Accessory Software

765670 Curve Tracer Software for the GS series





System configuration illustration



Product Overview

This product is a high-speed, high-accuracy real-time I-V curve tracer that consists of the GS series Source Measure Unit and the 765670 Curve Tracer Software. It is particularly well-suited to DC parametric tests of minute signals.

Features

■ Simple system configuration, easy connection, compact and light

This system is configured by connecting the GS series Source Measure Unit to a PC that contains the 765670 Curve Tracer Software via USB.
You can perform high speed, high-accuracy curve tracing despite its compact size, light weight, and simple system configuration.

■ Real-time, High-Speed Drawing

The GS series is high-speed communication and sweep features allow high-speed graph update rate up to 25 pages/s(GS820).
You can use the real-time curve tracer with comfort.

■ Field of Applications

- Discrete semiconductors such as transistors and diodes
- Analog ICs such as voltage regulators and op- amps
- MOS logic and other digital ICs
- LEDs and other optical devices
- Solar battery cells

Drawing Speed (times/s; reference values)

Plot Points	Model Number	
	GS610	GS820
20	20	25
50	10	16
100	5	11
200	3	6

Measurement conditions: Using Core2Duo CPU, 1.5 GHz, USB 2.0, and LabVIEW
Measurement integration time: 0.001 PLC for GS820 / 250 µs for GS610

http://tmi.yokogawa.com/products/generators-sources/source-measure-units/765670-curve-tracer-software/

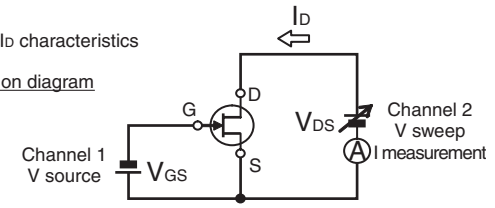
Specifications

- Graph drawing:
  Voltage vs. current, voltage vs. voltage, gain vs. voltage, voltage vs. timestamp, current vs. voltage, current vs. current, gain vs. current, current vs. timestamp
  - Sweep axis: Voltage source or current source
  - Measurement axis: Voltage measurement or current measurement
  - Parameter: Voltage source or current source
  - Sweep shape: Ramp (linear or log), triangle (linear or log), rectangle
  - Sweep points: 5, 10, 20, 50, 100, 200, 1000
  - Scaling: Auto scale or fixed scale
  - Averaging count: 2 to 100
- Analysis feature:
  Cursor, zoom & scroll, reference curve designation
- File operations:
  CSV data storage and loading, graphic image storage, panel image storage, setup storage and recall

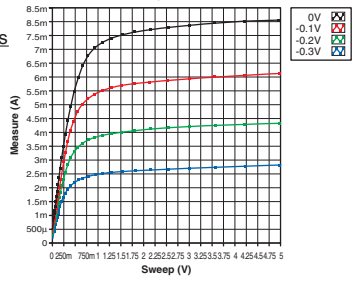
Examples of Measurements of Characteristics

● FET V_{DS}-I_D characteristics

Connection diagram



Measurement results



AC Voltage Current Standard **2558A**

AC Standard Source with Improved Performance and Usability

2558A

Features

The wide output ranges of 1.00mV to 1200.0 V AC and 1.00 mA to 60.00 A AC mean that the 2558A is the instrument of choice for the cost effective calibration of AC analog meters.

- Wide output range — AC voltage : 1.00 mV to 1200.0V; AC current : 1.00 mA to 60.00 V
- High accuracy — AC voltage : 0.04%; AC current : 0.05%
- High output stability : ±50 ppm/h
- Wide frequency range : 40 to 1000 Hz
  Accuracy : ±50 ppm
- Intuitive operation with dials for setting each digit
- Sweep function : 16/32/64 sec. (selectable)
- Output divider function (Divided output of the main setting)
- Direct readout of the deviation (Displays the deviation from the main setting)

Functions and Specification

Output

Range	Output Range	Guaranteed Accuracy Range
100 mV	0 to 144.00 mV	1 to 120.00 mV
1 V	0 to 1.4400 V	0.01 to 1.2000 V
10 V	0 to 14.400 V	0.1 to 12.000 V
100 V	0 to 144.00 V	1 to 120.00 V
300 V	0 to 432.0 V	3 to 360.0 V
1000 V	0 to 1440.0 V	10 to 1200.0 V
100 mA	0 to 144.00 mA	1 to 120.00 mA
1 A	0 to 1.4400 A	0.01 to 1.2000 A
10 A	0 to 14.400 A	0.1 to 12.000 A
50 A	0 to 72.00 A	0.5 to 60.00 A

Accuracy (180 days)

1 to 10% output of range ±(% of range)

Voltage	50/60 Hz	: 0.013
	40 to 400 Hz	: 0.015
	400 to 1000 Hz	: 0.030
Current	50/60 Hz	: 0.014
	40 to 400 Hz	: 0.016
	400 to 1000 Hz	: 0.032

10 to 120% output of range ±(% of setting + % of range)

Voltage	50/60 Hz	: 0.03 + 0.01
	40 to 40 0Hz	: 0.05 + 0.01
	400 to 1000 Hz	: 0.10 + 0.02
Current	50/60 Hz	: 0.04 + 0.01
	40 to 400 Hz	: 0.06 + 0.01
	400 to 1000 Hz	: 0.12 + 0.02

Functions and Specifications

Stability : ±(20 ppm of setting + 30 ppm of range)/h

Distortion factor
- Voltage : 0.07% or less
- Current : 0.18% or less

Frequency range
- Internal : 50 / 60 / 400 Hz / VAR
  VAR: 40 to 1000 Hz (0.001 Hz resolution)
- External : EXT1/EXT2
  (Use the terminals for synchronized operations)
- FREQUENCY METER : MIN/MAX
  20 to 1000 Hz (0.001 Hz resolution)
  Sweep, output divider and deviation functions are used for the frequency.

Sweep
- Target : Voltage / Current / Frequency
- Speed : Approx. 16/32/64 sec. selectable

Output divider
- Target : Voltage / Current / Frequency
- Denominator range : m4 to 15
- Numerator range : n0 to 15 (n ≤ m)

Deviation
- Target : Voltage / Current / Frequency
- Variable range: ±20.00%
- Operation : Two dials
  Resolution of the first dial: 0.2% of the main setting
  Resolution of the second dial: 0.01% of the main setting
- Deviation preset: OFF / 0 / 2% / 5%

Output terminal
Type
- Voltage : Plug-in terminal (safety terminal)
- Current : Binding post
- Selectable LO terminal to earth or floating
- Max. floating voltage to earth: 12 Vpk

Interface
- : USB interface (for PC connection)
- : Ethernet
- : GP-IB interface (optional)

Warm-up time : Approx. 30 minutes

Operating environment
- Temperature : 5 to 40ºC
- Humidity: 20 to 80%RH (no condensation)

Rated power supply voltage : 100 to 120 VAC / 200 to 240 VAC

Rated power supply frequency : 50/60 Hz

Max. power consumption : 200 VA

Weight : Approx. 20 kg

Dimensions : 426(W) x 132(H) x 400(D) mm

2558A Model and Suffix Codes

Model	Suffix Code	Description
2558A		AC Voltage Current Standard
Power cord	-D	UL/CSA standard, PSE
	-F	VDE standard
	-R	AS standard
	-Q	BS standard
	-H	GB standard
	-N	NBR standard
Option	/C1	GP-IB interface

Digital Multimeters 7561/7562

6.5 Digits Digital Multimeter

7561/7562

Digital Multimeters

- High accuracy (DC voltage-based accuracy)
  ±0.0045% of reading ± 15 digits
- Fast sampling at 333 times/s
- Large capacity buffer memory: up to 8000 data items
  IC memory card usable
- GP-IB interface (standard)

7561/7562 Specifications

- DC voltage (DCV)
  Range: 200 mV to 1000 V
- DC current (DCA)
  Range: 2 mA to 2000 mA
- AC voltage (ACV)(7562 only)
  Range: 200 mV to 700 V
- AC current (ACA)(7562 only)
  Range: 2 mA to 2000 mA
- Resistance measurement (OHM, 2 W/4 W)
  Range: 200 Ω to 200 MΩ
- Maximum indication: 1999999
- External dimensions:
  approx. 213 (W) × 88 (H) × 330 (D) mm
- Weight: approx. 3 kg

Digital Resistance Meter 7556

High-Speed Digital Resistance Meter for Production Line of Fixed Chip Resistors

The 7556 is designed to be mounted on a taping machine.
* When you use the 7556 for any purpose other than a production line, you need to be careful. Please read the specifications carefully.

7556

- High-speed measurement (2.8 ms)
- High accuracy: ±(0.006% of reading + 3 digits)
- High resolution: 5.5 digits
- Wide range: 1 Ω range to 100 MΩ range
- Full remote control through serial (RS-232) or GP-IB interface
- Software-based calibration function
- Advanced contact check function

7556 Specifications

Range: 1 Ω, 10 Ω, 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ,
1 MΩ, 10 MΩ, 100 MΩ
Resolution: Deviation display
755601: -99.99% to 19.99% or -99.9% to 199.9% (selectable)
755611: -99.999% to 19.999% or -99.99 to 199.99% (selectable)
Absolute value display
755601: 100 μΩ (at 1 Ω range)
755611: 10 μΩ (at 1 Ω range)
Measurement time:
Normal mode: 60 Hz power supply: 19.9 ms
50 Hz power supply: 23.2 ms
Fast mode: 5.7 ms
High-speed mode: 2.8 ms
Accuracy (at 1 kΩ range, 23±5°C in normal mode)
755601: ±(0.015% of reading + 1 digit)
755611: ±(0.006% of reading + 3 digits)
Contact check function
Check level: 1 Ω to 30 Ω (Selectable)
Execute checks before or after measurement (selectable)
Check current: 50 mA
Contact check error message with display panel and handler interface
Measured current abnormality detection function (Detect measured current abnormality caused by a contact error)
Comparator function (both Hi and Lo)
Deviation setting range
755601: -9.99% to 9.99% or -99.9% to 99.9% (selectable)
755611: -9.999% to 9.999% or -99.99% to 99.99% (selectable)
Absolute value setting range
755601: 0.0000 Ω to 1.2000 Ω
755611: 0.00000 Ω to 1.20000 Ω

Temperature Measuring Instrument 7563

Precision Digital Thermometer

7563

Digital Thermometer, 6.5 Digits

- Thermometer has a 6.5-digits display
  Twelve types of TC's and four types of RTD's
- Basic accuracy in temperature
  measurement: 0.006% (TC)
- Basic accuracy in DCV measurement: 0.0045% (2000 mV range)
- Basic accuracy in resistance measurement: 0.006% (2000 Ω range)
- Number of sampling times: up to 100 times/s (4.5 digits)

7563 Specifications

Maximum display: ±1999999
Resolution: Voltage 100 nV
Resistance 100 μΩ
Thermocouple 0.1°C
RTD 0.01°C
Reference junction compensation accuracy:
±0.2°C
Various computation functions
Software calibration function
Memory function
- Internal memory up to 1000 data items
- IC memory up to 8000 data items

Communication function: GP-IB
Analog output (optional): code /DA specified
Power consumption: 20 VA
External dimensions: 213 (W) × 88 (H) × 350 (D) mm
Weight: approx. 3 kg

Arbitrary/Function Generator **FG400 Series**

Easily Generate Basic, Application Specific and Arbitrary Waveform

FG400

Features

The FG400 Arbitrary/Function Generator provides a wide variety of waveforms as standard and generates signals simply and easily. There are one channel (FG410) and two channel (FG420) models. As the output channels are isolated, an FG400 can also be used in the development of floating circuits. (up to 42 V)

- 0.01 µHz to 30 MHz output (sine wave)
- 20 Vp-p output/open, 10 Vp-p output/50
- Arbitrary waveform generation function
- 3.5-inch color display
- Up to 6 units (12 channels) can be synchronized.
- A variety of sweeps, modulations and functions
- Parameter-variable waveforms

Functions and Specifications

• Number of channels	FG410: 1 channel FG420: 2 channels
• Output waveforms	Sine, square, pulse, ramp, DC, parameter-variable waveform (25 types), noise (Gaussian distribution), arbitrary waveform
• Oscillation modes	Continuous, modulation, sweep, burst, sequence
• Frequency	Sine 0.01 µHz to 30 MHz Square/pulse 0.01 µHz to 15 MHz Ramp/parameter-variable waveform 0.01 µHz to 5 MHz
• Arbitrary waveform	Waveform length 4 K to 512 K words or 2 to 10,000 control points
• Modulation type	FM, FSK, PM, PSK, AM, DC offset, PWM
• Sweep type	Frequency, phase, amplitude, DC offset, duty
• Synchronization of multiple units	Sync operation is possible. Up to 6 units can be connected with BNC cables in the form of master/slave connections, using the frequency reference output and external 10 MHz frequency reference input.
• Power supply	AC 100 V to 230 V ± 10% (250 V max.) 50 Hz/60 Hz ± 2 Hz
• Power consumption	FG410 50 VA or less FG420 75 VA or less
• Weight	Approx. 2.1 kg
• Dimensions	216 (W) × 88 (H) × 332 (D) mm

FG410/FG420 Models and Suffix Codes

Model	Suffix code	Description
FG410		Arbitrary /Function Generator, 1-Channel Model
FG420		Arbitrary /Function Generator. 2-Channel Model
Power cord	-D	UL/CSA standard, PSE
	-F	VDE standard
	-R	AS standard
	-Q	BS standard
	-H	GB standard
	-N	NBR standard

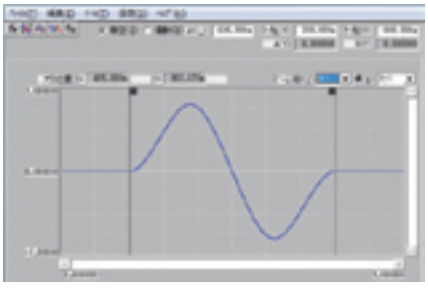
Related Software

XviewerLITE

This software allows you to display the waveforms and measurement results on a PC for the data measured with Yokogawa's DLM/DL/SL series. It allows you to clip part of a waveform and generate an arbitrary waveform with the FG400.

Arbitrary Waveform Editor

This software supports the arbitrary waveform function of the FG400. It allows you to edit waveforms and transfer data to the FG400. It also makes it easy to work on a pre-installed waveform to generate an arbitrary waveform.



Sequence Editor

This software supports the sequence function of the FG400 that outputs different waveforms sequentially. It controls the edit, transfer, and execution of sequence data. Complex programs can also be created easily.

Pressure Standard MC100

Pneumatic Pressure Standard

MC100
Pneumatic Pressure Standard

- High accuracy: ±0.05% of full scale
- Output ranges and resolution
  0 to 200 kPa (resolution 0.01 kPa)
  0 to 25 kPa (resolution 0.001 kPa)
- Functions useful for instrument calibration
  Divider output, auto-step output, and sweep output
- Excellent temperature coefficient
  Zero point: ±0.003% of full scale/°C
  Span: ±0.002% of full scale/°C

MC100 Series Specifications

- Supply pressure
  0 to 200 kPa range model:
  280 kPa ±20 kPa
  0 to 25 kPa range model: 50 kPa ±10 kPa
- Accuracy
  ±0.05% of full scale (at 23°C ±3°C)
- Output noise: ±0.02% of full scale
- Effect of mounting orientation
  Forward/backward incline of 90°
  0 to 200 kPa range model: ±0.01% of full scale
  0 to 25 kPa range model: ±0.1% of full scale
  Sideways incline of 30°
  0 to 200 kPa range model: ±0.2% of full scale
  0 to 25 kPa range model: ±2.5% of full scale
- Pressure display units (selectable):
  kPa, kgf/cm^2, mmH$_2$O, mmHg
  kPa, psi, inH$_2$O, inHg
- External dimensions:
  213 (W) × 132 (H) × 400 (D) mm
- Weight: approx. 9.5 kg

Manometers MT210/MT210F/MT220/MT10

Precision Digital Manometer

MT210
Digital Manometer

- High accuracy: ±(0.01% of reading + 3 digits) (130 kPa range gauge model)
- A wide range pressures, from a low differential pressure of 1 kPa to a high gauge pressure of 3000 kPa, and absolute pressure of 130 kPa
- D/A conversion output, comparator output, and external trigger input (optional)
- Both gases and liquids measurable
- External attachable battery pack (optional)

MT210 Series Specifications

- Measuring range (gauge pressure: positive)
  0 to 10 kPa, 130 kPa, 700 kPa and 3000 kPa
  Measuring range (gauge pressure: negative)
  -80 to 0 kPa, -10 to 0 kPa
- Measuring range (absolute pressure)
  0 to 130 kPa abs
- Measuring range (differential pressure)
  0 to 1 kPa, 10 kPa, 130 kPa and 700 kPa
- Accuracy (for 0 to 10 kPa range model)
  ±(0.01% of reading + 0.015% of full scale) (at positive pressure)
- Resolution
  0 to 1 kPa range model: 0.00001 kPa
  0 to 10 kPa range model: 0.0001 kPa
  0 to 130 kPa range model: 0.001 kPa
  0 to 700 kPa range model: 0.01 kPa
  0 to 3000 kPa range model: 0.01 kPa
- Maximum allowable input (for gauge pressure positive)
  0 to 10 kPa range model: 500 kPa gauge
  0 to 130 kPa range model: 500 kPa gauge
  0 to 700 kPa range model: 3000 kPa gauge
  0 to 3000 kPa range model: 4500 kPa gauge
- Pressure display units (selectable):
  psi, inH$_2$O, inHg, kPa, kgf/cm^2, mmH$_2$O, mmHg
- External dimensions:
  213 (W) × 132 (H) × 350 (D) mm
- Weight
  Approx. 6.5 kg (0 to 130 kPa range model)

Fast Response Digital Manometer

MT210F
Digital Manometer

- High accuracy: ±(0.01% of reading + 3 digits) (130 kPa range gauge model)
- Select from three measurement modes: normal speed, medium speed, and high speed
- D/A conversion output, comparator output, and external trigger input (optional)
- Both gases and liquids measurable
- External attachable battery pack (optional)

MT210F Series Specifications

- Measuring range (gauge pressure: positive)
  0 to 10 kPa, 130 kPa, 700 kPa and 3000 kPa
  Measuring range (gauge pressure: negative)
  -80 to 0 kPa, -10 to 0 kPa
- Measuring range (absolute pressure)
  0 to 130 kPa abs
- Accuracy (for 0 to 10 kPa range model)
  ±(0.01% of reading + 0.015% of full scale) (at positive pressure)
- Response time (0 to 130 kPa range model, at high speed mode)
  50 msec max.
- Readout update interval (at medium and high speed mode)
  100 msec
- Resolution
  0 to 10 kPa range model: 0.0001 kPa
  0 to 130 kPa range model: 0.001 kPa
  0 to 700 kPa range model: 0.01 kPa
  0 to 3000 kPa range model: 0.01 kPa
- Maximum allowable input (for gauge pressure positive)
  0 to 10 kPa range model: 500 kPa gauge
  0 to 130 kPa range model: 500 kPa gauge
  0 to 700 kPa range model: 3000 kPa gauge
  0 to 3000 kPa range model: 4500 kPa gauge
- Pressure display units (selectable):
  psi, inH$_2$O, inHg, kPa, kgf/cm^2, mmH$_2$O, mmHg
- External dimensions:
  213 (W) × 132 (H) × 350 (D) mm
- Weight
  Approx. 6.5 kg (0 to 130 kPa range model)

Digital Manometer For Efficient Field Calibration

MT220
Digital Manometer

- The de facto standard of field celibrators for pressure and ditferential pressure transmitters
- High accuracy: ±(0.01% of reading + 3 digits) (130 kPa range gauge model)
- DCV/DCA measurement function (DMM function)
- 24 VDC power supply for driving the transmitter
- % display, error display, and measured data memory
- D/A conversion output, comparator output, and external trigger input (optional)
- Both gases and liquids measurable
- External attachable battery pack (optional)

MT220 Series Specifications

- Measuring range (gauge pressure: positive)
  0 to 10 kPa, 130 kPa, 700 kPa and 3000 kPa
  Measuring range (gauge pressure: negative)
  -80 to 0 kPa, -10 to 0 kPa
- Measuring range (absolute pressure)
  0 to 130 kPa abs
- Accuracy (for 0 to 10 kPa range model)
  ±(0.01% of reading + 0.015% of full scale) (at positive pressure)
- Resolution
  0 to 10 kPa range model: 0.0001 kPa
  0 to 130 kPa range model: 0.001 kPa
  0 to 700 kPa range model: 0.01 kPa
  0 to 3000 kPa range model: 0.01 kPa
- Maximum allowable input (for gauge pressure positive)
  0 to 10 kPa range model: 500 kPa gauge
  0 to 130 kPa range model: 500 kPa gauge
  0 to 700 kPa range model: 3000 kPa gauge
  0 to 3000 kPa range model: 4500 kPa gauge
- Pressure display units (selectable):
  psi, inH$_2$O, inHg, kPa, kgf/cm^2, mmH$_2$O, mmHg
- Measurement range of DCV/DCA measurement function
  0 to ±5.25 V
  0 to ±21 mA
- Accuracy of DCV/DCA measurement function (6 months after calibration)
  ±(0.05% of reading + 3 digits)
- 24 VDC output
  24 ± 1 VDC, 30 mA max.
- External dimensions:
  213 (W) × 132 (H) × 350 (D) mm
- Weight
  Approx. 7.0 kg (0 to 130 kPa range model)

Handheld Digital Manometer

MT10
Mini-Manometer

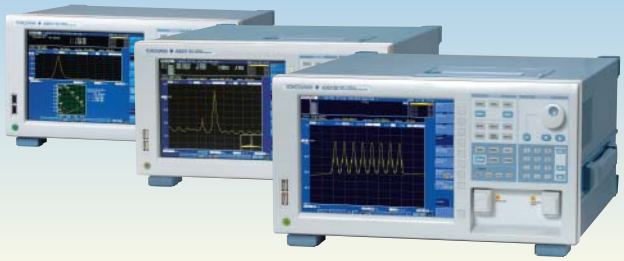
- Compact and lightweight (approx. 700 g), battery-operated
- High reliability (silicon resonant sensor adopted)
- Accuracy: ±(0.04% of rdg + 0.03% of FS) for 130 kPa model
- Three models for 130 kPa, 700 kPa, and 3000 kPa (gauge pressure)
- Data hold function
- RS-232-C interface
- Comes with carrying case

MT10 Series Specifications

- Type of pressure: gauge
- Three measuring ranges
  0 to 130 kPa, 0 to 700 kPa, and 0 to 3000 kPa
- Measurement display range:
  -2.5 to 110% of FS
- Accuracy:
  0 to 130 kPa range model
  ±(0.04% of rdg + 0.03% of FS)
  0 to 700 kPa and 0 to 3000 kPa range models
  ±0.1% of FS
- Resolution
  0 to 130 kPa range model: 0.01 kPa
  0 to 700 kPa range model: 0.1 kPa
  0 to 3000 kPa range model: 1 kPa
- Maximum allowable input
  0 to 130 kPa range model: 500 kPa
  0 to 700 kPa range model: 1000 kPa
  0 to 3000 kPa range model: 4500 kPa
- Effect of temperature
  Zero: ±0.02% of FS/10°C or less
  Span: ±0.02% of FS/10°C or less
- Pressure display units (specified at shipment)
  kPa, kgf/cm^2, mmH^{2}O, mmHg, Psi, inH^{2}O, inHg
- External dimensions:
  Approx. 72 (W) × 174 (H) × 60 (D) mm
  (excluding input connections)
- Weight: Approx. 700 g (including battery)

Optical Spectrum Analyzer **AQ6370 Series**

High Performance Optical Spectrum Analyzers Meeting Measurement Needs in a Broad Range of Applications



Features

- Best-in-class optical performance
  - · High wavelength resolution and high dynamic range
  - · High sensitivity
  - · Free-space optical input
- Excellent measurement throughput
  - · High-speed spectrum measurement
  - · High-speed remote interface
  - · High resolution and wide bandwidth batch measurement
- More user-friendly
  - · USB interface available
    For mouse, keyboard, and external storage devices such as a memory device and hard disc drive (HDD).
  - · Trace zooming function
  - · More than 10 waveform analysis functions available
- Support for creating an automatic measurement system
  - · GP-IB, RS-232C, and Ethernet interfaces available
    Support for the remote commands and formats of the AQ6317 series
  - · Macro programming function available
- Wavelength calibration reference light source or alignment light source available
- PC emulation and remote control software (option)

Three Models Converting a Wide Wavelength from 350 nm to 2400 nm

■ AQ6370D (600 to 1700 nm)
Standard model optimized to the wavelengths often used in telecommunication applications

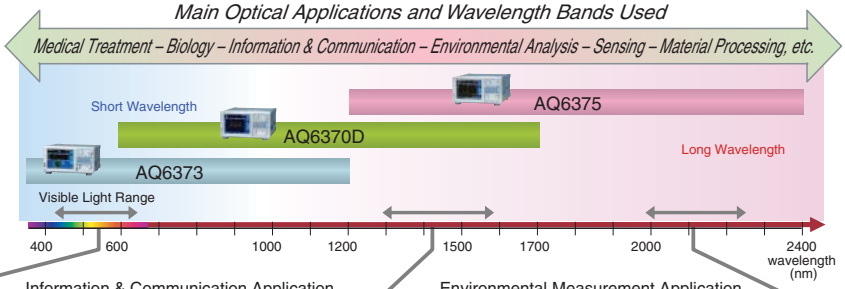
■ AQ6373 (350 to 1200 nm)
Model for short-wavelength including visible light (VIS)

■ AQ6375 (1200 to 2400 nm)
Model for long wavelength over 2 µm commonly used in the near-infrared range

Optical Applications

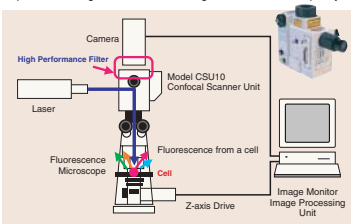
Today, optical technology is used in a wide variety of applications, which include biomedical application and environmental measurement, as well as information and communication, where demand for broadband connectivity is growing rapidly, driven by the popularity of the Internet, IP telephony, and video streaming. Yokogawa's optical spectrum measurement technology contributes to the development of such optical applications.

Main Optical Applications and Wavelength Bands Used



Biomedical Application

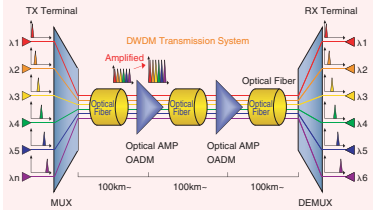
Example of a Configuration of a Scanning Confocal Microscope System



• Evaluating the performance of high performance filers for a visible light laser and fluorescence extraction

Information & Communication Application

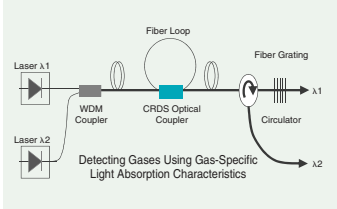
Example of a Configuration of a Dense Wavelength Division Multiplexing (DWDM) Optical Communication System



• Evaluating the performance of optical components, such as a laser, optical multiplexer, optical demultiplexer and optical amplifier, as well as the system as a whole

Environmental Measurement Application

Example of a Configuration of Simultaneous Multi-Wavelength Measurement of Gases Using the CDRS Technique



• Evaluating the performance of optical components such as a laser and grating
• Evaluating the light absorption characteristics of gases

AQ6370 Series of Optical Spectrum Analyzers Common Specifications

Item	Specifications
Electrical interface	AQ6373/AQ6375: GP-IB × 2 (standard/controller), AQ6370D: GP-IB × 1 (standard), RS-232, Ethernet, USB, PS/2 (keyboard)***, SVGA output, analog output port, trigger input port, trigger output port
Remote control *	GP-IB, RS-232, Ethernet (TCP/IP) AQ6317 series compatible commands (IEEE488.1) and IEEE488.2
Data storage	Internal storage: 512 MB, Internal memory: 64 traces, 64 programs, 3 template lines, External storage: USB storage (memory/HDD), FAT32 format File types: CSV (text), Binary, BMP, TIFF
Display **	10.4-inch color LCD (Resolution: 800 × 600)
Printer***	Built-in thermal printer (Factory installed option)
External dimensions	Approx. 426 (W) × 221 (H) × 459 (D) mm (excluding protector and handle)
Mass	AQ6370C: Approx. 19 kg, AQ6373: Approx. 20 kg, AQ6375: Approx. 27 kg (without printer option)
Power supply	100 to 240 VAC, 50/60 Hz, approx. 100 VA (AQ6370D), 150 VA (AQ6373/AQ6375)
Environmental conditions	Performance guarantee temperature range: + 18 to + 28°C, Operating temperature range: +5 to +35°C, Storage temperature range: -10 to +50°C, Humidity: ≤80 %RH (no condensation)

*: Some AQ6317 series commands may not be compatible due to changes in the specifications or functions of models.
**: Liquid crystal display may include a few defective pixels (within 0.002% with respect to the total number of pixels including RGB). There may be a few pixels on the liquid crystal display that do not emit all the time or remain ON all the time. These are not malfunctions.
***: Excl. AQ6370D

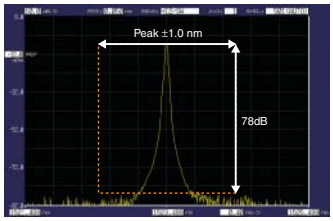
Optical Spectrum Analyzer **AQ6370D**

Redefining Optical Spectrum Measurement Excellence

Features

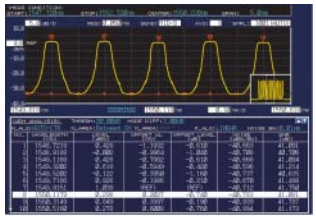
- Enhanced new functions
- World Class Optical Performance & Flexibility
  High wavelength resolution: 0.01 nm
  Wide close-in dynamic range: 78dB typ.
  Single and multimode fiber test capability (up to GI 62.5/125µm)
- Improved Measurement Throughput
  Double-speed mode
  Fast measurement and fast data transfer
- Enhanced User Friendliness
  USB for Mouse, keyboard, and external storage devices
  Bright 10.4" LCD
  Trace zoom capability
  Various built-in analysis functions
- Expedites Development of Automated Test Systems
  Supports GP-IB, RS-232C, and Ethernet interfaces
  Compatible with SCPI and supports AQ6317 series remote commands
  Built-in simple macro programming function
- Includes Wavelength Calibration Source (Optional)
- AQ6370 Viewer: Emulation/Remote control software (Optional)

World-class optical performance



Example of the dynamic range

Peak±1.0nm, Resolution setting 0.05 nm, High dynamic mode: ON, High performance model



DWDM signal measurement

DWDM channels allocated at 50GHz spacing can be measured and analyzed.

Improved Measurement Throughput

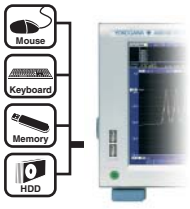
20x Measurement speed with double-speed mode

100x Key & Command response

100x Data transfer Speed

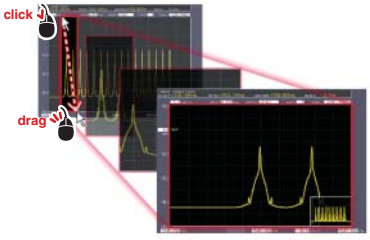
(in comparison with AQ6317C Optical spectrum Analyzer)

Enhanced User Friendliness



USB interface

Supports mouse, keyboard, and external storage devices.



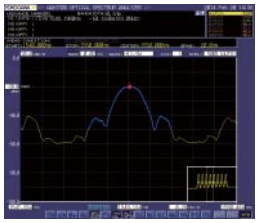
Trace zoom function

Enlarges a designated area

Enhanced new functions

- Data logging function
  The Data Logging function records analysis results such as WDM analysis (OSNR, optical signal/noise ratio), distributed feedback laser diode (DFB-LD) analysis, and multi-peak measurements at up to 10,000 points per channel with time stamps. Recorded data can be displayed in table and graphical forms.
- Advanced marker function
  The Advanced Marker function adds markers to obtain the power density and the integrated power of a designated spectrum.
- Gate sampling function
  The Gate Sampling function facilitates the recirculating loop testing of optical transmission systems.
- Resolution calibration function
  The Resolution Calibration function is used to calibrate the noise equivalent bandwidth with an external light source.

Data Logging display



Advanced marker display

Basic Specifications

- Measurement wavelength range: 600 to 1700 nm
- Wavelength accuracy: ±0.01 nm (High performance model), ±0.02 nm (standard model)
- Measurement data point: 101 to 50001
- Wavelength resolution setting: 0.02 to 2.0 nm
- Level sensitivity:
  -90 dBm (1300 to 1620 nm, resolution: 0.05nm or wider, sensitivity: HIGH3)
- Maximum input power: +20 dBm (Per channel, full span)
- Close-in dynamic range (at 1523nm):
  45 dB (±0.1 nm from peak, resolution: 0.02 nm)
  58 dB (±0.2 nm from peak, resolution: 0.02 nm)
  45 dB (±0.2 nm from peak, resolution: 0.1 nm)
  60 dB (±0.4 nm from peak, resolution: 0.1 nm)
- Applicable fiber: SM (9.5/125 µm), GI (50/125 µm, 62.5/125 µm)

Model Number and Suffix Codes

Model	Suffix Codes	Descriptions
AQ6370D		Optical Spectrum Analyzer AQ6370D
Spec-code	-10	Standard model
	-20	High performance model
Power cord	-D	UL/CSA Standard
	-F	VDE Standard
	-R	AS Standard
	-Q	BS Standard
	-H	GB Standard
	-N	NBR Standard
Factory Installed Options	/FC	AQ9447(FC) Connector adapter for optical input
	/SC	AQ9447(SC) Connector adapter for optical input
	/RFC	AQ9441(FC) Universal adapter for calibration output
	/RSC	AQ9441(SC) Universal adapter for calibration output

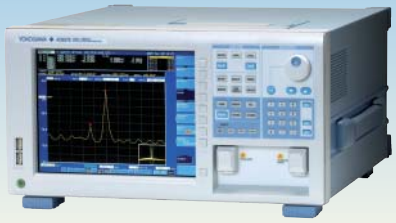
AQ6370 Viewer Emulation/Remote Control Software (Optional)

Note. AQ6370 Viewer contains the AQ6370D Viewer.

The AQ6370D Viewer is a PC application software that has the same user interface and functions as the AQ6370D so that you can easily display and analyze waveform data acquired by the AQ6370D.

Optical Spectrum Analyzer **AQ6375**

Long Wavelength OSA 1200 - 2400nm

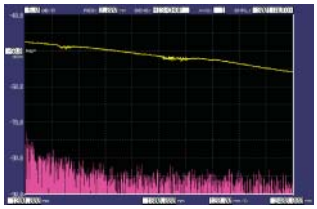


Features

- Unparalleled Performance
  - Long wavelength: 1200 - 2400nm
  - High sensitivity: +20 to -70dBm
  - High resolution & wide dynamic range
- Greater Efficiency
  - High speed measurement
  - Fast command processing and data transfer
- Support Multimode Fiber
  - Free-space optical input
- Intuitive Easy Operation
  - Mouse & keyboard operation
  - Trace zoom function
- Easy Calibration
  - Built-in calibrator
- AQ6375 Viewer: Emulation/Remote control software (Optional)

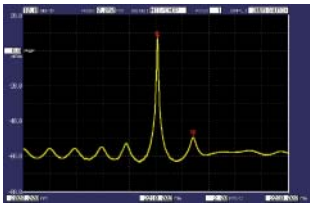
Unparalleled Optical Performance

■ **High sensitivity in long wavelength**



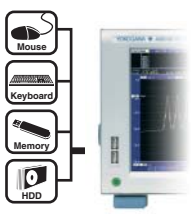
The spectrum of a white light source (yellow) and the background noise of AQ6375 (red)

■ **Measurement Example**

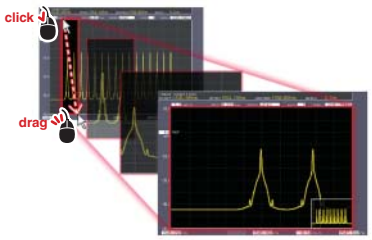


2010nm DFB-LD
Resolution: 50 pm, Span: 20 nm Sensitivity: HIGH1/CHOP

Easy Operation



USB interface
Supports mouse, keyboard, and external storage devices.



Trace zoom function
Enlarges a designated area

Basic Specifications

- Measurement wavelength range: 1200 to 2400 nm
- Wavelength accuracy: ±0.05 nm (1520 to 1580 nm), ±0.1 nm (1580 to 1620 nm), ±0.5 nm (Full range)
- Measurement data point: 101 to 50001
- Wavelength resolution setting: 0.05 to 2.0 nm
- Level sensitivity:
  -70 dBm (1800 to 2200 nm, resolution: 0.1nm or wider, sensitivity: HIGH3)
- Maximum input power: +20 dBm (Per channel, full span)
- Close-in dynamic range (at 1523nm):
  45 dB (±0.4 nm from peak, resolution: 0.05 nm)
  55 dB (±0.8 nm from peak, resolution: 0.05 nm)
- Applicable fiber: SM (9.5/125 µm), GI (50/125 µm, 62.5/125 µm)

Model Number and Suffix Codes

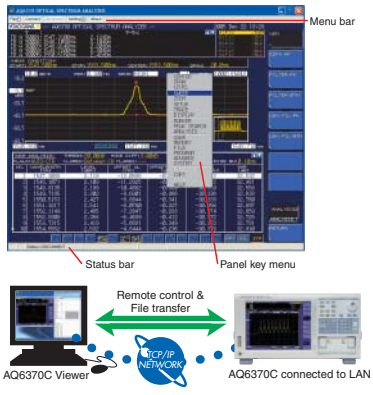
Model	Suffix Codes	Descriptions
AQ6375		Optical Spectrum Analyzer AQ6375
Spec-code	-10	Standard model
Power cable	-D	Power cord (UL3P)
	-F	Power cord (CEE-C7)
	-R	Power cord (SAA-3P)
	-Q	Power cord (BS3P Rectangular)
	-H	Power cord (BS3P Round)
Factory Installed Options	/FC	AQ9447(FC) Connector adapter for optical input
	/SC	AQ9447(SC) Connector adapter for optical input
	/ST	AQ9447(ST) Connector adapter for optical input
	/RFC	AQ9441(FC) Universal adapter for calibration output
	/RSC	AQ9441(SC) Universal adapter for calibration output
	/RST	AQ9441(ST) Universal adapter for calibration output
	/B5	Built-in thermal printer

AQ6370 Viewer Emulation/Remote Control Software (Optional)

Note. AQ6370 Viewer contains AQ6375 Viewer.

The AQ6375 Viewer is a PC application software that has the same user interface and functions as the AQ6375 so that you can easily display and analyze waveform data acquired by the AQ6375.

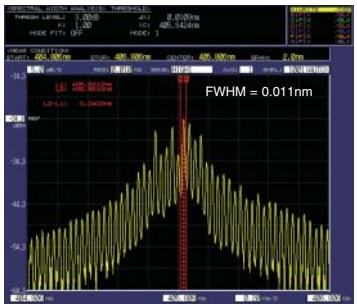
- **Viewer function**
  Trace data files saved on the AQ6375 can be retrieved and analyzed on a PC.
- **Remote Control function**
  The remote control allows you to set measurement conditions and to execute a measurement on AQ6375 Optical Spectrum Analyzer from anywhere on the Ethernet network.
- **File Transfer function**
  Files can be exchanged between AQ6375 and PC.



Optical Spectrum Analyzer **AQ6373**

Short Wavelength OSA 350 - 1200 nm

- Wavelength accuracy: ±0.05 nm
- Wavelength resolution setting: 0.02 to 10 nm (Settable to 0.01 nm at 400 to 470 nm)
- Max. safe input power: +20 dBm
- Level sensitivity: -80 dBm
- Dynamic range: ≥60 dB
- Single-mode, multimode, and large-core fibers
- Built-in optical alignment source
- Automatic wavelength calibration with an external source
- Built-in color analysis function for VIS



Example of 405 nm FP-LD measurement (Resolution setting: 0.01 nm)

Higher resolution measurement is possible in 400 to 470 nm range.

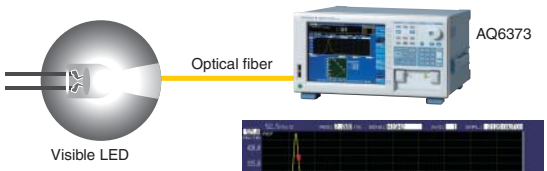
Applications

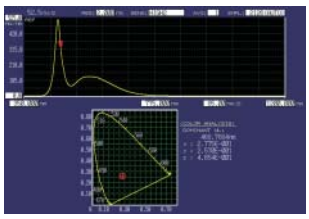
■ Active optical device (semiconductor laser, fiber laser, LED)
■ Passive active device (filter, FBG, special optical fiber)
■ Support for the development of optical devices

- Medical and biological applications (medical laser treatment, DNA analysis, laser microscope)
- Industrial equipment (laser processing, laser marking)
- Home electronics (laser projector, next-generation optical disc, LED products)
- Measurement (LIDAR, interferometer)
- Communication (plastic optical fiber (POF) communication)

Visible LED Test

The optical spectrum of visible LEDs used in a wide variety of applications such as lighting, indication, and measurement can be measured and analyzed. By supporting the large core fiber input, the AQ6373 can efficiently acquire the LED light and measure its spectrum. The standard built-in color analysis function automatically evaluates a dominant wavelength and XYZ color coordinates.





Color analysis of white LED

Main Specifications

Item	Specifications
Wavelength range *1	350 to 1200 nm
Span *1	0.5 nm to 850 nm (full span), and 0nm
Wavelength accuracy *1	± 0.05 nm (633nm), ± 0.20 nm (400 to 1100nm) (after wavelength calibration with 633 nm He-Ne laser)
Wavelength resolution setting *1, *2	0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10 nm (full range), and 0.01nm (400 to 470 nm)
Minimum sampling resolution *1	0.001 nm
Number of sampling points	101 to 50001, AUTO
Measurement sensitivity setting	NORM_HOLD, NORM_AUTO, NORMAL, MID, HIGH1, HIGH2 and HIGH3
High dynamic mode	SWITCH (sensitivity setting: MID, HIGH1 to 3)
Level sensitivity *3	-80 dBm (500 to 1000 nm), -60 dBm (400 to 500 nm, 1000 to 1100 nm) (Typical, Resolution setting: ≥ 0.2nm, Averaging: 10 times, Sensitivity: HIGH3)
Maximum safe input power *3	+ 20 dBm (550 to 1100nm), + 10 dBm (400 to 550nm) (total input power)
Level accuracy *2	± 1.0 dB (850 nm, Input level: -20 dBm, Resolution: ≥ 0.2 nm, Sensitivity: MID, HIGH1 to 3, SMF [MFD5 µm@850nm, NA0.14]
Level linearity *3	± 0.2 dB (Input level: -40 to 0 dBm, Sensitivity: HIGH1-3)
Dynamic range *1	60 dB (Peak ± 0.5 nm, Resolution: 0.02 nm, 633nm, Sensitivity: HIGH1 to 3)
Applicable fiber	SM, GI (50/125 µm, 62.5/125 µm), Large core fiber (up to 800 µm)
Optical connector	FC type (optical input and calibration light source output)
Built-in calibration light source	Optical alignment light source (not equipped with wavelength reference light source.)
Sweep time *1, *4	NORM_ AUTO: 0.5 sec, NORMAL: 1 sec, MID: 2 sec, HIGH1: 5 sec, HIGH2: 20 sec, HIGH3: 75 sec
Warm-up time	Minimum 1 hour (after warming up, optical alignment adjustment with built-in light source is required.)

Performance and functions can be limited by type of used fiber. The specifications are only guaranteed when a single mode fiber in which light travels in single mode at the measured wavelength is used. In the case in which the measured wavelength is less than the cut-off wavelength of the used fiber, or a multimode fiber is used, a measured spectrum may be inaccurate due to speckle noise. Please be careful especially when measuring high coherency sources like gas laser and laser diode.
*1: Horizontal scale: Wavelength display mode.
*2: Actual wavelength resolution varies according to the measured wavelength. Actual resolution at the 10 nm resolution setting is about 8 nm at most.
*3: Vertical scale: Absolute power display mode.
*4: High dynamic mode: OFF, Pulse light measurement mode: OFF, Number of sampling points: 1001, Average number: 1, Span: ≤ 100 nm excluding 450 to 470 nm and 690 to 700 nm.

Optical Wavelength Meter **AQ6150 series**

High performance and cost-effective Optical Wavelength Meter Exceeding the testing needs of optical devices and transmission systems

Features

The AQ6150 series optical wavelength meter is an ideal instrument for accurately measuring the optical wavelength of optical devices and systems used in telecommunication applications from 1270 to 1650 nm. By employing a Michelson interferometer and a high speed Fast Fourier Transform (FFT) algorithm, the AQ6150 series can measure not only a single wavelength laser signal but also a multiple wavelength laser signal from a DWDM system and Fabry-Perot laser.

- Wavelength Range: 1270 to 1650 nm
- Wavelength accuracy: ±0.3 pm (AQ6151), ±1 pm (AQ6150)
- Simultaneous measurement of up to 1024 wavelengths
- Cope with modulated light and optical filter measurement
- Increase throughput with high speed measurement
- Reduce the lifetime ownership costs
- Upgrade the test system with ease
- Abundant functions to increase work efficiency

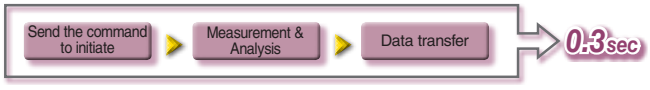
Product Lineup

There are two models in the series. The High Accuracy AQ6151 model offers an accuracy of ±0.3pm to meet the most demanding precision requirements. The Standard Accuracy AQ6150 offers a ± 1pm accuracy for applications with less demanding requirements at a more affordable price.

Model	Accuracy	Key applications
AQ6150	± 1 pm	Inspection of DFB-LDs, Tunable lasers, Optical transceivers. WDM transmission systems
AQ6151	± 0.3 pm	Adjustment, characterization, and inspection of Laser chips, Tunable lasers, WDM transmission systems, etc.

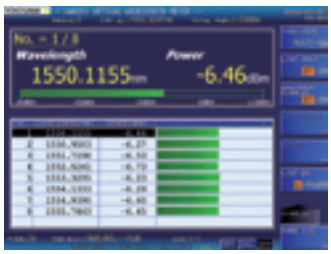
Increase throughput with high speed measurement

Both models can acquire, analyze and transfer a measurement to a PC within 0.3 seconds. This vastly improves production throughput.



Various view modes

Multi wavelength view

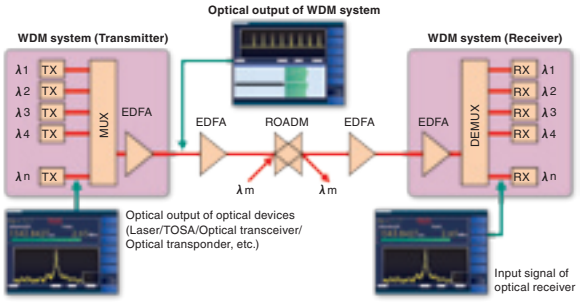


Optical spectrum view

Other modes:
Single wavelength view, Delta wavelength view, and List view

Applications

- **WDM transmission systems**
  - Simultaneous measurement of multi channel and narrow spacing WDM system
  - Precise adjustment and inspection of laser sources
  - Measurement of modulated signals
- **Lasers / optical transceivers**
  - Precise adjustment and inspection of tunable lasers
  - Modulated signal measurement of optical transceivers and transponders.
  - Measurement of all channels of 40G and100G optical transceivers with WDM technology.
- **Calibration of test systems**
  - Calibration of optical spectrum analyzers.
  - Calibration of DFB lasers for optical amplifier test system.
  - Calibration of tunable lasers for passive component test systems.



Specifications

Applicable optical fiber	SM (ITU-T G.652)
Wavelength range	1270 to 1650 nm
Wavelength accuracy	AQ6150: ±0.7 ppm (±1 pm at 1550 nm)
	AQ6151: ±0.2 ppm (±0.3 pm at 1550 nm)
Min. resolvable separation	5 GHz (40 pm at 1550 nm)
Display resolution (Wavelength)	0.0001 nm
Power accuracy	±0.5 dB (1550 nm, -10 dBm)
Linearity	±0.3 dB (1550 nm, -30 dBm or higher)
Polarization dependency	±0.5 dB (1550 nm)
Display resolution (Power)	0.01 dB
Max. number of wavelengths	1024
Min. input power	-40 dBm (1270 to 1600 nm)
	-30 dBm (1600 to 1650 nm, single line input)
Max. input power	+10 dBm (total of all lines)
Safe max. input power	+18 dBm (total of all lines)
Return loss	35 dB
Measurement time	0.3 s or less (single measurement)
Display	5.7-inch color LCD (640×480 dots)
Data storage	Internal: 256 MB or more, External: USB
Interfaces	GP-IB, ETHERNET, USB, VGA output
Remote control	GP-IB, ETHERNET
Optical connector	FC/PC or SC/PC (AQ9441 Universal adapter)
Dimensions	Approx. 426 (W)×132 (H)×450 (D) mm
Mass	Approx. 11 kg

Please refer to the product brochure for details.

Model and Suffix Codes

Model	Suffix	Descriptions
AQ6150		AQ6150 Optical Wavelength Meter
AQ6151		AQ6151 Optical Wavelength Meter
Spec code	-10	Base model
Power cord	-D	UL/CSA standard, and PSE standards
	-F	VDE standard
	-R	AS standard
	-Q	BS standard
	-H	GB standard
	-N	NBR standard
Optical connector (Factory option)	/FC	AQ9441(FC) Universal Adapter
	/SC	AQ9441(SC) Universal Adapter

Multi Application Test System **AQ2200**

Build Your Own Test Configurations in Small Footprint

Features

The AQ2200 Multi Application Test System is the ideal system for measuring and evaluating a wide range of optical devices and optical transmitters.

- Flexible and space effective
- Easy-to-View TFT color display
- Remote operation through Ethernet network
- Built-in applications
  - Optical power stability measurement
  - Short-term optical power fluctuation measurement
- Wide variety of plug-in modules
- Hot-swappable modules

Applications

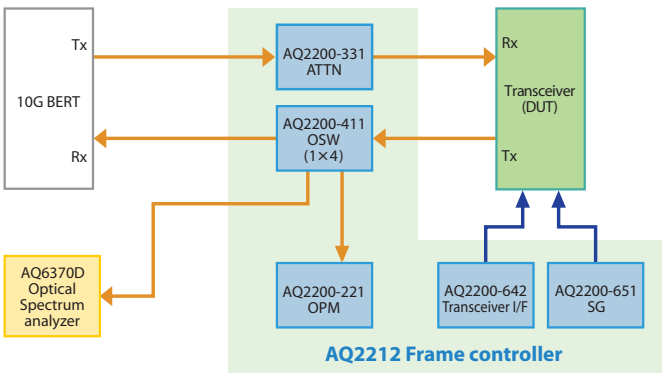
- GE-PON ONU/OLT measurement system
- GE-PON optical three wavelength filter measurement
- Optical amplifier measurement system
- Optical transceiver measurement system

Frame and Module Lineup

- Frame controllers
  AQ2211 Frame controller (3 slots for modules)
  AQ2212 Frame controller (9 slots for modules)
- Light source modules
  AQ2200-131 Grid TLS module (C/L-band, 1 channel)
  AQ2200-132 Grid TLS module (C/L-band, 2 channels)
- Sensor modules
  AQ2200-215 Sensor module (+30dBm, 970-1660nm, 1-slot)
  AQ2200-221 Sensor module (Dual sensor, 800-1700nm, 1-slot)
- Optical attenuator modules
  AQ2200-311A ATTN module [w/ Monitor output (optional)] (SMF or MMF, 1-slot)
  AQ2200-331 ATTN module [w/built-in optical power meter] (SMF or MMF, 1-slot)
- Optical switch modules
  AQ2200-411 OSW module (1×4 or 1×8, SMF or MMF, 1-slot)
  AQ2200-412 OSW module (1×16, SMF, 2-slot)
  AQ2200-421 OSW module (1×2 or 2×2, SMF or MMF, 1-slot)
- Modules for Optical Transceiver
  AQ2200-642 Transceiver interface module (2-slot)
  AQ2200-651 SG module (2-slot)

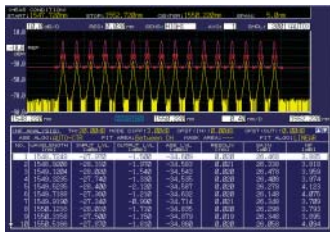
Transceiver Measurement System

The 10 Gbit/s optical transceiver modules such as XFP or SFP+ are frequently used in transmission systems and Ethernet systems.
The measuring system for such modules requires many instruments including power supplies, multi-meters and the signal generators to control optical transceiver modules.
The AQ2200 Multi Application Test System allows for building a space saving test system with a variety of plug-in modules.



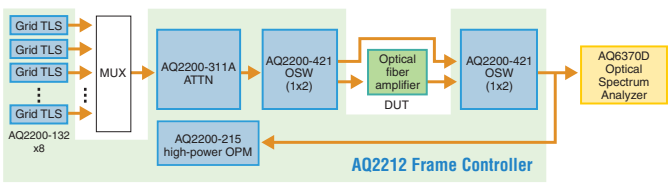
Optical Fiber Amplifier Measurement System

An optical fiber amplifier is an indispensable device for WDM transmission systems. This measurement system characterizes gains and noise figures (NF) of the fiber amplifier by measuring input light to an optical fiber amplifier, which was multiplexed using multiple light sources, as well as amplified output light with an optical spectrum analyzer. A high-power sensor allows for measuring total output power.



AQ6370C Measurement Screen

[Measurement items]
- Gain, NF, and total output power



Optical Measuring Instruments

Optical Time Domain Reflectmeter **AQ7275**

Superior cost performance, easy to operate Makes your work more efficient

General Specifications

- Display: 8.4-inch color TFT (640 × 480 pixels, semi-transparent)
- External interface: USB 1.1 Type A and Type B, one each
- Power supply: AC adapter 100 to 240 VAC, 50 to 60 Hz
  Battery operation time 6 hours and recharge time 5 hours
- Dimensions and weight: 287 mm (W) × 197 mm (H) × 85 mm (D), approx. 2.8 kg (excluding options)

Features

A wealth of features, including a short event dead zone, quick startup, high-speed measurement, easy operation, as well as optional functions such as stabilized light source, APC connector and PON measurement, extend the range of applications. In particular, the PON measurement option allows the user to test fiber optic cable with a splitter and view waveforms in a more understandable way.

Model and Suffix Code

Model	Option availability							Remarks
	Optical power monitor	Stabilized light source	Visible light source	PON measure-ment	High Dynamic range	Printer/ LAN	Dummy fiber	
735031	—	√	√	√	—	√	√	1-port, SM1650nm, filter
735032	√	√	√	—	√	√	√	1-port, SM1310/1550 nm
735033	√	√	√	√	—	√	√	1-port, SM1310/1550 nm, High DR
735034	√	√	√	—	—	√	√	1-port, SM1310/1550 nm, Higher DR
735035	√	√	√	—	—	√	√	1-port, SM1310/1490/1550 nm
735036	√	√	—	√	—	√	√	2-port, SM1310/1550/1625 nm, filter
735037	√	√	—	—	—	√	√	2-port, SM1310/1550/1650 nm, filter
735038	√	√	√	√	—	√	√	1-port, SM1310/1550/1625 nm
735041	√*1	√*1	—	—	—	√	—	2-ports, MM850/1300 nm, SM1310/1550 nm

*1 : MMF is not supported.
√ : Available.

	Suffix Codes	Description
Optical Connector	-SCC	SC type connector
	-FCC	FC type connector
	-NON	No universal adapter
	-USC	Universal adapter (SC)
	-UFC	Universal adapter (FC)
	-ASC	Angled-PC connector (SC) *2
Language	-HE	English
	-HC	Chinese/English
	-HK	Korean/English
	-HR	Russian/English
Power Cord	-D	UL/CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS/Singapore standard
	-H	GB standard, Complied with CCC
	-P	Korean standard
Options	/PM	Optical power monitor
	/SLS	Stabilized light source
	/VLS	Visible light source
	/PN	PON measurement
	/DR	High Dynamic range
	/PL	Built-in printer, LAN
	/DF	Dummy fiber (SMF)
	/SB	Shoulder belt

*2: An angled-PC connector cannot be used in the MM port of the 735040. -USC needs to be attached.

Example: 735033-USC-HE-D/PM/SLS
AQ7275 OTDR 1310/1550nm, high dynamic range, with SC universal adapter, English version, with a UL/CSA standard power cord, with optical power monitor function and with stabilized light source function.

Standard Accessories
Power cord, AC adapter, battery pack, hand belt, user's manual (CD-ROM), operation guide

Specifications by Model

Fiber	Number of wavelengths	Wavelength	Dynamic range	Model	Features
SMF	1	1650nm	30dB	735031	Single-wavelength model, supporting a maintenance wavelength of 1650 nm, including a built-in light cut filter.
	2	1310/1550nm	34/32dB	735032	Standard model for installation and maintenance of FTTH.
	2	1310/1550nm	40/38dB	735033	Standard model for installation and maintenance of Metro and Access networks.
	2	1310/1550nm	43/41dB 45/43dB(typ)	735034	High dynamic range model for installation and maintenance of Core and Metro networks.
	3	1310/1490/1550nm	34/30/32dB	735035	Three-wavelength model for PON system supporting 1490 nm.
	3	1310/1550/1625nm	40/38/33dB	735036	Three-wavelength model, supporting a maintenance wavelength of 1625 nm, including a built-in light cut filter.
	3	1310/1550/1650nm	40/38/30dB	735037	Three-wavelength model, supporting a maintenance wavelength of 1650 nm,including a built-in light cut filter. 1310/1550 nm is for Metro and Access networks.
	3	1310/1550/1625nm	40/38/36dB	735038	Model for installation and maintenance of WDM network.
MMF SMF	4	850/1300nm 1310/1550nm	22.5/24dB (62.5GI) 21.5/23dB (50GI) 40/38dB	735041	Four-wavelength model for installation and maintenance of LAN and FTTH with support for both multimode and single mode fiber. Dynamic range is available for measuring 50GI fiber.

Accessories (Sold Separately)

Name	Model	Description
Soft carrying case	739860	
Battery pack	739880	
External large capacity battery	739881	With battery case and connection cable
Universal adapter (SC)	SU2005A-SCC	SC type
Universal adapter (FC)	SU2005A-FCC	FC type
Printer roll paper	A9010ZP	80 mm × 25 m
Shoulder belt	B8070CY	
AC adapter	739870-D	UL/CSA standard
	739870-F	VDE standard
	739870-R	AS standard
	739870-Q	BS/Singapore standard
	739870-H	GB standard, Complied with CCC
	739870-P	Korean standard

Application Software

Model	Suffix Codes	Description
735070		AQ7932 Emulation Software (Ver3.0 or later)
	-EN	English
735071		AQ7940 Optical fiber Monitorning Software
	-EN	English

MFT-OTDR

AQ1200

Features

The AQ1200 is a multifunctional handheld OTDR that combines all the necessary field test functions in one unit. It offers various functions, including an OTDR function that features short 80 cm event dead zone, a fault locator function that is effective in locating a fault, a loss test function (option) that combines light sources and an optical power meter in one unit, and a visible light source (option). You can also connect a fiber end-face inspection probe. The AQ1200 retains the interface of the very popular AQ7252 series. So you can use the variety of functions and the user-friendly interface.

Specifications

Model	AQ1200A	AQ1200B*1	AQ1200C*1	AQ1200E*1	AQ1205A	AQ1205E*1	AQ1205F*1
Measured wavelength (nm)	1310±20(typ)*2/ 1550±20(typ)*2	1625±10	1650±5*3 1650±10*4	1310±20(typ)*2/ 1550±20(typ)*2, 1625±10	1310±20(typ)*2/ 1550±20(typ)*2	1310±20(typ)*2/ 1550±20(typ)*2, 1625±20(typ)	1310±20(typ)*2/ 1550±20(typ)*2, 1650±5*3 1650±10*4
Optical Port	PORT2			PORT2, 3	PORT2	PORT2, 3	
Measured fiber	SM(ITU-T G.652)						
Distance range(km)	0.5, 1, 2, 5, 10, 20, 50, 100, 200, 300, 400, 512*11			0.5, 1, 2, 5, 10, 20, 50, 100, 200, 300, 400, 512			
Pulse width(ns)	3, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, 10000, 20000*11			3, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, 10000, 20000			
Event Dead zone (typ.)*7	0.75m*8						
Attenuation Dead zone (typ.)*9	4m/5m	7m		4m/5m, 7m	4m/5m	4m/5m, 7m	
Dynamic range(dB) (typ.)	34/32*5	33*5	34*5	38/36,36*5	42/40*6	42/40,38*6	42/40,37*6
Loss measurement accuracy	±0.05dB or ±0.05dB/dB						
Optical connector	Universal Adapter SC, FC						
Output power control*10	–	Normal / Low			–	Normal / Low	
Laser safety standard	Class 1M						

*1 : Pulse light output poert at 1625 nm and 1650 nm, +15 dB or less, built-in 1310 & 1550 nm cut filter.
*2 : 25 nm is guaranteed
*3 : At a point -20 dB from the pulse light output peakvalue (measured after 30 minutes or more form power-on at an ambient temperature of 23°C)
*4 : At a point -60 dB from the pulse light output peakvalue (measured after 30 minutes or more form power-on at an ambient temperature of 23°C)
*5 : SNR=1, Pulse width: 10 µs, measurement time: 3 minutes, When angled -PC connectors are used, each dynamic range decreases by 0.5 dB,
Guaranty value [dB]; 32/30 (AQ1200A), 30 (AQ1200B), 30 (AQ1200C), 32/30, 30 (AQ1200E)
*6 : SNR=1, Pulse width: 20 µs, measurement time: 3 minutes, When angled -PC connectors are used, each dynamic range decreases by 0.5 dB,
Guaranty value [dB]; 40/38 (AQ1205A), 40/38, 36 (AQ1205E), 40/38, 30 (AQ1205F)
*7 : Pulse width 3 ns, return loss: 55 dB or more
*8 : 0.8 m is guaranteed
*9 : Pulse width 10 ns, Return loss 55 dB or more, at a point where the backscatter level is within ±0.5 dB of the normal value.
*10 : At 1625 nm and 1650 nm
*11 : FirmWare Rev2.01 or later
Note : Specifications are at 23°C±2°C uncless otherwise noted.

Accessories (optional)

Name	Model	Descriptions
Soft carrying case	SU2006A	
Connector adapter	735480-SCC	For optical powermeter (SC type)
	735480-FCC	For optical powermeter (FC type)
Ferrule adapter *	735481-LMC	For optical powermeter (ϕ 1.25)
	735481-SFC	For optical powermeter (ϕ 2.5)
Universal adapter	SU2005A-SCC	For OTDR, LS and PON power meter (SC type)
	SU2005A-FCC	For OTDR, LS and PON power meter (FC type)
Battery pack (Spare)	739882	
Shoulder belt	B8070CY	
AC Adapter	739871-D	UL/CSA standard
	739871-F	VDE standard
	739871-R	AS standard
	739871-Q	BS, Singapore standard
	739871-H	GB standard, Complied with CCC
	739871-P	EK standard (S. Korea)
	739871-T	BSMI standard
	739871-N	Brazil standard

* : The ferrule adapter has no mechanism to lock the connected fiber.
Please be cautious of the connection, especially when emitting high power light.

Model and suffix code

Model	Suffix codes	Description
AQ1200A		1310/1550 nm
AQ1200B		1625 nm
AQ1200C		1650 nm
AQ1200E		1310/1550, 1625 nm
AQ1205A		1310/1550 nm, High Dynamic Range
AQ1205E		1310/1550 nm, 1625 nm High Dynamic Range
AQ1205F		1310/1550 nm High Dynamic Range, 1650 nm
Language	-HE	English
	-HC	Chinese/English
	-HK	Korean/English
	-HR	Russian/English
Power cord	-D	UL/ CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS, Singapore standard
	-H	GB standard, Complied with CCC
	-P	EK standard (S. Korea)
	-T	BSMI standard
	-N	Brazil standard
Optical connector	-USC	SC type
	-UFC	FC type
	-ASC	SC/Angled-PC type
light source & optical power meter	/SLT	Stabilized light source & Standard optical power meter
	/HLT	Stabilized light Source & High power optical power meter
	/PPM	Light source & PON Power meter
Visible light source	/VLS	Optical connector: 2.5 ϕ ferrule
PON measurement*	/PN	PON measurement mode
Ethernet	/LAN	10BASE T/100BASE TX (PING test, Remote control)
Shoulder belt	/SB	Shoulder belt

* : Only for AQ1200A. AQ1200B/C/E and AQ1205A/E/F come equipped this function.
The mode is optimized for PON measurement.

Factory Installed Options

●Optical Loss Test

Optical power meter	Optical power meter model	Standard (/SLT)	High power (/HLT)	PON (/PPM)
	Wavelength setting	850/1300/1310/1490/1550/1625/1650 nm, 800 to 1700 nm (1 nm steps), or CWDM (1270 to 1610 nm, 20 nm steps)		1310/1490/1550 nm
	Power range	+10 to -70dBm (CW) +7 to -70dBm (CHOP)	+27 to -50dBm (CW) *3 +24 to -50dBm (CHOP) *3	+10 to -70 dBm *1 (CW) +27 to -50 dBm *2 (CW)
	Noise level	0.5nW (-63dBm,1310nm)	50nW (-43dBm,1310nm)	0.5 nW (-63 dBm, 1310 nm), 50 nW (-43 dBm, 1550 nm)
	Uncertainty under standard conditions *4	± 5%		±0.5 dB
	Readout resolution	0.01		
	Level unit	Absolute: dBm, mW, µW, nW, Relative: dB		
	Modulation mode	CW, CHOP(270Hz/1kHz/2kHz)		
	Average function	1, 10, 50, and 100 times		
light source	Wavelength (nm)	1310/1550 ±25 nm (AQ1200A), 1625 ±10 nm (AQ1200B), 1650 ±5 nm *5, 1650 ±10 nm *6 (AQ1200C)		
	Output level (dBm)	-3 ± 1		
	Level stability (dB) *7	± 0.05 (AQ1200A), ± 0.15 (AQ1200, AQ1200C)		
	Modulation mode	CW, 270Hz, 1kHz, 2kHz		
	Applicable fiber	SM (ITU-T G.652)		

*1 : at 1310/1490 nm
*2 : at 1550 nm
*3 : 1300 to 1600 nm
*4 : Power level: 100 µW(-10dBm); CW, Wavelength: 1310 ±20 nm (1550 nm ±10 nm for 1550 nm setting of /PPM), Spectral width: 10 nm or less (1310 nm), ambient temperature: 23 ±2°C, Optical fiber: SM (ITU-T G.652), Optical connector: FC/PC, Wavelength setting error: 0.5 nm or less, excluding aging (add 1% one year after calibration)
*5 : At a point -20 dB from the pulse peak value
*6 : At a point -60 dB from the pulse peak value
*7 : Constant temperature within 23°C ±2°C ; CW (15 min.)

●Visible Light Source (/VLS) option

Optical connector	2.5 mm type ferrule
Wavelength and optical output level	650 nm± 20 nm, -3 dBm or more (peak)
Modulation mode	CHOP approx. 2 Hz
Laser class	3R

●Ethernet Interface (/LAN) option

Interface	10BASE-T/100BASE-TX
Function	Ping test and remote control

Optical Measuring Instruments

AQ2170 *Optical Power Meter*

AQ2170
AQ2170H

AQ2180 *Optical Power Meter*

AQ2180
AQ2180H

AQ4280 *Optical Light Source*

AQ4280A
AQ4280B
AQ4280C

Features

Due to the increase in broadband services such as FTTH (Fiber To The Home), the communication carriers are reinforcing the infrastructure of optical fiber networks.. In the introductory period of such networks, there is a strong need for handy OPM/LS for installation and maintenance together with OTDRs. the AQ2170, AQ2170H, AQ2180 and AQ2180H Optical Power Meters, and the AQ4280A, AQ4280B and AQ4280C Optical Light Sources to address installation and maintenance needs.

Specifications by model

Model	AQ2170	AQ2170H
Wavelength Setting(nm)	850/1300/1310/1490 /1550/1625/165	1310/1490/1550/ 1625/1650
Photo Detector	InGaAs	
Optical Fiber	SM (ITU-T G.652), GI (50/125 µm), GI (62.5/125 µm)	SM (ITU-T G.652)
Power Range	-70 to +10 dBm	-50 to +26 dBm
Noise Level	-60 dBm	-40 dBm
Uncertainty*1	±5%	±5%
Modulation	CW, CHOP (270Hz, 1kHz, 2kHz)	
Memory function	–	
I/O	–	
Power Source	Four AAA Cell batteries	
Battery life time*2	40 hours	
Dimensions Weight*3	63(W)×116(H)×35(D) mm, Approx.160 g	

*1: 23 ± 2°C ambient temperature reference conditions
Wavelength setting of Power Meter : 1310 nm
Wavelength of light source to be measured : 1310 nm
Spectral width of the light source to be measured : Less than 5 nm
Power of measured light source : -10 dBm
Modulation : CW
Use Fiber : SM (ITU-T G652)
Connector Type : FC
Does not include the polarization dependence and polarization conditions
1 year aging
Including uncertainty in attaching and removing the adapter

Model	AQ2180	AQ2180H
Wavelength Setting(nm)	850/1300/1310/1490 /1550/1625/1650	1310/1490/1550/ 1625/1650
Photo Detector	InGaAs	
Optical Fiber	SM (ITU-T G.652), GI (50/125 µm), GI (62.5/125 µm)	SM (ITU-T G.652)
Power Range	-70 to +10 dBm	-50 to +26 dBm
Noise Level	-60 dBm	-40 dBm
Uncertainty*1	±5%	±5%
Modulation	CW, CHOP (270Hz, 1kHz, 2kHz)	
Memory function	999 records	
I/O	USB-B (mini)	
Power Source	Two AA Cell batteries	
Battery life time*2	40 hours	
Dimensions Weight*3	76(W)×153(H)×43(D) mm, Approx.280 g	

*2: 23 ± 2°C ambient temperature, when using the batteries, when the continuous measurement
*3: except protector
*4: stable temperature in the range of 23 ± 2°C, CW light
*5: RMS (2 , -20 dB)
*6: When connected FC / PC 2m code
*7: Using the battery, when continuous emission
23 ± 2°C, if not specified, when using the FC adapter

Model	AQ4280A	AQ4280B	AQ4280C
Element	LD		
Optical Fiber	SM (ITU-T G.652)		
Wavelength*4 (nm)	1310/1550±20	1310/1550±20, 1490±10	1310/1550±20, 1490/1625±10
Spectral width*4*5 (nm)	< 5 (1310) < 10 (1550)	< 5 (1310) < 10 (1550) < 5 (1490)	< 5 (1310) < 10 (1550) < 5 (1490) < 5 (1625)
Opt putt power level*6	-5 dBm±1 dB	-5 dBm±1 dB	-5 dBm±1 dB
Power stability (15min)*4*6 (dB)	< ±0.05	< ±0.05 (1310/1550 nm) < ±0.1 (1490 nm)	< ±0.05 (1310/1550 nm) < ±0.1 (1490/1625 nm)
Modulation	CW, CHOP (270Hz, 1kHz, 2kHz)		
Power Source	Two AA Cell batteries		
Battery life time*7	25 hours		
Laser Class	CLASS1(IEC 80625-1)		
Dimensions Weight*3	76(W)×153(H)×43(D) mm, Approx.300 g		

Standard Accessory

AQ2170 Optical Power Meter

Connector adapter (FC, SC, LC, ferrule2.5, ferrule1.25), Four AAA Cell batteries, Carrying pouch, Protector, Operation Guide, User's Manual (CD)

AQ2180 Optical Power Meter

Connector adapter (FC, SC, LC, ferrule2.5, ferrule1.25), Two AA Cell batteries, Carrying pouch, Protector, Operation Guide, User's Manual (CD)

AQ4280 Optical Light Source

Universal adapter (FC/PC, SC/PC, ST/PC Standard), Two AA Cell batteries, Carrying pouch, Protector, Operation Guide, User's Manual (CD)

MFT-OLTS

AQ1100

General Specifications

Display: 5.7-inch color LCD (640 × 480)
Loss test mode (only with /SPM or /HPM): Auto loss test, Loopback test, Multi-core loss test
External interface: USB1.1 Type A and Type B (mini) × 1
Power supply: AC adapter voltage 100 to 120 VAC or 200 to 240 VAC (auto-switching)
Battery (Li-ion) operation time 6 hours and charging time 5 hours
External dimensions: Approx. 217.5 mm (W) × 157 mm (H) × 74 mm (D)
Weight: Approx. 1 kg or less (including internal battery)

Features

The AQ1100 is an optical loss test set combining an optical power meter and light sources in one unit. An optical power meter is a measuring instrument usually used for optical loss tests. The AQ1100 supports up to MM850/1300 nm and SM1310/1550/1625 nm. Also, you can select a +27 dBm high power optical meter. For the light source, three models are available depending on the wavelength and fiber type used. For the optical power meter, you can select from three models depending on the measurement power and the purpose of the optical power meter.

Model and Suffix Codes

Model	Suffix codes	Description
AQ1100A		LS:1310/1550nm
AQ1100B		LS:1310/1550/1625nm
AQ1100D		LS:MM850/1300, SM1310/1550nm
Language	-HJ	Japanese/English
	-HE	English
	-HC	Chinese/English
	-HK	Korean/English
	-HR	Russian/English
Power cord	-M	Complied with PSE
	-D	UL/ CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS, Singapore standard
	-H	GB standard, Complied with CCC
	-P	KC standard (S. Korea)
	-N	Brazil standard
Optical power meter	-SPM	Optical power meter
	-HPM	High power optical power meter
	-PPM (AQ1100A only)	PON Optical power meter
Optical connector	-USC	SC type (LS port, and OPM port)
	-UFC	FC type (LS port, and OPM port)
	-ULC	LC type (LS port, and OPM port for -PPM), φ1.25 adapter(OPM port for -SPM and -HPM)
	-ASC (except AQ1100D)	SC/Angled-PC type (LS port, and OPM port for -PPM), SC type (OPM port for -SPM and -HPM)
Factory installed options	/VLS	Visible light source, optical connector: 2.5φ ferrule
	/LAN	Ethernet (10/100BASE-TX)
	/SB	Shoulder belt

■Standard Accessories
Power cord, AC adapter, battery pack, hand belt, user's manual (CD-ROM), operation guide

Optional Accessories

Model	Suffix codes	Description
SU2006A		Soft carrying case
735480 (For opticalpower meters)	-SCC	Connector adapter (SC)
	-FCC	Connector adapter (FC)
735481	-LMC	Ferrule adapter (φ 1.25)
SU2005A (For LS and PON optical power meter)	-SCC	Universal adapter (SC)
	-FCC	Universal adapter (FC)
	-LCC	Universal adapter (LC)
739871	-M	Complied with PSE
	-D	UL/ CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS, Singapore standard
	-H	GB standard, Complied with CCC
	-P	KC standard (S. Korea)
	-N	Brazil standard
739882		Battery pack (Spare)
B8070CY		Shoulder belt

Specifications by Model

Models		AQ1100A	AQ1100B	AQ1100D
Light source performance	Wavelength (nm) *1	1310/1550 ± 25	1310/1550/1625 ± 25	1310/1550 ± 25 (SM) 850/1300 ± 30 (GI)
	Light emitting device	LD	LD	LD(SM), LED(GI)
	SM (LD) spectral width (nm) *1 *2	<5 / <10	<5 / <10 / <10	<5 / <10
	GI (LED) spectral width (nm) *1 *3 (FWHM)	–	–	40(typ)/140(typ)
	Optical output level (dBm)	-3 ± 1	-3 ± 1	SM: -3 ± 1 GI: -20 ± 1
	Level stability (dB) *4	±0.05	±0.05	SM: ±0.05 GI: ±0.1
	Modulation mode	CW, CHOP(270Hz, 1kHz, 2kHz) *5		
	Applicable fiber	SM (ITU-T G.652)		SM (ITU-T G.652)GI (50/125um)
	Optical connector	SC, FC, 1.25 mm ferrule, SC/Angled-PC		SC, FC, 1.25 mm ferrule
	Laser class	1		

Factory Installed Options		
Visible light source (/VLS)	Optical connector	2.5 mm ferrule type
	Wavelength and optical output level	650 nm ±20 nm, peak value -3 dBm or more
	Modulation frequency	Approx. 2 Hz
	Laser class	3R
LAN interface (/LAN)	10BASE-T/100BASE-TX RJ-45 connector	Ping test, PC remote control

Optical Power Meter Performance and Functions			
	Standard (/SPM)	High power (/HMP)	PON (/PPM)
Wavelength setting	Simple mode: 850/1300/1310/1490/1550/1625/1650 nm Detail mode setting range: 850 nm to 1650 nm, 1 nm step CWDM mode setting range: 1270 nm to 1610 nm 20 nm step		1310/1490/1550 nm (1490 nm and 1550 nm can be measured separately)
Power range (dBm)	-70 to +10 (CW) -70 to +7 (CHOP)	-50 to +27 (CW) -50 to +24 (CHOP) *6	-70 to +10: 1310/1490nm -50 to +27: 1550nm
Noise level	0.5nW (-63dBm, 1310nm)	50nW (-43dBm, 1310nm)	0.5nW(-63dBm, 1310nm) 50nW(-43dBm, 1550nm)
Uncertainty under standard conditions *7	±5%	±5%	±0.5dB (10%)
Readout resolution	0.01		
Level unit	Absolute: dBm, mW, µW, nW, Relative: dB		
Modulation mode	CW CHOP(270/1k/2kHz)	CW CHOP(270/1k/2kHz)	CW
Average function	1, 10, 50 and 100 times		
Logging function	Measurement intervals: 500 ms, 1 s, 2 s, 5 s, 10 s, Measurement count: 10 to 1000		

The specifications are at 23°C ±2°C unless otherwise noted.
*1 23°C ±2°C, CW
*2 RMS (2σ, -20dB)
*3 Envelope (-3dB)
*4 for 15 minutes at a constant temperature within 23°C ±2°C
*5 CW and 270Hz only at 850nm and 1300nm
*6 Except for 850nm and 1650nm.
*7 23°C ±2°C , standard conditions (CW, 1310nm, 100µW, SMF), at 1550nm for /PPM.
*8 LD ON. (in screen save mode)

Optical Measuring Instruments

MFT-1/10GbE AQ1300 Series

General Specifications

Display: 5.7-inch color LCD (640 × 480)
External interface: USB1.1 Type A and Type B (mini), LAN (RJ-45) × 1
Power supply: AC adapter 100 to 240 V, 50 to 60 Hz
Battery (Li-ion) operation time 1 hour
External dimensions: 217.5 (W) × 157 (H) × 74 (D) mm
Weight: Approx. 1.3 kg (including internal battery)

Features

The AQ1300 series is a compact and lightweight Ethernet tester that is designed to improve both work efficiency and quality at the same time, with function optimized for the network path testing and maintenance of Ethernet networks up to 1G or 10G depending on model chosen.
Easy operation prevents operational errors and stabilizes work quality for routine tasks such as network path testing.
Powerful analysis functions help isolate failures during maintenance work.
The AQ1300 series has two models, AQ1300 and AQ1301 to choose from depending on the measurement interface and bit rate. You can choose the model suitable for your test needs.

Model and Suffix Codes

Model	Suffix Code	Description
AQ1301		AQ1301 MFT-1GbE
AQ1300		AQ1300 MFT-10GbE
Language	-HE	English
Power Coad	-D	UL/CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS, Singapore Standard
	-H	GB standard, CCC correspondence
	-P	KC standard (South Korea)
	-T	BSMI, Taiwan Standard
Optical power meter*1	/SPML	Standard Optical power meter
XFP module*1, *2	/SR	10 GBASE-SR XFP module
	/LR	10 GBASE-LR XFP module
	/ER	10 GBASE-ER XFP module
SFP module*2	/SX	1000BASE-SX SFP module
	/LX	1000BASE-LX SFP module
RFC2544*3	/BM	RFC2544 Function
Shoulder belt	/SB	Shoulder belt

*1: Cannot be specified for the AQ1301
*2: For the SFP and XFP modules, be sure to use the modules listed above.
If you use other than an SFP or XFP module from Yokogawa, the functionality and performance of this product are not guaranteed. Furthermore, the warranty will be void.
*3: Cannot be specified for the AQ1301 (this option is available for the AQ1301 as standard)

Optional Accessories

Model	Suffix codes	Description
735454		Optical transceiver module
	-SR*	10GBASE-SR XFP module
	-LR*	10GBASE-LR XFP module
	-ER*	10GBASE-ER XFP module
	-SX	1000BASE-SX SFP module
	-LX	1000BASE-LX SFP module
739882		Battery pack (reserve)
SU2006A		Soft carrying case
739871		AC / DC adapter
	-D	UL/CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS, Singapore Standard
	-H	GB standard, CCC correspondence
	-P	KC standard (South Korea)
	-T	BSMI, Taiwan Standard
B8070CY		Shoulder belt
735480*	-SCC	SC connector adapter for optical power meters
	-FCC	FC connector adapter for optical power meters

* Cannot be used with the AQ1301.

Specifications

Item		Specifications
Interface	RJ-45	10BASE-T, 100BASE-TX, 1000BASE-T
	SFP	1000BASE-SX, 1000BASE-LX
	XFP	10GBASE-SR, 10GBASE-LR, 10GBASE-ER
Measurement function	Measurement menu	Auto, Auto (Remote), Manual, OPM (Optical power meter)
	Measurement mode	TRAFFIC, QoS, PING, Loop Back, BERT
	RFC2544	Throughput, Latency, Frame loss rate, Back-to-Back, Packet Jitter
Transmission function	Frame length	48 to 9999 bytes
	QoS transmission	Up to 8 channels (up to 4 ch in Auto and Auto (remote) mode)
Receive function	Receivable frame length	48 to 9999 bytes (Minimum IFG: 5 bytes)
	Latency time measurement resolution	100ns
Loop back function	Field swap	DA/SA of MAC address, DA/SA of IP address, Dst/Src port of TCP/UDP
Remote control function	In-band remote	Remote test synchronization, Remote test start synchronization, Opposite tester automatic search(*), Opposite tester automatic addressing (*) (*: Applicable only within a segment)
Layer-1 measurement function	Receiving clock measurement	Measurement range: -100 to +100 ppm Measurement resolution: 0.1 ppm
	LFS generation	Manual: Continuous transmission (Start/Stop), Auto: When a link down or LF is received, RF is transmitted automatically.

Remote OTDR **AQ7277**

High-performance OTDR Module for Remote Fiber Test Systems

Features

The AQ7277 is an OTDR module for RFTS (Remote Fiber Test System), which uses the advanced technology transferred from the AQ7275 high performance OTDR.

- Measurement at 1650 nm (Maintenance wavelength)
- Built-in 1310/1550 nm cut filter for live-fiber monitoring
- Allow to test PON system through high-port-count splitter
- Ethernet interface for fast data transfer

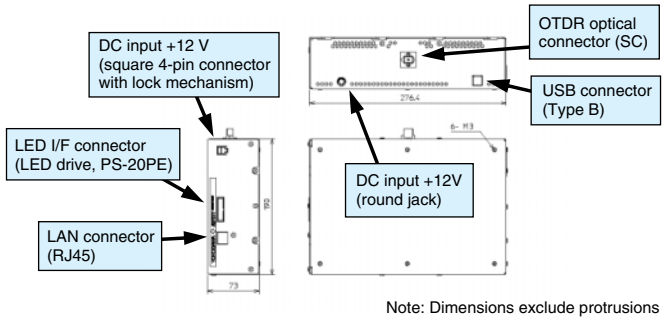
Specifications

Wavelength		1650 ±5 nm
Distance range (km)		0.5, 1, 2, 5, 10, 20, 50, 100, 200, 300, 400
Pulse width (ns)		3, 10, 20, 50, 100, 200, 500, 1,000, 2,000, 5,000, 10,000, 20,000
Sampling resolution		5 cm, 10 cm, 20 cm, 50 cm, 1 m, 2 m, 4 m, 8 m, 16 m, 32 m
Dynamic range		37 dB (typ.)
Event dead zone		0.8 m (typ.)
Attenuation dead zone		12 m (typ.)
Distance measurement accuracy		±1 m ±measurement distance x 2 x 10^{-5} ±1 sampling resolution
Number of sampling data		Max.100,000 points
Control interface		LAN (10BASE-T, 100BASE-TX), USB1.1 (Type B)
Alarm output		LED drive signal
Environmental conditions	Operating temperature	0 to +50°C
	Storage temperature	-20 to +60°C
	Humidity	20 to 85% (no condensation)
DC power supply		12 V DC to 19.5 V DC 1.5 A or less (at 12 V DC), 1 A or less (at 19.5 V DC)
Dimensions and weight		277 mm (W) x 190 mm (D) x 73 mm (H) (excluding protrusions), approx. 2 kg
Laser safety standards		Class 1M (IEC 60825-1:1993 +A2:2001), 21CFR1040.10

Model and Suffix Code

Model and suffix code: AQ7277-B01

External View



Note: Dimensions exclude protrusions

Calibrator

CA700 Pressure Calibrator

High Accurate and High Functional Pressure Calibrator Specially Designed for the Calibration of Differential Pressure and Pressure Transmitters.

New product

CA700

Detailed catalog: Bulletin CA700-EN

Features

- Basic accuracy: Pressure (measurement) 0.01% rdg
  Current (source/measurement) 0.015% rdg
  Voltage (source/measurement) 0.015% rdg
- Widest range and highest resolution in class achieved
  200 kPa gauge pressure model (resolution 0.001 kPa)
  1000 kPa gauge pressure model (resolution 0.01 kPa)
  3500 kPa gauge model (resolution 0.01 kPa)
- DC mA signals can be measured by supplying power to the transmitter from a 24V DC power supply.
- Calibration procedures of pressure transmitters and pressure switches are embedded.
  "As Found", " As Left" data and error rate (%) can be recorded.
- IP54 dustproof and waterproof robust case enables use in harsh environments.
- Hart and Brain communication resistance is embedded.
- Dimensions: Approx. 264 (W) × 188 (H) × 96 (D) mm
  Weight: Approx. 2 kg (including 6 AA size batteries)

Main Specifications

Pressure Measurement

Model	CA700-E-01	CA700-E-02	CA700-E-03
Pressure type	Gauge		
Measurement range	Positive pressure 0 to 200 kPa Negative pressure -80 to 0 kPa	Positive pressure 0 to 1,000 kPa Negative pressure -80 to 0 kPa	Positive pressure 0 to 3,500 kPa Negative pressure -80 to 0 kPa
Measurement display range	Up to 240.000 kPa	Up to 1,200.00 kPa	Up to 4,200.00 kPa
Measurement accuracy (6 months after calibration) (Tested after zero calibration)	Positive pressure 20 to 200 kPa: ±(0.01% of reading + 0.003 kPa) 0 to 20 kPa: ±0.005 kPa	Positive pressure ±(0.01% of reading + 0.04 kPa)	Positive pressure ±(0.01% of reading + 0.15 kPa)
	Negative pressure ±(0.2% of reading + 0.090 kPa)	Negative pressure ±(0.2% of reading + 0.08 kPa)	Negative pressure ±(0.2% of reading + 0.08 kPa)
Measurement fluid	Gas and liquid (non-corrosive, non-flammable, non-explosive, and non-toxic fluids)		
Pressure display units	kPa and other units (Pa, hPa, MPa, mbar, bar, atm, mmHg, inHg, gf/cm², kgf/cm², mmH_2O@4°C, mmH_2O@20°C, ftH_2O@4°C, ftH_2O@20°C, inH_2O@4°C, inH_2O@20°C, Torr, psi)		
Input port	Rc 1/4 or 1/4 NPT female thread (selectable)		

Current and Voltage Measurement (common to all models)

DC current	0 to ±20.000 mA	±(0.015% of reading + 3 μA)
	0 to ±100.00 mA	±(0.015% of reading + 30 μA)
DC voltage	0 to ±5.0000 V	±(0.015% of reading + 0.5 mV)
	0 to ±50.000 V	±(0.015% of reading + 5 mV)

24 V Loop power supply

Supply voltage	24 V ± 1 V	Load current 24 mA when communication resistance OFF
	24 V ± 6 V	Load current 20 mA when communication resistance ON

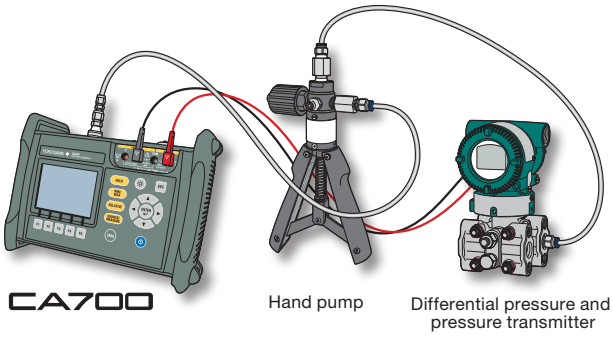
Current and voltage source (common to all models)

DC current*	0 to 20.000 mA	±(0.015% of setting + 3 μA)
DC voltage	0 to 5.0000 V	±(0.015% of setting + 0.5 mV)

* External power supply for 20 mA SIMULATE: 5 to 28 V

Example of field calibration of differential pressure and pressure transmitter

Calibration of pressure transmitters is required to accurately measure the input and output values and to calculate the error rate.
The CA700 ensures reliable calibration with its function to accurately measure the input and output values of pressure and current. Additionally its embedded calibration procedures enable users to perform certain calibration following the prescribed procedure.



Hand Pump Series

Three High-Performance Hand Pump Models Available

Model 91050

Model 91055

Model 91060

Detailed catalog: Bulletin CA700-EN

Features

- Smooth pressurization with less internal leaking
- Strainer preventing debris from entering the pump included
- Low Pressure Hand Pump
  Pressure generation range: -83 to 700 kPa
  Ultra-compact hand pump
- Pneumatic Hand Pump
  Pressure generation range: -83 to 4,000 kPa
  High-performance small hand pump with a wide range of pressure generation
- Hydraulic Hand Pump
  Pressure generation range: 0 to 70 MPa
  High-performance hand pump capable of generating a pressure of up to 70 MPa

Product name	Model	Description of kit (individual models)
Hand Pump Kit (Low pressure)	91050	Hand Pump (91051), Connector Set (91052), Case (93052)
Hand Pump Kit (Pneumatic)	91055	Hand Pump (91056), Connector Set (91057), Case (93053)
Hand Pump Kit (Hydraulic)	91060	Hand Pump (91061), Connector Set (91062), Case (93053)

High accuracy and compact design

CA150
Handy Calibrator

Features

- Highly accurate within 0.02% of the DC voltage range for source and measure
- Source and measurement can be performed simultaneously
- Vertical body with large-screen display
- Loop power supply function (24 V DC at a load of max 22 mA)
  It is possible to measure current in the mA range while supplying power
- Sink function
- Sweep functions that allow 3 types of continuous outputs:
  Step sweep function
  Linear sweep function
  Program sweep function

General Specifications

Common source specifications

- Power supply: 6 AA size alkaline batteries
  AC adapter (sold separately) or dedicated NiMH battery (sold separately)
- Battery life Conditions: Simultaneous Source/measurement
  When 6 batteries are used: Approx. 8 hours
  When NiMH battery is used: Approx. 10 hours
- Auto power-off: Approx. 10 minutes
- Insulation resistance: Between input terminal and output terminal: 500 V DC, 50 MΩ or more
- Withstand voltage: Between measurement terminal and generation terminal: 350 V AC, 1 minute
- Operating temperature/humidity range: 0 to 40°C, 20 to 80%RH (no condensation)
- Storage temperature range: -20 to 60°C 90%RH or less (no condensation)
- External dimensions: Approx. 251 × 124 × 70 mm
- Weight: Approx. 1000 g (with Batteries)
- Conforming Standards:
  Safety: EN61010-1, UL61010-1, CAN/ CSA C22.2 No. 61010-1
  EMC: EN 61326 Class B; EN 55011 Class B Group1
  EN 61000-3-2; EN 61000-3-3

Specifications

Source Unit

Accuracy=±(% of setting + µV, mV, µA, Ω and °C) at 23°C±5°C

	Range	Resolution	Source range	Accuracy
DC voltage	100 mV	1 uV	0 to ±110.000 mV	±(0.02% + 10 uV)
	1 V	10 uV	0 to ±1.10000 V	±(0.02% + 0.05 mV)
	10 V	0.1 mV	0 to ±11.0000 V	±(0.02% + 0.5 mV)
	30 V	10 mV	0 to ±30.00 V	±(0.02% + 10 mV)
DC current mA SINK	20 mA	1 uA	0 to +22.000 mA	±(0.025% + 3 uA)
	20 mA SINK	1 uA	0 to -22.000 mA	±(0.025% + 6 uA)
OHM	500 Ω	0.01 Ω	0 to 550.00 Ω	±(0.02% + 0.1 Ω)
	5 kΩ	0.1 Ω	0 to 5.5000 kΩ	±(0.05% + 1.5 Ω)
	50 kΩ	1 Ω	0 to 55.000 kΩ	±(0.1% + 50 Ω)
RTD	PT100	0.1°C	-200.0 to 850.0°C	±(0.025% + 0.3°C)
	JPT100		-200.0 to 500.0°C	
Thermocouple	K	0.1°C	-200.0 to -100.0°C	±(0.02% + 0.8°C)
			-100.0 to 1372.0°C	±(0.02% + 0.5°C)
	E		-200.0 to -100.0°C	±(0.02% + 0.6°C)
			-100.0 to 1000.0°C	±(0.02% + 0.4°C)
	J		-200.0 to -100.0°C	±(0.02% + 0.7°C)
			-100.0 to 1200.0°C	±(0.02% + 0.4°C)
	T		-200.0 to -100.0°C	±(0.02% + 0.8°C)
			-100.0 to 400.0°C	±(0.02% + 0.5°C)
	N		-200.0 to 0°C	±(0.02% + 1.0°C)
			0.0 to 1300.0°C	±(0.02% + 0.5°C)
	L		-200.0 to 900.0°C	±(0.02% + 0.5°C)
	U		-200.0 to 0°C	±(0.02% + 0.7°C)
			0 to 400.0°C	±(0.02% + 0.5°C)
	R	1°C	0 to 100°C	±(0.02% + 2°C)
			100 to 1768°C	±(0.02% + 1.2°C)
	S		0 to 100°C	±(0.02% + 2°C)
			100 to 1768°C	±(0.02% + 1.2°C)
	B		600 to 1000°C	±(0.02% + 1.5°C)
			1000 to 1820°C	±(0.02% + 1°C)
Frequency /pulse	100 Hz	0.01 Hz	1.00 to 110.00 Hz	±0.05 Hz
	1000 Hz	0.1 Hz	90.0 to 1100.0 Hz	±0.5 Hz
	10 kHz	0.1 kHz	0.9 kHz to 11.0 kHz	±0.1 kHz
	50 kHz	1 kHz	9 kHz to 50 kHz	±1 kHz
	CPM	0.1 CPM	1.0 to 1100.0 CPM	±0.5 CPM

Temperature coefficient: Accuracy above x (1/10)/°C
The temperature coefficient is added in the ranges from 0 to 18°C and from 28 to 40°C

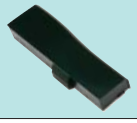
Measurement Unit

Accuracy=±(% of reading + µV, mV, µA, Ω or dgt(digit)) at 23°C±5°C

	Range	Resolution	Measurement range	Accuracy
DC voltage	500 mV	10 uV	0 to ±500.00 mV	±(0.02% + 50 uV)
	5 V	0.1 mV	0 to ±5.0000 V	±(0.02% + 0.5 mV)
	35 V	1 mV	0 to ±35.000 V	±(0.025% + 5 mV)
DC current	20 mA	1 uA	0 to ±20.000 mA	±(0.025% + 4 uA)
	100 mA	10 uA	0 to ±100.00 mA	±(0.04% + 30 uA)
OHM	500 Ω	0.01 Ω	0 to 500.00 Ω	±(0.055% + 0.075 Ω)
	5 kΩ	0.1 Ω	0 to 5.0000 kΩ	±(0.055% + 0.75 Ω)
	50 kΩ	1 Ω	0 to 50.000 kΩ	±(0.055% + 10 Ω)
RTD *5	PT100	0.1°C	-200.0 to 850.0°C	±(0.05% + 0.6°C)
	JPT100		-200.0 to 500.0°C	
Thermocouple	K	0.1°C	-200.0 to 1372.0°C	±(0.05% + 1.5°C)/-100°C or more ±(0.05% + 2°C)/-100°C or less
	E		-200.0 to 1000.0°C	
	J		-200.0 to 1200.0°C	
	T		-200.0 to 400.0°C	
	N		-200.0 to 1300.0°C	
	L		-200.0 to 900.0°C	
	U		-200.0 to 400.0°C	
	R	1°C	0 to 1768°C	±(0.05% + 2°C)/100°C or more ±(0.05% + 3°C)/100°C or less
	S		0 to 1768°C	
	B		600 to 1800°C	
Pulse	100 Hz	0.01 Hz	1.00 to 110.00 Hz	±2 dgt
	1000 Hz	0.1 Hz	1.0 to 1100.0 Hz	
	10 kHz	0.001 kHz	0.001 to 11.000 kHz	
	CPM	1 CPM	0 to 100000 CPM	----
	CPH	1 CPH	0 to 100000 CPH	----
Loop power supply	24 V LOOP			24 V±2 V

Temperature coefficient: Accuracy above x (1/10)/°C
The temperature coefficient is added in the ranges from 0 to 18°C and from 28 to 40°C

Optional Accessories (sold separately)

Product name	AC adapter	RJ sensor	Accessory storage case	NiMH battery	Main body case	Lead cable for measurement
						
Model name	94010	B9108WA	B9108XA	94015	93027	98064
Remark	-D For UL/CSA Standard -F For VDE Standard -H For GB Standard -N For NBR Standard -P For KC Standard -R For AS Standard -S For BS Standard	For reference junction compensation	Lead cables, RJ sensor, etc. can be stored.	NiMH battery Dedicated	With strap and accessory storage case	Alligator clip, CAT I, for control signal only (under 70 V) One set of 1 red and 1 black cables Length: Approx. 1.7m

Calibrator

Simultaneous Signal Source and Measurement Capability

CA51/CA71

Handy Calibrators

Features

- Source and measure operations can be performed at the same time. (Select from the following source signal and measurement signal options: voltage, current, resistance, thermocouple (TC), resistance temperature detector (RTD), frequency, pulse).
- AC voltages, including supply voltage, can be measured.
- Easy operation.
- Compact size and Lightweight
- Includes a wide array of additional functions.
  - Source
    Values set in steps of 4-20 mA
    24V DC Power Supply to Transmitter
  - Divided output (n/m) function
    Output settings are divided, eliminating the need for bothersome calculations for percentage output.
  - Autostep function
    Changes the output value in step form based on the setting from the divided output (n/m) function. Changes can be sourced automatically every 10% or 25%.
  - Online communication (CA71 only)
    RS-232C-compliant optically isolated interface
  - Sweep function
    Linearly increases or decrease the output. The increasing/decreasing time can be set to either 16 or 32 seconds.
  - Memory function
    Source values and measurements forming individual value sets can be saved to or read from the Handy Calibrator's internal memory (maximum 50 value sets).
  - Temperature monitor function

General Specifications

Parameter	Specifications
Power supply	Four AA alkaline batteries, or special AC adapter (sold separately)
Battery life	Measurement off, output 5 V DC/10 kΩ or greater: Approximately 40 hours Simultaneous signal generation/measurement, output 5 V DC/10 kΩ or greater: Approximately 20 hours Simultaneous signal generation/measurement, output 20 mA/5 V: Approximately 12 hours (using alkaline batteries, with backlight off)
Auto-power-off function	Approximately 10 minutes (auto-power-off can be disabled through a DIP switch setting)
Applicable standards	IEC61010-1, IEC61010-2-31 EN61326-1 EN55011, Class B, Group 1
Operating temperature and humidity ranges	0–50°C, 20–80% RH (no condensation)
External dimensions (WHD)	Approximately 190 × 120 × 55 mm
Weight	Approximately 730 g (including batteries)

Specifications

Source Unit

Parameter	Reference	Range	Accuracy (23±5°C per year)	Resolution
DC voltage	100 mV	-10.00–110.00 mV	±(0.02% + 15 μV)	10 μV
	1 V	0–1.1000 V	±(0.02% + 0.1 mV)	0.1 mV
	10 V	0–11.000 V	±(0.02% + 1 mV)	1 mV
	30 V	0–30.00 V	±(0.02% + 10 mV)	10 mV
DC current	20 mA	0–24.000 mA	±(0.025% + 3 μA)	1 μA
	4–20 mA	4/8/12/16/20 mA		4 mA
mA SINK	20 mA	0.1–24.000 mA	±(0.05% + 3 μA)	1 μA
Resistance	400 Ω	0–400.00 Ω	±(0.025% + 0.1 Ω)	0.01 Ω
RTD	Pt100	-200.0–850.0°C	±(0.025% + 0.3°C)	0.1°C
	JPt100	-200.0–500.0°C		
TC	K	-200.0–1372.0°C	±(0.02% + 0.5°C) (-100°C or greater) ±(0.02% + 1°C) (-100°C or less)	0.1°C
	E	-200.0–1000.0°C		
	J	-200.0–1200.0°C		
	T	-200.0–400.0°C	±(0.02% + 0.5°C) (0°C or greater) ±(0.02% + 1°C) (0°C or less)	
	N	-200.0–1300.0°C		
	L	-200.0–900.0°C		
	U	-200.0–400.0°C		
	R	0–1768°C	±(0.02% + 2.5°C) (100°C or less) ±(0.02% + 1.5°C) (100°C or greater)	1°C
	S			
	B	600–1800°C	±(0.02% + 2°C) (1000°C or less) ±(0.02% + 1.5°C) (1000°C or greater)	
Frequency, pulse	500 Hz	1.0–500.0 Hz	±0.2 Hz	0.1 Hz
	1000 Hz	90–1100 Hz	±1 Hz	1 Hz
	10 kHz	0.9 kHz–11.0 kHz	±0.1 kHz	0.1 kHz
	Pulse cycle	1–99,999 cycles	–	1 cycle

Measurement Unit

• Both CA51 and CA71

Parameter	Reference	Accuracy (23±5°C per year)	Resolution
DC voltage	100 mV	±(0.025% + 20 μV)	10 μV
	1 V	±(0.025% + 0.2 mV)	0.1 mV
	10 V	±(0.025% + 2 mV)	1 mV
	100 V	±(0.05% + 20 mV)	0.01 V
DC current	20 mA	±(0.025% + 4 μA)	1 μA
	100 mA	±(0.04% + 30 μA)	10 μA
Resistance	400 Ω	±(0.05% + 0.1 Ω)	0.01 Ω
AC voltage	1 V	±(0.5% + 5 dgt)	1 mV
	10 V		0.01 V
	100 V		0.1 V
	250 V	±(0.5% + 2 dgt)	1 V
Frequency, pulse	100 Hz	±2 dgt	0.01 Hz
	1000 Hz		0.1 Hz
	10 kHz		0.001 kHz
	CPM		1 CPM
	CPH		1 CPH

• CA71 only

Parameter	Reference	Accuracy (23±5°C per year)	Resolution
TC	K	±(0.05% + 1.5°C)(-100°C or greater) ±(0.05% + 2°C)(-100°C or less)	0.1°C
	E		
	J		
	T		
	N		
	L		
	U		
	R	±(0.05% + 2°C)(100°C or greater) ±(0.05% + 3°C)(100°C or less)	1°C
	S		
	B		
RTD	Pt100	±(0.05% + 0.6°C)	0.1°C
	JPt100		

Spare parts

Product	Source signal lead cable	Measurement lead cable	Carrying case	Terminal adapter	Fuse
					
Model	**98020**	**RD031**	**93016**	**99021**	**99040 (10pcs of A1566EF)**

Optional accessories (sold separately)

Product	AC adapter			RJ sensor	Accessory storage case	Communication cable (RS232)
						
Model	**94013**	**94016-F**	**94016-S**	**B9108WA**	**B9108XA**	**91017**
Remarks	120 V AC	220 to 240 V AC VDE standard	220 to 240 V AC BS standard	For reference junction compensation	Lead cables, RJ sensor, etc. can be stored	D-sub 9-pin (female)

Calibrator

Source and Measuring of Voltage and Current

CA11E
Voltage/Current Calibrator

Features

- Source and Measuring of Voltage and Current
  Generates and measures voltages up to 30 V DC and currents up to 24 mA DC.
- Improved display resolution for current
  The generation /measurement resolution has improved to 0.001 mA.
- 24 V (20 mA)/Loop check function*
- Enables measurement of generated current signals while supplying loop power to two-wire transmitter.
  * Load current: Max. DC22 mA
- 20 mA SINK Function
  Absorbs the voltage supplied from an external power supply to its H terminal and simulates a two-wire transmitter making it ideal for loop checks.
- 4-20 mA and 1-5 V DC Step-up/ down Function
- Sweep Function

Specifications

Source Functions

Accuracy = ±(% of setting + value in mV, µV, or µA), at 23 ±5°C for one year

Range Selection	Range of Generated Signal	Accuracy	Setting Resolution	Remarks
30 V	0 to 30.00 V	0.05% + 20 mV	10 mV	Maximum current: 1 mA
10 V	0 to 11.000 V	0.05% + 2 mV	1 mV	Maximum output current: 10 mA
1-5 V	1/2/3/4/5 V	0.05% + 2 mV *2	1 V step	*2 When the load is 1 kΩ or geater, and the error of the lead cables is excluded
1 V	0 to 1.1000 V	0.05% + 0.2 mV *2	0.1 mV	
100 mV	0.00 to 110.00 mV	0.05% + 50 µV	10 µV	
20 mA *1	0 to 24.000 mA	0.05% + 4 µA	1 µA	Maximum load: 12 V
4-20 mA *1	4/8/12/16/20 mA		4 mA step	
24 V (20 mA) *1	24 V	±10%	—	Maximum curret: 22 mA
20 mA SINK *1	0.1 to 24.000 mA	0.1% + 4 µA	1 µA	External power supply: 5 to 28 V

Temperature effect: 1/10 of accuracy/°C; however, for 100-mV range, 0.005% + 10 µV/°C

*1 The display resolution can select 24.000 or 24.00 displays with dip switch.

Measurement Functions

Accuracy = ±(% of reading + value in the least significant digit), at 23 ±5°C for one year

Range Selection	Indication	Accuracy	Resolution	Remarks
30 V	0 to ±30.00 V DC	0.05% + 2 digits	10 mV	Input impedance: Approx. 1 MΩ
10 V	0 to ±11.000 V DC	0.05% + 2 digits	1 mV	
1 V	0 to ±1100.0 mV	0.05% + 2 digits	0.1 mV	
100 mV	0 to ±110.00 mV DC	0.05% + 7 digits	0.01 mV	
20 mA *1	0 to ±24.000 mA DC	0.05% + 4 digit	0.001 mA	Input impedance: Approx. 45 Ω

*1 The display resolution can select 24.000 or 24.00 displays with dip switch.

Simulator of Common Thermocouples and RTD Sensors

CA12E
Temperature Calibrator

Features

- Simulator of Common Thermocouples and RTD Sensors
  Outputs a signal equivalent to signals of ten types of thermocouple K, E, J, T, N, S, B, L, U and R as well as Pt100 resistance temperature detector.
  Suitable for a broad range of applications such as maintenance of industrial process instruments and various thermometers.
- Multi-range Thermometer
  Can be used as a multi-range thermometer. Three-wire RTD connection for an RTD is possible.
- Built-in Sensor for Reference Junction Compensation
  Reference junction compensation when generating a thermocouple signal can be performed by the built-in temperature sensor. For more precise compensation, use the external RJC sensor (model B9108WA, sold separately).

Specifications

Source and Measurement Functions

Accuracy = ±(% of setting or reading + value in °C), at 23 ±5°C for one year

Range Selection		Range of Generated Signal/Indication	Accuracy		Resolution
			Source *4	Measurement *5	
TC *1*4	**K**	–200.0 to 1372.0°C	0.05% + 1°C (>-100°C) 0.05% + 2°C (≤-100°C)	0.07% + 1.5°C (>-100°C) 0.07% + 2°C (≤-100°C)	0.1°C
	E	–200.0 to 1000.0°C			
	J	–200.0 to 1200.0°C			
	T	–200.0 to 400.0°C			
	N	–200.0 to 1300.0°C			
	R	0 to 1768°C	0.05% + 3°C (<100°C) 0.05% + 2°C (≥100°C)	0.07% + 3°C (<100°C) 0.07% + 2°C (≥100°C)	1°C
	S				
	B	600 to 1800°C	0.05% + 4°C (<1000°C) 0.05% + 3°C (≥1000°C)	0.07% + 4°C (<1000°C) 0.07% + 3°C (≥1000°C)	
	L	–200 to 900°C	0.05% + 0.5°C (≥0°C) 0.05% + 1°C (<0°C)	0.07% + 1.5°C (≥0°C) 0.07% + 2°C (<0°C)	0.1°C
	U	–200 to 400°C			
100 mV		0 to ±110.00 mV	0.05% + 30 µV	0.05% + 30 µV	10 µV
RTD PT100 *2 *3 **(JPT100)**		–200.0 to 850.0°C (–200.0 to 500.0°C)	0.05% + 0.6°C *6	0.05% + 0.6°C *7	0.1°C
400 Ω		0 to 400.0 Ω	0.05% + 0.2 Ω *6	0.05% + 0.2 Ω *7	0.1 Ω

Temperature effect: 1/10 of accuracy/°C

*1 Based on the reference thermal EMF table of JIS C1602-1995
*2 Based on the reference resistance table of JIS C1604-1997.
*3 Based on the international temperature standard 1990 (ITS-90).
*4 The accuracy for generation of thermocouple signals does not include the error of the reference junction compensation. When compensating the output using an RJC sensor, add the accuracy of the RJC sensor. The output compensation is performed every 4 seconds. RJC sensor specifications - measurement range: –10 to 50°C; accuracy (in combination with the CA12E): ±0.5°C at 18 to 28°C and ±1°C at other temperatures.
*5 The accuracy for measurement of thermocouple signals indicates the error against the reference EMF table and includes the error of the internal reference junction compensation when the temperature at the terminals is stable.
*6 External excitation current: 0.5 to 2 mA; add 0.05% + 1°C (or 0.4 Ω) when it is 0.1 mA. Input capacitance of receiver instrument: 0.1 µF or less.
*7 When measuring a temperature using a three-wire RTD.

Loop Power and 4 to 20 mA Output function in a DMM

CA450
Process Multi Meter

Features

- Loop check functions
  - Simultaneous 24 V loop power and mA measurement
  - HART/BRAIN mode setting with loop power (Adds 250 ohm resistance internally)
- Generation functions
  - SIMULATE (SINK) function simulates transmitters
  - 4-20 mA span/step/auto-step/sweep output
- Measurement functions
  - High accuracy signal measurement:DC mA 0.05%/30.000 mA
  - Handheld DMM function
  - Peak Hold function for the peak voltage measurement of DCS power supply
  - Dedicated sensor modes for direct reading of many sensor signal types
- Enhanced Safety—helps eliminate electric shocks
  - Current terminal shutter prevents incorrect connections
  - 1 A or more of AC/DC current can be read directly using the optional clamp probe and scaling in SENSOR mode.*1
  - Measurement categories 600 V CAT. IV, 1000 V CAT. III

*1: AC/DC 600 mV range only

Specifications

Measurement

Function	Range	Resolution	Max Accuracy
DCV	600 mV/6 V/60 V/600 V/1000 V	0.1 mV/0.001 V/0.01 V/0.1 V/1 V	0.09%+2 digits
ACV		0.1 mV/0.001 V/0.01 V/0.1 V/1 V	0.5%+5 digits
DCA	30 mA/60 mA	0.001 mA/0.01 mA	0.05%+2 digits
Ohm	600 Ω/6 kΩ/60 kΩ/600 kΩ/6 MΩ /60 MΩ	0.1 Ω/0.001 kΩ/0.01 kΩ/0.1 kΩ 0.001 MΩ/0.01 MΩ	0.2%+2 digits
Freq	10Hz to 199.99 Hz,	0.01 Hz	0.005%+1 digits
	90Hz to 1999.9 Hz	0.1 Hz	
	0.900 kHz to 19.999 kHz	0.001 kHz	
Source			
DCmA	20 mA	0.001 mA	0.05% of range
Loop Power	24 V		24 VDC (typ.) Load current 20 mA

Other Functions and Spection
Functions Diode check, Continutity check, Data Hold, Peak Hold, Step mode, linear mode, Sesor mode, MIN/MAX, REL△%

General Specifications

Specificaton

- Display : 5-digit (7 Segment)
  Measurement DC current 33000, Frequency 19999, Other 6600
  Output DC current 25000
- Operating temperature and humidity: -20 to 55°C (80%RH or less) with no condensation
- Storage temperature and humidity: -40 to 70 (70%RH or less) with no condensation
- Battery life: DC voltage measurment: Appox.140hours
  DC current output (SIMULATE) Approx.140hours
  DC current output (SOURCE) 12mA (500Ω load) Approx.10hours
- External dimensions: Approx. 90 (W) × 192 (H) × 49 (D) mm
- Weight: Approx. 600g (including the batteries)
- Compliant standards:
- Safety standards: EN61010-1 and EN61010-031

Measurement Categories:
1000 V CATIII, 600 V CATIV
For current measurement and output: 48 V max, 100 mA max
Lead cables (98064): 70 VDC, 100 mA
Pollution degree 2, indoor use
Vibration: Sweep vibration frequencies 10 Hz to 5 Hz to 10 Hz Amplitude 0.15 mm (peak value)
Duration 30 minutes
Shock: 1 m drop test as defined by the safety standards
Altitude: 2000 m or less
EMC standards: EN61326-1 Class B, EN61326-2-2 EN55011 Class B Group 1
Influence of radiated immunity: In RF electromagnetic fields of 3 V/m
EN61326-1 AC voltage measurement, 600 mV range:1.5% of range
DC voltage measurement, 600 mV range:1% of range
DC current measurement, all ranges: 1.5% of range
DC current output: 1.5% of range
EN61326-2-2 AC voltage measurement (6 V range or higher): Within 5 times the accuracy
DC voltage measurement (6 V range or higher): Within 5 times the accuracy

Accessories


Test leads
Model:98073


Lead Cables
Model:98064


Fuse
Model:99042


DMM Communication Package
92015 (*1)


Alligator
Test leads
Model:99014


AC/DC
Clamp-on Probe
Model:96095


Current
Clamp-on Probe
Model:96001


Carrying Case
Model:93029


Magnet hook
Model:99032


The Magnet hook can be attached to magnetic body (e.g. iron).


Carrying Case
Model:93043-P1


The inner case with detachable straps can be hung on bar.

(*1) Settings for output is not capable.

Data Logger

Compact Data Logger Offering Best-in-class Noise Resistance and Communication Function

Datum-Y (XL120 Series)

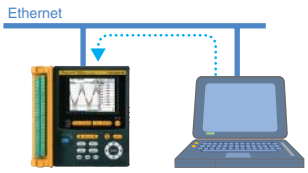
Portable Data Station (Data Logger)

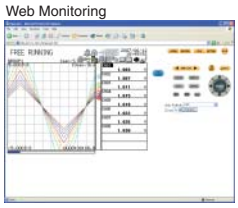
Features

- All channels adopt universal insulated inputs
  : The temperature and voltage can be set independently for each channel.
- Easy-to-read screen display
  : A wide view color TFT LCD makes it easy to read even outdoors
- Data can be saved at the maximum speed of 100 ms
  : Reliably measures temperature changes
- Large amounts of data can be acquired
  : Employs compact flash and SD cards.
  USB memory enables support for a data copy function.
- Comes standard with a LAN port
  : Also supports remote data acquisition.

Web Server Function

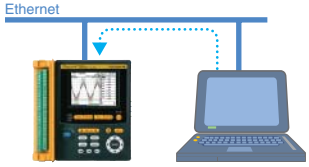
You can easily monitor the Datum-Y screens with the Internet Explorer*1 Web browser (Screen display can be updated every 5, 10, or 30 seconds automatically, or manually). You can use Operator Page to remotely operate Datum-Y, except for turning the power on and off and key locking. You can use Monitor Page just to check and switch the Datum-Y screens. You can set access authentication for each screen to enhance security.
*1: Internet Explorer is a registered trademark of Microsoft Corporation.





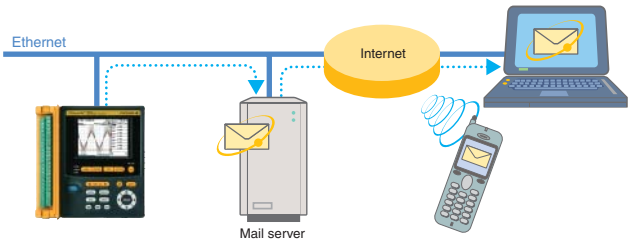
FTP Server Function

You can output a list of files stored in Datum-Y's internal memory and connected external storage media, and you can transfer and delete files.



E-mail Delivery Function

You can deliver a text message to e-mail addresses specified in Datum-Y to notify of the occurrence and cancellation of alarms, the occurrence of errors in storage media and FTP client errors, power outage and recovery, and scheduled times.
You can attach the instantaneous data at that time to the email message.

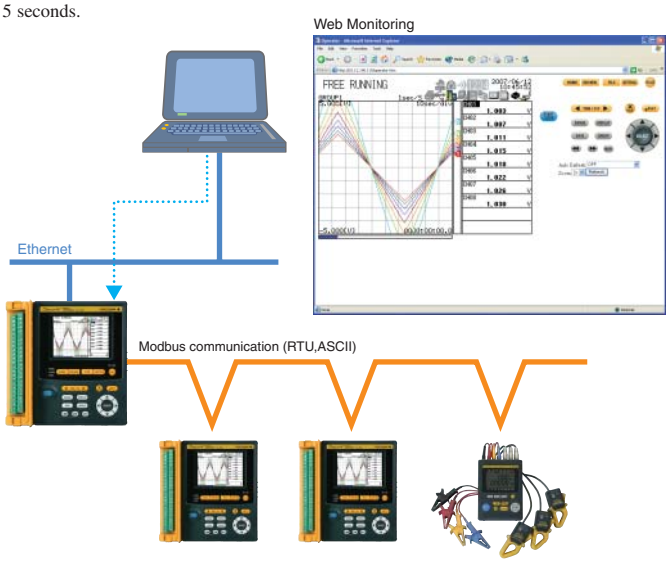


Specifications

Number of inputs : 8 channels (XL121), 16 channels (XL122, XL124)
Floating unbalanced input, insulated between channels
Measurement interval : 100 ms (only when the 8-channel terminal block is used), 200 ms, 500 ms, 1 sec, 2 sec, 5 sec, 10 sec, 20 sec, 30 sec, 1 min, 2 min, 5 min, 10 min, 20 min, 30 min, 1 hr
Input type : TC, RTD, DCV
* RTD for XL121 and XL122 only
Digital Pulse (1 ch), DI (2 ch)
Functions : Trigger Functions (Pre-trigger/trigger delay), Four arithmetic operation, Linear scaling, Statistical operation (MAX, MIN, AVE, P-P, RMS)
Communication Functions: Ethernet, USB, RS-232, RS-485
• Network Functions : Web server, FTP server, FTP client, E-mail delivery, Time synchronization
Serial communication Modbus protocol:
Transmission medium: RS-232 or RS-485
Transmission mode: RTU mode, ASCII mode
Data saving : Internal memory : 16 MB
External storage medium :
Compact flash memory card (Type II), SD card, USB memory
(Only the copy function is supported by USB memory. Only those USB memories that have been verified by Yokogawa are recommended.)
Display unit : 3.5-inch TFT color LCD (320 × 240 pixels)
External dimensions : Approx. 155 (W) × 155 (H) × 55 (D) mm
Weight : Approx. 800 g (Without battery and rubber boot)

LAN/RS-232,LAN/RS-485

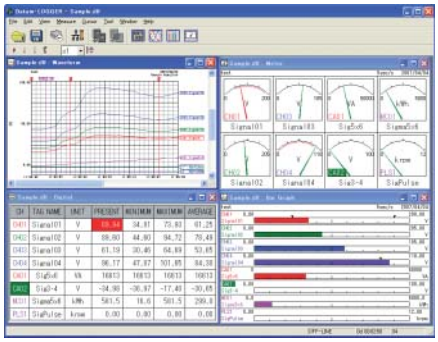
You can connect another Modbus protocol enabled device to Datum-Y to use all of the LAN functions while you are acquiring data.
* For the LAN/RS-232 or LAN/RS-485 communication protocol, the measurement interval is more than 10 seconds, and the Modbus communication interval is more than 5 seconds.



Model Number and Suffix Code

Model	Suffix code	Specification
XL121		8 ch, with Screw in type terminal block unit
XL122		16 ch, with Screw in type terminal block unit
XL124		16 ch, with M3 screws type terminal block unit
	-D	Power cord (UL/CSA Standard)
	-F	Power cord (VDE Standard)
	-H	Power cord (GB Standard)
	-N	Power cord (NBR Standard)
	-P	Power cord (KC Standard)
	-R	Power cord (AS Standard)
	-S	Power cord (BS Standard)

Application Software "Datum-LOGGER"



XL900
Application Software

Features

- Real-time measurement at the maximum speed of 1 second
- Zooming to analyze acquired data in the waveform view
- A variety of data saving functions available (selective and partial saving)

Composite Operation on Four Dedicated Channels during Real-time Measurement

You can perform composite operations (e.g. log, Σ, and √, except for the four arithmetic operations) typical for a scientific electronic calculator on four dedicated arithmetic channels. You can create a calculation formula containing up to 16 terms comprising measured values and functions.

Measured Value Display at Two Points (A and B) with a Cursor

You can display each of the measured values at two points (A and B), the difference between the measured values (B-A), and the maximum, minimum, and average values between the two points. You can change the cursor position using the method of clicking on the waveform display and the method to specify the day and hour.

Analysis Screen Display for Measured Data

You can sort and display all the measurement data or the measured values between two points (A and B) in ascending or descending order, as well as sort and display the amounts of changes in ascending or descending order.

Specifications

■ Applicable models: Datum-Y firmware version 3.01 or later
■ Real-time measurement data acquisition functions
- Communication interface: Ethernet, USB, RS-232, RS-485
- Maximum number of units that can be connected:10 units
- Data acquisition channels (per unit): Analog channels (16 ch), Pulse channel (1 ch), Logic channels (2 ch), XL unit calculation channels (32 ch), Calculation channels dedicated to Datum-LOGGER (4 ch), Communication channels (32 ch)
- Measurement acquisition period: 1, 2, 5, 10, 20, 30 seconds, 1, 2, 5, 10, 20, 30 minutes, 1 hour

■ Display functions
- Display: Waveform, Digital, Bar graph, Meter display
- Cursor value display: Display of each measurement values, difference, maximum value, minimum value and average value of cursors A and B.
- Arbitrary cursor list display: Display a list of arbitrary cursors and comments inserted in a waveform graph.
- Alarm list display: Display a list of alarms for acquired data.
- Analysis view display: Display all specified channels, value differences between cursors A and B in descending or ascending order, and the rate of change in descending or ascending order.
- Horizontal Scroll: By scrolling a waveform display horizontally, it is possible to display data acquired in the past even during real-time acquisition.
- Resizing the Horizontal axis: Display all the acquired data or data between cursors A and B.
- Jump function: Re-display a waveform centering on a data selected in the cursor value display, arbitrary cursor list display, alarm list display or analysis view display.

■ Dedicated calculation functions (available for Real-time measurement)
■ Data load functions
Datum-Y main unit measurement files, Datum-LOGGER measurement files on PC.

■ File processing functions
- Partial storage: Save data between cursors A and B
- Divided storage: Save by specifying date/time intervals or store by dividing into specified number of files
- File division: Datum-Y measurement data files and Datum-LOGGER measurement data files stored on PC can be divided at the specified number of data interval or specified date/time interval.
- Combined storage: Combine and save divided sub files of Datum-LOGGER measurement data files.
- Skipped storage: Skip data using specified time intervals
- Storage format: Binary format (dedicated for Datum-LOGGER)

■ Report format storage: Save maximum, minimum and average of hourly reports, daily reports, weekly reports and monthly reports in CSV format. Measurement data can be added to CSV data to be stored.
■ Main unit setting functions: Send/receive setting details, load setting files and save setting files via communication.
■ Clipboard copy functions: Copy a displayed waveform image to the clipboard
■ Printing functions: Print a displayed waveform image

System requirements

OS	Windows, XP (SP1 or later), Windows Vista, Windows 7
Display	XGA (1024 × 768) or higher, 65536color or higher
CPU performance	Pentium III 1.6 GHz or higher, Pentium 4 1.6 GHz or faster is recommended
Memory	512 MB or higher, 1 GB or more is recommended
Hard disk	At least 1 GB of free space

Optional Accessories

Model Number

	Name	Model No.	Description
Optional accessories	Type-K TC	90060	5 meter × 4 sets
	Carrying case	93037	To store the main unit and accessories
	Lithium ion battery	94009	2,400 mAh, 7.4 V
	Stand	93039	Supports tilted installation on the desktop, wall mounting, and DIN rail mounting
	Digital I/O cable	91029	For pulse/logic inputs and alarm outputs, 3 m
	Application Software (Datum-LOGGER)	XL900	For Datum-Y
	Communication cable	91011	RS-232 communication cable for PC (9 pin)
	Memory Card (256MB)	97034	256MB CF with PC Card Adapter
	Memory Card (512MB)	97035	512MB CF with PC Card Adapter
	Memory Card (2GB)	97037	2GB CF with PC Card Adapter

Carrying case (93037)

Lithium ion battery (94009)

Digital I/O cable (91029)

Stand (93039)

Data Logger

Check Temp Distribution of Water Cooler

Application

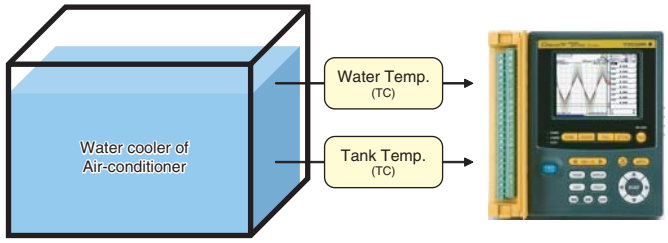
Maintenance for water cooler of air-conditioning equipment

Purpose

Temperature data acquisition for the maintenance of equipment.
Need to collect data without carrying PC and heavy data logger.

Decisive factor to purchase Datum-Y

- Compact and easy to carry
- Saved data can be checked at work site so no need to bring PC.



Evaluation Test Data for Electric Hot Water Supply Device

Application

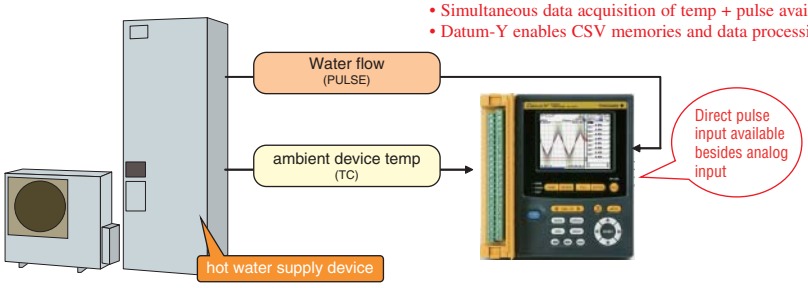
Device temp (TC) and water flow (pulse) evaluation test data in an electric hot water supply device.

Purpose

Quality inspection of device temp, water temp and water flow prior to equipment deliveries.
Comparison between water temp increase and water flow per number of sample data.

Decisive factor to purchase Datum-Y

- Simultaneous data acquisition of temp + pulse available with one unit.
- Datum-Y enables CSV memories and data processing by PC easily.



Measure concentration of CO and CO_2 for environmental research

Application

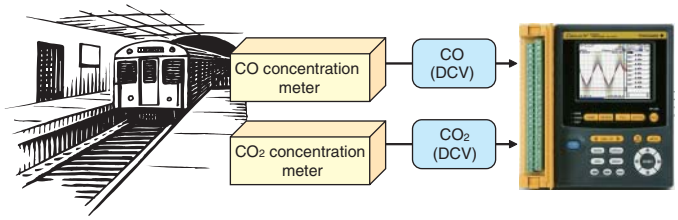
Measure concentration of CO and CO_2 at Subway Stations

Purpose

Needed to measure & collect data for short term and check trend data.

Decisive factor to purchase Datum-Y

- Rubber boot (Not available for competitor models)
- Easy to carry around
- Easy to set scaling



Checking in Operating Conditions for Food Processing Device

Application

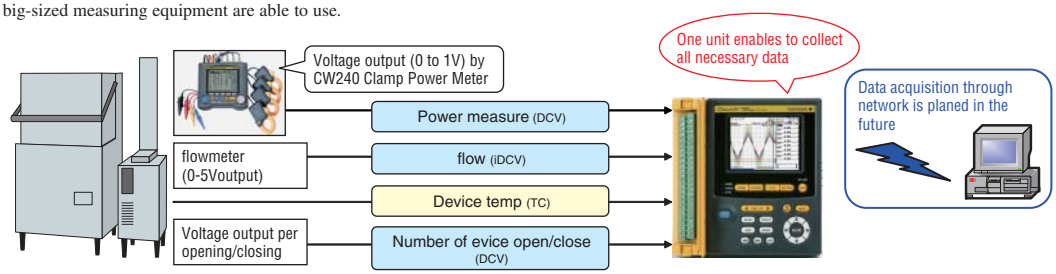
Checking of operating conditions at the customer's site (temp. water flow, power measurement)

Purpose

Realize the actual operating conditions of the device and data is commonly used. These data will be used for the maintenance service as well. Due to the limited space where the target device is located, no big-sized measuring equipment are able to use.

Decisive factor to purchase Datum-Y

- Compact size and space saving design
- Set of communication functions that facilitate data acquisition.
  Periodical data acquisition will be possible without visiting customer's site.



A Powerful Power Measuring Tool

CW10
Clamp-on Power Meter

Features

- AC / DC Power up to 600 kW
- True RMS for AC.
- Harmonics 1st to 25th order
- Power fluctuation using the ACA Inrush and Peak hold functions.
- AC / DC Voltage max. 1000 V
- AC / DC Current max. 600 A
- Frequency, Resistance, Continuity, Diode check, Power factor.
- Up to 9999 counts, approx. 37mm max. diameter of measurable conductor (the jaw opens approx. 45mm max.)

Specifications

Accuracy

23± 5°C, 80%RH or less
Accuracy: ±(% of reading + digits)

Voltage

Rms-value detection

Function	Range	Resolution (Maximum reading)	Accuracy*
DCV	100 V	99.99 V	0.7% + 2
	1000 V	999.9 V	
ACV	100 V	99.99 V	1.0% + 5 50 ~ 500Hz
	1000 V	999.9 V	
LPF ACV	100 V	99.99 V	50 ≤ f ≤ 60Hz: 1.0% + 5
	1000 V	999.9 V	60 < f ≤ 400Hz: 5.0% + 5

* DCV<1000digits: add 6digits to accuracy
ACV<1000digits: add 3digits to accuracy
Maximum input voltage: 1000 Vrms, 1414.2 Vpk
Input impedance: approx. 3.5MΩ, <100pF
AC+DC Vrms accuracy=ACV accuracy + DCV accuracy

Crest factor effects
1.4 < CF ≤ 2.0: add 1.0% of reading to accuracy
2.0 < CF ≤ 2.5: add 2.5% of reading to accuracy
2.5 < CF ≤ 3.0: add 4.0% of reading to accuracy
Maximum input voltage: 690 Vrms CF=2 460 Vrms CF=3

Current

Rms-value detection

Function	Range	Resolution (Maximum reading)	Accuracy*
DCA	100 A	99.99 A	1.5% + 20
	600 A	600.0 A***	1.5% + 5*
ACA	100 A**	99.99 A	50 ≤ f ≤ 60Hz : 1.5% + 5* 60 < f ≤ 400Hz : 2.0% + 5*
	600 A	600.0 A***	
LPF ACA	100 A**	99.99 A	50 ≤ f ≤ 60Hz : 1.5% + 5
	600 A	600.0 A***	60 < f ≤ 400Hz: 5.0% + 5

*The measured value <1000digits: add 5digits to accuracy
**Input current ≥ 0.10A at 100 A range of ACA and LPF ACA
***600 A : Guaranteed accuracy (not maximum reading)
Maximum input current: 600 Arms, 848.5Apk
Conductor position effects: ±1.0% of reading
AC+DC Arms accuracy=ACA accuracy + DCA accuracy

Crest factor effects
1.4 < CF ≤ 2.0: add 1.0% of reading to accuracy
2.0 < CF ≤ 2.5: add 2.5% of reading to accuracy
2.5 < CF ≤ 3.0: add 4.0% of reading to accuracy
Maximum input current: 420 Arms CF=2 280 Arms CF=3

Peak Hold (AC mode only)

Function	Range	Resolution (Maximum reading)	Accuracy
ACV	100 V	140.0 V	3.0% + 15
	1000 V	1400 V	
ACA	100 A	140.0 A	3.0% + 15
	600 A	850 A	

PEAK MAX: polarity+, polarity-
Maximum input voltage and current: 1000 Vrms, 600 Arms
Sine wave, ACV ≥ 5 Vrms, ACA ≥ 5 Arms, 50 to 400 Hz continuous wave

Frequency (Hz)

Function	Resolution (Measuring range)	Accuracy
100 Hz	20.00 to 99.99 Hz	0.5% + 3
1000 Hz	20.0 to 999.9 Hz	
10 kHz	0.020 to 9.999 kHz	

Maximum input voltage and current: 1000 Vrms, 600 Arms
Input condition; (Sine wave)
100 V range: 10 to 100 Vrms
1000 V range: 100 to 1000 Vrms
100 A range: 10 to 100 Arms (<400Hz)
600 A range: 100 to 600 Arms (<400Hz)
The measured value < approx. 10 Hz: 0.00Hz

Harmonic Measurement

Individual Harmonic

Harmonic order	Resolution (Maximum reading)	Accuracy
1st to 12th (h01- h12)	99.9 %	5% + 10
13th to 25th (h01- h12)		10% + 10

Maximum input voltage and current: approx. 1000 Vrms, 600 Arms
The "rdy" is displayed at ACV < 10 Vrms, ACA < 10 Arms
The "OutF" is displayed at f < 45, 65 < f (f: fundamental frequency)

Inrush Current

Function	Range	Resolution (Maximum reading)	Accuracy
ACA	100 A	99.99 A	2.5% + 20
	600 A	600.0 A*	2.5% + 5

Maximum input current: approx. 600 Arms
*600 A : Guaranteed accuracy (not maximum reading)
100A range: ACA1 ≥ 10 Arms (Sine wave, 50Hz/60Hz)
600A range: ACA ≥ 100 Arms (Sine wave, 50Hz/60Hz)
Measurement time: approx. 100ms

Active Power

Function	Range	Resolution (Maximum reading)	Accuracy
ACW DCW	10 kW	9.999 kW*	ACW: 2.5% + 11** DCW: 2.2% + 22**
	100 kW	99.99 kW	
	600 kW	600.0 kW**	

* The measured value < 1.000kW: add 10digits to the accuracy.
**Conditions of accuracy (combination of Voltage and Current range)
10 kW range: 100 V and 100 A
100 kW range: 100 V and 600 A or 1000 V and 100 A
600 kW range: 1000V and 600 A
Other combinations:
Accuracy: (Current accuracyVoltage reading) + (Voltage accuracyCurrent reading)

**600 kW : Guaranteed accuracy (not maximum reading)
Maximum input voltage and current: 1000 Vrms, 600 Arms
ACW: ACV ≥ 10 Vrms and ACA ≥ 5 Arms (Sine wave, 50 ≤ f ≤ 60Hz, PF=1.00)
DCW: at DCV ≥ 10 V and DCA ≥ 5 A

Power Factor

Function	Resolution (Measuring range)	Accuracy
Power factor	-1.00~0.00~1.00	±(3°+2digits)

Maximum input voltage and current: 1000 Vrms, 600 Arms
PF: ACV ≥ 10 Vrms and ACA ≥ 5 Arms (Sine wave, 50 ≤ f ≤ 60Hz)

Resistance/Continuity check

Function	Range	Resolution (Maximum reading)	Accuracy
Resistance Ω	1000 Ω	999.9 Ω	1.0% + 5
	10 kΩ	9.999 kΩ	1.0% + 3
	100 kΩ	99.99 kΩ	
Continuity check	1000 Ω	999.9 Ω	1.0% + 5
	The buzzer turns on for resistances lower than approx. 30Ω. (Response time: approx. 100msec)		

Maximum input voltage: 1000 Vrms
Maximum test current: approx. 0.5mA
Open circuit voltage: approx. 3V

Diode Test

Function	Resolution (Measuring range)	Accuracy
Diode Test	0.40~0.80 V	±0.1 V

Maximum test current: approx. 0.5mA
Open circuit voltage: approx. 1.8V

General Specifications

Display count: 9999 / 6000
Measuring rate: 3 times / sec.
Over range indicator: "OL" or "-OL"
Auto Power Off: Approx. 15 minute.
Low-battery indicator: (four steps)
Power supply: 9V alkaline battery (6LR61)
Battery life: When using alkaline battery, backlight off
Approx. 20 hours
Operating temperature and humidity: 0 ~ 50 °C (with no condensation)
≤ 80% RH (0 ~ 30 °C)
≤ 75% RH (30 ~ 40 °C)
≤ 45% RH (40 ~ 50 °C)
Temperature coefficient: At 0 to 18 °C and 28 to 50 °C
Add 23±5 °C accuracy x 0.2 / °C
Storage temperature: -10 to 50 °C, 80% RH or less (remove the battery)
Withstand voltage: AC 6880 Vrms 5 sec. (between the core and the case)
AC 4300 Vrms 5 sec. (between the core and the voltage input terminals)
AC 6880 Vrms 5 sec. (between the voltage input terminals and the case)
Insulation resistance: 100MΩ or greater at 1000 VDC
(between the core and the case, the core and the voltage input terminals and the voltage input terminals and the case)
Compliant standards:
Safety standards: EN 61010-1, EN 61010-2-032
1000V CAT.III, 600V CAT.IV
EN 61010-031 (the test leads)
Pollution degree 2, Indoor use, Altitude 2000m or less
EMC standards: EN 61326-1, EN 61326-2-1, EN 61326-2-2, EN 55011
Dimensions: Approx 87.5 mm(W) x 242 mm(L) x 51 mm(D)
Diameter of measurable conductors: φ37mm (Maximum)
Weight: Approx. 435g (including the battery)
Accessories: Test leads 1set (Red and Black)
Carrying case
9V alkaline battery (6LR61)
User's Manual
Accessories (Sold Separtely): Lead with Alligator Clip Model code 99014

Clamp-on Power Meter

Electric Power Analysis & Power Supply Quality Control

CW240
Clamp-on Power Meter

Features

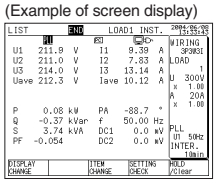
- Simultaneous measurement of power, harmonics, voltage fluctuation, and waveform
- Supports a range of connections
- Wide measurement range
- Leakage current measurement
- External memory
- Large LCD

Power Investigation Improves power Efficiency Through Detailed Data Collection

Measurement of Instantaneous Value:

The CW240 can be used to carry out investigation regarding renewal of electric equipment such as transformers in building, check load factors and demand factors, and to check current/voltage fluctuation at motor start-up.

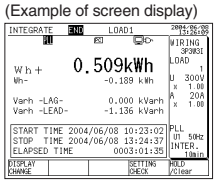
(Example of screen display)



Power Quantity Measurement:

The CW240 can measure and display the power quantity consumed up to the specified time (from the start of integration until the end).

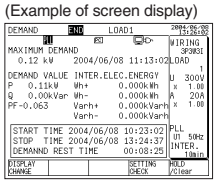
(Example of screen display)



Demand Measurement: For Review and Investigation on Contract Demand

Demand time limit
: Length of time set to obtain the average power (normally 30 minutes)
Demand power
: Average power during the demand time limit

(Example of screen display)



Specifications

Inputs

Item	Voltage	Current
Input type	Resistive potential division	Clamp detection
Rated value (range)	150.0 V 300.0 V 600.0 V 1000 V	Varies with the clamp and range used. 96036 (2 A) 200.0/500.0 mA/1.000/2.000 A 96033 (50 A) 5.000/10.00/20.00/50.00 A 96030 (200 A) 20.00/50.00/100.0/200.0 A 96031 (500 A) 50.00/100.0/200.0/500.0 A 96032 (1000 A) 200.0/500.0 A/1.000 kA 96034 (3000 A range) 300.0/750.0 A/1.500/3.000 kA (2000 A range) 200.0/500.0 A/1.000/2.000 kA (1000 A range) 100.0/200.0/500.0 A/1.000 kA 96035 (3000 A range) 300.0/750.0 A/1.500/3.000 kA (300 A range) 30.00/75.00/150.0/300.0 A
Phase to be measured	Single-phase 2-wire, single-phase 3-wire, single-phase 3-wire 3-current (current in neutral line), three-phase 3-wire 2-current (2-power meter method), Three-phase 3-wire 3-current (3-power meter method), three-phase 4-wire, three-phase 4-wire 4-current (current in neutral line), Scott connection (three-phase 3-wire + single-phase 3-wire)	
Number of systems to be measured	With the same voltage Single-phase 2-wire: 4 systems, single-phase 3-wire: 2 systems, three-phase 3-wire 2-current: 2 systems	
Input resistance	Approx. 1.3 MΩ	Approx. 100 KΩ (CW240 main unit)
Maximum allowed input (continuous)	1000 Vrms	96036 (2 A) 20 Arms 96033 (50 A) 130 Arms 96030 (200 A) 250 Arms 96031 (500 A) 625 Arms 96032 (1000 A) 700 Arms 96034 (3000 A range) 2400 Arms (3600 Arms for 10 minutes) (2,000 A range) 2400 Arms (1000 A range) 1200 Arms 96035 (3000 A range) 3600 Arms (300 A range) 360 Arms
A/D converter	Voltage/current input simultaneous conversion, PLL synchronized 128 samples/period, 16-bit resolution	

Measurement Input functions

Item	Voltage	Current / Active power / Reactive power (reactive power meter method is used)
Method	Digital sampling	
Frequency range	45 to 65 Hz (Measurement element is selected from U1, U2 and U3)	
Crest factor	Rated input: 3 (however, 1.8 when 1000 V range is used)	
Accuracy	±0.2%rdg. ±0.1%rng.	96030, 96031, 96033, 96036 ±0.6%rdg.±0.4%rng. 96032, 96034, 96035 ±1.0%rdg.±0.8%rng.
Power factor influence	—	96030 ±1.0%rng (45 to 65 Hz, power factor =±0.5) Other than 96030 ±2.0%rng (45 to 65 Hz, power factor =±0.5)
Reactive factor influence	—	96030 ±1.0%rng. (45 to 65 Hz, reactive factor =±0.5) Other than 96030 ±2.0%rng (45 to 65 Hz, reactive factor =±0.5)
Active input range	5 to 110% of each range (Max. 100% in the case of 1000 V range)	
Display range	Voltage / current:0.4 to 130% of each range (Zero suppression when below 0.4% of the range) Power (active, reactive, apparent):0 to 130% of each range (Zero suppression when below 0.17% of the range rating). Harmonic level: 0 to 130% of each range Frequency: 40 to 70 Hz	
Temperature coefficient	±0.03%rng/°C	±0.05%rng/°C
Display updating interval	Approx. 0.5 seconds	

rdg: Reading rng: Range

General specifications

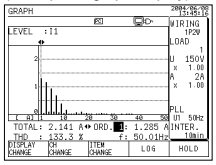
Location for use:	Indoor, at an altitude of 2000 meters or less
Storage temperature and humidity ranges	-20 to 60°C, 90%RH (no condensation)
Operating temperature and humidity ranges	5 to 40°C, 5 to 80%RH (no condensation)
Insulating resistance	500 VDC, 50 MΩ or greater Between voltage input terminals and case Between voltage input terminals and current input terminals / DC power terminals / external interface terminals
Insulating withstand voltage (50/60 Hz, for one minute)	5.55 kVAC rms for one minute (Sensed current: 1 mA) Between voltage input terminals and case 3.32 kVAC rms for one minute (Sensed current: 1 mA) Between voltage input terminals and current input terminals / DC power terminals / external interface terminals
Power supply	AC adapter (standard accessory), 100 to 240 VAC, 50/60 Hz
Backup battery (for power failure)	Six AA size alkaline batteries (standard accessory) One NiMH battery pack (optional)
Maximum rated power consumption	Main unit: Approx. 10 W (normal operation), approx. 20 W (during charging of NiMH battery pack) AC adaptor: Approx. 30 VA (normal operation), approx. 60 VA (during charging of NiMH battery pack)
External dimensions	Approx. 206 (W) u 184 (H) u 65 (D) mm (excluding projecting parts)
Weight	Approx. 1.2 kg (without batteries)

Discovers Failures in Power Supply Lines

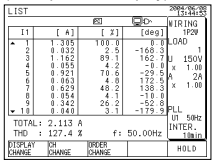
Harmonic Measurement

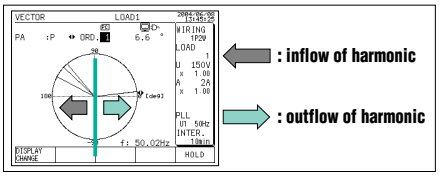
In many cases, inverter power supplies are used to drive air-conditioners and compressors. These power supplies cause distortions in voltages and currents, leading to malfunctions and power loss. Therefore, investigation and control of influences on the main power supplies by harmonics is necessary.

(Example of graph display)



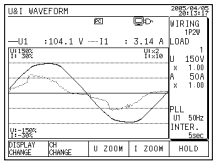
(Example of list display)





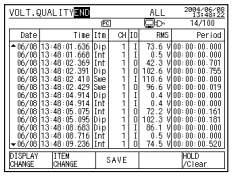
Waveform Measurement

Measurement elements:
Voltage of each phase, current of each phase
Voltage and current of each phase



Voltage Fluctuation Measurement

The CW240 detects dates/times of when fluctuations occur, fluctuation type, channels where they occur, rms values, and periods between start and end. The voltage threshold is set, and fluctuations exceeding the threshold are detected.



Low-cost Tools to Support Your Energy Conservation

CW120 Series
Clamp-on Power Meter

Features

Useful features for energy conservation and power measurement

- Periodically save data as often as once a second
- Check equipment operating conditions
- Wiring error check function
- Simultaneous measurement of multiple facilities
- Works even with small electric energy values

General Specifications

- Environmental requirements: Indoor usage at an altitude of 2000 meters or less.
- Usage temperature and humidity ranges:
  0–50°C, 5–85% RH (no condensation)
  0–40°C, 5–85% RH (no condensation) for UL, C-UL
- Storage temperature and humidity ranges:
  -20–60°C, 90% RH (no condensation)
- Power supply: 100–240 V AC ±10%, 50/60 Hz
- Consumed power: 8 VA maximum
- External magnetic field effects: Within accuracy levels at 400 A/m
- External dimensions: Approximately 117 × 161 × 51 mm (W × H × D)
- Weight: Approximately 0.6 kg
- Terminals:

Voltage input	CW120: 3 terminals	Banana terminals (safety terminals)
	CW121: 4 terminals	Banana terminals (safety terminals)
Current terminals	CW120: 2 pairs	Banana terminals (safety terminals)
(H/L)	CW121: 3 pairs	Banana terminals (safety terminals)
External control I/O	3 terminals (H/L/H)	Screwless terminals
terminals RS-485	4 terminals (+/-/SG/TM)	M3 screw terminals

- Connectors:
  RS-232: Mini DIN 8-pin
  AC power supply: 2-pin
- Accessories:
  Voltage input probes: 3 for CW120, 4 for CW121
  Power cord, user's manual, operation guide, Toolbox (setting software)
- Safety standards:
  Compliant with EN61010-1, EN61010-2-031, UL3111-1 First Edition, CAN C22.2 No. 1010.1-92
  –Voltage input line
  Measurement (Overvoltage) category III (Max. input voltage : 600 Vrms)
  –Power line
  Installation category II (Max. input voltage : 264 Vrms)
  Pollution degree 2
- EMC (emission):
  Compliant with EN55011, Group1, ClassA; EN61326; EN61000-3-2; EN61000-3-3
- EMC (immunity):
  Compliant with EN61326

Specifications

Inputs

Parameter		Voltage (V)	Current (A)
Input type		Resistive potential division	Clamp detection
Rated value (range)		150/300/450 V	Clamp 96033: 5/10/20/50 A Clamp 96030: 20/50/100/200 A Clamp 96031: 50/100/200/500 A Clamp 96032: 200/500/1000 A
Wiring	CW120	Single-phase 2-wire, single-phase 3-wire, three-phase 3-wire	
	CW121	Single-phase 2-wire, single-phase 3-wire, three-phase 3-wire, three-phase 4-wire	
Input resistance	CW120	Approximately 1.5 MW	Approximately 100 kW
	CW121	Approximately 1.3 MW	
Maximum allowed input		495 Vrms	Clamp 96033: 130 Arms Clamp 96030: 250 Arms Clamp 96031: 625 Arms Clamp 96032: 1000 Arms
A/D converter		Voltage/current input simultaneous conversion, 12-bit resolution	

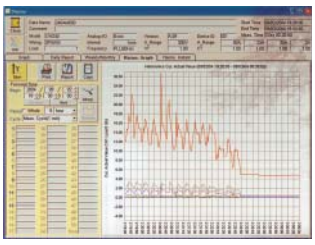
Measurement Input functions

Parameter		Voltage		Current/active power
Method		Digital sampling		
Frequency range		45–65 Hz (reciprocal system), detected from V1		
Crest factor		150/300 V range	Rated input: 2	Rated input: 3
		450 V range	Rated input: 1.56	
Active input range		10–110% of each range		
Display range	Lower limit	All ranges 1.5 V		0.4% of each range
	Upper limit	130% of each range, except 110% for 450 V range		130% of each range
Temperature coefficient		±0.05% rng/°C		±0.07% rng/°C (including clamp)
Display updating interval		Approximately one second		

Instantaneous Value Measurement

- Measurement parameters: Voltage rms (V), current rms (A), active power (W), frequency (Hz)
- Measurement accuracy (at power factor 1, including clamp)
  Voltage: ±(0.3% rdg + 0.2% rng)
  Current/active power: ±(0.8% rdg + 0.4% rng) when using clamps 96030, 96031, and 96033
  ±(1.2% rdg + 0.8% rng) when using clamp 96032, 96034 and 96035
  Frequency: ±(0.1% rdg + 1% dgt)
- Computation parameters: Reactive power (Var), power factor
- Computation accuracy: (value calculated from measurement) ±1 dgt
- Power factor influence: ±1.0% rng cosø = ±0.5 (relative to power factor 1) when using clamp 96030
  ±2.0% rng cosø = ±0.5 (relative to power factor 1) when using clamps 96031, 96032, and 96033
- Reactive factor influence: ±1.0% rng sinø = ±0.5 (relative to reactive factor 1) when using clamp 96030
  ±2.0% rng sinø = ±0.5 (relative to reactive factor 1) when using clamps 96031, 96032, and 96033

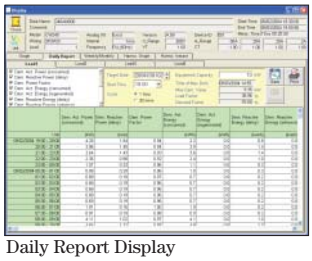
Effective power supply quality and power saving management for PCs

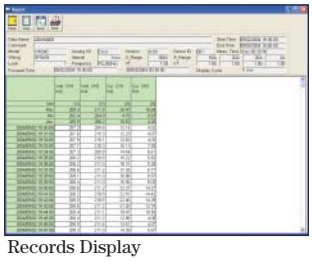


AP240E
Data Analysis Program for CW series

- Data Management
- Data Display Selection
- Graph Display
- Daily Report Display, Weekly / Monthly Report Display
- Harmonic Graph Display
- Harmonics Instant Value Display
- Waveform Data Display
- Voltage Change Display

One-Touch Selection of Daily and Weekly Reports


Daily Report Display


Records Display

Report Creation Customization Functions

- Graph and Record Printing
- Selectable Printer Type
- Graph Copy
- Record Copy
- Saving Record Data as CSV Format Files

Clamp-on Power Meter

CW240

Accessories

Carrying case

93020

CW240 main unit can be packed in the carrying case with accessories like current clamps and voltage probes, without disconnecting them from the main unit. It also holds the other accessories.

Protective Cover

91022

To prevent error connection of clamp probes.

Name	Model No.	Description
Voltage probes (4 pcs/set)	91007	
NiMH battery pack	94004	
AC adapter (for CW240)	94011	
Memory Card (256MB)	97034	256MB CF with PC Card Adapter
Memory Card (512MB)	97035	512MB CF with PC Card Adapter
Memory Card (2GB)	97037	2GB CF with PC Card Adapter
AC adapter	94011	-D For UL/CSA Standard
		-F For VDE Standard
		-H For GB Standard
		-N For NBR Standard
		-P For KC Standard
		-R For AS Standard
		-S For BS Standard
AC adapter for 96035	94013	For AC 120V
CW viewer	AP240E	

CW120

Accessories

Carrying case

93022

CW120 main unit can be packed in the carrying case with accessories like the current clamps and voltage probes. It also holds the other accessories.

Main unit case

93023

Includes magnet and stand

Portable case

93024

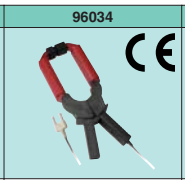
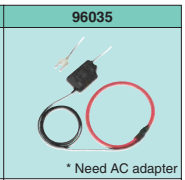
Power cable

98030

This cable supplies power from a measurement circuit. length 1.5m
*Not applied to CE and UL.

Name	Model No.	Description
Voltage probe	91007	Four per set
Voltage probe	91018	Three per set
Communication cable	91011	RS232 communication cable for PC (9-pin)
Memory Card (256MB)	97034	256MB CF with PC Card Adapter
Memory Card (512MB)	97035	512MB CF with PC Card Adapter
Memory Card (2GB)	97037	2GB CF with PC Card Adapter
AC adapter for 96035	94013	For AC 120V
AC adapter for 96035	94016	For AC 220 to 240V
Case for Main Unit	93023	With magnet
Portable Case	93024	For Main Unit + Accessories
Power Supply Case	98030	
CW viewer	AP240E	

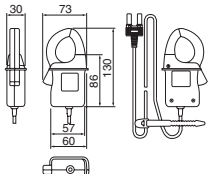
Clamp Probes for CW240/CW120 series

Model	96036	96033	96030	96031	96032	96034	96035
Clamp Probes							 * Need AC adapter
Diameter of measurable conductor	ϕ 40 mm	ϕ 18 mm	ϕ 30 mm	ϕ 30 mm	ϕ 65 mm	65 × 100 mm	ϕ 170 mm
Measuring Range	AC 2 A	AC 50 A	AC 200 A	AC 500 A	AC 700 A (1000 A 5 min)	AC 1000/2000/3000 A	AC 300/3000 A
Output Voltage	AC 50 mV	AC 500 mV	AC 500 mV	AC 500 mV	AC 250 mV	AC 500 mV	AC 500 mV
Frequency Range	20 Hz to 5 kHz	20 Hz to 20 kHz	20 Hz to 20 kHz	20 Hz to 5 kHz	45 Hz to 66 Hz	30 Hz to 1.5 kHz	10 Hz to 20 kHz
External dimensions	70 × 120 × 25 mm	52 × 106 × 25 mm	73 × 130 × 30 mm	73 × 130 × 30 mm	100 × 172.5 × 32 mm	120 × 310 × 48 mm	140 × 64 × 28 mm
Weight	Approx. 300 g	Approx. 220 g	Approx. 300 g	Approx. 300 g	Approx. 500 g	Approx. 1,390 g	Approx. 470 g

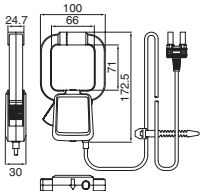
* Need to purchase AC adapter separately

External Dimensions

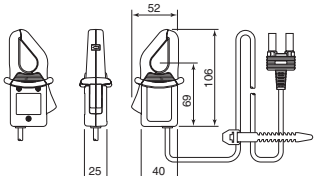
96030,31 CE — unit: mm



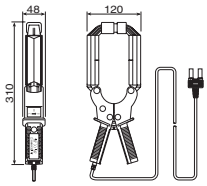
96032 — unit: mm



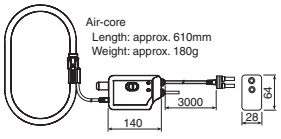
96033 — unit: mm



96034 — unit: mm

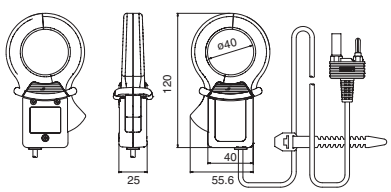


96035 — unit: mm



Box Weight: approx. 300g
(including a battery and output cable)

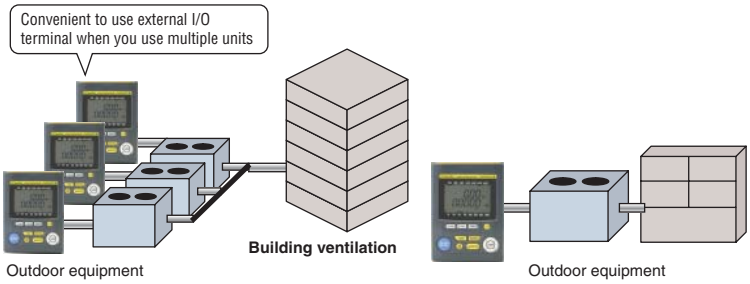
96036 CE — unit: mm



Energy Saving for Air-conditioning & Freezing machine

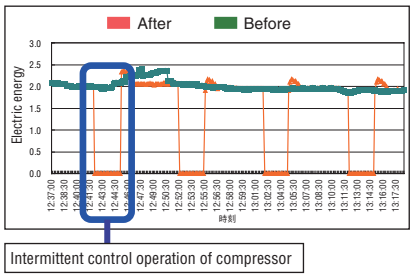
Introduction Example

Measure electric energy of Air-conditioning and compressor of Freezing machine to check energy-saving effect



Point: Min data saving interval is 1 second

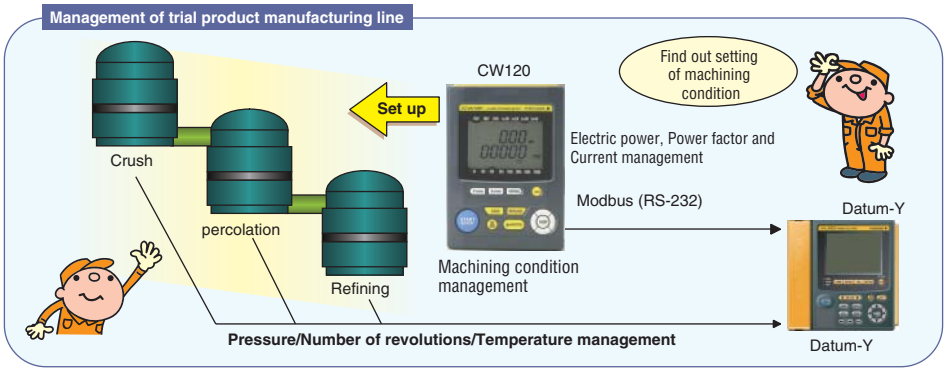
Can be measure electric energy for rise characteristics & Intermittent control operation



Intermittent control operation of compressor

Food company - Sesame oil production plant

Customer's Benefit : No need to use PC. Datum-Y to save all valuable data!



Harmonics measurement

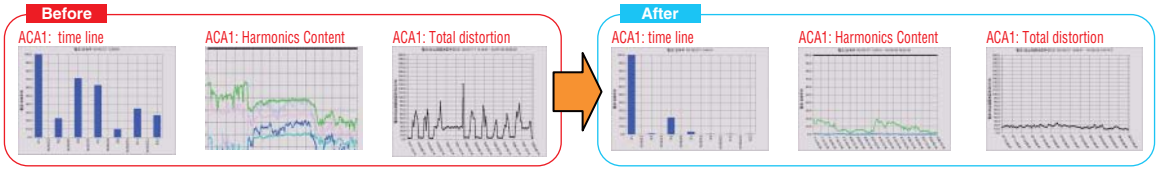
Case Example at Special Paper Printing Factory Facility : 500kV Transformer

- Problem: Periodically the printing machine is having trouble
  →Assume the problem caused by Harmonics on power supply line
  Odd order harmonics except 3rd order harmonics cause malfunction of electronics device or power equipments.
  Especially, 5th order harmonics cause burnout of D.C. reactor for power factor improvement condenser.

Use CW240's harmonics measurement function and found out harmonics on power supply line.
Harmonics e was generated by internal load.

Countermeasure: Set 5th and 7th transformer filter

Measured by CW240



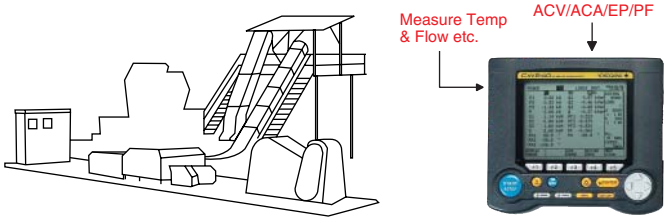
Result: Sharp decrease of relative harmonic content after 5thorder.Distortion rate is less than 30% maximum

Maintenance of Pumping Equipment

- Pump maintenance of water & sewerage system
- Measure voltage, current, flow, power factor, temperature and harmonics of pump motor

CW240 Solution

- CW240 is compact & handy type and easy to carry around the maintenance field
- Backup battery
- Can measure voltage/current waveform for 1 cycle of commercial power supply
- Harmonics Noise measurement when pumps are running
- Can be monitor heat of pump motor by connection with analog output of thermometer
- Simultaneously measure consumption of electric energy and power factor, and use taken data to determine change timing of bearings.



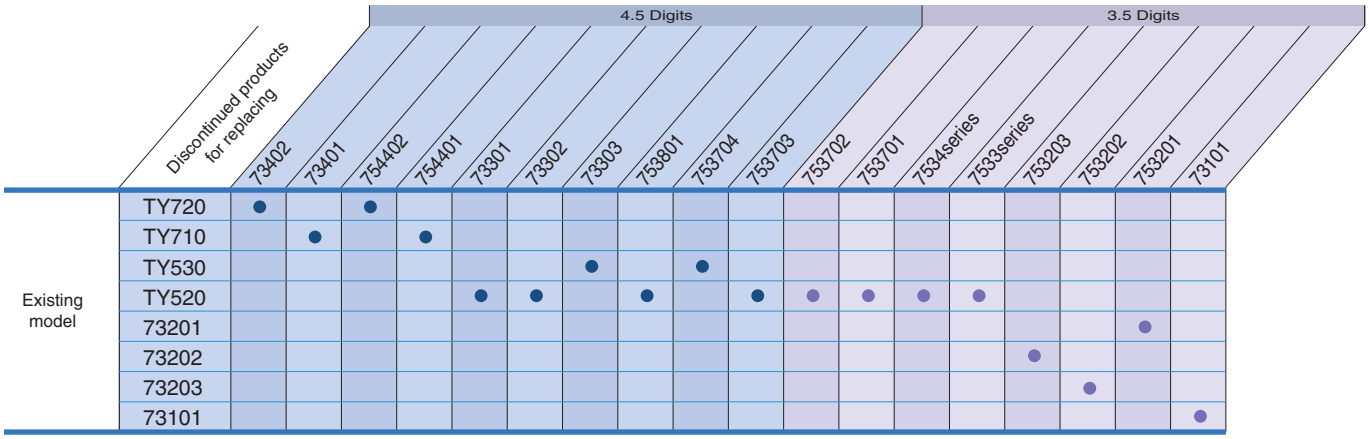
Digital Multi Meter

Handheld Digital Multi Meter Sellection

	Handhel Digital Multi Meter Models								
Function item	TY710	TY720	TY520	TY530	73201	73202	73203	73204	73101
Measurment Function	Ture RMS	Ture RMS MEAN Sellect	RMS	RMS MEAN Sellect	MEAN	MEAN	MEAN	MEAN	MEAN
Max. Measurrement Accuracy at DCV	0.02%		0.09%		0.5%	0.5%	0.3%	0.5%	0.7%
Wide bandwidth	20KHz	100KHz	1kHz		—				—
Display Digits(Uint:Digit)	5 digits		3.5 Digits		3.5 Digits				3.5 Digits
Max. Value	50000		6000		4300				4300
Bar Graph Dsiplay (Uints:Segment)	51		31		—				32
LCD Back Light	White LED		LED		—				—
Max.Measurement Voltage (AC/or DC)	50.000mV to 1000.0V	50.000mV to 1000.0V	600.0mV to 1000V	600.0mV to 1000V	4.000V*3 to 600V	4.000V*3 to 600V	4.000V*3 to 600V	4.000V*3 to 600V	4.000V*3 to 600V
Max.Measurement Currents (AC/or DC)	500.00μA to 10.000A	500.00μA to 10.000A	600.0μA to 10.00A	600.0μA to 10.00A	400.0μA to 10.00A	400.0μA to 10.00A	400.0μA to 10.00A	—	—
Max.Measurement Resistance	500.00Ω to 50.000MΩ	500.00Ω to 50.000MΩ	600.0Ω to 60.00MΩ	600.0Ω to 60.00MΩ	400.0Ω to 40.00MΩ	400.0Ω to 40.00MΩ	400.0Ω to 40.00MΩ	400.0Ω to 40.00MΩ	400.0Ω to 40.00MΩ
Max.Measurement Frequency	2.000Hz to 99.99kHz	2.000Hz to 99.99kHz	10.00Hz to 99.99kHz	10.00Hz to 99.99kHz	—	—	—	—	—
Max.Measurement Capcitance	5.000nF to 50.00mF	5.000nF to 50.00mF	10.00nF to 1000μF	10.00nF to 1000μF	—	20.00nF to 200.0μF	20.00nF to 200.0μF	—	—
Max.Measurement Temperature	+1372°C*1	+1372°C*1	+600°C*1	+600°C*1	—	—	—	—	—
Duty Ratio (%) Measuement	●	●	—	—	—	—	—	—	—
Low-Power	—	●	—	—	—	—	—	—	—
AC+DC Measurement	●	●	—	—	—	—	—	—	—
Max./Min./Ave. Value Memory	●	●	—	●	—	—	—	—	—
Diode Test	●	●	●	●	●	●	●	●	●
Continuity Check	●	●	●	●	●	●	●	●	●
Relative/Percentage (%) calculation	●	●	●	●	—	—	—	—	—
Decibel calculation	●	●		—	—	—	—	—	—
Selection Auto range or Manual range	●	●	●	●	●	●	●	●	—
Peak Hold	—	●	—	—	—	—	—	—	—
Data Hold	●*2	●	●	●	●	●	●	●	●
Auto Hold	●	●	●	●	●	●	●	●	
Communication for PC	●*2	●*2	—	●*2	—	—	—	—	—
Data Logging Memory	●*2	●*2	—	●*2	—	—	—	—	—
Data Memory	1000	10000	—	1600	—	—	—	—	—
Operating Temp. and Humidity	-20 to 55°C	-20 to 55°C	-10 to 55°C	-10 to 55°C	0 to 50°C	0 to 50°C	0 to 50°C	0 to 50°C	0 to 50°C
Electric Safety 1000V	CAT III		CAT III		—				—
Electric Safety 600V	CAT IV		CAT IV		CAT II			CAT III	CAT III
Electric Safety 300V	—		—		CAT III			—	CAT II

*1 Temperature probe is necessary when measuring temperature.
*2 The communications package (model: 92015) for DMM is necessary when connecting it with PC.
*3 73101,732Series minimum range of DCvoltage is 400. 0 mVDC.

Simple selection for replacing discontinued products



A New De Facto Standard for Handheld DMM

- Maximum Measurement Accuracy: 0.020% rdg + 2 dgt
- Highly Reliable: Closed case calibration
- Full Support of Data Management: Measured data stored in internal memory
- Safe Design: Shutters prevent erroneous insertion of test leads into current measurement-terminals (terminal shutters)
- Shockproof elastomer casing
- Wide operating temperature range: -20 °C to 55°C

General Specifications

Additional Functions	USB communication (optional adapter & software), data memory (TY720: 10,000 data, TY710: 1,000 data), max/min value memory, relative/percentage value computation, logarithm computation, data/auto hold, peak hold (TY720), overvoltage warning, backlight
Power Supply	Four AA (R6) dry cells
Battery Life	Approx. 120 hours
Dimensions	90 (W) × 192 (H) × 49 (D) mm
Weight	Approximately 560 g (including batteries)
Safety Standards	1000 V CAT. Ⅲ, 600 V CAT. Ⅳ

TY700 Series
Digital Multimeters

		TY710			TY720		
Detection		RMS			Switching detection (RMS or MEAN)		
Item	Range	Accuracy					
DCV	50mV	0.05+10					
	500mV/2400mV	0.02+2					
	5V	0.025+5					
	50V/500V/1000V	0.03+2					
ACV [RMS]		Upper: 10 to 20Hz Lower: 20Hz to 1kHz	Upper: 1kHz to 10kHz Lower: 10kHz to 20kHz	Upper: 20kHz to 50kHz Lower: 50kHz to 100kHz	Upper: 10 to 20Hz Lower: 20Hz to 1kHz	Upper: 1kHz to 10kHz Lower: 10kHz to 20kHz	Upper: 20kHz to 50kHz Lower: 50kHz to 100kHz
	50mV	— —	— —	— —	2+80 0.4+40	5+40 5.5+40	15+40 15+40
	50mV/5V/ 50V/500V	1.5+30	0.7+30 2+50	— —	1+30	0.4+30 1+40	2+70 5+200
	1000V	0.7+30	3+30 —	— —	0.4+30	3+30 —	— —
ACV [MEAN]					10 to 20Hz	20Hz to 500Hz	500Hz to 1kHz
	50mV	—			4+80	1.5+30	5+30
	50mV/5V/ 50V/500V/1000V	—			2+30	1+30	3+30
DCV+ACV		Upper: DC,10 to 20Hz Lower: DC,20Hz to 1kHz	Upper: DC,1kHz to 10kHz Lower: DC,10kHz to 20kHz	Upper: DC,20kHz to 50kHz Lower: DC,50kHz to 100kHz	Upper: DC,10 to 20Hz Lower: DC,20Hz to 1kHz	Upper: DC,1kHz to 10kHz Lower: DC,10kHz to 20kHz	Upper: DC,20kHz to 50kHz Lower: DC,50kHz to 100kHz
	5V/50V/500V	1.5+10 1+10	1+10 2+10	— —	1.5+10 0.5+10	0.5+10 1+10	2+10 5+20
	1000V	1.5+10 1+10	— —	— —	1.5+10 0.5+10	— —	— —
DCA	500µA/5000µA/ 50mA/500mA	0.2+5					
	5A	0.6+10					
	10A	0.6+5					
ACA [RMS]		10Hz to 20Hz	20Hz to 1kHz	1kHz to 5kHz	10Hz to 20Hz	20Hz to 1kHz	1kHz to 5kHz
	500µA/5000µA/ 50mA/500mA	1.5+20	1+20	—	1+20	0.75+20	1+30
	5A/10A				1.5+20	1+20	2+30
ACA [MEAN]					10Hz to 20Hz	20Hz to 1kHz	1kHz to 5kHz
	500µA/5000µA/ 50mA/500mA	—			2+20	1.5+20	2+30
	5A/10A	—			3+20	2+20	4+30
DCA+ACA		DC,10 to 20Hz	DC,20Hz to 1kHz	DC,1kHz to 5kHz	DC,10 to 20Hz	DC,20Hz to 1kHz	DC,1kHz to 5kHz
	500µA/5000µA/ 50mA/500mA	2+10	1.5+10	—	1.5+10	1+10	1.5+10
	5A/10A				2+10	1.5+10	3+10
Resistance	500Ω/5kΩ/50kΩ 500kΩ	0.1+2			0.05+2		
	5MΩ	0.5+2					
	50MΩ	1+2					
Low-power Resistance	5kΩ/50kΩ/500kΩ	—			0.2+3		
	5MΩ	—			1+3		
Frequency	2.0Hz to 99.99kHz	0.02+1					
Capacitance	5nF/50nF/500nF 5µF/50µF	1+5					
	500µF	2+5					
	5mF/50mF	3+5					
Continuity check	550Ω	Buzzer sounds at 100±50Ω or less					
Diode test	2.4V	1+2					
Temperature	-200 to 1372°C	1+1.5°C					

●DMM of dedicated application software (Model: 92015)
DMM's and you can easily manage the data in memory. Is also capable of real-time communications

Features
- Data saved in the internal memory PC transfer is possible (Save memories or Logging Memories)
- DMM measurements show in real time monitor display is possible.
- Large amounts of data not covered by the internal memory PC communication with data transfer is possible. At the same time Excel transferable is also. Maximum incoming data: 32767
- Measurement data to Excel direct deployment is possible. Automatically creates a chart sheet.

92015 product specification:

Communication cable

Communications cable:	infrared communication adapter + communications cable (USB specifications) 2 m length
Interface standards:	USB specification conforms to the 1.1
Available models :	TY710 , TY720 , TY530

Application software

Operating environment of the personal computer

OS:	Windows XP / Vista / 7
CPU:	Pentium 133 MHz or higher
Memory:	64 MB
Hard disk has free space or more storage:	10 MB Over, CD drive
Excel: since the Excel2000	
Software:	CD, communication cable (including adapter), User's manual

Digital Multi Meter

Provides Safety Levels Demanded in Field Work

TY500 Series
Digital Multimeters

3.5 digits (6,000-count, 31-segment bar graph display), RMS type
Measurement Functions: Voltage, Current, Resistance, Continuity Check, Diode Test, Frequency, Capacitance, Temperature
Features: Closed case calibration, Hi-impact overmold case, USB communication (optional adapter & software) (TY530 only), data memory (1,600 data for TY530 only)
Safety Standards: 1000 V CAT. Ⅲ, 600 V CAT. Ⅳ

TY500 Series Specifications

Accuracy: (23°C ±5°C, Less than 80% RH), ±(% rdg + dgt)

		TY520		TY530
Detection		RMS		Switching detection (RMS or MEAN)
Item	Range	Accuracy		
DCV	600mV/6V/60V/600V	0.09 + 2		
	1000V	0.15 + 2		
ACV		50/60Hz	40 to 500Hz	500Hz to 1kHz
	600mV/6V/60V/600V	0.5 + 5	1 + 5	1.5 + 5
	1000V			—
DCA	600µA/6000µA/60mA	0.2 + 2		
	600mA/6A/10A	0.5 + 5		
ACA		50/60Hz		40Hz to 1kHz
	600µA/6000µA/60mA/ 600mA/6A/10A	0.75 + 5		1.5 + 5
Resistance	600Ω/6kΩ/60kΩ/600kΩ	0.4 + 1		
	6MΩ	0.5 + 1		
	60MΩ	1 + 2 (0 to 40MΩ) 2 + 2 (40 to 60MΩ)		
Frequency	10.0Hz to 99.99kHz	0.02 + 1		
Capacitance	10nF	2 + 10		
	100nF/1µF/10µF	2 + 5		
	100µF/1000µF	3 + 5		
Continuity check	600Ω	Buzzer sounds at 50±30Ω or less		
Diode test	2V	1 + 2		
Temperature	-50 to 600°C	2 + 2°C		

General Specifications
- External dimensions:
  90 (W) × 192 (H) × 49 (D) mm
- Weight: Approx. 570 g
- Power Supply: Four AA (R6) dry cells

Low-cost Handheld DMM

732 Series
Digital Multimeters

3.5 digits (4,300-count), Mean value type
Measurement Functions: Voltage, Current, Resistance, Continuity Check, Diode Test, Capacitance
Features: Auto hold, Auto power-off

732 Series Specifications

Accuracy: (23°C ±5°C, Less than 80% RH), ±(% rdg + dgt)

Model		73201	73202	73203	73204
Detection		Mean value			
Item	Range	Accuracy			
DCV	400.0 mV/4.000 V/ 40.00 V/400.0 V/600 V	0.5%+1 0.75%+1	0.5%+1	0.3%+1	0.5%+1
ACV	4.000 V/40.00 V/ 400.0 V/600 V	1.0%+5		0.75%+5	
DCA	400.0 µA/4000 µA/ 40.00 mA/400.0 mA/ 10.00 A	1.0%+2 2.0%+2			–
ACA (40 to 500 Hz)	400.0 µA/4000 µA/ 40.00 mA/400.0 mA/ 10.00 A	2.0%+20 2.0%+5 2.0%+20 2.0%+5 2.0%+20			–
Resistance	400.0 Ω/4.000 kΩ/ 40.00 kΩ/400.0 kΩ/ 4.000 MΩ/40.00 MΩ	0.75%+2 0.75%+1 2.0%+1 5.0%+2			

General Specifications
- External dimensions:
  74 (W) × 155 (H) × 31 (D) mm
- Weight: Approx. 240 g
- Power Supply:
  Two AAA (LR03 or R03) dry cells

Pocket DMM with Superb Portability

73101
Pocket Digital Multimeter

4300 count display
Continuity Check and Diode Test
Auto Hold
Auto Power Off

73101 Specifications

Accuracy: (23°C ±5°C, Less than 80% RH), ±(% rdg + dgt)

Item	Range	Accuracy	Input Resistance
DCV	400.0 mV 4.000 V 40.00/400.0/600 V	1.2%+2 0.7%+1 1.2%+1	>100 MΩ 11 MΩ 10 MΩ
ACV	4.000 V 40.00/400.0/600 V	2.0%+5	10 MΩ
Resistance	400.0 Ω 4.000 k/40.00 k/400.0 kΩ 4.000 MΩ 40.00 MΩ	1.2%+2 2.0%+3 5.0%+3	
Continuity check	400.0 Ω	–	
Diode test	2.00 V	1.5%+1	Open-circuit Voltage<3.4 V Testing Current<1.0 mA

Genetal Specifications
- External dimensions:
  76 (W) × 117 (H) × 18 (D) mm
- Weight: Approx. 110 g
- Power Supply: Two LR-44 dry cells

96095

AD/DC Clamp-on Probe

- Light and compact, easy to carry and easy to clamp on crowded wirings.
- Expands measuring span of currents and assure safety when measuring with any kind of DMM.

Specifications

Model	96095	
Conductor Size	φ12mm	
Measurement range	Output voltage	Accuracy (at 23°C±5°C)
AC 0.1 to 130A	AC10mV/A(AC 1～1300mVrms)	50/60Hz: 1.2%+0.4mV; 40Hz to 1kHz: 2.5%+0.4mV
DC 0 to ±180A	DC10mV/A (DC 0～±1800mV)	1.2%+0.4mV
General specifications		
Operating Temp&Humidity range	-10 to 55°C relative Humidity 85% or less (no condensation)	
Storage Temp&Humidity range	-30 to 70°C relative Humidity 85% or less (no condensation)	
Power source	DC3V(Size AAA alkaline Battery LR03 × 2pcs) Low battery warning ：2.2V±0.2V or less red LED flash 1.9V±0.2V or less Power off	
Continuous use	Approx. 35Hours till a low battery indicator flashes *1	
Dimensions&Weight	127 (L) × 42 (W) × 22 (D) mm Cord length: Approx.1200mm Weight: Approx 140g	
Applicable standards	EN61010-1：CAT Ⅲ Pollution degree2, Altitude 2000m or less for indoor use EN61326-1：ClassB, EN61326-2-032	
Accessories	Soft case(94030),Battery,User's Manual	

*1 From low battery warning to power off is about 5hours

Standerd Accessories

			Applicable DMM Models							
			TY700		TY500		732			
Name	Model	Specification	TY710	TY720	TY520	TY530	01	02	03	04
Test leads	98073	1000V CAT Ⅲ 600V CAT Ⅳ Red/Black(1set)	●	●	●	●				
	RD031	L-plug,Red/Black(1set)					●	●	●	●
Fuse	99015	440mA/1000V	●	●	●	●				
	99016	10A/1000V	●	●	●	●				
	F02	15A/250V					●	●	●	●
	F05	500mA/250V					●	●	●	●

Accessorise

			Applicable DMM Models							
			TY700		TY500		732			
Name	Model	Specification	TY710	TY720	TY520	TY530	01	02	03	04
Communication Package for Digital Multimeters	92015	Communication Adapter for USB+cable+Application Software	●	●		●				
Test leads with Alligator Clip	99014	1000V CAT Ⅲ 600V CAT Ⅳ Red/Black(1set)	●	●		●				
Alligator Clips	B9646HF	Red/Black(1set)	●	●	●	●	●	●	●	●
Rubber Case	93007						●	●	●	●
Carrying Case	93029	Hard case	●	●	●	●				
	B9646GB	Hard case	●	●	●	●	●	●	●	●
Temperature Probe (Thermocouple type K) (Banana plag output)	90050	-50 to 150°C for liquld	●	●	●	●				
	90051	-50 to 600°C for liquld	●	●	●	●				
	90055	-20 to 250°C for surface	●	●	●	●				
	90056	-20 to 500°C for surface	●	●	●	●				
Currents Clamp-on probe	96001	For 400AAC Output:AC10mV/A*1	●	●	●	●	●	●	●	●
	96095	For 130AAC/180ADC Output: AC10mV/A or DC10mV/A*2	●	●	●	●	●	●	●	●

*1 Please use it with the ACV range. It is necessary to read the indicated value in a different way as TY710 and the TY720,732 series. The example: In AC1V display = 100A TY520 and TY530, it is possible to scale it. (Even 60A or less display is possible in case of 96001.)
*2 Please use it with ACV or DCV range. It is necessary to read the indicated value in a different way as TY710 and the TY720,732 series. The example: In AC1V display = 100A TY520 and TY530, it is possible to scale it. (Even 60A or less display is possible in case of 96095.)

DMM Accessories


93029


92015

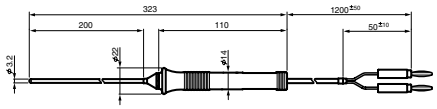

98073


96095

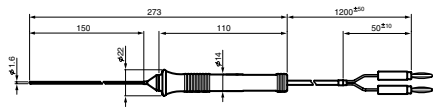

96001


RD031

90050



90051



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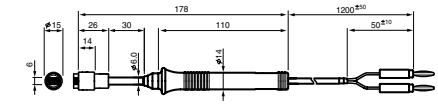
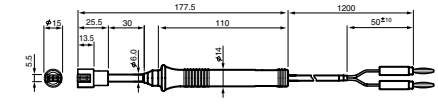


90056



Clamp-on Tester

Model	Diameter of measurable conductor	Range	Accuracy	AC current	DC current	Leak current	DC voltage	AC voltage	Resistance	Continuity check	Frequency	True RMS	Output	Data hold	Peak hold	Filter
CL120	ϕ24	20 to 200 A	2.0+7	●										●		
CL130	ϕ33	200 to 600 A	1.5+6	●			●		●	●				●		
CL135	ϕ33	200 to 600 A	1.5+4	●			●		●	●		●		●		
CL150	ϕ54	400 to 2000 A	1.0+3	●			●	●	●	●			●	●	●	
CL155	ϕ54	400 to 2000 A	1.0+3	●			●	●	●	●		●	●	●	●	
CL220	ϕ24	400 to 300 A	1.0+4	●	●									●		
CL235	ϕ33	400 to 600 A	1.0+5	●	●		●	●	●	●	●	●		●		
CL250	ϕ55	400 to 2000 A	1.5+2	●	●		●	●	●	●			●	●		
CL255	ϕ55	400 to 2000 A	1.5+2	●	●		●	●	●	●		●	●	●	●	
CL320	ϕ24	20 mA to 200 A	2.0+4	●		●								●		●
CL340	ϕ40	40 mA to 400 A	1.0+5	●		●								●	●	●
CL345	ϕ40	40 mA to 400 A	1.0+5	●		●						●		●	●	●
30031A	ϕ40	3 mA to 60 A	1.0+5	●		●								●		
30032A	ϕ40	3 mA to 60 A	1.0+5	●		●								●		●
CL360	ϕ68	200 mA to 1000 A	1.0+2	●		●							●	●	●	●
CL420	ϕ6	DC 20 to 100 mA	0.2+3		●								●	●		

Light weight & compact design

CL120
Clamp-on Tester

- ACA
- ϕ 24
- AC/20 to 200 A

CL120 Specifications

Accuracy: (23°C ±5°C, Less than 75% RH), ±(% rdg + dgt)

Item	Range	Accuracy
ACA	20A	2.0+7 (50 to 1 kHz)
	200A	2.0+5 (50/60 Hz)
		3.0+10 (40 to 1 kHz)

AC/DC Current Measurement

CL130/135
Clamp-on Testers

- ACA
- ϕ 33
- AC/200 to 600 A
- AC V/Ω
- RMS for CL135

CL130/CL135 Specifications

Accuracy: (23°C ±5°C, Less than 85% RH), ±(% rdg + dgt)

Item	Range	Accuracy (CL130/CL135)	
ACA	200A	1.5+6 (50/60 Hz)	1.5+4 (50/60 Hz)
		2.0+5 (40 to 1 kHz)	2.0+5 (40 to 1 kHz)
	600A	1.0+3 (50/60 Hz)	1.5+4 (50/60 Hz)
		2.0+5 (40 to 1 kHz)	2.0+5 (40 to 1 kHz)
ACV	200V/600V	1.0+2 (50/60 Hz)	1.0+2 (50/60 Hz)
		1.5+4 (40 to 1 kHz)	1.5+4 (40 to 1 kHz)
Resistance	200 Ω	1.2+4, Beeps at below 30 Ω (continuity check)	

Wide Range of Current Measurement

CL150/CL155
Clamp-on Testers

- ACA
- ϕ 54
- AC/400 to 2000 A
- AC V/DC V/Ω
- DC Output
- RMS for CL155

CL150/CL155 Specifications

Accuracy: (23°C ±5°C, Less than 75% RH), ±(% rdg + dgt)

Item	Range	Accuracy
ACA	400A	1.0 + 3 (50/60 Hz)
		2.0 + 3 (40 to 1 kHz)
	2000 A (0 to 1500 A)	1.0 + 3 (50/60 Hz)
		3.0 + 3 (40 to 1 kHz)
	2000 A (1500 to 2000 A)	3.0 (50/60 Hz)
ACV	40/400/750V	1.0 + 2 (50/60 Hz)
		1.5 + 3 (40 to 1 kHz)
DCV	40/400/1000V	1.0 + 2
Resistance	400/4 k/40 k/400 kΩ	1.5 + 2, Beep sound at less than 50 ±35 Ω

AC/DC Current Measurement

CL220
Clamp-on Tester

- ACA/DCA
- ϕ 24
- AC/40 to 300 A
- DC/40 to 300 A

CL220 Specifications

Accuracy: (23°C ±5°C, Less than 85% RH), ±(% rdg + dgt)

Item	Range	Accuracy
ACA	40A	1.0 + 4
	300 A (±20 to ±200 A)	1.5 + 4
	300 A (±200 to ±300 A)	3.0
DCA	40A	1.0 + 4 (50/60 Hz)
		2.5 + 4 (20 to 1 kHz)
	300 A (20 to 200 A)	1.5 + 4 (50/60 Hz)
		2.5 + 4 (20 to 1 kHz)
	300 A (200 to 300 A)	3.5 (50/60 Hz)
		4.0 (20 to 1 kHz)

RMS ACA/DCA measurement

CL235
Clamp-on Tester

- ACA/DCA
- ϕ 33
- AC/400 to 600A, DC/400 to 1000A
- AC V/DC V/Ω/Hz
- RMS

CL235 Specifications

Accuracy: (23°C ±5°C, Less than 75% RH), ±(% rdg + dgt)

Item	Range	Accuracy
ACA	400/600A	1.5+5 (50/60Hz) 3.5+5 (40 to 1kHz)
DCA	400/1000A	1.0+5
ACV	40/400/600V	1.5+5 (50/60Hz) 3.5+5 (40 to 1kHz)
DCV	40/400/600V	1.0+5
Resistance	400/4000Ω	1.0+5, Beeps at below 20Ω (continuity check)
Frequency	10 to 3000Hz	1.5+5

Leakage Currents of 1 mA measurement

30031A/30032A
Leakage Clamp-on Tester

- ACA
- ϕ 40
- AC/3 mA to 60 A

30031A/30032A Specifications

Accuracy: (23°C ±5°C, Less than 80% RH), ±(% rdg + dgt)

Item	Range	Accuracy	
		30031A, 30032A Filter OFF	30032A Filter ON
ACA	0 to 30 mA	1.0+5 (50±1.0Hz/60±1.0Hz)	1.5+5 (50±1.0Hz/60±1.0Hz)
	0 to 50 A		
	50 to 60 A	5.0+5 (50±1.0Hz/60±1.0Hz)	5.5+5 (50±1.0Hz/60±1.0Hz)

Compact design of Leakage current measurement

CL320
Leakage Clamp-on Tester

- ACA
- ϕ 24
- AC/20mA to 200A

CL320 Specifications

Accuracy: (23°C ±5°C, Less than 85% RH), ±(% rdg + dgt)

Item	Range	Accuracy	
		WIDE (40 to 400Hz)	50/60Hz
ACA	20mA/200mA	2.0+4 (50/60Hz)	3.0+5 (50/60Hz)
	200A (0 to 100A)	5.0+6 (40 to 400Hz)	
	200A (100.1 to 200A)	5.0+4 (50/60Hz)	5.0+5 (50/60Hz)

Wide Range of Leakage current measurement

CL360
Leakage Clamp-on Tester

- ACA
- ϕ 68
- AC/200mA to 1000A
- DC/AC Output

CL360 Specifications

Accuracy: (23°C ±5°C, Less than 85% RH), ±(% rdg + dgt)

Item	Range	Accuracy	
		WIDE (40 to 1kHz)	50/60Hz
ACA	20mA/2A/20A	1.0+2 (50/60Hz) 3.0+2 (40 to 1kHz)	1.5+2
	200A	1.5+2 (50/60Hz) 3.5+2 (40 to 1kHz)	2.0+2
	1000A (0 to 500A)	1.5+2 (50/60Hz) 3.5+2 (40 to 1kHz)	2.0+2
	1000A (501 to 1000A)	5.0 (50/60Hz) 10.0 (40 to 1kHz)	5.5

Wide Range of ACA/DCA measurement

CL250/CL255
Clamp-on Testers

- ACA/DCA
- ϕ 55
- AC/400 to 2000A, DC/400 to 2000A
- AC V/DC V/Ω
- DC Output
- Hz,RMS for CL255

CL250 Specifications

Accuracy: (23°C ±5°C, Less than 75% RH), ±(% rdg + dgt)

Item	Range	Accuracy
DCA	400/2000A	1.5+2
ACA	400A/2000A (0 to 1000A)	1.5+2 (50/60Hz) 3.0+4 (40 to 500Hz) 5.0+4 (500 to 1kHz)
	2000A (1001 to 2000A)	3.0+2 (50/60Hz)

CL255 Specifications

Accuracy: (23°C ±5°C, Less than 75% RH), ±(% rdg + dgt)

Item	Range	Accuracy
DCA	400/2000A	1.5+2
ACA	400A/2000A (150 to 1700A)	1.5+3 (50/60Hz) 3.0+4 (30 to 1kHz)
	2000A (1701 to 2000A)	3.5+3 (50/60Hz)

Leakage current measurement

CL340/CL345
Leakage Clamp-on Testers

- ACA
- ϕ 40
- AC/40mA to 400A
- RMS for CL345

CL340 Specifications

Accuracy: (23°C ±5°C, Less than 85% RH), ±(% rdg + dgt)

Item	Range	Accuracy	
		WIDE (20Hz)	50/60Hz
ACA	40mA/400mA	2.5+10 (20 to 1kHz)	1.0+5 (50/60Hz)
	400A (0 to 350A)	2.5+10 (40 to 1kHz)	1.0+5 (50/60Hz)
	400A (350 to 400A)	5.0 (40 to 1kHz)	2.0 (50/60Hz)

CL345 Specifications

Accuracy: (23°C ±5°C, Less than 85% RH), ±(% rdg + dgt)

Item	Range	Accuracy	
		WIDE (20Hz)	50/60Hz
ACA	40mA/400mA	2.5+10 (20 to 1kHz)	1.0+5 (50/60Hz)
	400A (0 to 300A)	2.5+10 (40 to 1kHz)	1.0+5 (50/60Hz)
	400A (300 to 400A)	5.0 (40 to 1kHz)	2.0 (50/60Hz)

DC signals of 4 to 20mA measurement

CL420
Clamp-on Process Meter

- DCmA
- ϕ 6
- DC/20mA to 100mA
- DC Output

CL420 Specifications

Accuracy: (23°C ±5°C, Less than 80% RH), ±(% rdg + dgt)

Item	Range	Accuracy
DCmA	20mA	0.2+5
	100mA	1.0+5

Insulation Tester

Selection Guide

Type		Series/ Model	Suffix Code & Backlight	Rating	AC Voltage Measuring range	Display	Additional Function	External View	Page
Digital insulation testers	4 ranges	MY40 CE	01 (EL-illuminated)	125V/200MΩ 250V/200MΩ 500V/2000MΩ 1000V/2000MΩ	0–600V	3 1/2-digit LCD	Automatic discharge Conductor resistance measurement Comparator function Memory function		P.77
Analog insulation testers	2 & 3 ranges	2406E	31 (N/A)	25V/5MΩ	0–300V	Analog	Automatic discharge Battery check		P.78
			41 (EL-illuminated)	50V/10MΩ 125V/20MΩ					
			32 (N/A)	125V/20MΩ	0–300V				
			42 (EL-illuminated)	250V/50MΩ					
			33 (N/A)	125V/20MΩ	0–600V				
			43 (EL-illuminated)	250V/50MΩ 500V/100MΩ					
			34 (N/A)	250V/50MΩ	0–600V				
			44 (EL-illuminated)	500V/100MΩ 1000V/2000MΩ					
			35 (N/A)	250V/500MΩ	0–600V				
			45 (EL-illuminated)	500V/1000MΩ 1000V/2000MΩ					
	Single range	MY10 CE	01 (afterglow-illuminated)	125V/20MΩ	0–250V	Analog	Automatic discharge Battery check		P.78
			02 (afterglow-illuminated)	250V/50MΩ	0–300V				
			03 (afterglow-illuminated)	500V/100MΩ	0–500V				
			04 (afterglow-illuminated)	500V/1000MΩ	0–500V				
			05 (afterglow-illuminated)	1000V/2000MΩ	0–500V				
	Single range	3213A	41 (N/A)	100V/20MΩ	0–150V	Analog	Battery check		P.78
			42 (N/A)	250V/50MΩ	0–250V				
			43 (N/A)	500V/100MΩ	0–300V				
			44 (N/A)	500V/1000MΩ	0–300V				
			45 (N/A)	1000V/2000MΩ	0–300V				

Points on How to Choose an Insulation Tester

1 Type

Two choices:
Choose an analog model if visual recognition is of utmost importance, or a digital model if precise numeric recognition is of utmost importance.

2 Ratings

A wide choice of voltage/resistance ratings, from 25 V/5 MΩ to 1000 V/2000 MΩ
Some models have two or three ranges; thus, you need not take more than one instrument to the site.

3 Functionality

Each series includes a model or models with a backlight for working in dark places. Multi-functional models capable of, for example, AC voltage measurement, are also available.

4 Accessories

Optional test probes and probe tips are available for a variety of test environments.

Simple selection for replacing discontinued products

Existing products					Discontinued products for replacing	
Type		Series /Models	Suffix Code (BackLight)	Rating	Series/Models	References and notes
Digital insulation testers	4 ranges	MY40 CE	01 (EL-illuminated)	125V/200MΩ 250V/200MΩ 500V/2000MΩ 1000V/2000MΩ	240651 to 55*1 240661 to 65*1 3213D31 to D35*2	*1 2406D series is single or 2 range. *2 3213D series is single range.
Analog insulation testers	2 & 3 ranges	2406E	31	25V/5MΩ 50V/10MΩ 125V/20MΩ	240631	
			41 (EL-illuminated)			
			32	125V/20MΩ 250V/50MΩ	–	
			42 (EL-illuminated)			
			33	125V/20MΩ 250V/50MΩ	240622	
			43 (EL-illuminated)	500V/100MΩ	240626	
			34	250V/50MΩ 500V/100MΩ 1000V/2000MΩ	240623/25	
			44 (EL-illuminated)			
			35	250V/500MΩ 500V/1000MΩ 1000V/2000MΩ	240621	
			45 (EL-illuminated)			
	Single range	MY10 CE	01	125V/20MΩ	321346	
			02	250V/50MΩ	240301	
			03	500V/100MΩ	240302	
			04	500V/1000MΩ	–	
			05	1000V/2000MΩ	240305	
	Single range	3213A	41	100V/20MΩ	321321	
			42	250V/50MΩ	321322	
			43	500V/100MΩ	321323	
			44	500V/1000MΩ	321324	
			45	1000V/2000MΩ	321325	

Digital model with 4 voltage/resistance ratings

CE

MY40

Digital Insulation Tester

Features

- Multifunction
  Insulation resistance, AC voltage and conductor resistance measurement
  Insulation test mode: Comparator, memory, auto-hold and discharge functions
  All test modes: Live-line alarm (excluding AC voltage measurement), battery check and automatic power-off
- Easy-to-view, fluctuation-free display
- Double-action safety mechanism

General Specifications

Dimensions: 125 (W) × 103 (H) × 53 (D) (mm)
Weight: 420 g (main unit and batteries only)
Batteries: Four AA (R6P) batteries

Testing Performance Specifications

Model	Rating	Range Option	Resolution	Measuring Range	Tolerance	Lower Limit of measured Ω	Rated Current	Central Scale Value
MY40-01	125V/200MΩ	.4000	.1kΩ	0–.0199MΩ	± (5%of rdg+6dgt)	0.125MΩ	1mA	5MΩ
		4.000	1kΩ	.0200–10.00MΩ*	± (2%of rdg+6dgt)			
		40.00	10kΩ	10.01–200.0MΩ	± 5%of rdg			
		200.0	100kΩ					
	250V/200MΩ	.4000	.1kΩ	0–.0499MΩ	± (5%of rdg+6dgt)	0.25MΩ	1mA	5MΩ
		4.000	1kΩ	.0500–20.00MΩ*	± (2%of rdg+6dgt)			
		40.00	10kΩ	20.01–200.0MΩ	± 5%of rdg			
		200.0	100kΩ					
	500V/2000MΩ	4.000	1kΩ	0–0.999MΩ	± (5%of rdg+6dgt)	0.5MΩ	1mA	50MΩ
		40.00	10kΩ	1.000–500MΩ*	± (2%of rdg+6dgt)			
		400.0	100kΩ	501–2000MΩ	± 5%of rdg			
		2000	1MΩ					
	1000V/2000MΩ	4.000	1kΩ	0–1.999MΩ	± (5%of rdg+6dgt)	2MΩ	0.5mA	50MΩ
		40.00	10kΩ	2.000–1000MΩ*	± (2%of rdg+6dgt)			
		400.0	100kΩ	1001–2000MΩ	± 5%of rdg			
		2000	1MΩ					

* First effective measuring range; ** The minimum value at which the rated voltage can be maintained

Standard test conditions
Ambient temperature/humidity ranges: 23 ±5℃/45-75% RH
Tolerances under the above-mentioned conditions:
Deviation from zero scale value: 6 digits maximum
Indication of ∞ mark on bar graph: Approx. 4000 MΩ min. (500 V/1000 V)
Approx. 400 MΩ min. (125 V/250 V)
Open circuit voltage: 130% max. of rated voltage
Rated measuring current: 1 mA (0 to 20%) when in first effective measuring range
Short-circuit Current: 2 mA max.

AC voltage measurement (45-400 Hz)

Model	Range	Resolution	Accuracy	Input Impedance
MY40-01	600V	1V	±(2% of rdg + 6dgt)	Approx. 2 MΩ

Conductor resistance measurement

Model	Range	Resolution	Accuracy	Open-circuit Voltage
MY40-01	400Ω	0.1Ω	±(2% of rdg + 8dgt)	Buzzer sound resistance: <40Ω.

Insulation Tester

Analog models with two and three ratings

2406E Series
Analog Insulation Testers

Features
- AC voltage measurement
- Automatic discharge
- Sky blue EL backlight
- Increased safety (covered battery charger)

General Specifications
Dimensions (main unit): Approx. 120 (W) × 110 (H) × 60 (D) (mm)
Weight: Approx. 500 g (including batteries)
Batteries: Six AA (R6P) batteries

Testing Performance Specifications

Model	Rating	Effective Measuring range	Central Scale Value	AC Voltage Measuring range	Lower limit of measured Ω	Rated Current
240631	25V/5MΩ	0.001–5MΩ	0.1MΩ	0–300V	0.025MΩ	1mA
240641	50V/10MΩ	0.005–10MΩ	0.2MΩ		0.05MΩ	1mA
	125V/20MΩ	0.01–20MΩ	0.5MΩ		0.125MΩ	1mA
240632	125V/20MΩ	0.01–20MΩ	0.5MΩ	0–300V	0.125MΩ	1mA
240642	250V/50MΩ	0.01–50MΩ	1MΩ		0.25MΩ	1mA
240633	125V/20MΩ	0.01–20MΩ	0.5MΩ	0–600V	0.125MΩ	1mA
	250V/50MΩ	0.01–50MΩ	1MΩ		0.25MΩ	1mA
240643	500V/100MΩ	0.05–100MΩ	2MΩ		0.5MΩ	1mA
240634	250V/50MΩ	0.01–50MΩ	1MΩ	0–600V	0.25MΩ	1mA
	500V/100MΩ	0.05–100MΩ	2MΩ		0.5MΩ	1mA
240644	1000V/2000MΩ	1–2000MΩ	50MΩ		1MΩ	1mA**
240635	250V/500MΩ	0.1–500MΩ	10MΩ	0–600V	0.25MΩ	1mA**
	500V/1000MΩ	0.5–1000MΩ	20MΩ		0.5MΩ	1mA**
240645	1000V/2000MΩ	1–2000MΩ	50MΩ		1MΩ	1mA**

EL-Back-Light Non-Back-Light

* The minimum value at which the rated voltage can be maintained;
** 0.55 mA in the case of the first effective measuring range

Analog models with single rating

MY10 Series
Analog Insulation Testers

Features
- AC voltage measurement
- Automatic discharge
- A wide choice of accessories
  –Designed for shared use with the MY40

General Specifications
Dimensions: Approx. 125 (W) × 103 (H) × 53 (D) (mm)
Weight: Approx. 400 g (main unit and batteries only)
Batteries: Four AA (R6P) batteries

Testing Performance Specifications

Model	Rating	Effective Measuring Range	Central Scale Value	AC Voltage Measuring Range	Lower Limit of Measured Ω*	Rated Current
MY10-01	125V/20MΩ	0.01–20MΩ	0.5MΩ	0–250V	0.125MΩ	1–1.2mA
MY10-02	250V/50MΩ	0.01–50MΩ	1MΩ	0–300V	0.25MΩ	1–1.2mA
MY10-03	500V/100MΩ	0.05–100MΩ	2MΩ	0–500V	0.5MΩ	1–1.2mA
MY10-04	500V/1000MΩ	0.5–1000MΩ	20MΩ	0–500V	1MΩ	0.5–0.6mA
MY10-05	1000V/2000MΩ	1–2000MΩ	50MΩ	0–500V	2MΩ	0.5–0.6mA

* The minimum value at which the rated voltage can be maintained

Analog models with single rating

3213A Series
Analog Insulation Testers

Features
- AC voltage measurement and check live lines such as motive power lines
- One-touch operation Press-and-lock switch for continuous measurement
- A wide choice of accessories to meet various testing requirements
- Vibration- and shock-resistant hand-held compact testers

General Specifications
Dimensions: Approx. 110 (W) × 180 (H) × 60 (D) (mm)
Weight: Approx. 700 g including batteries, or approx. 1.2 kg including hard case, handle, test leads and batteries
Batteries: Eight AA (R6P) batteries

Testing Performance Specifications

Model	Rating	Effective Measuring Range	Central Scale Value	AC Voltage Measuring Range	Lower Limit of measured Ω	Rated Current
321341	100V/20MΩ	0.02–20MΩ	0.5MΩ	0–150V	0.1MΩ	1mA
321342	250V/50MΩ	0.05–50MΩ	1MΩ	0–250V	0.25MΩ	1mA
321343	500V/100MΩ	0.1–100MΩ	2MΩ	0–300V	0.5MΩ	1mA
321344	500V/1000MΩ	1–1000MΩ	20MΩ	0–300V	0.5MΩ	1mA**
321345	1000V/2000MΩ	2–2000MΩ	50MΩ	0–300V	1MΩ	1mA**

* The minimum value at which the rated voltage can be maintained; ** 0.55 mA in the case of the first effective measuring range

Quick-reference Table of Accessories

Series/Model		3213A	2406E	MY10	MY40
Spare probe tip	For breaker pins	–	–	99011	
	General-purpose	B9600GN		B9600GN *2	
	Extended	B9600NX		B9600NX *2	
	Sharp-pointed	B9600NZ		B9600NZ *2	
Probe	Line probe	–	98007 Earth and Line probes	98001	
	Earth probe	–		98002	
	Measuring Lead unit (Paired earth/line terminals)	98050	–	–	–
	Replaceable type Line Probe	–	–	–	
Case *1	Bag for housing spare probe tips	B9600NV	–	–	–
	Accessory-housing case	B9646CA	B9108XA	B9108XA	
	Carrying case	B9600HA w/accessory-housing case	B9075MU(hard case) B9075MV(soft case) Note: Includes an accessory-housing case.	93015 Store main unit /accessories	93015 Store main unit /accessories
Others	Protection cover	–	–	93013	
	Shoulder strap	–	–	99005	
	Handle	B9303XE	–	–	–
	Lead for guard terminals	321803		–	–

Note that the color of the plastic part of a probe tip may not always match that of the probe, depending on the combination.

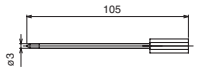
*1 Regarding external dimensions of cases, Pls refer to each product specification.

*2 For using with MYSeries, 98052 is necessary.

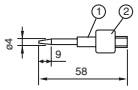
Spare Probe Tips

Unit: mm

99011



B9600GN



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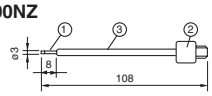

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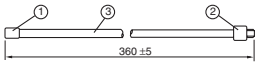


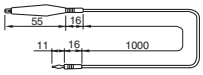
No.	Description	Remarks
①	Testing shank	Metal shank with ø6 screw
②	Fastening nut	ABS resin
③	PVC-clad	

Others

Unit: mm

B9303XE

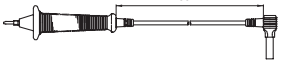
3218 03



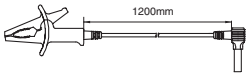
Probes

Unit: mm

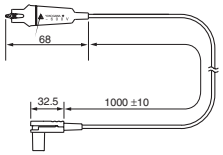
98001



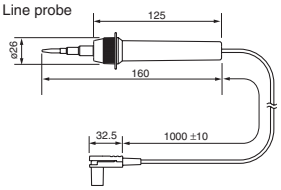
98002



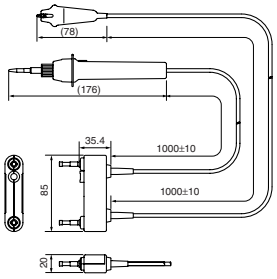
98007 Earth probe



Line probe



98050



Earth Tester/Leakage Current Tester/Illuminance Meter

Earth Tester Capable to Measure by 3 Pole or 2 Pole Method

EY200
Digital Earth Tester

- Capable to measure by 3-pole or 2-pole measuring
- Easy to measure with one touch button and dedicated test lead
- Small and lightweight
- Dust and drip proof (designed to IEC60529 IP54)

EY200 Specifications

Display	LCD Digital Display:1999-count digital reading
Measuring Range	Earth Resistance: 2000Ω LSD:0.01 to 1Ω Earth Voltage: 200V
Accuracy	Earth Resistance: 20Ω range: ±2%rdg±0.1Ω 200Ω range: ±2%rdg±3dgt 2000Ω range: ±2%rdg±3dgt Earth Voltage: ±1%rdg±4dgt
Measuring Frequency	Approx. 820Hz
Measuring Current	Approx. 3mA (at 20Ω range)
Battery Life	Approx. 4.5hours (at 5 second measuring 3300 times)
Operating Temp. and Humidity	0~40°C, 85%Rh or less 0~40°C, 85%Rh or less
Dimensions	Approx. 105×158×70mm
Weight	Approx. 550g

Handy Universal Tester for Checking Electrical Appliances

322610
Leakage Current Tester

- Three input resistance ranges – 1, 1.5 and 2 kΩ
- Four functions – AC current, DC current, DC + AC current and AC voltage measurements
- ±2.5% full scale accuracy
- 100 µA full scale value
- Shockproof indicator using taut band movement
- Built-in overload protection circuit
- Handy and easy to carry
- Shielded case, resistant to high-frequency fields

322610 Specifications

Range: DC current ... 0.1, 1, 10 mA,
AC current .... 0.1, 1, 10 mA,
(DC + AC) current ... 0.1, 1, 10 mA,
AC Voltage ... 150, 300 V (50 and 60 Hz)
Accuracy: ±2.5% of full scale value on current and voltage ranges
Input Impedance: Current range; 1 kΩ, 1.5 kΩ, and 2 kΩ
Voltage range; More than 100 kΩ
Frequency Range: 20 Hz to 5 kHz
Power Source: Two 9 V dry cells,
Continuous Operating Time; Approx. 290 hours
Overload Protection: Up to 30 mA AC for one minute will not damage instrument on current ranges
Dimensions: Approx. 190 × 124 × 90 mm not including handle
Weight: Approx. 1.0 kg

Excellent Performance, Multiple Functions

510 Series
Digital Lux Meter

- Wide range, High Accuracy
- Average illuminance computation function
- Timer hold
- USB communication

510 Series Specifications

Photoelectric Element: Silicon Photodiode
Measuring Range:
0.0 to 99.9/999/9,990/99,900/999,000lX
Response Time: 5 sec. (Auto Range)
2 sec. (Manual Range)
Accuracy: ±4% rdg. ±1 dgt. (51011)
±2% rdg. ±1 dgt. (51012, 51021)
General Specifications
- External dimensions (main unit):
Approx. 67 (W) × 177 (H) × 38 (D) (mm)
- Weight: Approx. 260 g
- Batteries: AA (LR6) × 2

Handy temperature data logger

TM20

Thermo-collectors

- Effective for HACCP program implementation.
- Collect up to 5000 data items with time-stamp, tag name and inspector name.
- Save 2 weeks continuous data logging with 1 minute interval, (up to 20000 data items, measuring interval is 1sec. to 24 houres.)
  Information on **when**, **by whom** and **what** is measured is saved along with the data.

TM20 Specifications

Product name (Model)	**TM20 Thermo-collector Thermocouple model (54011)**
Number of measuring channels	2
Measuring range (only the main unit)	Thermocouple Type K : -200°C to 1372°C Type J : -200°C to 1000°C Type E : -200°C to 700°C Type T : -200°C to 400°C Voltage input ±100 mV, ±1 V
Accuracy (only the main unit)	Thermocouple -200.0 to 100.1°C : ±(0.1% of rdg + 0.7°C) -100.0°C or above : ±(0.1% of rdg + 1.0°C) Voltage input ±(0.1% of rdg + 0.2% of range)
Measuring interval	Collector mode: 0.5 seconds or longer when 1 channel is used. Logging mode: 1 second to 24 hours when 1 channel is used.
Data capacity	5000 data items when used in collector mode only, 20000 data items when used in logging mode only.
External dimensions	Approx. 151(H) × 56(W) × 33(D) mm (excluding protrusions) Weight: Approx. 180 g (including batteries)
Supplied accessories	Software, two AA-size alkaline dry batteries (LR6), a waterproof cover, and an instruction manual

Optional Accessories for TM20

Product name	Model
RS-232C cable for PC connection (9-pin)	91011

Simplified Thermometer with easy operation

TX10 Series

Digital Thermometers

TX1001:
1-channel Single-function with data hold function
TX1002:
1-channel Multifunction with data hold, internal memory, user-calibration and relative display function
TX1003:
2-channel Multifunction with data hold, internal memory, user-calibration and relative display function

TX10 Series Specifications

- Thermocouple measurement ranges
  Type K: -200 to 1372 deg.C
  Type J: -200 to 1000 deg.C
  Type E: -200 to 700 deg.C
  Type T: -200 to 400 deg.C
- Resolution
  -200.0 to 199.9 deg.C: 0.1 deg.C, 200 deg.C: 1 deg.C (TX1001)
  -200.0 to 199.9 deg.C: 0.1 deg.C or 1 deg.C (when resolution is set at 1 deg.C), 200deg.C: 1 deg.C (TX1002, 03)
- Accuracy
  -200.0 to -100.1 deg.C: +/-(0.1% of rdg + 1.0deg.C);
  -100.0 to 199.9 deg.C: +/-(0.1% of rdg + 0.7deg.C);
  200deg.C and when resolution is set at 1deg.C:+/-(0.2% of rdg + 1 deg.deg.C)

General Specifications
- External dimensions:
  56 (W) × 151 (H) × 33 (D) mm
- Weight: Approx. 180 g
- Power: Two AA size (LR6) dry batteries

Probes for TM20/TX10

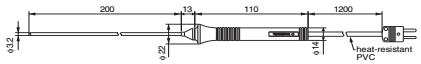
Temperature Probe (for type K)

Model	Probe type	Measuring range	Accuracy	Response time (second)	Sensor Dimenter / Length (m/m)
90020	rounded end	-50 to 600°C	0.4% or ±1.5°C	1.4	ϕ3.2 / 200
90021	rounded end	-50 to 600°C	0.4% or ±1.5°C	0.4	ϕ1.6 / 150
90022	rounded end	-50 to 600°C	0.4% or ±1.5°C	1.4	ϕ3.2 / 500
90023	needle	-50 to 500°C	0.4% or ±1.5°C	0.4	ϕ1.6 / 100
90024	needle	-50 to 500°C	0.4% or ±1.5°C	1	ϕ2.1 / 100
90030	Surface straight	-20 to 250°C	0.75% or ±2.5°C	2	ϕ15 (temp. sensing portion)
90031	Surface angled	-20 to 250°C	0.75% or ±2.5°C	2	ϕ15 (temp. sensing portion)
90032	Surface straight	-20 to 500°C	0.75% or ±2.5°C	2	ϕ15 (temp. sensing portion)
90033	Surface angled	-20 to 500°C	0.75% or ±2.5°C	2	ϕ15 (temp. sensing portion)
245907	Bead TC	-40 to 260°C	0.75% or ±2.5°C	(90% response)	1200 (included cord)

NOTE: 90030 is using polyimide to insulate from objects to be measured.
Manufacturers of polyimide are announcing not to apply polyimide directly for food, internal and body fluid.

Dimensions

90020
Material:
SUS316



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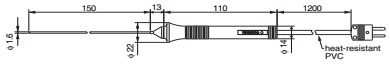

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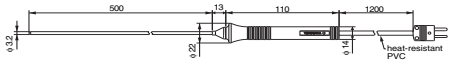

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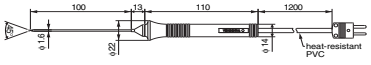

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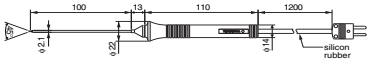

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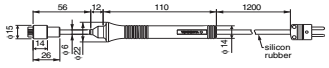

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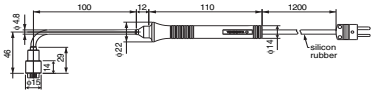

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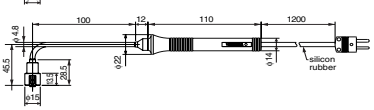


Precision Measuring Instruments

Metal foil resistors

2792A Series
Standard Resistors

- Traced to the national standard for high accuracy; test (calibrated) accuracy of ±5 ppm
- Resistance temperature coefficient
- A variety of models
  Eight models with nominal resistance values ranging between 0.001 Ω and 10 kΩ
- Precision temperature control equipment, such as an oil bath, not needed for calibration due to marked improvement in resistance temperature coefficient
- Included document: Test certificate

2792A series Specifications

Model	Nominal value	Accuracy 23˚C±2˚C
2792A01	0.001 Ω	±100ppm
2792A02	0.01 Ω	±75ppm
2792A03	0.1 Ω	±50ppm
2792A04	1 Ω	±30ppm
2792A05	10 Ω	±30ppm
2792A06	100 Ω	±30ppm
2792A07	1 kΩ	±30ppm
2792A08	10 kΩ	±30ppm

Operating temperature and humidity ranges: 0-50°C / 20-80% RH
Maximum allowable power: 3 W
Test (calibrated) accuracy: ±5 ppm
Power characteristics: ±100 ppm/W
Insulation resistance:
More than 1000 MΩ at 500 V DC
Withstand voltage: 1.5 kV for one minute between measurement terminal and casing
Terminal construction: 4 terminals
External dimensions: Approximately ϕ104 × 150 mm (current terminal width: approximately 174 mm)
Weight: Approximately 1.2 kg
Accessories: User'S Manual, One Test Certificate

High-accuracy, DC variable resistor with 6 dials

279301/279303
Decade Resistance Boxes

279301
- High accuracy and stability
- High reproducibility
- 1 mΩ resolution

279303
- Up to 100 MΩ in 100 Ω step
- Low voltage coefficient
- Shock- and vibration-proof construction

279301 Specifications

Resistance Range: 0.100 to 1,111.210 Ω (Minimum resistance is 0.100 Ω).
Dial Composition: 0.001 × 10 + 0.01 Ω × 10 + 0.1 Ω × 11 + 1 Ω × 10 + 10 Ω × 10 + 100 Ω × 10
Resolution: 0.001 Ω
Accuracy: ± (0.01% + 2 mΩ) at temperature 23 ± 2°C, humidity 45 to 75%, and 0.1 W power application

279303 Specifications

Resistance Range: 0 to 111. 1110 MΩ.
Dial Composition: 100 Ω × 10 + 1 kΩ × 10 + 10 kΩ × 10 + 100 kΩ × 10 + 1 MΩ × 10 + 10 MΩ × 10.
Accuracy: 100Ω, 1 kΩ, 10 kΩ and 100 kΩ steps ... ± (0.05% + 0.05Ω)
1 MΩ and 10 MΩ steps ... ±0.2%
(At temperature 23 ± 2°C, humidity below 75%, including residual resistance of approx. 0.05 Ω).

Quick and easy setting

278610/278620
Decade Resistance Boxes

Models 278610 and 278620 six-dial decade resistance boxes allow quick and easy setting of a wide range of resistance. These resistance boxes are used in combination with voltage or current standards to adjust voltage or current, as dummy load resistances or as an arm of AC bridges.

278610/278620 Specifications

Available Models:

Model Number	Resistance Range
278610	0.1 to 111,111 Ω (six decade dials)
278620	1 to 1,111,110 Ω (six decade dials)

Residual Resistance: Less than 23 mΩ.
Power Rating: 0.3W/step, within 3W for overall instrument.
Maximum Allowable Input: 0.5W/step, 5W for overall instrument.
Maximum Circuit Voltage: 250 V.
Operating Temperature Range: 0 to 40°C
Storage Temperature Range: -10 to 50°C
Humidity Range: 25 to 85%, relative humidity.
Insulation Resistance: More than 500 MΩ at 500 V DC.
Dielectric Strength: 1,500 V AC for one minute.

1Ω to 10MΩ by operation of dials and switches

2755
Portable Wheatstone Bridge

Model 2755 measures resistances from 1 Ω to 10 MΩ by operation of dials and switches. Batteries and a galvanometer are self-contained. The front control panel is provided with power and galvanometer circuit selectors, one ratio arm dial, and four measuring arm dials.

2755 Specifications

Measuring Range: 1,000 Ω to 10.00 Ω.
Measuring Arms: 1Ω × 10 + 10 Ω × 10 + 100 Ω × 10 + 1,000 Ω × 10 (min. one step: 1 Ω).
Ratio Arms (Multiplier): × 0.001, × 0.01, × 0.1, × 1, × 10, × 100, × 1,000 (M10, M100, M1000 ... Murray & Varley loop testing).
Accuracy: ±0.1% of reading on 100 Ω to 100 kΩ range, ±0.3% of reading on 10 Ω to 1 MΩ range, ±0. 6% of reading on 1Ω to 10 MΩ range.
Temperature Coefficient of Resistance Elements:
$\pm 5 \times 10^{-5}$/°C at ambient temperature of 5 to 35°C, $\pm 2 \times 10^{-5}$/°C at ambient temperature 20 to 35°C.
Galvanometer: Sensitivity ... 0.9 μA/div., internal resistance ... Approx. 150 Ω, external critical damping resistance ... Approx. 800 Ω, period ... within 1.5 seconds.
Power Source: Three 1.5 V batteries (built-in).
Operating Temperature Range: 5 to 35°C.
Humidity Range: 85% max., relative humidity.
Outer Case: ABS resin.
Accessory supplied at no extra cost:
Carrying case.

0.1mΩ to 110Ω with four plugs and one measuring dial

2769
Portable Double Bridge

Model 2769 is a compact, portable Kelvin double bridge designed for measuring low resistance from 0.1 mΩ to 110 Ω with four multiplication plugs and one measuring dial. It has built-in standard resistors, bridge power source and high-sensitivity taut-band suspension system electronic DC galvanometer.

2769 Specifications

Measuring Range: 0.1 mΩ* to 110 Ω.
Measuring Dial: 1.00 to 11.00 Ω at × 1.
Multipliers: × 0.0001*, × 0.001, × 0.01, × 0.1, × 1, × 10 (plug-in system).
Min. Division: 0.005 mΩ at × 0.0001*, 0.05 mΩ at ×0.001, 0.5 mΩ at × 0.01, 5 mΩ at × 0.1, 50 mΩ at × 1, 0.5 Ω at × 10.
Accuracy: ± (0.05 Ω × multiplier + 0.01 mΩ)
Current Rating: 10 A at × 0.0001* (0.01 Ω), 3A at × 0.001 (0.1 Ω), 1A at × 0.01 (1 Ω). 0.3A at × 0.1 (10 Ω), 0.1A at × 1 (100 Ω), 0.01A at × 10 (1,000 Ω).
Galvanometer: Built-in electronic DC galvanometer, voltage sensitivity ... approx. 20 μV/div.
sensitivity changeover;
G_0 ... (Input resistance: approx. 11 kΩ).
G_1 ... approx. 1/11 of G_0 sensitivity.
G_2 ... approx. 1/110 of G_0 sensitivity.
Operating Temperature Range: 5 to 35°C
Humidity Range: Less than 85%
Bridge Power Source: Tow 1.5 V batteries, External power source is also usable.
*Note: Standard Resistor (Model 2771) is required for measurement on 0.1 to 1.1 mΩ range at 0.0001 multiplier.

Portable Instruments


201314


205206

2011 to 2053
Portable Instruments

- Taut-band suspension system eliminates friction and provides strong resistance to shock impact.
- Stable performance for long term use.
- Products have been widely used over many years as an industry standard at various customers such as industries, power plants, research laboratories and schools, etc.

Line-up

DC Ammeters and Voltmeters	2011, 2012
AC Ammeters and Voltmeters	2013, 2014
High-frequency AC Ammeters and Voltmeters	2016
Audio-frequency AC Voltmeters	2017
Frequency Meters	2038
Power Factor Meters	2039
Wattmeters	2041, 2042
Miniature DC Ammeters and Voltmeters	2051
Miniature AC Ammeters and Voltmeters	2052, 2053

Switchboard Instruments


2105A


2188A

2100A Series
Switchboard Instruments

- Compliance with JIS C1102-2007

Line-up

DC Ammeters and Voltmeters	2101A, 2181A
AC Ammeters and Voltmeters	2102A, 2182A
Wattmeters	2105A, 2185A
Varmeters	2106A, 2186A
Power Factor Meters	2107A, 2187A
Frequency Meters	2108A, 2188A
Synchroscope	2109A

Front Cover Dimensions (Width × Height mm)

210□A	110×110
218□A	80×80

Panel Meters


Clearline Series


FS,FL Series
* Cover with set pointer

Clearline Series and FS,FL Series
Panel Meters

- Compliance with JIS C1102-2007
- Clearline Series
  Two types of movement suspension systems, Taut-band and Pivot & Jewel, are available to fit to various applications.
- FS,FL Series
  High visibility by adopting clear front cover.

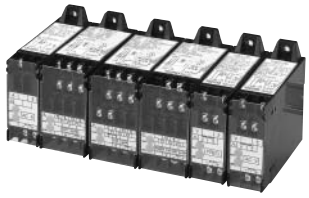
Line-up

- Clearline Series
  (2071 to 2076A, 2081 to 2086A, 2093A and 2094A)
  DC Ammeters and Voltmeters, AC Ammeters and Voltmeters and Frequency Meters
- FS,FL Series
  DC Ammeters and Voltmeters, AC Ammeters and Voltmeters,
  Frequency Meters, Wattmeters, Varmeters and Power Factor Meters

Front Cover Dimensions (Width × Height mm)

2071, 2081:	52×44
2072, 2082:	57×48
2073, 2083:	69×58
2074A, 2084A:	82×69
FL80:	80×67
2075A, 2085A:	102×85
FL10:	100×83
2076A, 2086A:	122×102
2093A, FS60:	60×60
2094A, FS80:	80×80
FS10:	100×100

0.5 Class Transducer for Power Applications



2370A Series
Class 0.5 Transducer for Power Applications

- Available for DIN rail and panel mountings

Line-up

DC-DC isolator	2371A
AC Voltage, current (average rectified)	2372A
AC Voltage, current (RMS rectified)	2373A
AC Voltage, current (True RMS rectified)	2374A
Power	2375A
Reactive power	2376A
Phase	2377A
Power factor	2377A
Frequency	2378A

Dimensions (mm)

2371A, 2372A, 2373A, 2374A, 2378A:
127(H) × 40(W) × 130(D)
2375A, 2376A, 2377A:
127(H) × 55(W) × 130(D)

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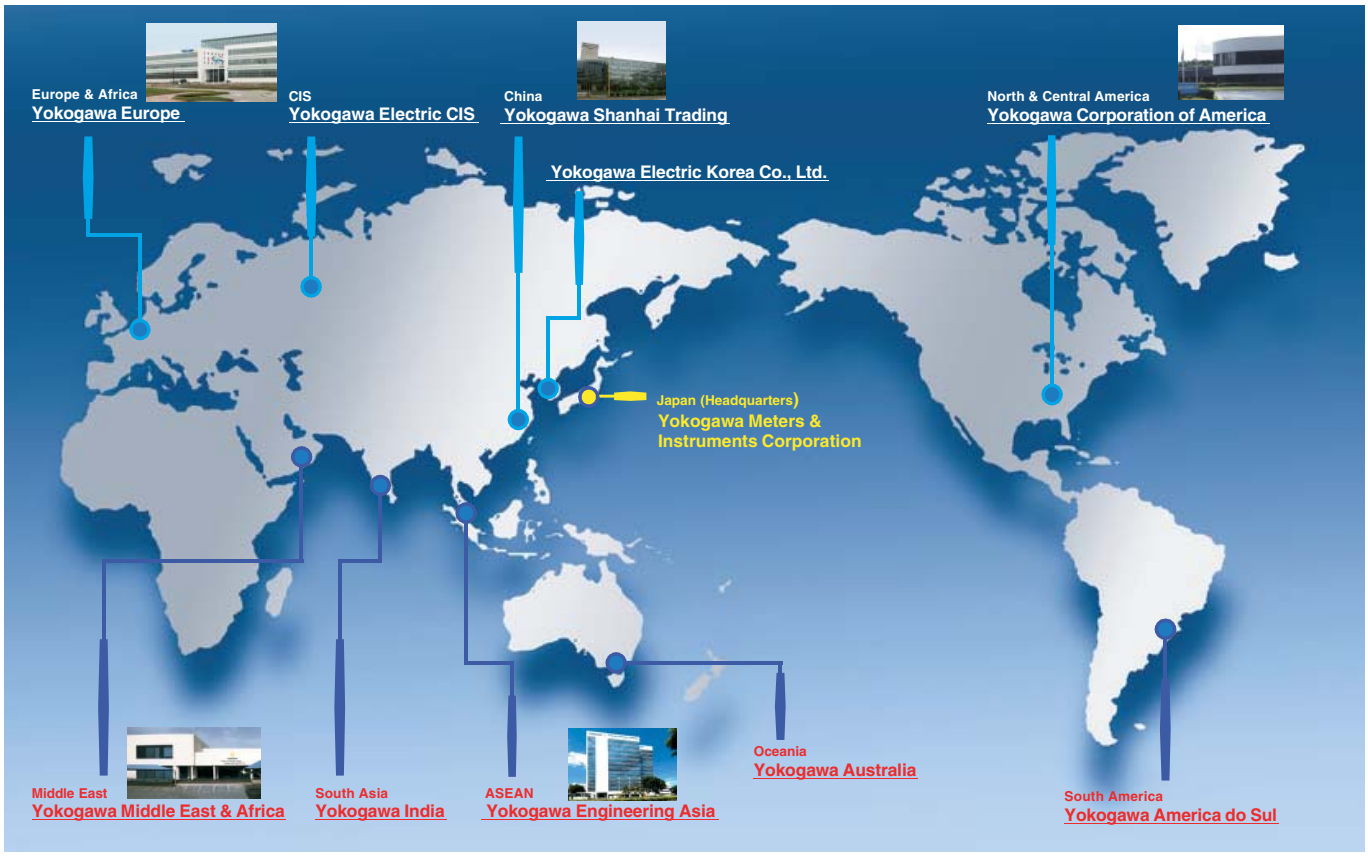
Yokogawa Meters & Instruments Global Network



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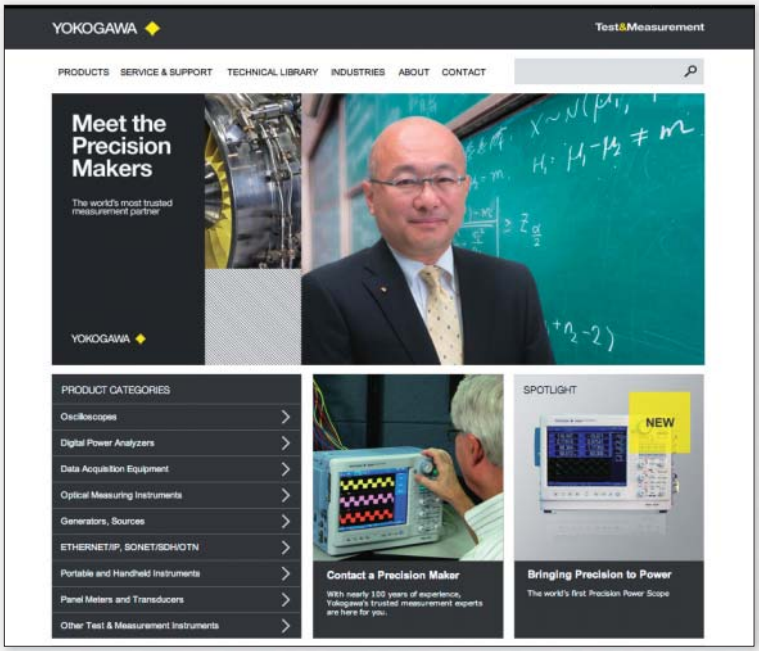

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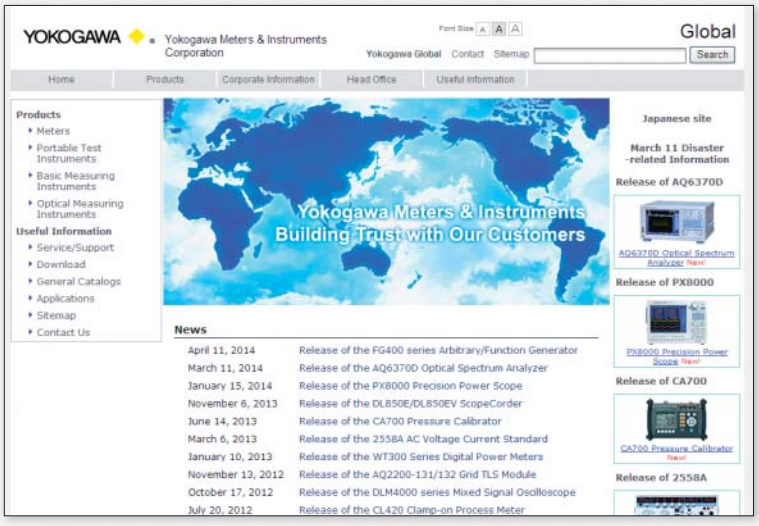

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NOTICE
- Before using the product, read the instruction manual carefully to ensure proper and safe operation.

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