YOKOGAWA

# All Products Guide

## Test & Measurement Instruments/Meters & Portable Instruments


Vol.2

Yokogawa Meters & Instruments Corporation

Catalog YMI130-EN

# Main Products Line up

## Oscilloscopes

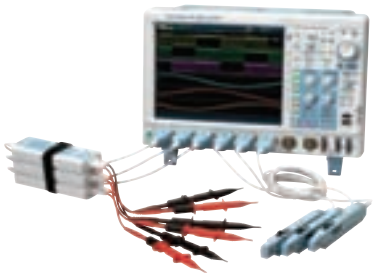
ScopeCorder
DL850/DL850V

GiGAZoom ENGINE

High-Speed Data Acquisition Unit
SL1000

Mixed Signal Oscilloscopes
DLM2000 Series

Mixed Signal Oscilloscopes
DL6000



new

Mixed Signal Oscilloscopes
DLM4000

## Digital Power Analyzer

Precision Power Analyzer
WT3000

Precision Power Analyzer
WT1800

Power Analyzer
WT500

Digital Power Meters
WT300 Series

## Generators, Sources, Manometers etc.

Source Measure Unit
GS200

GS Series Accessory Software
765670

### 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

Optical Spectrum Analyzer
AQ6370 Series

new

Optical Wavelength Meter
AQ6150 Series

Multi Application Test System
AQ2200 Series

Optical Time Domain Reflectmeter
AQ7275

Optical Loss Test Set
AQ1100

new

Multi Field Tester
OTDR
AQ1200 Series

1G/10G Ethernet Tester
AQ1300 Series

AQ2170
Series

AQ2180
Series

AQ4280
Series

new

Handy size
Optical Power Meter
/ Light Source

## Data Logger

XL120 Series

## Clamp-on Power Meter

CW240

CW120 Series

CW10

## Handy Calibrator

CA150

CA71

CA450

CA11E/CA12E

## 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

3235

EY200

## Leakage Current Tester

3226

## Illuminance Meter

510 Series

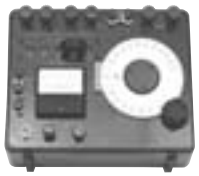
## Thermometer

TM20

TX10 Series

## Precision Measuring Instruments

279301



276910

## Meters Products

201314

204102

205206

# Contents

## [Oscilloscopes] 8P~27P





## [Digital Power Analyzers] 28P~39P





## [Generators, Sources, Manometers etc.] 40P~47P





## [Optical Measuring Instruments] 48P~59P

## [Data Logger]

62P～64P

Datum-Y (XL121/XL122/XL124)

## [Clamp-on Power Meter]

65P～69P

CW240, CW120／CW121, CW10, 960Series

## [Handy Calibrator]

70P～73P

CA150, CA51/CA71, CA11E/CA12E, CA450

## [Digital Multimeter]

74P～77P

TY700Series, TY500Series, 732Series, 73101

## [Clamp-on Tester]

78P～79P

30031A/32A, CL100Series, CL200Series, CL300Series, CL400Series

## [Insulation Tester]

80P～83P

MY40, MY10Series, 2406ESeries, 3213ASeries

## [Earth Tester, Other Products]

84P

3235, EY200

## [Thermometer]

85P

TM20, TX10Series

## [Precision Measuring Instruments]

86P

2723, 2768, 2755, 2752, 2769, 2792A,
2786, 2793, 2791, 2707, 2708

## [Meters Products]

87P

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.

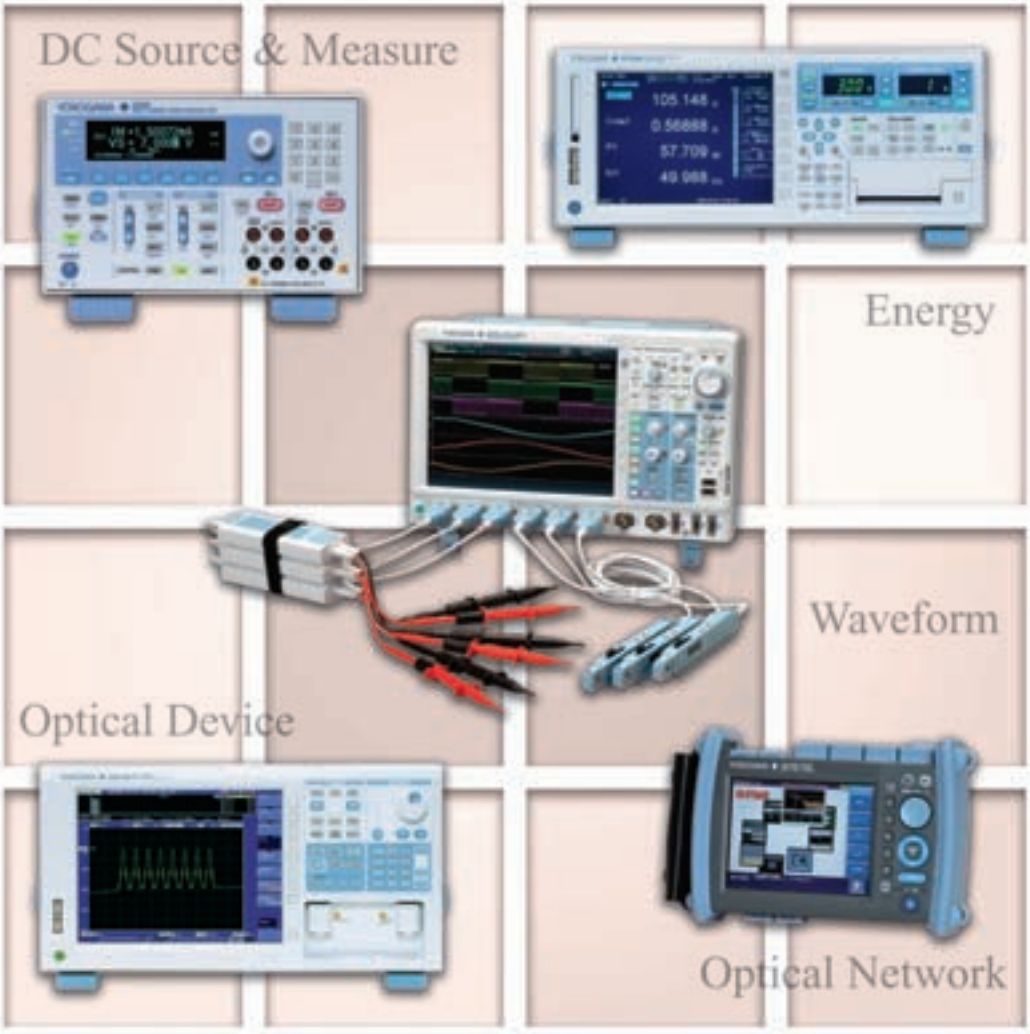
# Yokogawa Meters & Instruments Seeks the Trust of Customers

Linearity Test of A/D Converter
Steering Dynamic Tester
Engine Control Signal Analysis
PC12 Cell Neurite Analysis
Evaluation of Camera Drive for Digital Camera
Reliability Evaluation Test of ECU
Wide-Area Monitoring Model Example
Current & Power Measurement of Electric Equipment Using Clamp Probe
I²C Bus Signal Evaluation (Trigger)
Light-Emitting Spectrum Evaluation of DFB-LD
Optical Disk Sputtering Equipment
Wire Bonding Machine Adjustment
Inverter Evaluation Test
Power Evaluation for Inverter/Motor Test (1)
10G XFP Optical Transceiver Measurement System
16 A to 75 A IEC61000-3-11 Flicker Standard Test
Crystal Solar Cell Electrode Formation Equipment
Machine and Electronic Component Durability Test
Functional Multineuronal Calcium Imaging Technique
Loss Measurement & Bending Loss Detection for WDM Line
Rotary Encoder Evaluation
Green IT: Power Consumption Measurement in Data Center
Power Quality Evaluation Test of Uninterrupted Power Supply (UPS)
Interface of Plants and Atmospheric Environment Captured by Live Imaging
Maintenance & Calibration of Field Equipment
Evaluation & Verification of Power Line Communications (PLC) System
CAN Bus Signal Evaluation (Trigger)
Visualization of Welding Process in Laser Welding Machine
DC Characteristic Measurement of Two-Terminal Semiconductor Device
Robot Continuous Motion Test
Robot Continuous Motion Test
Mobile Phone Current Consumption Measurement
Flash Light Emission & Timing Evaluation
Characteristic Evaluation of Servo Motor
Measurement of Current Consumption & Amount of Current of Fire Alarm Device
Large Equipment Maintenance
Fire Detection, Disaster Prevention, & Energy Saving
Battery Charge/Discharge Test
Maintenance & Calibration of Field Equipment
Power Measurement by Calorie Meter

Yokogawa Meters & Instruments

Meters
Optical Instruments
Portable Test Instruments
Basic Measuring Instruments

# Test & Measurement Instruments



# 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 | | DL850/DL850V  …P10 | SL1400  …P12 |
|---|---|---|---|
| Features | | High-speed (up to 100 MS/s*2), High Resolution (up to 16-bit*2), Isolated (up to 1kV*2) Multichannel, 128-CH voltage/temperature, 128-bit logic measurement Continuous hard disk recording at 100 kS/s simultaneously on 16 channels (option) Monitors CAN and LIN buses to display trend waveforms (DL850V only) 17 types of plug-in modules | 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 160 GB (FAT32) or external HDD | 40 GB (FAT32) |
| 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 • Real time math function • IRIG interface • Probe power (4-output) • User-defined math function • DC 12V Power drive (DL850V 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] 250 V[*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] 250 V[*3] | ±0.5% | non-isolation version of model 701250 |
| | 701260 | 100 kS/s | 16-Bit | 40 kHz | 2 | Isolated | 1000 V[*2] 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 | 10V | — | CAN Data of max. 32-bit allowable It is available for DL850V only. Max two (2) modules can be installed in a main unit.[*6 *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 DL850V 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.

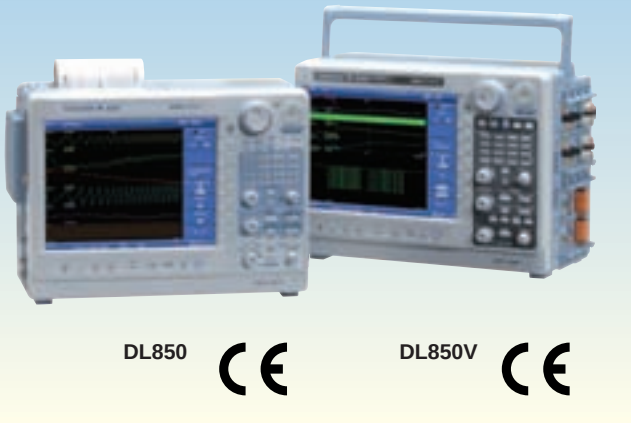
| Model | Description |
|---|---|
| 701250 | High-speed 10 MS/s 12-bit Isolation module (2 CH) |
| 701251 | High-speed 1 MS/s 16-bit Isolation module (2 CH) |
| 701255 | High-speed 10 MS/s 12-bit non-Isolation module (2 CH) |
| 701260 | High-voltage 100 kS/s 16-bit Isolation module (2 CH, with RMS) |
| 701261 | Universal module (2 CH) |
| 701262 | Universal module (with anti-aliasing filter, 2 CH) |
| 701265 | Temperature/high-precision voltage module (2 CH) |
| 701270 | Strain module (NDIS, 2 CH) |
| 701271 | Strain module (DSUB, Shunt-CAL, 2 CH) |
| 701275 | Accelaration module (with anti-aliasing filter, 2 CH) |
| 701280 | Frequency module (2 CH) |
| 720210[*9] | High-speed 100 MS/s 12-Bit Isolation Module (2 CH) |
| 720220[*9] | Voltage Input Module(16 CH) |
| 720221[*9] | 16 CH Temperature / Voltage Input Module |
| 720230[*9] | Logic Input Module (16 CH) |
| 720240[*10] | CAN Bus Monitor Module |
| 720241[*10] | CAN & LIN Bus Monitor Module |

*9: Available for only DL850/DL850V. *10: Available for only DL850V.

# Oscilloscopes

## ScopeCorder DL850/DL850V

# High Speed, Multichannel and Isolated Noise-resistant, Ultra-fast Memory Recorder

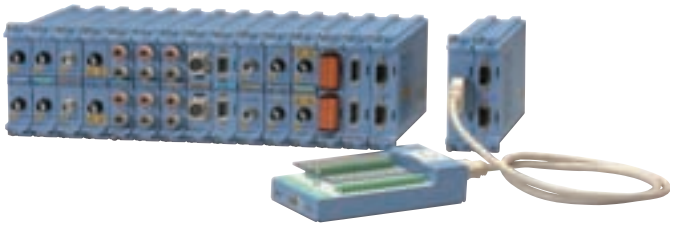


DL850 CE DL850V CE

## Overview

**The DL850 ScopeCorder Series are modular, waveform recording instruments that can measure voltage, current, strain, acceleration, and other phenomena simultaneously. With high speed sampling, high isolation withstand voltage, and multichannel measurements, the DL850 Series offers powerful support in the development, evaluation, and quality control of energy efficient devices.**
**The lineup includes two new module types: A 16-CH Temp./Voltage Input Module, and a CAN & LIN Bus Monitor Module (DL850V only).**
**All DL850 modules can be combined with measurement modules from the DL750 series products:**

- High-speed Voltage
- High Voltage
- High-precision Voltage
- 16-CH Voltage
- Temperature
- 16-CH Temp./Voltage NEW!
- Strain
- Acceleration
- Frequency
- Logic Input
- CAN Monitor (DL850V only)
- CAN & LIN Monitor (DL850V only) NEW!



## Basic Specifications

| | |
|---|---|
| Max. sampling rate | 100 MS/s (720210)(*1) |
| Frequency bandwidth | 20 MHz (720210)(*1) |
| Number of channels | Max. 128 ch,<br>Number of slots for the plug-in module: 8 |
| Logic input | Max. 128 bits<br>(When using eight 720230 modules) |
| A/D conversion resolution | 16 or 12 bits (1*) |
| DC accuracy | ±(0.5% of 10 div)<br>(701250 and 701255)(*1) |
| Time axis setting | 100 ns/div to 30 days/div |
| Time axis accuracy | ±0.005% |
| Max. record length | Standard 10 Mpts (MW)/ch, total 250 Mpts (MW) (with /M2 option)<br>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<br>Maximum number of parameters 64,000 |
| Internal media drive | SD memory card slot (standard)<br>160 GB internal hard drive (option)<br>External hard drive can be connected (option) |
| Communication interface | USB 2.0 (standard)/1000BASE-T Ethernet (standard)<br>GP-IB (option) |
| Built-in printer(option) | 112-mm width, A6 thermal printer |
| Other options | IRIG interface<br>User defined computation<br>Real time math computation<br>Four probe power outputs<br>DC 12V power drive (DL850V only) |
| Display | 10.4-inch TFT color LCD monitor |
| Display resolution | 1024 × 768 pixels (XGA) |
| External dimensions | 355 (W) × 259 (H) × 180 (D) mm<br>(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.

### High-speed 100 MS/s, high-resolution 12-bit, 1 kV isolated measurements

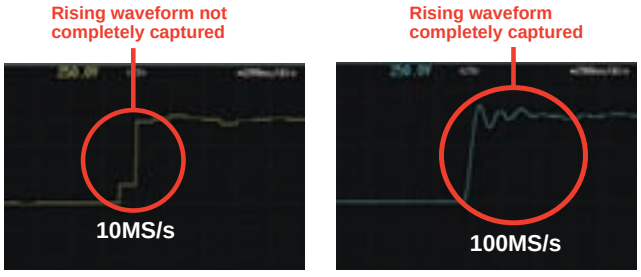
* With a combination of the high-speed isolation module 720210 and the 700929 or 701947 isolation probe

Yokogawa's isoPRO technology offers industry leading isolation performance at the highest speeds. The isoPRO core technology is designed with energy savings applications in mind. It gives you the performance needed to develop high efficiency inverters, which employ high voltages, large currents, and high operating speeds.

**isoPRO (High-speed & high withstand voltage isolation technology)**

Using high speed optical fiber-based transmissions, the module achieves high speed ADC clock and data isolation.

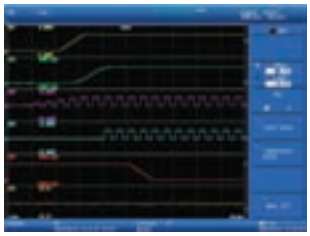
720210 High-speed Isolation Module




**Example: Same inverter output waveform measured at 10 MS/s and 100 MS/s**

## Up to 128 channels of voltage input, and 128 bits of logic input

The 16-channel Voltage Input Module (scanner type) can measure at 10 kS/s sample rate even when using all 16 channels. With this module populating all 8 input module slots, the DL850 performs 128-channel voltage measurements. The Logic Input Module supports everything from TTL levels to contact inputs. With eight logic modules, the DL850 can monitor and capture 128 bits of logic.



*A response time for the logic input varies depending on the logic probe used.

Power supplies used in home computing electronics have many outputs; therefore, there are many measurement points. With a multichannel module, you are not limited to voltage measurements; a single unit can also measure everything from PC control signals to AC fan operation and slow to high-speed signals.

720230 Logic Input Module (left photo)
720220 16-channel Voltage Input Module (right photo)

## Large 2-GPoint memory (option) offers long duration measurement and two instantaneous zoom locations

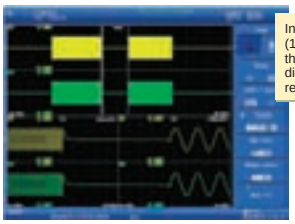
Comes standard with 250 MPoints of memory, expandable with 1 or 2 GPoint options. Large capacity memory does not simply provide longer durations of measurement. It makes it possible to measure at a higher sampling rate at the same measurement time.

Zoom to 2 locations instantaneously
GiGAZoom2 ENGINE

Main screen:
20 days of recording
(2 days/div)

By a factor of
1,728,000

Zoom screen:
1 hour (12 min/div)
&
1 second (100 ms/div)



Instantly zooms 1 second (100 ms/div) even when the main screen is displaying 20 days of recording (2 days/div)

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

– Continuous hard disk recording (/HD0, /HD1 option) –

Measured data can be streamed directly to a built-in 160 GB hard disk (option) or through the external HDD interface (option). With long duration evaluation testing, measurements can be performed at 100 kS/s on 16 channels simultaneously for 10 hours*.

* The /HD0 and /HD1 options cannot be specified together. The measurement time depends on the performance of the hard drive connected through the external HDD interface.

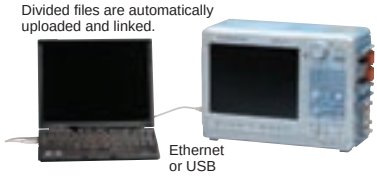
Data being continuously recorded on the DL850/DL850V's built-in HDD (/HD1 option) can be transferred to a PC without stopping measurement*. You can display and analyze the transferred waveform data using Xviewer, an accessory program for the PC.

* This function is an option of the optional software Xviewer.

### Divides and saves measured data across multiple files!

Xviewer

Divided files are automatically uploaded and linked.



Ethernet or USB

**Key Point 1**

**If an abnormality occurs during a long duration continuous test, you can analyze the saved measured data with a PC without having to stop measurement !**

**Key Point 2**

**Critical measured data can be easily duplicated on the main unit and a PC.**

## Processes noise rejection and executes power computations in real time

– Real time Math (/G3 option) –

The DL850 is armed with a dedicated DSP (digital signal processor) for computations that enables between-channel math during waveform capture. These between-channel computations are powerful because they can be set up separately from filter computations. In addition to FIR, IIR, Gauss, and moving average digital filters, you can use maximum 35 equations such as arithmetic with coefficients, integrals and differentials, and higher-order equations.simultaneously for 10 hours*.


## Model Number and Suffix Codes

### Models and Suffix Codes

| Model | Suffix Codes | Description |
|---|---|---|
| DL850 | | DL850 main unit, 250MPts(W) memory*1 |
| DL850V | | DL850V main unit, 250MPts(W) memory*1 |
| Power Code | -D | UL and CSA standard |
| | -F | VDE standard |
| | -R | AS standard |
| | -Q | BS standard |
| | -H | GB 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 DL850V only)*5 |
| | /M1 | Memory expansion to 1GPts(W)*2 |
| | /M2 | Memory expansion to 2GPts(W)*2 |
| | /HD0 | External HDD interface*3 |
| | /HD1 | Internal HDD (160GB)*3 |
| | /C1 | GP-IB interface*4 |
| | /C20 | IRIG and GP-IB interface*4 |
| | /G2 | User-defined math function |
| | /G3 | Real time math function |
| | /P4 | Four probe power outputs |

*1: The main unit is not supplied with a plug-in module. *2, *3, *4, and *5: When selecting these, specify one of them.

### Models of dedicated Plug-in Modules for DL850/DL850V

| Model | Description |
|---|---|
| 720210 | High-speed 100 MS/s 12-Bit Isolation Module (2 ch) |
| 720220 | Voltage Input Module(16 ch) |
| 720221 | 16-CH Temperature/Voltage Input Module |
| 701953-L1 | 16-CH Scanner Box (provided with 1 m cable) |
| 701953-L3 | 16-CH Scanner Box (provided with 3 m cable) |
| 720230 | Logic Input Module (16 ch) |
| 720240 | CAN Bus Monitor Module (32 ch, available DL850V only) |
| 720241 | CAN & LIN Bus Monitor Module |

Note 1: Up to two 720240 or 720241 modules in total can be installed in a single DL850V main unit.
Note 2: Max. four(4) 720210 modules can be installed in a main unit.
Note 3: The use of a 720221 module always requires the External Scanner Box (model 701953).
Note 4: The firmware ver2.00 or later is required when using 720221 and/or 720241 module.

# Oscilloscopes

*ScopeCorder LITE* **SL1400**

## Easily & Quickly Saves Data to Memory and Paper

SL1400

## 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

## 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

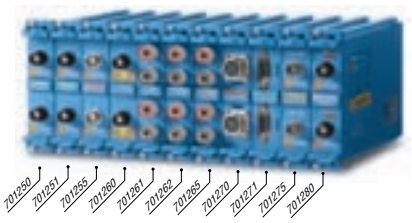
Weight: Approx. 8.0 kg (main unit with full options, including C8, C10 and P4)
Approx. 10.3 kg (main unit and eight 701250 modules)

## 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 cable[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.

## Module Selection




* Above plug-in modules can be used among all ScopeCorder series.

## Plug-in Module Model Numbers

| Model | Description |
|---|---|
| 701250 | High-speed 10 MS/s 12-bit Isolation module (2 CH) |
| 701251 | High-speed 1 MS/s 16-bit Isolation module (2 CH) |
| 701255 | High-speed 10 MS/s 12-bit non-Isolation module (2 CH) |
| 701260 | High-voltage 100 kS/s 16-bit Isolation module (2 CH, with RMS) |
| 701261 | Universal module (2 CH) |
| 701262 | Universal module (with anti-aliasing filter, 2 CH) |
| 701265 | Temperature/high-precision voltage module (2 CH) |
| 701270 | Strain module (NDIS, 2 CH) |
| 701271 | Strain module (DSUB, Shunt-CAL, 2 CH) |
| 701275 | Accelaration module (with anti-aliasing filter, 2 CH) |
| 701280 | Frequency module (2 CH) |

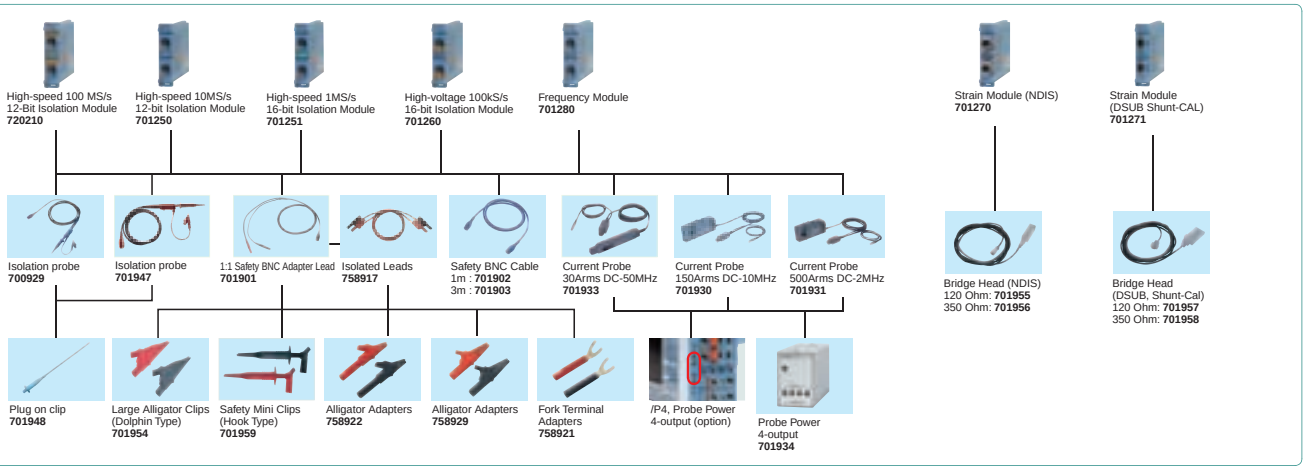
* Probes not included with any modules.

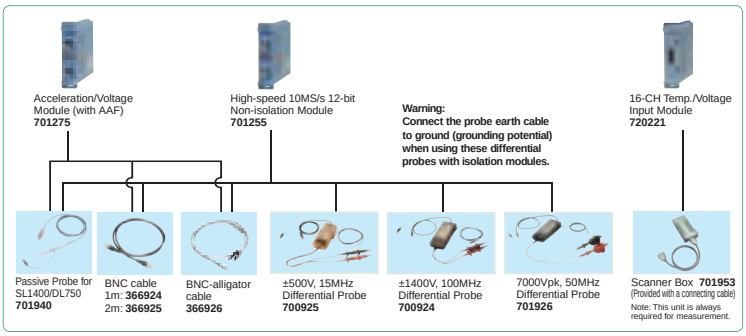
## *Waveform Measuring* ScopeCorder Accessories

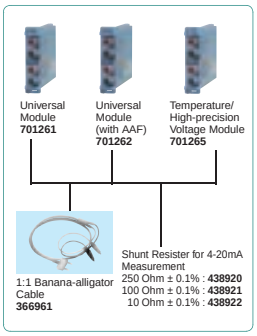
| Product | Model No. | Description*1 | |
|---|---|---|---|
| Differential Probe | 700925 | DC to 15 MHz, 1/10-1/100 selector switch, max. allowable differential voltage ±500 V (DC + ACpeak) |  |
| Differential Probe | 700924 | DC to 100 MHz, 1/100-1/1000 selector switch, max. allowable differential 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 |  |

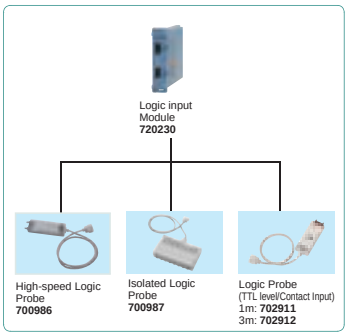
*1 Actual allowable voltage is the lower of the voltages specified for the main unit, probe and cable.
*2 42 V is safe when using the 701940 with an isolated type BNC input.

## 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)

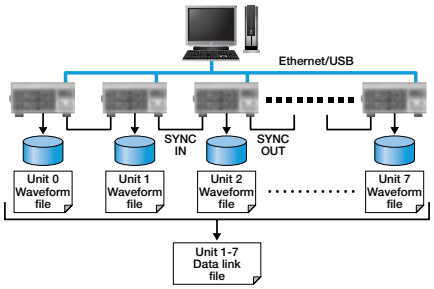
## Maximum measuring time (unit: sec) at Single triggered measurement

| | | 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.




## Model Number and Suffix Codes

| Model/Options | Suffix Code | Description |
|---|---|---|
| 720120 | | SL1000 High-Speed Data Acquisition Unit*1<br>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 40 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.

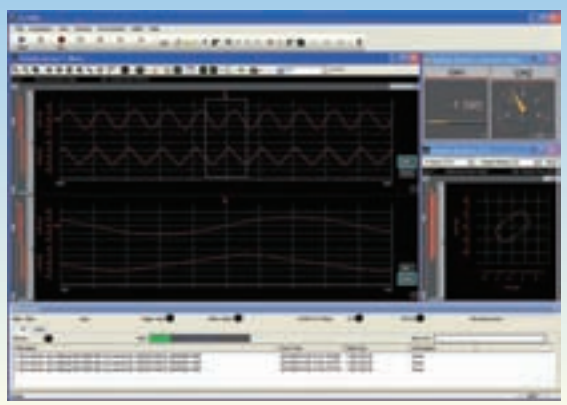
| Model | Description |
|---|---|
| 720210 | High-speed 100MS/s 12-Bit Isolation Module (2ch) |
| 701250 | High-speed 10MS/s 12-Bit Isolation Module (2ch) |
| 701251 | High-speed 1MS/s 16-Bit Isolation Module (2ch) |
| 701255 | High-speed 10MS/s 12-Bit non-Isolation Module (2ch) |
| 701260 | High-voltage 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) |
| CPU | Pentium 4, 2 GHz or faster (3.2 GHz or faster when using the auto-save function) |
| 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 |

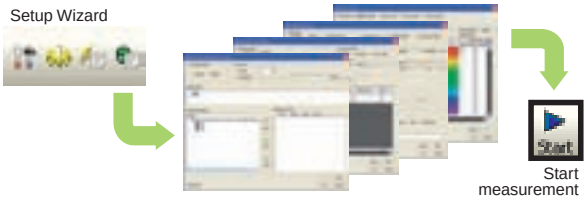
*1: Typical values. Actual values depend on PC performance and measurement conditions.
*2: When the measurement mode is Free run, the trigger mode is Single(N), and the number of measurements is Infinite, there may be a limit to the number of channels that can be trend-displayed during measurement.
*3: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

*For details on 701992 Xviewer, see page 27.*

## 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.

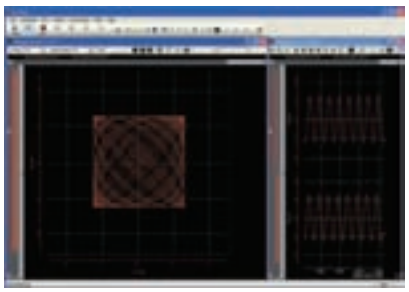



### Control Buttons—Just Like Your DVD Remote

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.

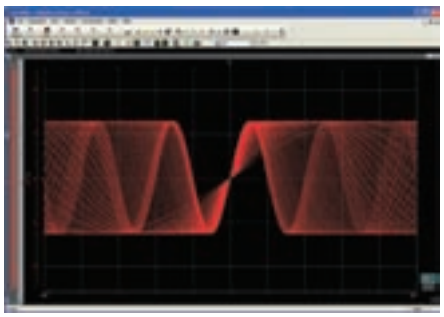

## Displaying X-Y Waveforms

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.



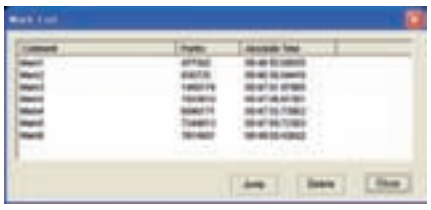
## Accumulating Waveforms

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



## Setting Marks

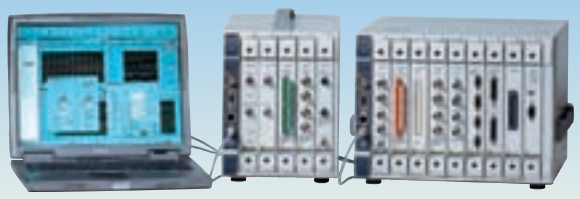
You can enter comments in the Mark area when monitoring over long periods of time (Free run mode).



# Oscilloscopes

*PC-Based Measuring Instruments* **WE7000**

## Modular Type Measuring Instruments for Easy Operation



WE500 WE900

only on sale in the United States, the United Kingdom, Germany, France, the Netherlands, Spain, Italy, South Korea, Australia, and Japan.

### Features

- Modular Design for easy operation
- Modules for a Variety of Signals and Extensive Features
- Easily Control All Modules Using the Control Software
- Control Software that brings out the full functionality of the WE7000
- Network-Friendly Measuring Instrument

  USB2.0

  Simply connect a USB cable and communication is ready

  Provides high-speed data communication using USB 2.0 (up to 480 Mbps)

  Ethernet (100Base-TX/10Base-T)

  Enables remote monitoring and measurement using the network such as a corporate LAN
- Utility Software for More Convenience
- Transformation into Dedicated Measuring Instrument by Customization
- Embedded Modules That Enable High Speed and Independent Processing (Option)

### Overview

- **Simple data acquisition without any software development**

Each WE7000 system includes the standard control software and each module has its firmware resident within the module.

- **Isolation and noise immunity**

Isolation and noise immunity are very important for mechanical electronics. WE7000 has great isolation from the base station to the input modules as well as channel to channel (depending on the module) isolation.

- **Various precision modules with traceability**

WE7000 has various modules from 2 Hz to 20 MS/sec digitizing rates. There are also modules with signal output capability, including a precision D/A and a function generator.

- **Remote control and monitoring using Ethernet Communication**

WE7000 control, monitoring, and real time saving of data are all available using Ethernet communication.

### Specifications

**Number of slots:**

WE500:

5 measurement modules

WE900:

9 measurement modules

**Interface for communicating with the PC:**

USB (Complies with USB Rev. 2.0), Ethernet (10Base-T or 100Base-TX)

**External dimensions:**

WE500:

Approx. 213 (W) × 266 (H) × 360 (D) mm (projections excluded)

WE900:

Approx. 350 (W) × 266 (H) × 360 (D) mm (projections excluded)

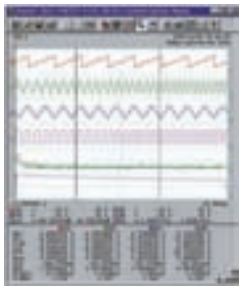
**PC system requirements:**

OS: Windows XP /Windows Vista (32 bit) /Windows 7 (32 bit)

### List of Measurement Module Features

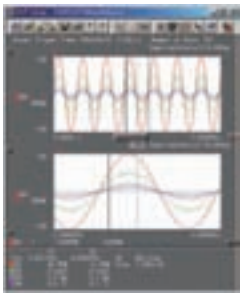
| Product | Model Number | Bandwidth | Number of Channels | Isolation | Input Coupling | Range | Resolution bit | Maximum Memory (point) | Memory Partition | I/O Connector | Link Feature | Maximum number of waveforms displayed simultaneously | Scaling Feature | Other Features | Power Consumption | Number of Used Slots Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WE7116 2-CH, 20 MS/s Digitizer Module | 7071 16/HE | DC to 8 MHz | 2 | No | DC/AC /GND | ±100 mV to 50 V (1-2-5 steps) | 12 | 4 M | Up to 1024 | BNC | Yes | 18 When 9 modules are linked | Yes | Calibration signal output | Approx. 10 VA | 1 Approx. 0.7 kg |
| WE7275 2-CH, 1 MS/s Isolated Digitizer Module | 7072 75/HE | DC to 400 kHz | 2 | Yes | DC/AC | ±100 mV to 200 V (1-2-5 steps), 350 V | 14 | 4 M | Up to 256 | BNC | Yes | 18 When 9 modules are linked | Yes | Anti-aliasing filter OFF/20 Hz to 40 kHz (2-4-8 steps) | Approx. 14 VA | 1 Approx. 0.8 kg |
| WE7273 8-CH, 100 kS/s Isolated Digitizer Module | 7072 73/HE | DC to 40 kHz | 8 | Yes | DC/AC | ±50 mV to 50 V (1-2-5 steps) | 16 | 8 M | Up to 256 | Clamp terminal | Yes | 72 When 9 modules are linked | Yes | | Approx. 20 VA | 1 Approx. 0.9 kg |
| WE7271 4-CH, 100 kS/s Isolated Digitizer Module | 7072 71/HE | DC to 40 kHz | 4 | Yes | DC | ±1 V to 20 V (1-2-5 steps), ±35 V | 16 | 4 M | Up to 256 | Clamp terminal | Yes | 36 When 9 modules are linked | Yes | | Approx. 12 VA | 1 Approx. 0.7 kg |
| WE7272 4-CH, 100 kS/s Isolated Digitizer Module | 7072 72/HE | DC to 40 kHz | 4 | Yes | DC | ±1 V to 20 V (1-2-5 steps), ±35 V | 16 | 4 M | Up to 256 | BNC | Yes | 36 When 9 modules are linked | Yes | | Approx. 12 VA | 1 Approx. 0.7 kg |
| WE7251 10-CH, 100 kS/s Digitizer Module | 7072 51/HE | DC to 10 kHz | 10 | No L end common | DC | ±1 V to 20 V (1-2-5 steps) | 16 | 1 M | Up to 256 | Input unit sold separately | Yes | 90 When 9 modules are linked | Yes | Multiplex type | Approx. 8 VA | 1 Approx. 0.7 kg |
| WE7241 10-CH Thermometer Module | 7072 41/HE | Scan interval 0.5 s or longer | 10 | Yes | DC | K, E, J, T, L, U, N, R, S, B, W, KPvsAU7Fe ±50 mV to 50 V (1-2-5 steps) | 14 | None | –– | Input unit sold separately | Yes | 90 When 9 modules are linked | Yes | Multiplex type | Approx. 7 VA | 1 Approx. 0.8 kg |
| WE7245 4-CH, 100 kS/s Strain Module | 7072 45/HE | DC to 20 kHz | 4 | Yes | DC | 1000 μ to 20000 μ strain, ±100 mV to ±20 V (1-2-5 steps) | 15 | 4 M | Up to 256 | Dsub (9-pin) | Yes | 36 When 9 modules are linked | Yes | 1, 2, or 4 gauges, DC bridge Gauge resistance 120 to 1 kΩ, auto balance | Approx. 15 VA | 1 Approx. 1 kg |
| WE7235 4-CH, 100 kS/s Accelerometer Module | 7072 35/HE | DC to 40 kHz | 4 | No | DC (voltage only) /AC | Gain: x1 (5 V) to x100 (50 mV) (1-2-5 steps) | 16 | 4 M | Up to 256 | BNC | Yes | 36 When 9 modules are linked | Yes | Anti-aliasing filter OFF/20 Hz to 40 kHz (2-4-8 steps) | Approx. 12 VA | 1 Approx. 0.8 kg |
| WE7521 4-CH Timing Measurement Module | 7075 21/HE | 100 ns to 20 s | 4 | No | DC/AC | Period, time interval, totalize count, up and down count, and frequency ratio measurements | –– | 4 M | Up to 256 | BNC | Yes | 32 When 8 modules are linked | Yes | Time stamp measurement | Approx. 8 VA | 1 Approx. 0.7 kg |
| WE7281 4-CH, 100 kS/s D/A module | 7072 81/HE | DC to 20 kHz | 4 | Yes | –– | ±1 V to 10 V (1-2-5 steps) | 16 | 4 M | Up to 256 | Clamp terminal | Yes | –– | –– | Sweep function, arbitrary waveform output | Approx. 15 VA | 1 Approx. 0.9 kg |
| WE7282 4-CH, 100 kS/s D/A Module | 7072 82/HE | DC to 20 kHz | 4 | Yes | –– | ±1 V to 10 V (1-2-5 steps) | 16 | 4 M | Up to 256 | BNC | Yes | –– | –– | Sweep function, arbitrary waveform output | Approx. 15 VA | 1 Approx. 0.7 kg |
| WE7262 32-Bit Digital I/O Module | 7072 62/HE | –– | 32 | No | –– | TTL level (input), CMOS level (output) | –– | None | –– | Dsub (25-pin) | No | 32 | –– | 2-MHz counter feature Connect the 707823/707824 and input/output contact signals | Approx. 4 VA | 1 Approx. 0.6 kg |
| WE7081 CAN Bus Interface Module | 7070 81/HE | | | | | | | | | Dsub (9-pin) | | 64 | Yes | CAN data I/O | Approx. 5 VA | 1 Approx. 0.7 kg |

# Application Software for WE7000 7077 02/7077 14/7077 51/7077 61



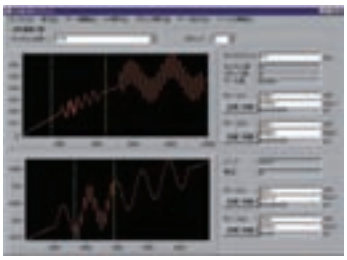
## 7077 02
### Computation Function Setup Software

- Software utility that adds data computation function to the WE7000 Control Software.
- Enables four arithmetic operations, FFT analysis, filter functions, waveform parameter measurement, etc.



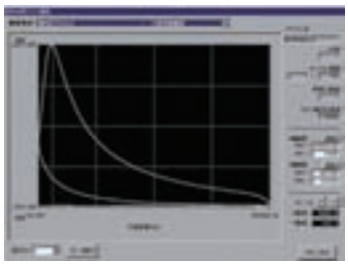
## 7077 14
### Computation Waveform Viewer

- Can display waveforms of the WE7000 or DL Series data as well as compute and analyze the data on the PC
- Equipped with extensive computation functions



## 7077 51
### Arbitrary Waveform Editor

- Create and edit data for the WE7121 and WE7281/82
- Can edit waveforms of up to 4 M data points
- Can load measured data (WVF format) and Excel (CSV format) files
- Edit data within the specified interval (functions and dots)



## 7077 61
### Engine Combustion Pressure Analysis Package

- Offline analysis software for the measured data for the WE7275
- Supports 4- to 8-cyclinder engines
- Equipped with standard analysis items (functions) required for the combustion pressure analysis

## WE7000 Utility Software

| Type | Product | Model Number | Specifications |
|---|---|---|---|
| Added on to the Control Software | Computation Function Setup Software | 707702 | Adds computation functions to the Control Software |
| Package software | Computation Waveform Viewer | 707714 | Waveform Viewer for the WE7000, DL, etc. |
| | Arbitrary Waveform Editor | 707751 | Arbitrary waveform data editor for the WE7121 and WE7281/82 |
| | Engine Combustion Pressure Analysis Package | 707761 | Offline combustion pressure analysis for the WE7275 |

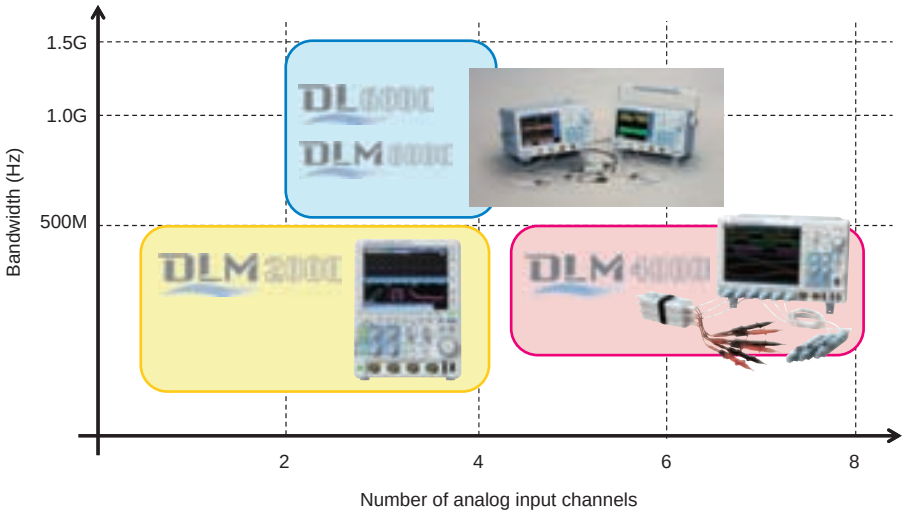
## Software for developing user application programs

| Product | Model Number | Specifications |
|---|---|---|
| WVF File Access API | 707712 | API for accessing WVF |
| WVF File Access Tool Kit for MATLAB | 707713 | MATLAB toolkit for accessing WVF |
| WE Control API | 707741 | Functions for controlling the WE7000 |
| Control Tool Kit for LabVIEW | 707746 | Toolkit for LabVIEW |
| Control Tool Kit for MATLAB | 707747 | Toolkit for MATLAB |

# Oscilloscopes

## *Waveform Measuring* Digital and Mixed Signal Oscilloscopes Selection Guide

■ The DL/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 DL/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.




| Item \ Model | | DLM4000 Series ...P24 | DLM2000 Series ...P20 | DL6000 Series ...P22 | DLM6000 Series ...P22 |
|---|---|---|---|---|---|
| Features | | Analog 8ch/Analog 7ch+Logic 8bits<br>Long memory<br>UART,I²C,SPI,CAN,LIN and FlexRay bus analysis functions<br>Power supply analysis functions<br>Compact & lightweight<br>Large display | Compact & lightweight<br>Analog 4ch/Analog 3ch+Logic 8bits<br>Max, 2.5GS/s<br>UART,I²C,SPI,CAN LIN and FlexRay bus analysis functions<br>Power supply analysis functions | Easy to use and high performance, and 32-bit logic | |
| | | | | Analog 4 channels<br>1 GHz/1.5 GHz<br>bandwidths, max 10 GS/s | Analog 4 channels + logic 32<br>1 GHz bandwidths,<br>max 5 GS/s |
| | | | | High-speed acquisition: max 2.5 million waveforms/sec/channel<br>Sophisticated waveform computation, analysis and fast screen update | |
| Max. sampling rate | | 2.5 GS/s | 2.5 GS/s | 10 GS/s(*2) | 5 GS/s |
| Bandwidth | | 500 MHz(*2) | 500 MHz(*2) | 1.5 GHz(*2) | 1.0 GHz(*2) |
| Number of analog input channels | | 8 | DLM2022,DLM2032,DLM2052:2<br>DLM2024,DLM2034,DLM2054:4 | 4 | |
| Logic input | | 8 bits(*3) | DLM2024, DLM2034,<br>DLM2054: St'd 8 bits | None | 32 bits (8 bits × 4) |
| Max. vertical sensitivity (1:1) | | 2 mV/div | 2 mV/div | 2 mV/div | |
| Vertial axis resolution | | 8 bits | 8 bits | 8 bits | |
| Max. sweep sensitivity | | 1 ns/div | 1 ns/div | 500 ps/div | |
| Max. record length | St'd | 12.5 Mpoints | 12.5 Mpoints | 6.25 Mpoints | |
| | Optional | 125 Mpoints | 125 Mpoints | — | |
| Internal storage | St'd | Approx. 1.8 GB | Approx. 100 MB | Approx. 390 MB | |
| | Optional | Approx. 7.2 GB | Approx. 1.8 GB | — | |
| Interface | St'd | USB/Ethernet | USB | USB/GP-IB(*4) | |
| | Optional | GP-IB | Ethernet/GP-IB | Ethernet | |
| Built-in printer | Optional | 112 mm width | 112 mm width | 112 mm width | |
| Others | Optional | I²C bus analysis<br>SPI bus analysis<br>CAN & LIN bus analysis<br>FlexRay bus analysis<br>UART bus analysis<br>Probe Power<br>Power Supply analysis functions<br>User-defined math functions | I²C bus analysis<br>SPI bus analysis<br>CAN & LIN bus analysis<br>FlexRay bus analysis<br>UART bus analysis<br>Probe Power<br>Power supply analysis functions<br>User-defined math functions | • I²C bus analysis<br>• SPI bus analysis<br>• CAN & LIN bus analysis<br>• UART bus analysis<br>• User-defined math<br>• Power supply analysis<br>• Probe power | |
| Display (TFT LCD) | | 12.1-inch color XGA | 8.4-inch color, XGA | 8.4-inch color, XGA | |
| External dimensions W × H × D (mm) | | 426 x 266 x 178 | 226 × 293 × 193 | 350 × 200 × 178 | 350 × 200 × 285 |
| Weight (kg) | | Approx. 6.6 | Approx. 4.2 | Approx. 6.5 | Approx. 7.7 |

*1: See each product catalog for more detaled specifications.
*2: Depends on model
*3: Additional logic 16 bits option is coming soon.
*4: PCMCIA-GPIB card is required.

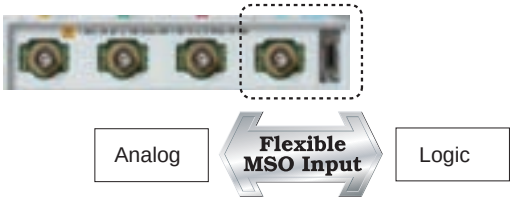
## Common Features of DL/DLM Series

### 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.

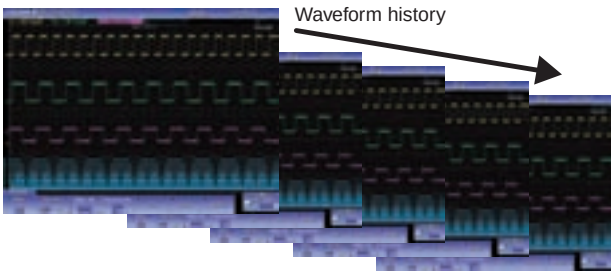
- DLM6000 series

  Up to 32-bit logic signals and 4 channels of analog signals can be measured simultaneously at high speed.

**ScopeCorder Series is available for customers that require more channels for measurement (see page 2). The DL850 supports up to 128 channel measurement.**

### Long Memory

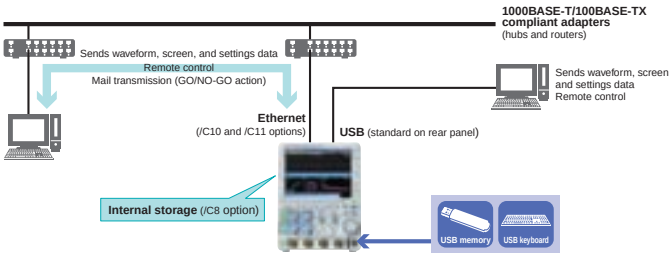
**When the sample rate is increased with oscilloscopes with less memory, the observation time may run out. All of Yokogawa's oscilloscope models are equipped with large capacity memory. For example, the DLM2000/DLM4000 offers long memory of up to 125 Mpoints for measurement.**
**Even at a fast sample 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 (option with the exception of some models).**

### 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**

(* Not available for some models)

# 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<br>DLM20x4: CH1 to CH4<br>(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<br>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:<br>1.25 M/6.25 M/12.5 MPoints |
| | 2 ch model (/M1S) | Repeat/Single/Single Interleave:<br>6.25 M/25 M/62.5 MPoints |
| | 4 ch model (Standard) | Repeat/Single/Single Interleave:<br>1.25 M/6.25 M/12.5 MPoints |
| | 4 ch model (/M1) | Repeat/Single/Single Interleave:<br>6.25 M/25 M/62.5 MPoints |
| | 4 ch model (/M2) | Repeat/Single/Single Interleave:<br>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<br>Model 701989: 250 MHz |
| Compatible probes | 701988, 701989 (8 bit input)<br>(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 |

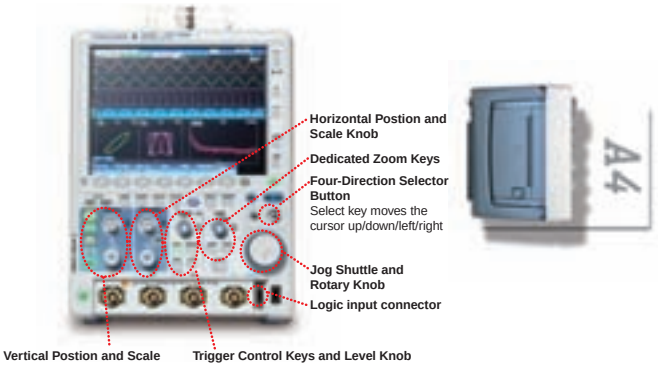
*1 Measured under standard operating conditions after a 30-minute warm-up followed by calibration.
*2 Value in the case of repetitive phenomenon.

## Features

### Easy-to-Use & Easy-to-See

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

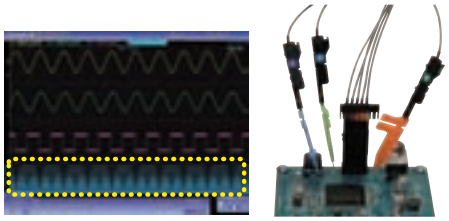
We elevated the large (8.4-inch) LCD screen up into the line of sight. Also, the portrait format saves space on the desk or test bench. A compact personal oscilloscope designed for easy viewing and ease of use.




### Signal observation on 4 channels or more...

- Flexible MSO Input

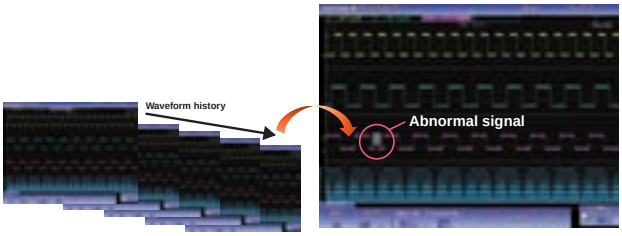
Four channels is not sufficient to view the functioning of digital control circuits. The DLM2000 series converts 4 channels of analog input to 8-bit logic, and functions as a 3 channel analog + 8-bit logic MSO (mixed signal oscilloscope).



### 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

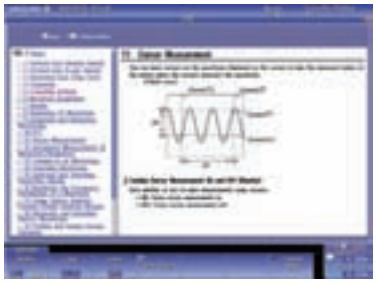
- Zoom two locations simultaneously, zoom search and history search

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. Two 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

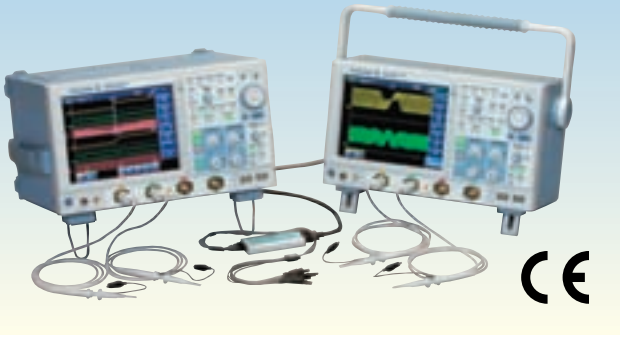
| Model | Suffix code | Description |
|---|---|---|
| 710105 | | Digital Oscilloscope DLM2022 2ch, 200MHz |
| 710110*1 | | Mixed Signal Oscilloscope DLM2024 4ch, 200MHz |
| 710115 | | Digital Oscilloscope DLM2032 2ch, 350MHz |
| 710120*1 | | Mixed Signal Oscilloscope DLM2034 4ch, 350MHz |
| 710125 | | Digital Oscilloscope DLM2052 2ch, 500MHz |
| 710130*1 | | Mixed Signal Oscilloscope DLM2054 4ch, 500MHz |
| Power cable | -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 Oscilloscope Digital Oscilloscope* **DLM6000 Series DL6000 Series**

## Easy-to-Use, Compact and Lightweight, Wide Bandwidth Oscilloscope with a Wide Variety of Functions
## Your Best Tool for Developing Embedded Systems



## Basic Specifications

| | |
|---|---|
| Input channels | DL6000 series 4 analog<br>DLM6000 series 4 analog + 32 logic |
| **Analog Input** | |
| Frequency bandwidth | DLM6104/DL6104: 1.0 GHz<br>DL6154: 1.5 GHz |
| Voltage axis sensitivity setting range | 1 MΩ : 2 mV/div to 5 V/div<br>50 Ω : 2 mV/div to 500 mV/div |
| Voltage axis DC accuracy | ±(1.5% of 8 div + offset voltage accuracy) |
| A/D conversion resolution | 8 bits |
| **Logic Input** | |
| Maximum toggle frequency | 100 MHz (701988), 250 MHz (701989) |
| Compatible probes | 701988, 701989 (701980 and 701981 can also be used) |
| Minimum input voltage | 500 mVp-p (701988), 300 mVp-p (701989) |
| Input range | ±40 V (701988); Threshold level ±6 V (701989) |
| Maximum nondestructive input voltage | ±40 V (DC + ACpeak) or 28 Vrms (701989) |
| Threshold level setting range | ±40 V (701988), ±6 V (701989) |
| **Common Specifications** | |
| Maximum sampling rate | |
| Real time sampling mode | Interleave mode OFF: 10 GS/s (DL6154), 5 GS/s (others)<br>Interleave mode ON: 5 GS/s (DL6154), 2.5 GS/s (others) |
| Equivalent time sampling mode | 25 TS/s |
| Time axis setting range | 500 ps/div to 50 s/div |
| Maximum record length | 6.25 Mpoints |
| History memory maximum data | 2,000 (2.5 kPoints) |
| Trigger modes | Auto, Auto Level, Normal, Single, N Single |
| Trigger types | Edge, Edge/State, Width, Serial Bus ($I^2C$/SPI/UART/CAN/LIN/User defined), TV, Event Interval, A Delay B, A to B (N) |
| Internal storage | 390 MB |
| PC card interface | 1 |
| Interface | USB peripheral connection interface × 2, USB-PC connection interface × 1 (standard), Ethernet, GP-IB (using a PCMICA card) |
| Built-in printer | 112 mm width, monochrome, thermal |
| Display | 8.4-inch color TFT LCD 1024 × 768 (XGA) |
| External dimensions | 350 (W) × 200 (H) × 178 (D) mm (DL6000)<br>350 (W) × 200 (H) × 285 (D) mm (DLM6000) |
| Weight | Approx. 6.5 kg (DL6000, including printer)<br>Approx. 7.7 kg (DLM6000, including printer) |

## Features

### Never miss the waveforms you want

● High acquisition rate unchanged even when displaying logic signals

- During continuous measurement: Up to 25,000 times per second per channel
- In N Single mode: Up to 2.5 million times per second per channel

Maximize your probability of catching anomalies with the high-speed acquisition rate, which does not change even when you observe analog and logic signals simultaneously.

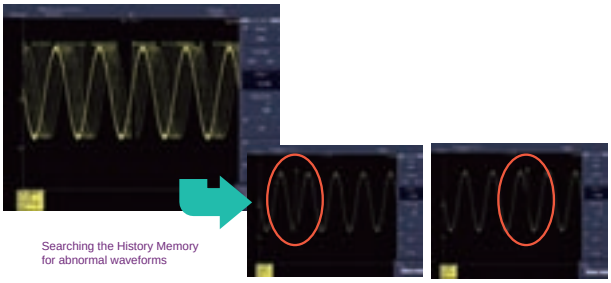
● Never miss abnormal waveforms with high-speed acquisition and history memory

You can preserve up to 2,000 captures of actual waveform data (not screen images), and after measurement has stopped, you can review past waveforms individually for detailed analysis.

- Search and Zoom
- Automated measurement of waveform parameters
- Variety of advanced computations

● You can analyze any past waveforms in detail by recalling them from memory

On most oscilloscopes, to observe and analyze abnormalities such as unpredictable noise in detail, you have to devise clever trigger settings and re-measure the event. But with the DL6000/DLM6000, there is no need to re-measure the phenomena because once the event occurs, you can use the History Memory function to review past waveforms that were originally displayed on screen.



Searching the History Memory for abnormal waveforms

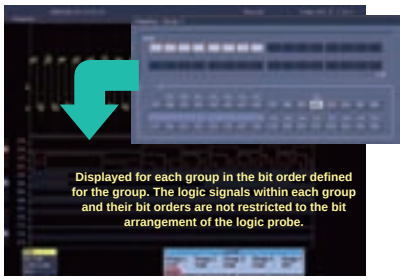
## Making 32-bit logic signals easy to read and understand

### Logic signal measurement and analysis

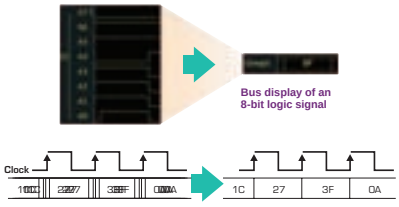
■ Observing up to 32-bit logic signals together with analog signals
Observing many signals simultaneously and checking their correlations and timing is an effective means of verifying increasingly complex embedded systems.
With the DLM6000 series, you can measure up to 32-bit logic signals and 4 channels of analog waveforms simultaneously, and investigate hidden data in waveforms using bus analysis and computation functions.

■ Grouping logic signals to make them easy to read and understand
As many as 5 groups of logic signals can be defined. You can enter display settings for each group, and specify bit arrangement in each group regardless of the bit arrangement of the logic probe. This means that even if pin assignments or signal arrangements change, you only need to change settings rather than to repeat the probing of the circuit.

- Easy-to-read address bus and data bus displays
- Even if device pin assignments or signal arrangements change, you only need to change settings



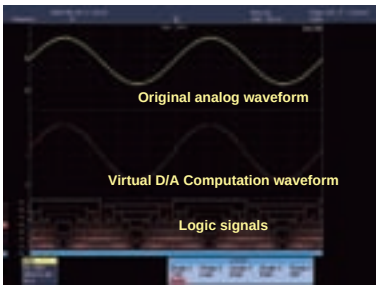

■ Bus and State displays make logic signals easy to read and analyze
The DL6000/DLM6000 can show logic signals assigned to groups in a Bus display, or specified clock signals in a State display. With clock synchronization, you can display logic signals in binary or hexadecimal format, so parallel output values of an address bus or A/D converter can be analyzed easily, and operating checks of the device under test can be performed more quickly and accurately.




State display: Normalization based on a specified clock edge

■ Virtual D/A Computation function displays up to 32-bit logic signals as analog waveforms
Even a one-bit error of digital signals is a big problem. It is difficult to find such a digital error with logic waveforms alone.
With a Virtual D/A Computation function, you can convert digital data into analog waveforms and display them to make data verification easier.

- Easy verification of address bus and data bus
- Real time comparison and verification of analog waveforms and digital values prior to and after A/D or D/A conversion.
- D/A converted waveforms can undergo FFT analysis or have additional digital filtering computations applied to them.




## Analysis Functions

### UART/CAN/LIN/I2C/SPI

#### Serial bus analysis function (option)

With an Auto Setup function for serial bus analysis, the DL6000/DLM6000 series automatically performs the tedious task of entering settings. You just need to select the bus type and input channel, and the oscilloscope will automatically recognize the waveform, set parameters such as a bit rate, and display analysis results instantaneously. Also, two different busses can be analyzed at the same time. For example, you can analyze a CAN and LIN bus simultaneously.

### Analyzing switching circuit characteristics

#### Power supply analysis function (option)

By using combinations of differential and current probes, you can evaluate the switching loss or analyze the safe operating area (SOA) in power supply waveforms. Through statistical computation you can also measure multiple switching waveforms and display the loss on a per-period basis in lists and trends, or display statistics on the aggregate loss of up to 2,000 switching waveforms stored in History Memory. If precise calculations are required, a correction function and High Resolution mode are available.

## Models and Suffix Codes

■ DL6104/6154

| Model | Suffix Code | Description |
|---|---|---|
| DL6104 | | 4CH 1GHz,Max. 5GS/s(2.5GS/s/CH), 6.25 Mpts/CH |
| DL6154 | | 4CH 1.5GHz,Max. 10GS/s(5GS/s/CH), 6.25 Mpts/CH |
| Power cable | -D | UL/CSA standard |
| | -F | VDE standard |
| | -Q | BS standard |
| | -R | AS standard |
| | -H | GB standard |
| Help language | -HE | English Help (Menu and Panel) |
| | -HC | Chinese Help (Menu and Panel) |
| | -HK | Korean Help (Menu and Panel) |
| | -HG | German Help (Menu and Panel) |
| | -HF | French Help (Menu and Panel) |
| | -HL | Italian Help (Menu and Panel) |
| | -HS | Spanish Help (Menu and Panel) |
| Option | /B5 | Built-in printer |
| | /P2*3 | Probe power |
| | /C12*4 | LXI compliant LAN |
| | /G2*5 | User defined Math |
| | /G4*5 | Power supply analysis function (includes /G2) |
| | /F3 | UART+I²C+SPI trigger and analysis |
| | /F4 | UART+CAN+LIN trigger and analysis |
| | /EX4*6 | Attach four 701946 probes |

■ DLM6104

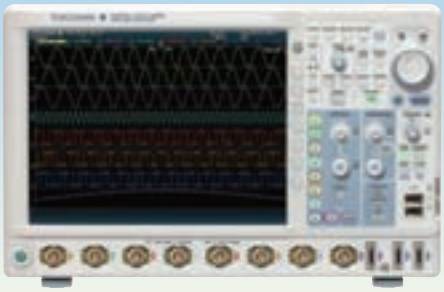
| Model | Suffix Code | Description |
|---|---|---|
| DLM6104 *1 | | 4CH 1GHz+Logic 32bit, Max. 5GS/s(2.5GS/s/CH), 6.25Mps/CH |
| Power cable | -D | UL/CSA standard |
| | -F | VDE standard |
| | -Q | BS standard |
| | -R | AS standard |
| | -H | GB standard |
| Help Language | -HE | English Help (Menu and Panel) |
| | -HC | Chinese Help (Menu and Panel) |
| | -HK | Korean Help (Menu and Panel) |
| | -HG | German Help (Menu and Panel) |
| | -HF | French Help (Menu and Panel) |
| | -HL | Italian Help (Menu and Panel) |
| | -HS | Spanish Help (Menu and Panel) |
| Logic input | -L32 *2 | Logic 32bit (Logic probe interface x 4) |
| Option | /B5 | Built-in printer |
| | /P4 *3 | Probe power |
| | /C12 *4 | LXI compliant LAN |
| | /G2 *5 | User defined Math |
| | /G4 *5 | Power supply analysis function (includes /G2) |
| | /F3 | UART+I²C+SPI trigger and analysis |
| | /F4 | UART+CAN+LIN trigger and analysis |
| | /EX4 *6 | Attach four 701946 probes |

*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: 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

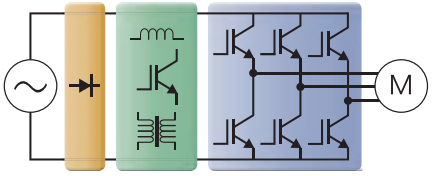
**Yokogawa's proprietary new enhanced eight channel oscilloscope comes with a larger display to enable waveforms to be easily viewed and the latest functions.**

- 8 analog channels or 7 analog channels + 8-bit logic input
- 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
- Inherits excellent functionality and operability from the DLM2000 series

### 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

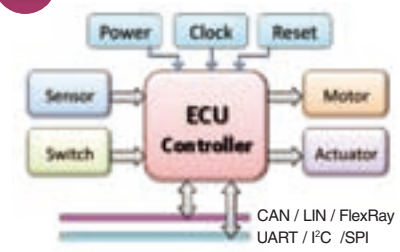
Whole-system measurement is impossible due to a lack of analog input channels when, for example, measuring the overall timing of the control signals, checking an error of the phase-to-phase balance between 3 phases, and simultaneously measuring the I/O signals of a motor driver IC.

#### 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 MOS 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.

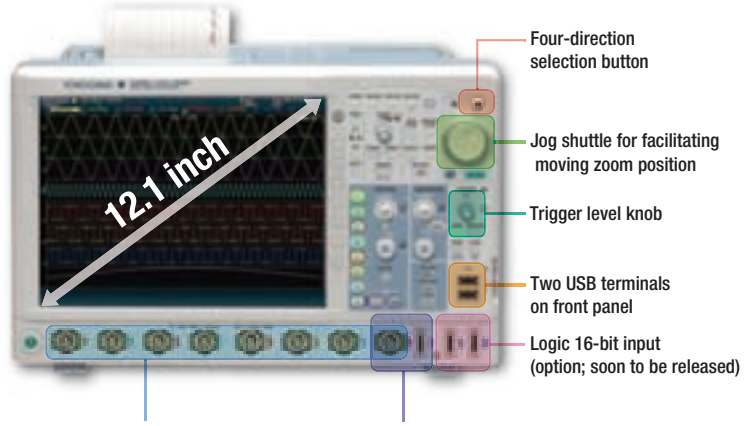
Recorder

#### Limitations of Memory Recorder

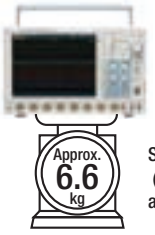
A memory recorder is generally suitable for long-time multi-channel measurement, but due to its low sampling rate and slow waveform update speed, its performance is not adequate for measuring high-speed signals and communication signals of CPUs and FPGAs, or detecting noise that causes problems or error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

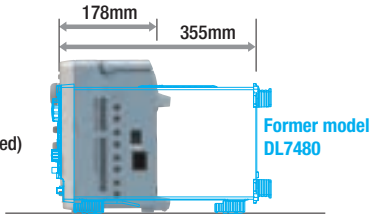
# The portable eight-channel DLM4000 is the daily instrument of choice. Maximum easiness of use coupled with minimum depth and weight

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




**Portable**




**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; soon to be released)

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
2 mV/div to 500 m V/div for 50
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)
200,000 (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, PSE compilant, 3 pole*2 |
| Language | -HJ | Japanese message and panel |
| Option | /L16 | Logic 16-bit (soon to be released) |
| | /B5 | Built-in printer |
| | /M1*3 | Memory expansion<br>During continuous measurement: 6.25 Mpoints;<br>Single mode: 25 Mpoints (when interleave mode ON: 62.5 Mpoints) |
| | /M2*3 | Memory expansion<br>During continuous measurement: 12.5 Mpoints;<br>Single mode: 62.5 Mpoints (when interleave mode ON: 125 Mpoints) |
| | /P8*4 | Eight probe power connectors |
| | /C1 | GP-IB Interface |
| | /C8 | Internal storage (7.2 GB) |
| | /G2*5 | User defined math |
| | /G4*5 | Power supply analysis function (includes /G2) |
| | /F1*6 | UART trigger and analysis |
| | /F2*6 | I²C+SPI trigger and analysis |
| | /F3*6 | UART+I²C+SPI trigger and analysis |
| | /F4*7 | CAN+LIN trigger and analysis |
| | /F5*7 | FlexRay trigger and analysis |
| | /F6*7 | FlexRay+CAN+LIN trigger and analysis |
| | /E1*8 | Four additional passive probes (8 in total) |
| | /E2*8 | Attach four 701946 probes*9 |
| | /E3*8 | Attach eight 701946 probes*9 |

*1: Logic probes are not included. Please order the accessory logic probe 701988/701989 sold separately.
*2: If a 3P-2P adapter (Model A1253JZ) is required, please purchase it separately.
*3: Only one of these options can be selected at a time.
*4: Specify this option when using current probes or differential probes that don't support probe interface.
*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: Only one of these options can be selected at a time.
*9: The 701939 passive probes are not included when this option is specified.

## Accessory PBDH0150 High-voltage Differential Probe

Compact solution to enable non-contact signal measurement with a scope

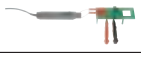
### Features and Model

- Up to 1,400 Vpeak
- 150 MHz frequency bandwidth
- 1 meter extension lead set available as standard
- Compact design
- Scope auto-detection and integral probe power connector

| Product Name | Model |
|---|---|
| PBDH0150 Differential Probe | 701927 |

# Oscilloscopes

## *Waveform Measuring* Oscilloscopes Accessories

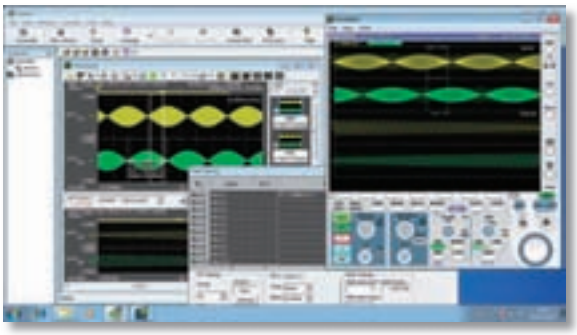
| Classification | Product | Model No. | Power supply: Probe interface terminal (front panel)*2 | Power supply: Probe power (option)/probe power supply (sold separately) | Description | | DLM2000 | DLM4000 | DLM6000 | DL6000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Passive | 200MHz passive probe | **701938** | | | DC to 200 MHz, 10:1, 1.5 meters |  | ● (*5) | | | |
| | 500MHz passive probe | **701939** | | | DC to 500 MHz, 10:1, 1.3 meters |  | ● (*5) | ● (*5) | ● | ● |
| | 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<br>Max. differential input voltage: ±25V |  | ● | ● | ● | ● |
| | PBDH 0150 150 MHz differential probe | **701927** | ○ | | DC to 150 MHz, 50:1, 500:1<br>Max. differential input voltage: ±140 V (50:1), ±1400 V (500:1) |  | ● | ● | ● | ● |
| | 500 MHz differential probe | **701920** | | ○ | DC to 500 MHz, 10:1,<br>Max. differential input voltage: ±12 V |  | ● | ● | ● | ● |
| | 200 MHz differential probe | **701922** | | ○ | DC to 200 MHz, 10:1,<br>Max. differential input voltage: ±20 V |  | ● | ● | ● | ● |
| | 100 MHz differential probe | **701921** | | ○ (*3) | DC to 100 MHz, 10:1, 100:1,<br>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,<br>Max. differential input voltage: ±350 V (100:1), ±1400 V (1000:1) |  | ● | ● | ● | ● |
| | 50MHz differential probe | **701926** | | ○ (*3) | DC to 50 MHz, 100:1, 1000:1,<br>Max. differential input voltage: 700Vpeak(100:1), 7000Vpeak(1000:1) |  | ● | ● | ● | ● |
| | 15 MHz differential probe | **700925** | | ○ (*4) | DC to 15 MHz, 10:1, 100:1,<br>Max. differential input voltage: ±50 V (10:1), ±500 V (100:1) |  | ● | ● | ● | ● |
| Current | PBC100 Current probe | **701928** | ○ | | DC to 100MHz<br>30 Arms |  | ● | ● | ● | ● |
| | PBC050 Current probe | **701929** | ○ | | DC to 50MHz<br>30 Arms |  | ● | ● | ● | ● |
| | Current probe | **701932** | | ○ | DC to 100 MHz,<br>30 Arms |  | ● | ● | ● | ● |
| | Current probe | **701933** | | ○ | DC to 50 MHz<br>30 Arms |  | ● | ● | ● | ● |
| | Current probe | **701931** | | ○ | DC to 2 MHz,<br>500 Arms |  | ● | ● | ● | ● |
| | Current probe | **701930** | | ○ | DC to 10 MHz<br>150 Arms |  | ● | ● | ● | ● |
| Logic | PBL100 (100MHz Logic probe) | **701988** | | | Input impedance 1 MΩ<br>Max. toggle frequency: 100 MHz |  | ● | ● | ● | |
| | PBL250 (250MHz Logic probe) | **701989** | | | Input impedance: 100 kΩ<br>Max. toggle frequency: 250 MHz |  | ● | ● | ● | |
| Other | De-skew correction signal source | **701936** | | | Voltage/current signal de-skew<br>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<br>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. *5: Use 701938 for the 200 MHz model and 701939 for the 350/500 MHz models.
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

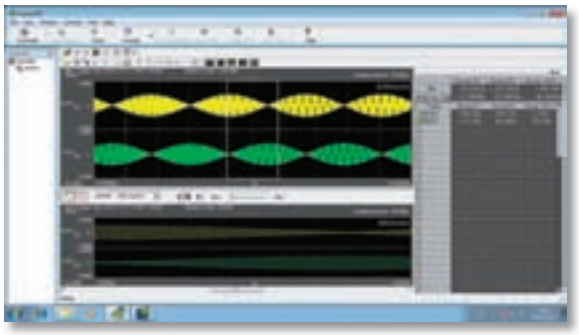


**701992**

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.

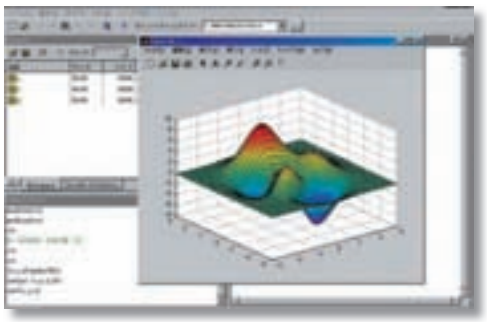
## Remote Control Measuring Instrument on Your PC

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



**701991**

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.

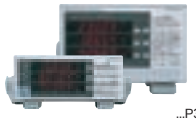
# Digital Power Analyzers

## Selection Guide

Digital Power Analyzer

**Yokogawa's 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  ...P34 | WT500  ...P29 | WT3000  ...P30 | WT1800  ...P32 | WT210/WT230  ...P36 |
|---|---|---|---|---|---|
| Features | New Entry Class Digital Power Analyzers<br>4 models line up, equipping 5mA range (WT310), 40A range (WT310HC), and 2 or 3 CH inputs (WT332/WT333)<br>Standard Communication I/F and auto-ranging under integration mode | Low-Middle Class Power Analyzer<br>Compact half rack size and easy use<br>Max. 1000V and 40A input<br>Simultaneous measurement U, I, P and those harmonics components<br>External USB memory for direct data saving | Top model of Digital Power Analyzer<br>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<br>Up to six Input elements in one instrument (3 phase power input from two systems in one unit)<br>8.4-Inch XGA TFT Color LCD<br>Wide voltage and current input range | Entry Class Digital Power Analyzer<br>Compact design (half-rack size) and superior cost performance<br>5 mA range for very low current measurements (model WT210 only) |
| Input elements | 1(WT310,WT310HC), 2 (WT332), 3(WT333) | 1 to 3 | 1 to 4 | 1 to 6 | 1 (WT210), 2 or 3 (WT230) |
| 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 rdg + 0.1% of rng |
| Power measurement frequency range | DC, 0.5 Hz to 100 kHz<br>(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, 0.5 Hz to 100 kHz |
| 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/<br>150/300/600/1000 V | 1.5/3/6/10/15/30/60/<br>100/150/300/600/1000 V | 15/30/60/150/300/600 V |
| Input current range (for crest factor 3) | Direct input: 5m/10m/20m/50m/100m/ 200m/500m/1/2/5/10/20 A (WT310)<br>Direct input: 1/2/5/10/20/40 A (WT310HC)<br>Direct Input: 500m/1/2/5/10/20 A (WT332,WT333)<br>External input(option): 2.5/5/10 V, or 50m/100m/200m/500m/1/2 V | Direct input: 500m/1/2/5/10/20/40A<br>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<br>External input:<br>50 m/100 m/200 m/500 m/1/2/5/10 V | Direct input:<br>10 m/20 m/50 m/100 m/200 m/ 500 m/1/2/5 A or 1/2/5/10/20/50 A<br>External input (option):<br>50 m/100 m/250 m/500 m/ 1/2.5/5/10 V | Direct input:<br>5 m/10 m/20 m/50 m/100 m/200 m/ 500 m/1/2/5/10/20 A (WT210)<br>Direct input:<br>500 m/1/2/5/10/20 A (WT230)<br>External input (option):<br>2.5/5/10 V or 50 m/100 m/200 mV |
| 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, Active power integration, Current integration, Harmonic analysis |
| 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 | 7-segment LED, 3 displays |
| External dimensions (mm) (W × H × D) | 213 × 88 × 379 (WT310 and WT310HC)<br>213 × 132 × 379 (WT332 and WT333) | 213 × 177 × 408.5 | 426 × 177 × 459 | 426 × 177 × 459 | 213 × 88 × 379 (WT210)<br>213 × 132 × 379 (WT230) |
| Weight (kg) | 3 (WT310), 5 (WT330) | 6.5 | 15 | 15 | 3 (WT210), 5 (WT230) |

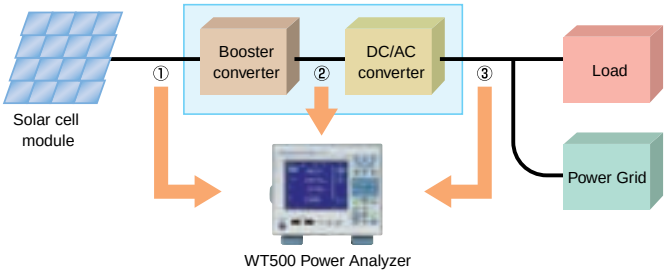
***About CW series Clamp-on Power Meters, please refer to the page 60.**

## WT500 Series

# 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 2013, for power accuracy in a three-phase power meter as investigated by Yokogawa)

WT3000

### Features

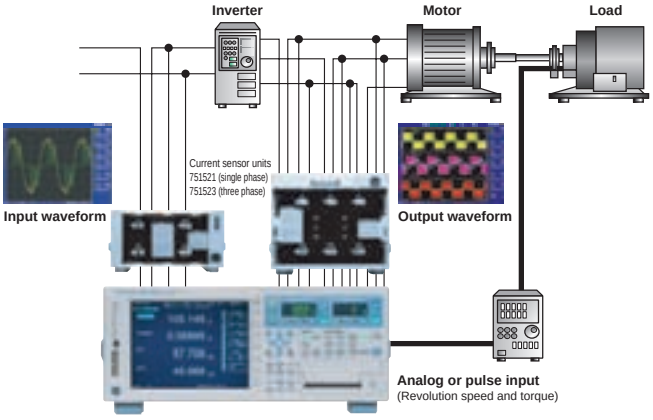
**The WT3000 has the highest precision of all the Yokogawa power analyzers in the WT series. The WT3000 can be used as a reference instrument for calibration and to measure the power and conversion efficiency of power transformers such as an inverter. It helps increase efficiency in evaluation and testing.**

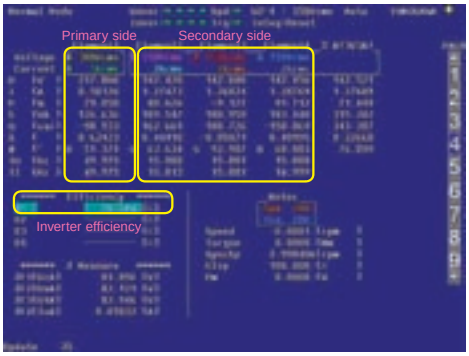
- Basic power accuracy ±0.06% of total, the highest precision of all power analyzers in the WT series
- Up to four input elements to achieve accurate measurement of input and output conversion efficiency
- Motor efficiency and total efficiency measurement of the motor version
- Simultaneous harmonic 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.

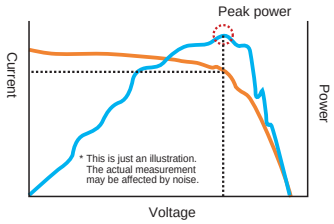



Example of measurement data display on the primary and secondary sides

### 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).

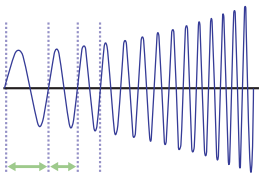



MPPT: Maximum Power Point Tracker
Example of measurement results of voltage, current, and power under control


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

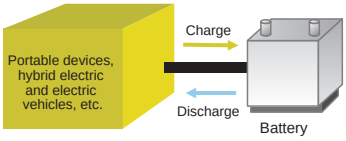
Lighting equipment is shifting from incandescent to fluorescent lamps. Furthermore, in recent years, long-life, low power consumption LEDs are attracting attention. To increase the power conversion efficiency of an LED driving circuit (drive module), it is necessary to measure the voltage, current, and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

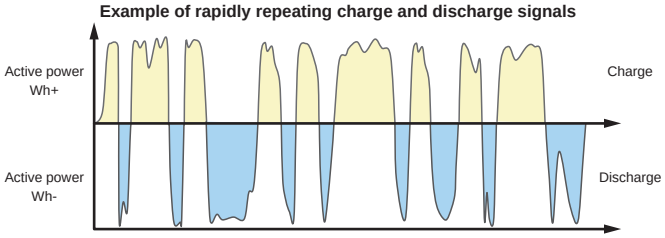
For battery-powered equipment such as portable devices and electric-powered bicycles, engineers must often perform short-duration charge/discharge tests under actual operating conditions. Since the WT3000 employs a digital sampling system, each rapidly changing charge/discharge current and power can 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<br>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

*For common optional accessories, please see page 39*

## 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 | 30A input element, for 760302 model |
| | -03 | 30A input element, for 760303 model |
| | -04 | 30A input element, for 760304 model |
| | -10 | 2A input element, for 760301 model |
| | -20 | 2A input element, for 760302 model |
| | -30 | 2A input element, for 760303 model |
| | -40 | 2A input element, 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 | Serial (RS-232) Interface (Select one) |
| | /C12 | USB port (PC) (Select one) |
| | /C5 | USB port (Peripheral) |
| | /C7 | Ethernet function |
| | /CC | Cycle by Cycle |
| | /FL | Voltage Fluctuation, Flicker |

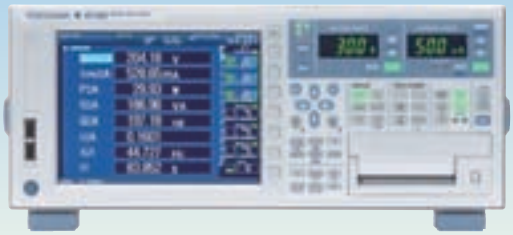
* requires 761922 software

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.

# Digital Power Analyzers

*High Performance Power Analyzer* **WT1800**

## Broad Ranges Power Measurement with One Unit



**WT1800**
Bulletin WT1800-00EN

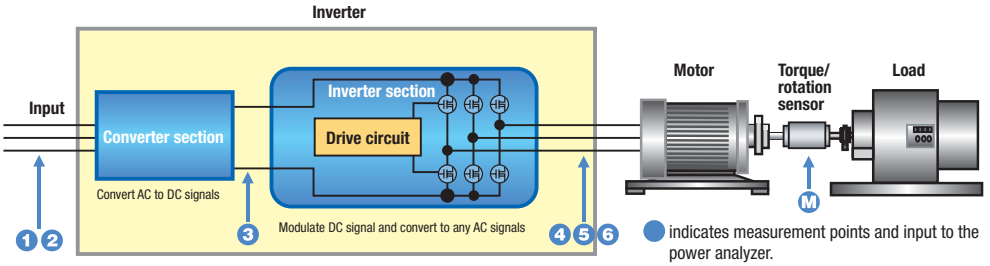
CE

### 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.

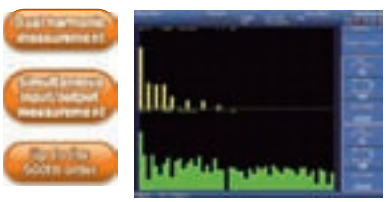
### Advantages of WT1800

**• 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.

**• 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.

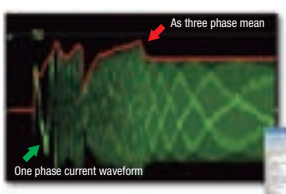


The following measurements can be performed for up to the 500th order
Single harmonic measurement (/G5 option)
Dual harmonic measurement (/G6 option)

**Fast Date Capturing performance**

**• ms response capability (/HS Option)**

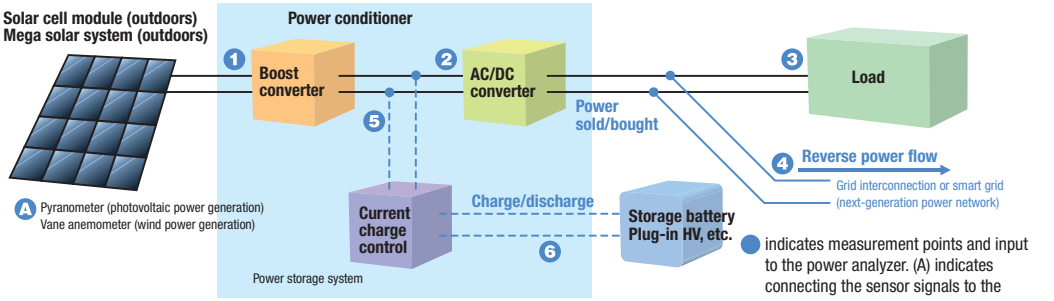

The High Speed data capturing /HS option can measure ΣUrms, ΣIrms and ΣP from single phase (DC signal) and three phase devices every 5 ms (When External Synchronization is OFF) or, 1 ms to 100 ms when External Synchronization is ON (depending on the frequency of the clock signal). It outputs data in 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

## 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.

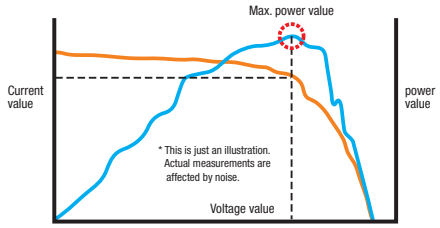
## Advantages of WT1800

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


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


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 | SimItaneous Dual Harmonic Measurement | | | | | |
| | /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 | | | | | |
| | /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

*Series 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.**
**The world' s best selling power meter is the power meter of choice in multiple industries from production lines to R&D applications.**

## 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 WT310/WT330 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

## 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)**

**Useful functions powerfully support QA production lines and development**

- 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

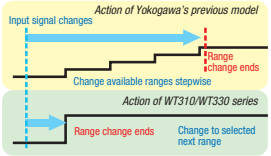
| Model | Suffix Code | | Description |
|---|---|---|---|
| WT310 | | | 1 Input element model |
| Power Cord | -D | | UL, CSA standard, PSE |
| | -F | | VDE standard |
| | -R | | AS standard |
| | -Q | | BS standard |
| | -H | | GB standard |
| | -N | | NBR standard |
| Communication Interface *USB is 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)

## New Functions to Improve Measurement Efficiency

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

The WT310/WT330 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)




### ● Fast data and display update rate

The 100 ms maximum data update rate and data communication output are available. Data collection using a PC is useful in the evaluation of equipment that changes in a short period of time. Furthermore, the tact time can be reduced on the production line.

### ● 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.)

## 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

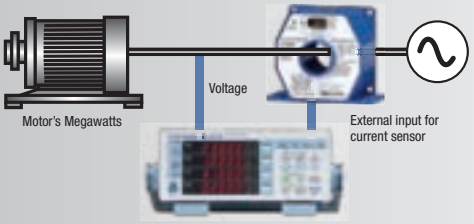
- Compact half rack mount size helps customers build smaller test systems with a better Return on Investment (ROI).
- D/A output function for data recording
- Multiple communication interfaces. USB, RS-232 or GP-IB and Ethernet capability.

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 WT310/330 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 Sampling Power Meters with Superior Cost Performance

**WT210**
For standby low-power measurements and rated-power measurements.
A single-phase model

**WT230**
For applications of three phase equipments and efficiency measurement.
A three-phase model

## Overview

**The WT210 and WT230 are compact, half-rack sized power meters. They are suited for a wide range of applications from production line to R&D, and offer improved basic accuracy and bandwidth. The WT210 also has 5 mA range allowing measurement of the extremely small currents found in energy-saving designs and intermittent or burst control devices.**

## Features

- Maximum input with assured accuracy: 26 A
- Compact design (half-rack size)
- 5 mA range for very low current measurements (model WT210 only)
- Line filter function
- High-speed data update (as fast as 10 readings per second)
- Harmonic measurement function available (optional)
- User calibration capability
- Large-current measurement capability using external sensor input (optional)

## Basic Specifications

- Measurement voltage range: (for crest factor 3)
  Voltage: 15/30/60/150/300/600 V
- Measurement current range: (for crest factor 3)
  Direct input:
  5 m/10 m/20 m/50 m/100 m/200 mA/
  0.5/1/2/5/10/20 A (WT210),
  0.5/1/2/5/10/20 A (WT230)
  External Sensor input (optional):
  2.5/5/10 V or 50/100/200 mV
- Frequency range:
  DC and 0.5 Hz to 100 kHz
- Basic accuracy (45 Hz ≤ f ≤ 66 Hz)
  Voltage/current/power
  ±(0.1% of rdg + 0.1% of rng)
- Effect of power factor (at cos ϕ = 0)
  ±0.2% of S added (S: apparent power)
- External dimensions:
  approx. 213 (W) × 88 (H) × 379 (D) mm (WT210)
  approx. 213 (W) × 132 (H) × 379 (D) mm (WT230)
- Weight: approx. 3.0 kg (WT210)
  approx. 5.0 kg (WT230)

- Wiring Types and Model Numbers

| Wiring \ Model | 760401 | 760502 | 760503 |
|---|---|---|---|
| Single-phase 2-wire | ✓ | ✓ | ✓ |
| Single-phase 3-wire | – | ✓ | ✓ |
| Three-phase 3-wire (2 voltages, 2 currents) | – | ✓ | ✓ |
| Three-phase 3-wire (3 voltages, 3 currents) | – | – | ✓ |
| Three-phase 4-wire | – | – | ✓ |

## Model Number and Suffix Codes

| Model number | Suffix code | Description | |
|---|---|---|---|
| 760401 | | WT210 single-input element model | |
| Power cord | -D | UL/CSA standard | |
| | -F | VDE standard | |
| | -R | AS standard | |
| | -Q | BS standard | |
| | -H | GB standard | |
| Options | /C1 | GP-IB communication interface | Select |
| | /C2 | Serial (RS-232-C) communication interface | one |
| | /EX1 | External input 2.5/5/10 V | Select |
| | /EX2 | External input 50/100/200 mV | one |
| | /HRM | Harmonic measurement function | |
| | /DA4 | 4-channel DA output | Select |
| | /CMP | Comparator and D/A, 4 channels each | one |

Note: The WT210 communication interface cannot be changed or modified after delivery.

| Model number | Suffix code | Description | |
|---|---|---|---|
| 760502 | | WT230 2-input element model | |
| 760503 | | WT230 3-input element model | |
| Interface | -C1 | GP-IB communication interface | Select |
| | -C2 | Serial (RS-232-C) communication interface | one |
| Power cord | -D | UL/CSA standard | |
| | -F | VDE standard | |
| | -R | AS standard | |
| | -Q | BS standard | |
| | -H | GB standard | |
| Options | /EX1 | External input 2.5/5/10 V | Select |
| | /EX2 | External input 50/100/200 mV | one |
| | /HRM | Harmonic measurement function | |
| | /DA12 | 12-channel DA output | Select |
| | /CMP | Comparator and D/A, 4 channels each | one |

## Current Sensor Units 751521/751523

### Accessory for Digital Power Meters and Power Analyzer

751521
(for single-phase measurements)

751523
(for three-phase measurements)

*751521/751523 do not conform to CE Marking.

**Current sensor units can be used for large-current power measurements, which exceed the direct input range of a power meter. With the ability to measure a wide range of frequencies from DC to 100 kHz with high precision, these can be used in a variety of power measurement applications, such as EV/ inverter drive motors.**

### 751521/751523 Models and Suffix Codes

| Model | Suffix codes | | Description |
|---|---|---|---|
| 751521 | | | Single phase |
| 751523 | -10 | | Three phase U, V |
| | -20 | | Three phase U, W |
| | -30 | | Three phase U, V, W |
| Power supply voltage | | -1 | 100 V AC (50/60 Hz) |
| | | -3 | 115 V AC (50/60 Hz) |
| | | -7 | 230 V AC (50/60 Hz) |
| Power cable | | -D | UL/CSA standard |
| | | -F | VDE standard |
| | | -R | SAA standard |
| | | -J | BS standard |

* Model 751523-10 is for the WT3000/WT1800 series and Model 751523-20 is for the WT2000/WT200 series.

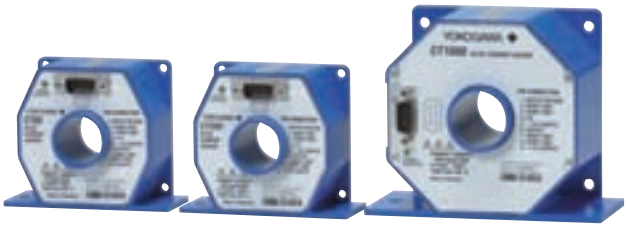
### 751521/751523
Current Sensor Units

Specifications

Input format: Floating input method using a CT (s)
Rated Current:
DC –600 A-0-600 A
AC 600 A peak
Output current: 400 mA (when the rated 600 A input current is flowing)
Input/Output Ratio: 1500 : 1
Accuracy:
DC ±(0.05% of rdg + 40 µA)
45 Hz ≤ f ≤ 66 Hz ±(0.05% of rdg + 40 µA)
Frequency Band: DC-100 kHz (-3dB)
• External dimensions
751521: Approx. 426 (W) × 221 (H) × 430 (D) mm
751523: Approx. 426 (W) × 355 (H) × 430 (D) mm
(excluding the input terminal, feet, and other protrusions)
• Weight
751521: Approx. 14 kg
751523: Approx. 24 kg

## 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 Transducer 751574/751552

### Accessory for Digital Power Meters and Power Analyzer

CE

CE

758917

758921

### 751574
Current Transducer

Specifications

Rated Current:
DC –600 A-0-600 A
AC 600 A peak
Output current: 400 mA (when the primary rated current of 600 A is flowing)
Current transformation Ratio: 1500:1
Accuracy:
DC ±(0.05% of rdg + 40 µA)
50/60 Hz ±(0.05% of rdg + 40 µA)
Frequency band: DC-100 kHz (-3dB)
External dimensions:
Approx. 122 (W) × 98 (H) × 57 (D) mm
(excluding the connector, primary cable guide, and other protrusions)
Weight: Approx. 1 kg.

### 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).

# Digital Power Analyzers

## WT Series Accessory Software — 760122, 761922 and Power Consumption Measurement Software

## PC-based Control and Data Acquisition

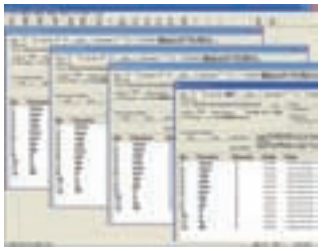
### WTViewer

### 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 | ● | × | ● | ○ |
| WT210 | ● *2 | ● *2 | × | × |
| WT230 | ○ *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.

## Support for IEC Standards Testing

### Harmonic/Flicker Measurement Software

### 761922

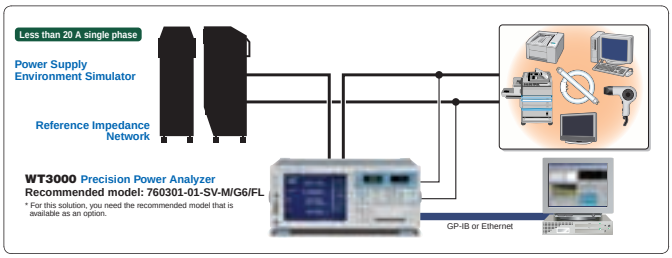
- Allows you to judge high current equipment with input current of 16 A or more per phase (IEC61000-3-11/-3-12)
- Support for the method that does not consider interharmonics in the window of 16 cycles specified in IEC61000-4-7 1991
- Best-in-class high-precision current and voltage measurements (also 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

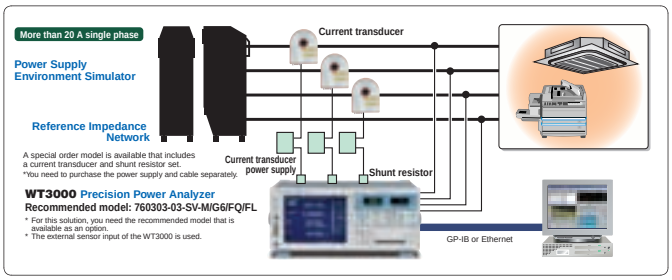
Example of a measurement screen


Launcher screen

Example of an initial setup screen

Example of a printed report




| | Applicable standards |
|---|---|
| Harmonic current standard | IEC61000-3-2 Ed3.0 2008 (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 |

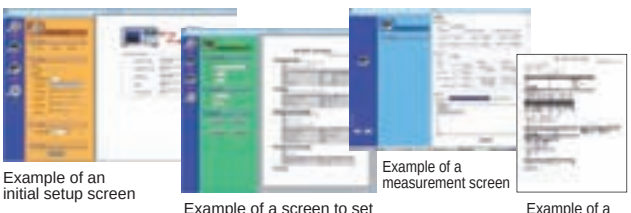
## Power Consumption Measurement Software

### 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.

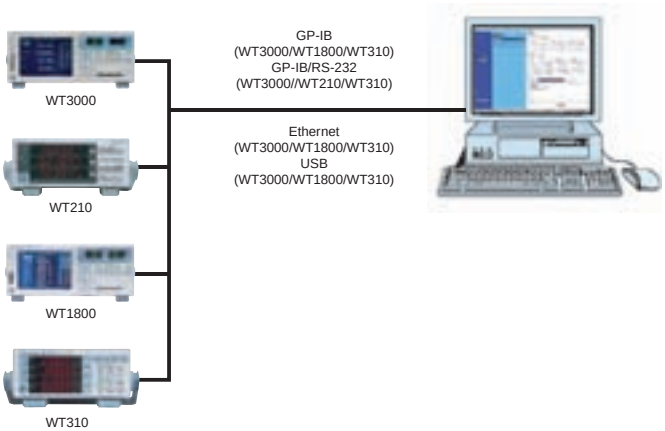
(The free software can be downloaded from Yokogawa's website)


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

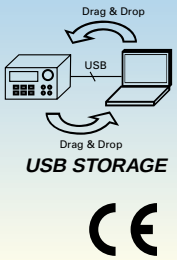


*Digital Analyzers Accessories List*

# Accessories List

| Product | Part No. | Description | | WT3000 | WT1800 | WT500 | WT210/WT230 | WT310/WT330 |
|---|---|---|---|---|---|---|---|---|
| 1:1 BNC safety adapter lead | 701901 | 1000 Vrms-CAT II, 1.8 m long<br>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.<br>Total length: 75 cm<br>Rating: 1000 V, 32 A |  | ● | ● | ● | ● | ● |
| Small alligator adapters | 758922 | For connection to measurement leads (758917). Two in a set.<br>Rating: 300 V |  | ● | ● | ● | ● | ● |
| Large alligator adapters | 758929 | For connection to measurement leads (758917). Two in a set.<br>Rating: 1000 V |  | ● | ● | ● | ● | ● |
| Safety terminal adapter set | 758923 | (spring-hold type) Two adapters in a set. |  | ● | ● | ● | ● | ● |
| Safety terminal adapter set | 758931 | Screw-fastened adapters. Two adapters in a set. 1.5 mm Allen wrench included for tightening. |  | ● | ● | ● | ● | ● |
| 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 WT210 and WT230.<br>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<br>/A: keyboard, mouse table<br>/B: 3-prong power strip | | ● | ● | ● | ● | ● |
| Deluxe instrument cart | 701961 | 570 (W) × 580 (D) × 893 (H) mm<br>/A: keyboard, mouse table<br>/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 WT210/WT310 EIA standalone installation | | | | | ● | ● |
| Rack mounting kit | 751533-J2 | For WT210/WT310 JIS standalone installation | | | | | ● | ● |
| Rack mounting kit | 751534-E2 | For WT210/WT310 EIA connected installation | | | | | ● | ● |
| Rack mounting kit | 751534-J2 | For WT210/WT310 JIS connected installation | | | | | ● | ● |
| Rack mounting kit | 751533-E3 | For WT230/WT310 EIA standalone installation | | | | | ● | ● |
| Rack mounting kit | 751533-J3 | For WT230/WT310 JIS standalone installation | | | | | ● | ● |
| Rack mounting kit | 751534-E3 | For WT230/WT310 EIA connected installation | | | | | ● | ● |
| Rack mounting kit | 751534-J3 | For WT230/WT310 JIS connected installation | | | | | ● | ● |

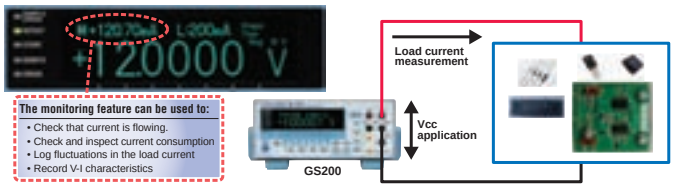
# Higher Accuracy — The New Advanced DC Voltage/Current




## Functions

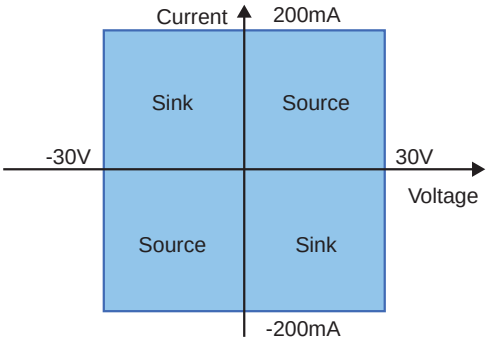
The GS200 is a DC voltage/current source that boasts high accuracy, high stability, and high resolution. With its excellent traceability, stability, and 5 1/2-digit resolution, the GS200 generates extremely low-noise DC voltage and current signals.

- 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, and 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

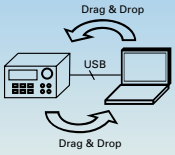
- Display : 256 × 64 dot vacuum fluorescent display
- External dimensions : Approx. 213 (W) × 88 (H) × 350 (D) mm (excluding protrusions)
- Weight : Approx. 5 kg

## 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.

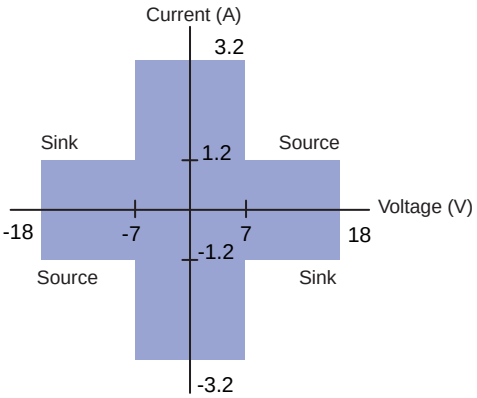
- Isolated 2-channel source and measurement function
- Source and measurement ranges: 7 V and 3.2 A or 18 V and 1.2 A
- Minute current ranges with 200-nA or 1-pA resolution
- Generate arbitrary waveforms consisting of up to 100,000 points at 100-µs intervals
- Channel expansion through master-slave synchronization 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 3600 s) |
| Sweep start source: | External or internal timers 1 and 2 (period: 100 µs to 3600 s) |
| Source delay: | 15 µ to 3600 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 3600 s) |
| Measure delay: | 0 µs to 3600 s |
| Measurement data storage: | Up to 100000 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 488.2-1987 |
| 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**

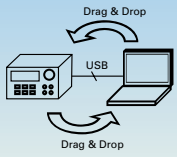
| | |
|---|---|
| Number of Ethernet ports: | 1 |
| Connector type: | RJ-45 connector |
| Electrical and mechanical specifications: | Conforms to IEEE 802.3 |
| Transmission system: | 100BASE-TX/10BASE-T |
| Data rate: | 100 Mbps or 10 Mbps |
| Protocol: | VXI-11 server, HTTP server, FTP server, DHCP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

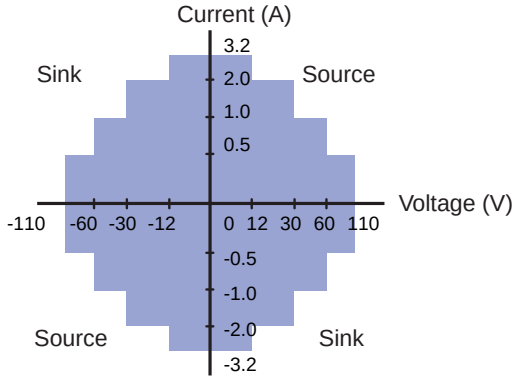
- Source and sink operation up to 110 V/3.2 A (four-quadrant operation)
- Basic accuracy: ±0.02% *1
- Sweep output at up to 100 µs intervals
- Comes with abundant sweep patterns (linear, logarithmic, and arbitrary)
- Stores up to 65535 points of source measure data in the internal memory
- Easy file 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)

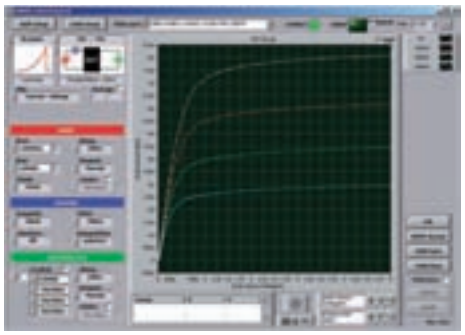
**■ Weight** : Approx. 7 kg

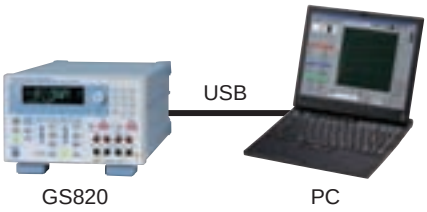
## Model and Suffix code

| 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 |

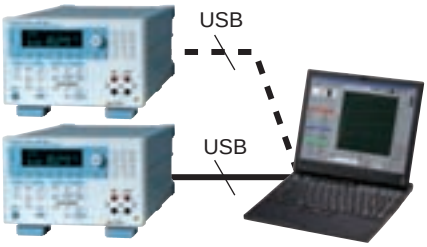
*GS Series Accessory Software*

# 765670 Curve Tracer Software for the GS series






System configuration illustration




## Product Overview

This product is a high-speed, high-accuracy real-time V-I 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/

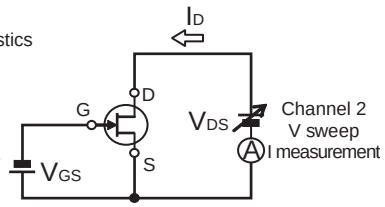
## Specifications

- 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

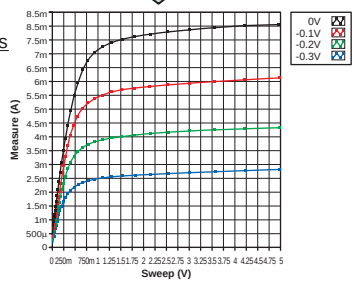
## Examples of Measurements of Characteristics

● 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 code | -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

# Generators, Sources

## *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$^2$, mm$H_2O$, mmHg
  kPa, psi, in$H_2O$, 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, in$H_2O$, inHg, kPa, kgf/cm$^2$, mm$H_2O$, 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, in$H_2O$, inHg, kPa, kgf/cm$^2$, mm$H_2O$, 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, $inH_2O$, inHg, kPa, $kgf/cm^2$, $mmH_2O$, 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, $kgf/cm^2$, $mmH_2O$, mmHg, Psi, $inH_2O$, 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

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

**■ AQ6370C (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

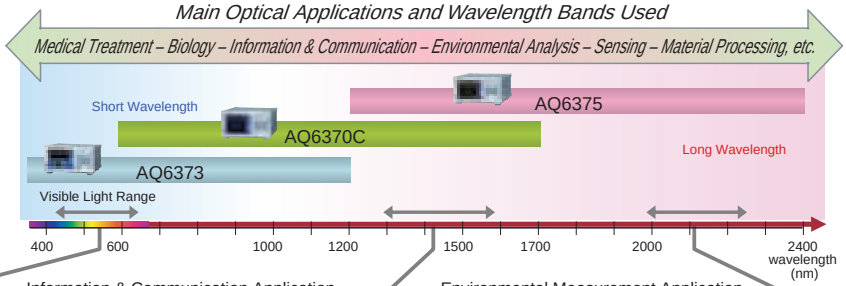
## Features

- 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)

## Optical Applications

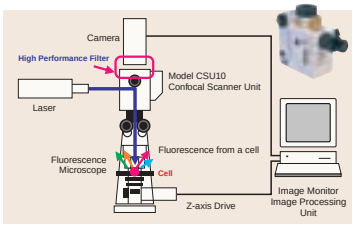
Today, optical technology is used in a wide variety of applications, which include biomedical application and environmental measurement, as well as information and communication, where demand for broadband connectivity is growing rapidly, driven by the popularity of the Internet, IP telephony, and video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

*Main Optical Applications and Wavelength Bands Used*




### Biomedical Application

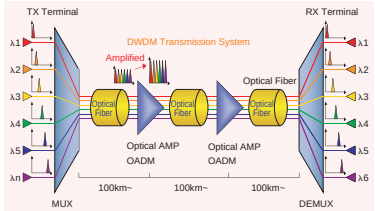
Example of a Configuration of a Scanning Confocal Microscope System




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

### Information & Communication Application

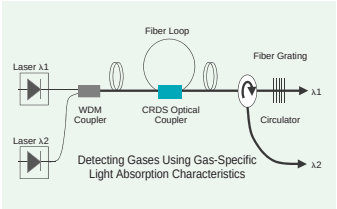
Example of a Configuration of a Dense Wavelength Division Multiplexing (DWDM) Optical Communication System




• 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 | GP-IB × 2 (standard/for external controller), 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)<br>AQ6317 series compatible commands (IEEE488.1) and IEEE488.2 |
| Data storage | Internal storage: 128 MB or more, 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. 150 VA |
| 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.

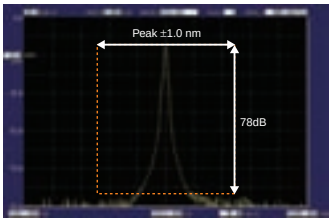
*Optical Spectrum Analyzer* **AQ6370C**

# Redefining Optical Spectrum Measurement Excellence

## Features

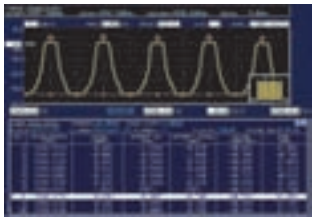
- World Class Optical Performance & Flexibility
  High wavelength resolution: 0.01 nm
  Wide close-in dynamic range: 78dB typ.
  Single and multimode fiber test capability (up to GI 62.5/125µm)
- Improved Measurement Throughput
  Double-speed mode NEW!
  Fast measurement and fast data transfer
- Enhanced 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
- 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**

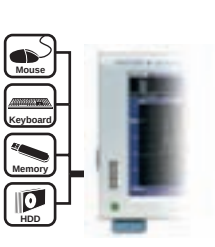
DWDM channels allocated at 50GHz spacing can be measured and analyzed.

## Improved Measurement Throughput

| | |
|---|---|
| 10x | Measurement speed |
| 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

## 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)
  50 dB (±0.2 nm from peak, resolution: 0.05 nm)
  64 dB (±0.4 nm from peak, resolution: 0.05 nm)
  73 dB (±1.0 nm from peak, resolution: 0.05 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

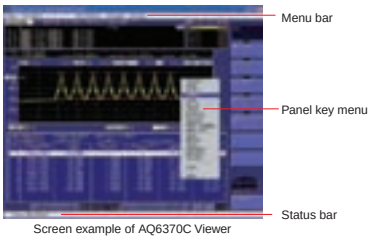
| Model | Suffix Codes | Descriptions |
|---|---|---|
| AQ6370C | | Optical Spectrum Analyzer AQ6370C |
| Spec-code | -10 | Standard model |
| | -20 | High performance model |
| Power cord | -D | UL/CSA Standard |
| | -F | VDE Standard |
| | -R | AS Standard |
| | -Q | BS Standard |
| | -H | GB Standard |
| 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)

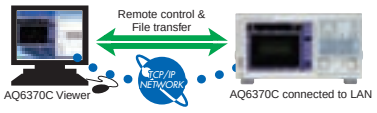
Note. AQ6370 Viewer contains the AQ6370C Viewer.

The AQ6370C Viewer is a PC application software that has the same user interface and functions as the AQ6370C so that you can easily display and analyze waveform data acquired by the AQ6370C.

- **Viewer function**
  Trace data files saved on the AQ6370C 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 AQ6370C Optical Spectrum Analyzer from anywhere on the Ethernet network.
- **File Transfer function**
  Files can be exchanged between AQ6370C and PC.




Screen example of AQ6370C Viewer



*Optical Spectrum Analyzer* **AQ6375**

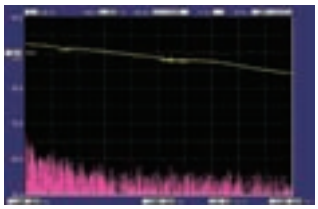
# Long Wavelength OSA 1200 - 2400nm

## 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)

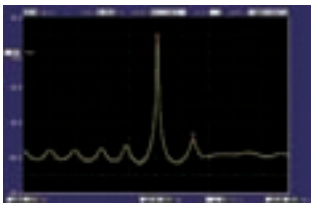
## Unparalleled Optical Performance

■ **High sensitivity in long wavelength**



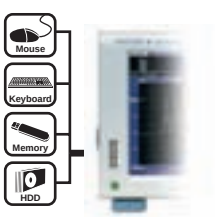
The spectrum of a white light source (yellow) and the background noise of AQ6375 (red)

■ **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

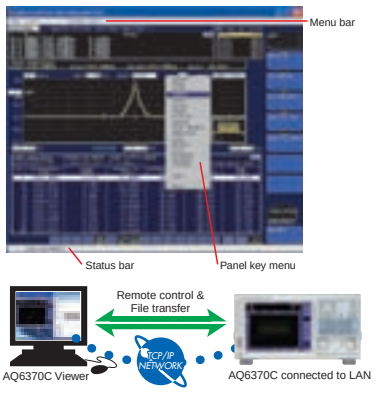
| Model | Suffix Codes | Descriptions |
|---|---|---|
| AQ6375 | | Optical Spectrum Analyzer AQ6375 |
| Spec-code | -10 | Standard model |
| Power cable | -D | Power cord (UL3P) |
| | -F | Power cord (CEE-C7) |
| | -R | Power cord (SAA-3P) |
| | -Q | Power cord (BS3P Rectangular) |
| | -H | Power cord (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.

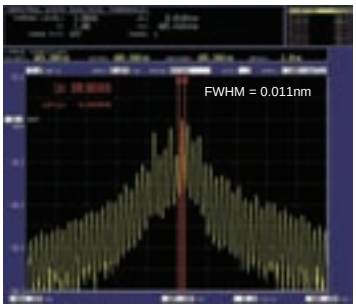
- **Viewer function**
  Trace data files saved on the AQ6375 can be retrieved and analyzed on a PC.
- **Remote Control function**
  The remote control allows you to set measurement conditions and to execute a measurement on AQ6375 Optical Spectrum Analyzer from anywhere on the Ethernet network.
- **File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

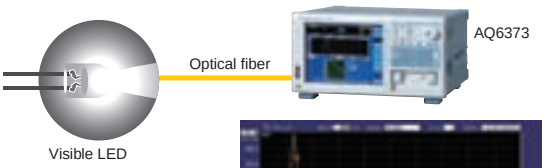
Higher resolution measurement is possible in 400 to 470 nm range.

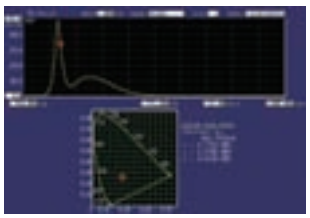
## Applications

- **■ 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

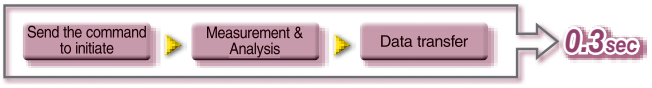
## Product Lineup

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

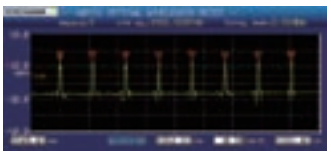
Both models can acquire, analyze and transfer a measurement to a PC within 0.3 seconds. This vastly improves production throughput.




## Various view modes

Multi wavelength view

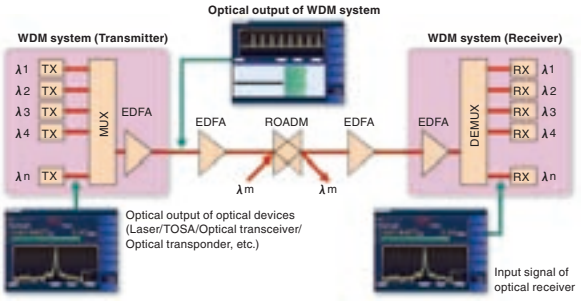

Optical spectrum view



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 |

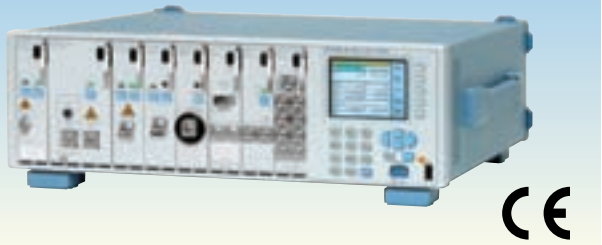
Please refer to the product brochure for details.

## 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.**

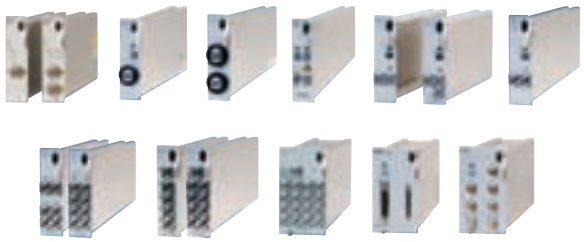
- Flexible and space effective
- Easy-to-View TFT color display
- Remote operation through Ethernet network
- Built-in applications
  - Optical power stability measurement
  - Short-term optical power fluctuation measurement
- Wide variety of plug-in modules
- Hot-swappable modules

## Applications

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

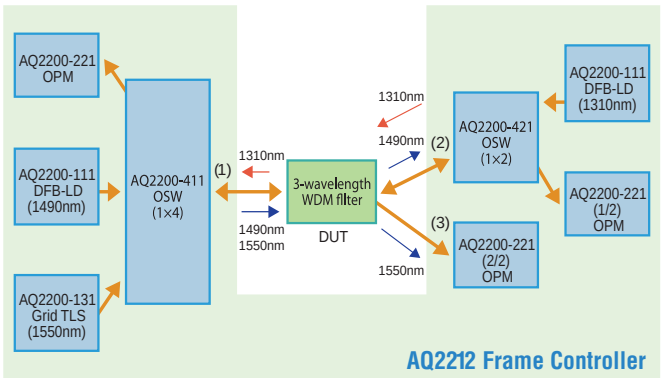
## Frame and Module Lineup

- Frame controllers
  AQ2211 Frame controller (3 slots for modules)
  AQ2212 Frame controller (9 slots for modules)
- Light source modules
  AQ2200-111 DFB-LD module (1310nm, 1490nm, 1-slot)
  AQ2200-131 Grid TLS module (C/L-band, 1 channel) NEW!
  AQ2200-132 Grid TLS module (C/L-band, 2 channels) NEW!
- 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)



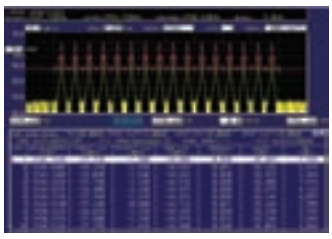
## 3-wavelength Optical Filter Measurement System for GE-PON

A 3-wavelength optical filter for GE-PON splits 1490 nm and 1550 nm optical signals, and pass a 1310 nm optical signal in the return direction. This measurement system measures the insertion losses of wavelengths passing between ports and the isolation of wavelengths blocked.
[Measurement items]
• Insertion loss: (1) to (2) 1490 nm, (1) to (3) 1550 nm, (2) to (1) 1310 nm
• Isolation: (1) to (2) 1550 nm, (1) to (3) 1490 nm, (2) to (3) 1310 nm

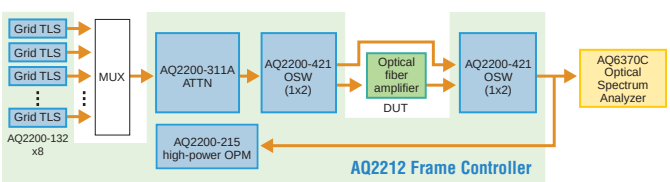



## Optical Fiber Amplifier Measurement System

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.
[Measurement items]
• Gain, NF, and total output power



AQ6370C Measurement Screen



# 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<br>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<br>SMF | 4 | 850/1300nm<br>1310/1550nm | 22.5/24dB (62.5GI)<br>21.5/23dB (50GI)<br>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 | Specifications |
|---|---|---|
| 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 | Specifications |
|---|---|---|
| 735070 | | AQ7932 Emulation Software (Ver3.0 or later) |
| | -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*5 | 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)

| Model | Suffix codes | Description |
|---|---|---|
| SU2006A | | Soft carrying case |
| 735480 (For optical powermeters) | -SCC | Connector adapter (SC) |
| | -FCC | Connector adapter (FC) |
| 735481 (For optical powermeters) | -LMC | Ferrule adapter (ϕ1.25 )* |
| | -SFC | Ferrule adapter (ϕ2.5)* |
| SU2005A (For OTDR, LS and PON Power meter) | -SCC | Universal adapter (SC) |
| | -FCC | Universal adapter (FC) |
| 739871 | -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 |
| 739882 | | Battery pack (Spare) |
| B8070CY | | Shoulder belt |

* : 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 model | Standard (/SLT) | High power (/HLT) | PON (/PPM) |
|---|---|---|---|---|
| Optical power meter | 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 (ϕ1.25) |
| 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<br>GI: -20 ± 1 |
| | Level stability (dB) *4 | ±0.05 | ±0.05 | SM: ±0.05<br>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<br>Detail mode setting range: 850 nm to 1650 nm, 1 nm step<br>CWDM mode setting range: 1270 nm to 1610 nm 20 nm step | | 1310/1490/1550 nm<br>(1490 nm and 1550 nm can be measured separately) |
| Power range (dBm) | -70 to +10 (CW)<br>-70 to +7 (CHOP) | -50 to +27 (CW)<br>-50 to +24 (CHOP) *6 | -70 to +10: 1310/1490nm<br>-50 to +27: 1550nm |
| Noise level | 0.5nW<br>(-63dBm, 1310nm) | 50nW<br>(-43dBm, 1310nm) | 0.5nW(-63dBm, 1310nm)<br>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<br>CHOP(270/1k/2kHz) | CW<br>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

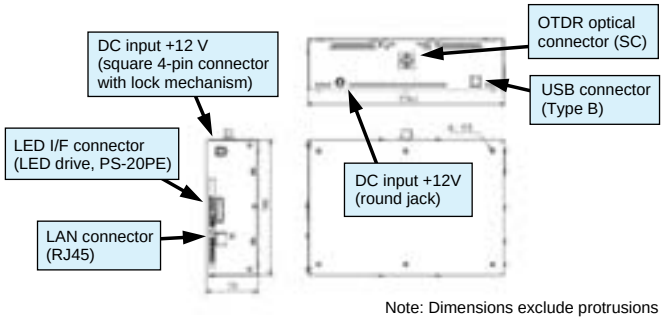
## Specifications

| | | |
|---|---|---|
| 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

# Meters & Portable Test Instruments

# Data Logger

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

### Datum-Y (XL120 Series)

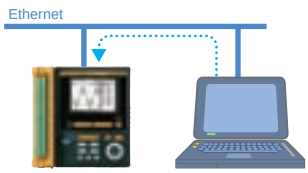
Portable Data Station (Data Logger)

## 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

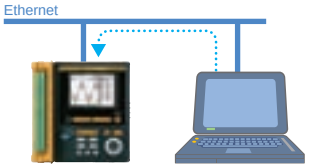
You can easily monitor the Datum-Y screens with the Internet Explorer*1 Web browser (Screen display can be updated every 5, 10, or 30 seconds automatically, or manually). You can use Operator Page to remotely operate Datum-Y, except for turning the power on and off and key locking. You can use Monitor 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.





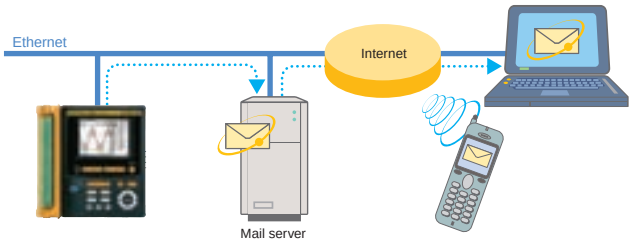
## FTP Server Function

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.

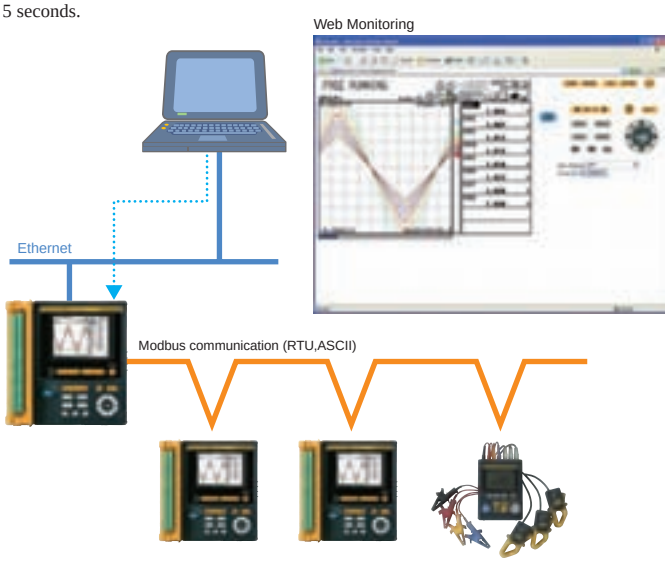



## Specifications

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, wth 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

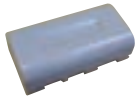
### Model Number

| | 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) |
| | Printer cable | 91010 | RS-232 cable for printer |
| | Printer | 97010 | Includes 1 roll thermal paper and 1 battery pack |
| | Printer thermal paper | 97080 | 10 rolls/set |
| | AC adapter for printer | 94006 | Power supply 200-240 V |
| | 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 |

Printer (97010)

Carrying case (93037)

Lithium ion battery (94009)



Digital I/O cable (91029)

Stand (93039)

# Data Logger

## Check Temp Distribution of Water Cooler

### Application

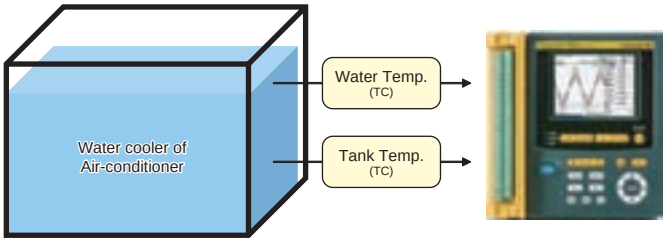
Maintenance for water cooler of air-conditioning equipment

### 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

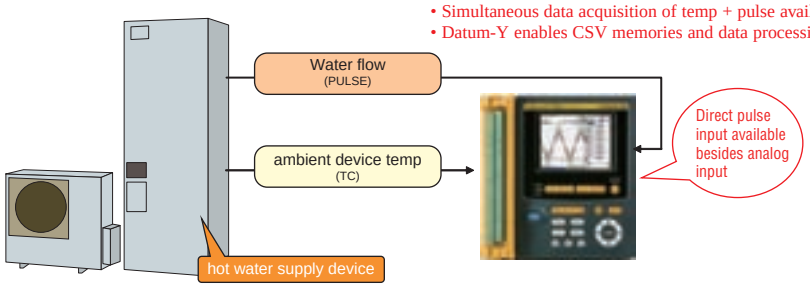
Device temp (TC) and water flow (pulse) evaluation test data in an electric hot water supply device.

### 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 CO2 for environmental research

### Application

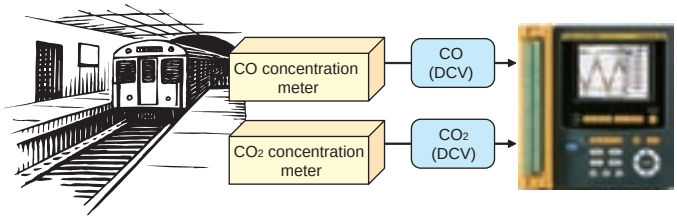
Measure concentration of CO and CO2 at Subway Stations

### 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

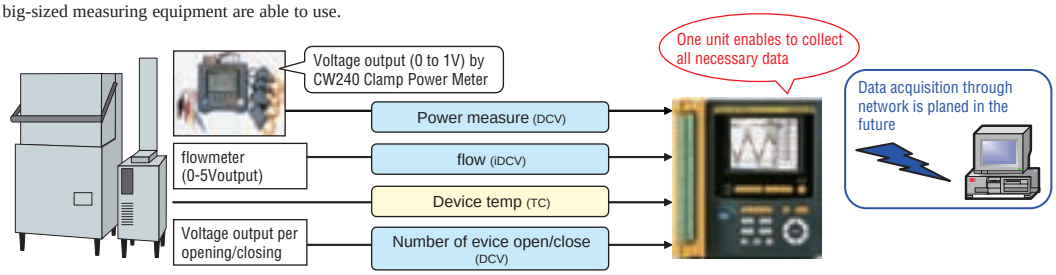
Checking of operating conditions at the customer's site (temp. water flow, power measurement)

### 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 Simple Yet 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<br>50 ~ 500Hz |
| | 1000 V | 999.9 V | |
| LPF<br>ACV | 100 V | 99.99 V | 50 ≤ f ≤ 60Hz: 1.0% + 5<br>60 < f ≤ 400Hz: 5.0% + 5 |
| | 1000 V | 999.9 V | |

* 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*<br>60 < f ≤ 400Hz : 2.0% + 5* |
| | 600 A | 600.0 A*** | |
| LPF<br>ACA | 100 A** | 99.99 A | 50 ≤ f ≤ 60Hz : 1.5% + 5<br>60 < f ≤ 400Hz: 5.0% + 5 |
| | 600 A | 600.0 A*** | |

*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; 100 V range: 10 to 100 Vrms
(Sine wave) 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<br>DCW | 10 kW | 9.999 kW* | ACW: 2.5% + 11**<br>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

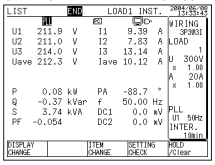
- Simultaneous measurement of power, harmonics, voltage fluctuation, and waveform
- Supports a range of connections
- Wide measurement range
- Leakage current measurement
- External memory
- Large LCD

## 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.

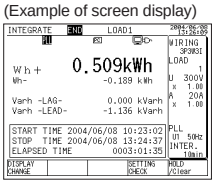
(Example of screen display)



### 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).

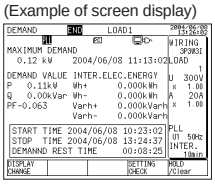
(Example of screen display)



### 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<br>300.0 V<br>600.0 V<br>1000 V | Varies with the clamp and range used.<br>96036 (2 A) 200.0/500.0 mA/1.000/2.000 A<br>96033 (50 A) 5.000/10.00/20.00/50.00 A<br>96030 (200 A) 20.00/50.00/100.0/200.0 A<br>96031 (500 A) 50.00/100.0/200.0/500.0 A<br>96032 (1000 A) 200.0/500.0 A/1.000 kA<br>96034 (3000 A range) 300.0/750.0 A/1.500/3.000 kA<br>(2000 A range) 200.0/500.0 A/1.000/2.000 kA<br>(1000 A range) 100.0/200.0/500.0 A/1.000 kA<br>96035 (3000 A range) 300.0/750.0 A/1.500/3.000 kA<br>(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<br>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<br>96033 (50 A) 130 Arms<br>96030 (200 A) 250 Arms<br>96031 (500 A) 625 Arms<br>96032 (1000 A) 700 Arms<br>96034 (3000 A range) 2400 Arms (3600 Arms for 10 minutes)<br>(2,000 A range) 2400 Arms<br>(1000 A range) 1200 Arms<br>96035 (3000 A range) 3600 Arms<br>(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.<br>96032, 96034, 96035 ±1.0%rdg.±0.8%rng. |
| Power factor influence | — | 96030 ±1.0%rng (45 to 65 Hz, power factor =±0.5)<br>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)<br>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<br>(Zero suppression when below 0.4% of the range)<br>Power (active, reactive, apparent):0 to 130% of each range<br>(Zero suppression when below 0.17% of the range rating).<br>Harmonic level: 0 to 130% of each range<br>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

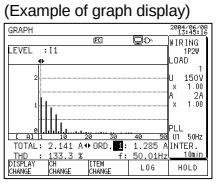
| | |
|---|---|
| Location for use: | Indoor, at an altitude of 2000 meters or less |
| Storage temperature and humidity ranges | -20 to 60°C, 90%RH (no condensation) |
| Operating temperature and humidity ranges | 5 to 40°C, 5 to 80%RH (no condensation) |
| Insulating resistance | 500 VDC, 50 MΩ or greater<br>Between voltage input terminals and case<br>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)<br>Between voltage input terminals and case<br>3.32 kVAC rms for one minute (Sensed current: 1 mA)<br>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)<br>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)<br>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

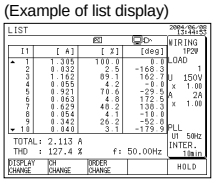
### Harmonic Measurement

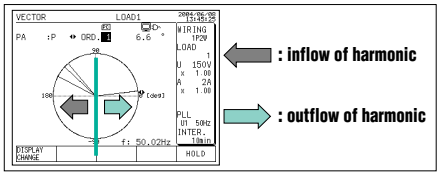
In many cases, inverter power supplies are used to drive air-conditioners and compressors. These power supplies cause distortions in voltages and currents, leading to malfunctions and power loss. Therefore, investigation and control of influences on the main power supplies by harmonics is necessary.

(Example of graph display)



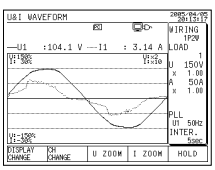
(Example of list display)





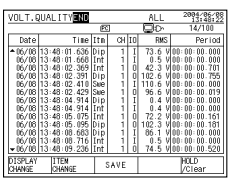

### Waveform Measurement

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<br>Clamp 96030: 20/50/100/200 A<br>Clamp 96031: 50/100/200/500 A<br>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<br>Clamp 96030: 250 Arms<br>Clamp 96031: 625 Arms<br>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

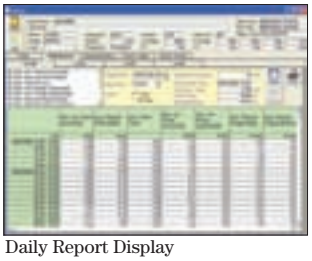
- Measurement parameters: Voltage rms (V), current rms (A), active power (W), frequency (Hz)
- Measurement accuracy (at power factor 1, including clamp)
  Voltage: ±(0.3% rdg + 0.2% rng)
  Current/active power: ±(0.8% rdg + 0.4% rng) when using clamps 96030, 96031, and 96033
  ±(1.2% rdg + 0.8% rng) 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

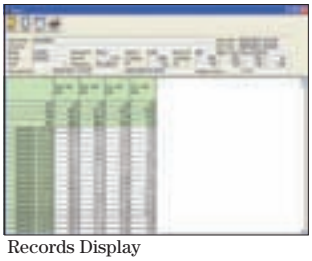
### AP240E
Data Analysic Program for CW series

- 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 |
| Printer | 97010 | |
| AC adapter (for printer, Europe) | 94006 | Power Supply 200-240 VAC |
| AC adapter (for printer, USA) | 94007 | Power Supply 100-120 VAC |
| 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 |
| Thermal paper for printer (10 rolls) | 97080 | |
| AC adapter for 96035 | 94013 | For AC 120V |
| | B9108WB | For AC 220-240V |
| 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.

**Printer** 97010

| 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) |
| Printer cable | 91010 | RS232 printer cable, length 1.5 m |
| 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 |
| Printer | 97010 | Includes one roll of thermal paper and one battery pack |
| AC adapter (for printer, Europe) | 94006 | Power Supply 200-240 VAC |
| AC adapter (for printer, USA) | 94007 | Power Supply 100-120 VAC |
| Printer thermal paper | 97080 | 10 rolls |
| AC adapter for 96035 | 94012 | For AC 100V |
| | 94013 | For AC 120V |
| | B9108WB | For AC 220-240V |
| Case for Main Unit | 93023 | With magnet |
| Portable Case | 93024 | For Main Unit + Accessories |
| Power Supply Case | 98030 | |
| CW viewer | AP240E | |

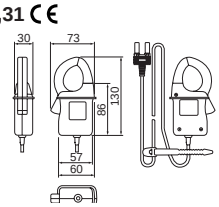
## Clamp Probes for CW240/CW120 series

| 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 |

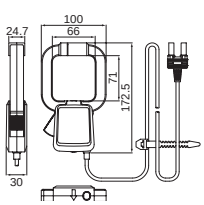
* Need to purchase AC adapter separately

## External Dimensions

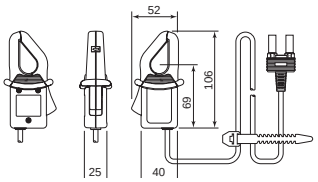
**96030,31** CE unit: mm



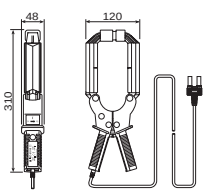

**96032** unit: mm



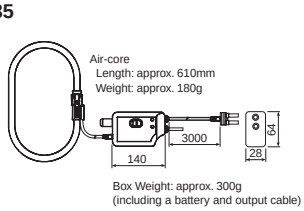

**96033** unit: mm



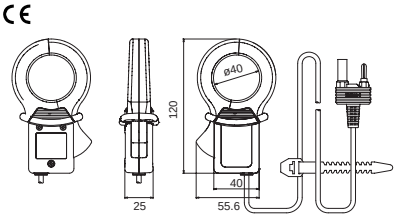

**96034** unit: mm




**96035** unit: mm



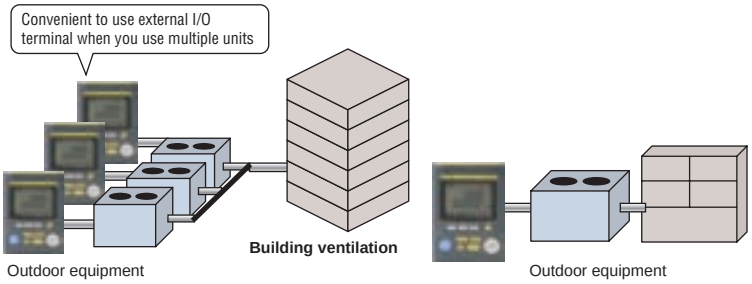

**96036** CE unit: mm



## Energy Saving for Air-conditioning & Freezing machine

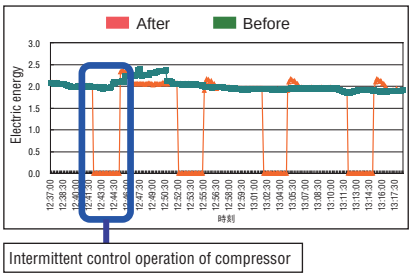
### Introduction Example

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



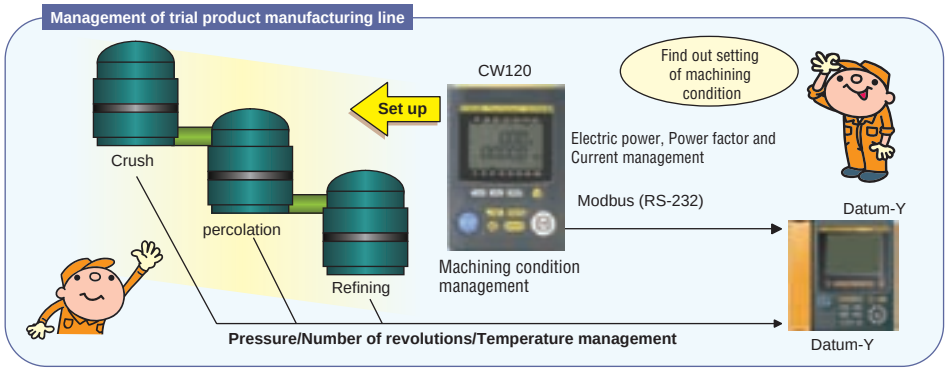

Point: Min data saving interval is 1 second

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




## Food company - Sesame oil production plant

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



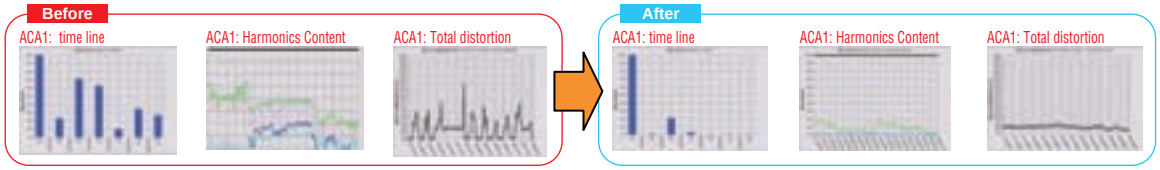

## Harmonics measurement

**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



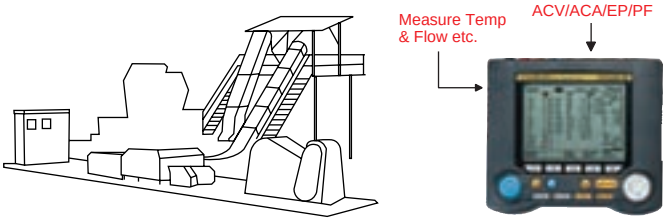

Result: Sharp decrease of relative harmonic content after 5thorder.Distortion rate is less than 30% maximum

## 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.



# Handy Calibrator

## 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 JPT100 | 0.1°C | -200.0 to 850.0°C | ±(0.025% + 0.3°C) |
| | | | -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

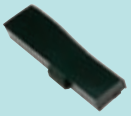
### Measurement Unit

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 JPT100 | 0.1°C | -200.0 to 850.0°C | ±(0.05% + 0.6°C) |
| | | | -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<br>-F For VDE Standard<br>-H For GB Standard<br>-N For NBR Standard<br>-P For KC Standard<br>-R For AS Standard<br>-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)<br>One set of 1 red and 1 black cables<br>Length: Approx. 1.7m |

## 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<br>Simultaneous signal generation/measurement, output 5 V DC/10 kΩ or greater: Approximately 20 hours<br>Simultaneous signal generation/measurement, output 20 mA/5 V: Approximately 12 hours<br>(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<br>EN61326-1<br>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)<br>(-100°C or greater)<br>±(0.02% + 1°C)<br>(-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)<br>(0°C or greater)<br>±(0.02% + 1°C)<br>(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)<br>(100°C or less)<br>±(0.02% + 1.5°C)<br>(100°C or greater) | 1°C |
| | S | | | |
| | B | 600–1800°C | ±(0.02% + 2°C)<br>(1000°C or less)<br>±(0.02% + 1.5°C)<br>(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 |
| | 300 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)<br>(-100°C or greater)<br>±(0.05% + 2°C)<br>(-100°C or less) | 0.1°C |
| | E | | |
| | J | | |
| | T | | |
| | N | | |
| | L | | |
| | U | | |
| | R | ±(0.05% + 2°C)<br>(100°C or greater)<br>±(0.05% + 3°C)<br>(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 | **94012, 94013, B9108WB** | **B9108WA** | **B9108XA** | **91017** |
| Remarks | 94012: 100 V AC power supply adapter<br>94013: 120 V AC power supply adapter<br>B9108WB: 220–240 V AC power supply adapter | For reference junction compensation | Lead cables, RJ sensor, etc. can be stored | D-sub 9-pin (female) |

# Handy 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 | Extemal 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)<br>0.05% + 2°C (≤-100°C) | 0.07% + 1.5°C (>-100°C)<br>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)<br>0.05% + 2°C (≥100°C) | 0.07% + 3°C (<100°C)<br>0.07% + 2°C (≥100°C) | 1°C |
| | **S** | | | | |
| | **B** | 600 to 1800°C | 0.05% + 4°C (<1000°C)<br>0.05% + 3°C (≥1000°C) | 0.07% + 4°C (<1000°C)<br>0.07% + 3°C (≥1000°C) | |
| | **L** | –200 to 900°C | 0.05% + 0.5°C (<0°C)<br>0.05% + 1°C (≥0°C) | 0.07% + 1.5°C (<0°C)<br>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<br>**(JPT100)** | | –200.0 to 850.0°C<br>(–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, RELΔ%

## 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 CAT I
Lead cables (98064): 70 VDC, 100 mA CAT I
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.

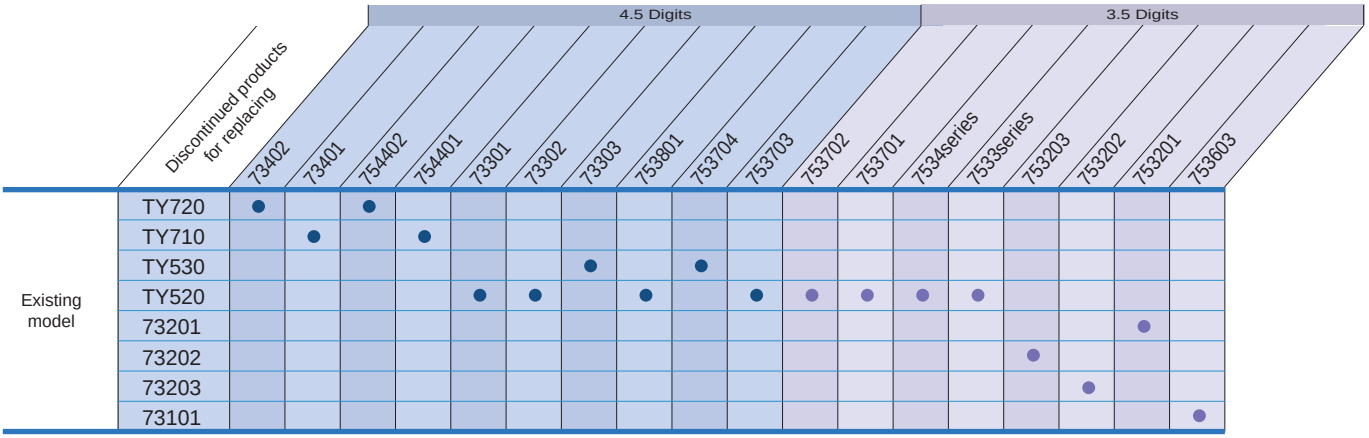
# Digital Multi Meter

## Handheld Digital Multi Meter Sellection

| Function item | Handhel Digital Multi Meter Models | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 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<br>Lower: 20Hz to 1kHz | Upper: 1kHz to 10kHz<br>Lower: 10kHz to 20kHz | Upper: 20kHz to 50kHz<br>Lower: 50kHz to 100kHz | Upper: 10 to 20Hz<br>Lower: 20Hz to 1kHz | Upper: 1kHz to 10kHz<br>Lower: 10kHz to 20kHz | Upper: 20kHz to 50kHz<br>Lower: 50kHz to 100kHz |
| | 50mV | —<br>— | —<br>— | —<br>— | 2+80<br>0.4+40 | 5+40<br>5.5+40 | 15+40<br>15+40 |
| | 50mV/5V/<br>50V/500V | 1.5+30 | 0.7+30<br>2+50 | —<br>— | 1+30 | 0.4+30<br>1+40 | 2+70<br>5+200 |
| | 1000V | 0.7+30 | 3+30<br>— | —<br>— | 0.4+30 | 3+30<br>— | —<br>— |
| ACV [MEAN] | | | | | 10 to 20Hz | 20Hz to 500Hz | 500Hz to 1kHz |
| | 50mV | — | | | 4+80 | 1.5+30 | 5+30 |
| | 50mV/5V/<br>50V/500V/1000V | — | | | 2+30 | 1+30 | 3+30 |
| DCV+ACV | | Upper: DC,10 to 20Hz<br>Lower: DC,20Hz to 1kHz | Upper: DC,1kHz to 10kHz<br>Lower: DC,10kHz to 20kHz | Upper: DC,20kHz to 50kHz<br>Lower: DC,50kHz to 100kHz | Upper: DC,10 to 20Hz<br>Lower: DC,20Hz to 1kHz | Upper: DC,1kHz to 10kHz<br>Lower: DC,10kHz to 20kHz | Upper: DC,20kHz to 50kHz<br>Lower: DC,50kHz to 100kHz |
| | 5V/50V/500V | 1.5+10<br>1+10 | 1+10<br>2+10 | —<br>— | 1.5+10<br>0.5+10 | 0.5+10<br>1+10 | 2+10<br>5+20 |
| | 1000V | 1.5+10<br>1+10 | —<br>— | —<br>— | 1.5+10<br>0.5+10 | —<br>— | —<br>— |
| DCA | 500µA/5000µA/<br>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/<br>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/<br>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/<br>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<br>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<br>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 1000V | 0.5 + 5 | 1 + 5 | 1.5 + 5 |
| | | | | — |
| 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)<br>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<br>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<br>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<br>2.0%+5<br>2.0%+20<br>2.0%+5<br>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<br>0.75%+1<br>2.0%+1<br>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<br>4.000 V<br>40.00/400.0/600 V | 1.2%+2<br>0.7%+1<br>1.2%+1 | >100 MΩ<br>11 MΩ<br>10 MΩ |
| ACV | 4.000 V<br>40.00/400.0/600 V | 2.0%+5 | 10 MΩ |
| Resistance | 400.0 Ω<br>4.000 k/40.00 k/400.0 kΩ<br>4.000 MΩ<br>40.00 MΩ | 1.2%+2<br>2.0%+3<br>5.0%+3 | |
| Continuity check | 400.0 Ω | – | |
| Diode test | 2.00 V | 1.5%+1 | Open-circuit Voltage<3.4 V<br>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) | |
| | | 50/60Hz | 40Hz to 1kHz |
| AC 0.1 to 130A | AC10mV/A(AC 1~1300mVrms) | 1.2%+0.4mV | 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)<br>Low battery warning ：2.2V±0.2V or less red LED flash<br>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<br>Cord length: Approx.1200mm Weight: Approx 140g | | |
| Applicable standards | EN61010-1：CAT Ⅲ Pollution degree2, Altitude 2000m or less for indoor use<br>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 | ● | ● | | ● | | | | |
| Printer Adapter and Cable | 97016 | Printer Adapter and Cable | ● | ● | | ● | | | | |
| Printer | 97010 | Thermal printer(paper width:112mm) | ● | ● | | ● | | | | |
| AC adpter | 94006 | For Europe 230VAC±10% | ● | ● | | ● | | | | |
| | 94007 | For USA 120VAC±10% | ● | ● | | ● | | | | |
| Thermal printer paper | 97080 | 1 Package of 10 rolls | ● | ● | | ● | | | | |
| 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

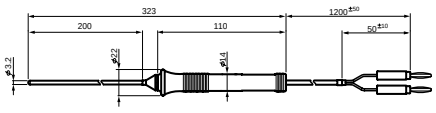

98073


96095

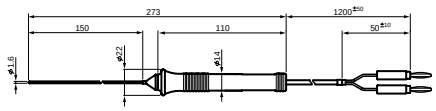

96001


RD031

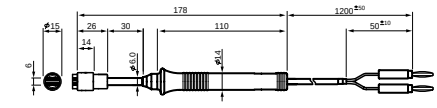
90050



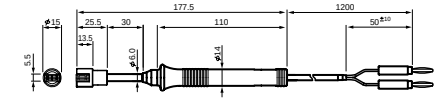

90051




90055




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)<br>3.5+5 (40 to 1kHz) |
| DCA | 400/1000A | 1.0+5 |
| ACV | 40/400/600V | 1.5+5 (50/60Hz)<br>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)<br>3.0+2 (40 to 1kHz) | 1.5+2 |
| | 200A | 1.5+2 (50/60Hz)<br>3.5+2 (40 to 1kHz) | 2.0+2 |
| | 1000A (0 to 500A) | 1.5+2 (50/60Hz)<br>3.5+2 (40 to 1kHz) | 2.0+2 |
| | 1000A (501 to 1000A) | 5.0 (50/60Hz)<br>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)<br>3.0+4 (40 to 500Hz)<br>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)<br>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<br>250V/200MΩ<br>500V/2000MΩ<br>1000V/2000MΩ | 0–600V | 3 1/2-digit LCD | Automatic discharge<br>Conductor resistance measurement<br>Comparator function<br>Memory function |  | P.81 |
| Analog insulation testers | 2 & 3 ranges | 2406E CE | 31 (N/A) | 25V/5MΩ<br>50V/10MΩ<br>125V/20MΩ | 0–300V | Analog | Automatic discharge<br>Battery check |  | P.82 |
| | | | 41 (EL-illuminated) | | | | | | |
| | | | 32 (N/A) | 125V/20MΩ<br>250V/50MΩ | 0–300V | | | | |
| | | | 42 (EL-illuminated) | | | | | | |
| | | | 33 (N/A) | 125V/20MΩ<br>250V/50MΩ<br>500V/100MΩ | 0–600V | | | | |
| | | | 43 (EL-illuminated) | | | | | | |
| | | | 34 (N/A) | 250V/50MΩ<br>500V/100MΩ<br>1000V/2000MΩ | 0–600V | | | | |
| | | | 44 (EL-illuminated) | | | | | | |
| | | | 35 (N/A) | 250V/500MΩ<br>500V/1000MΩ<br>1000V/2000MΩ | 0–600V | | | | |
| | | | 45 (EL-illuminated) | | | | | | |
| | Single range | MY10 CE | 01 (afterglow-illuminated) | 125V/20MΩ | 0–250V | Analog | Automatic discharge<br>Battery check |  | P.82 |
| | | | 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.82 |
| | | | 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 | | | | |

* JIS mark has changed from 2008

## 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<br>250V/200MΩ<br>500V/2000MΩ<br>1000V/2000MΩ | 240651 to 55*1<br>240661 to 65*1<br>3213D31 to D35*2 | *1 2406D series is single or 2 range.<br>*2 3213D series is single range. |
| Analog insulation testers | 2 & 3 ranges | 2406E CE | 31 | 25V/5MΩ<br>50V/10MΩ<br>125V/20MΩ | 240631 | |
| | | | 41 (EL-illuminated) | | | |
| | | | 32 | 125V/20MΩ<br>250V/50MΩ | – | |
| | | | 42 (EL-illuminated) | | | |
| | | | 33 | 125V/20MΩ<br>250V/50MΩ | 240622 | |
| | | | 43 (EL-illuminated) | 500V/100MΩ | 240626 | |
| | | | 34 | 250V/50MΩ<br>500V/100MΩ<br>1000V/2000MΩ | 240623/25 | |
| | | | 44 (EL-illuminated) | | | |
| | | | 35 | 250V/500MΩ<br>500V/1000MΩ<br>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˚C/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.

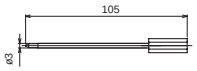
*1 Regarding external dimensions of cases, Pls refer to each product specification.

*2 For using with MYSeries, 98052 is necessary.

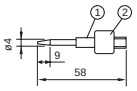
## Spare Probe Tips

Unit: mm

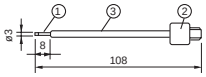
**99011**



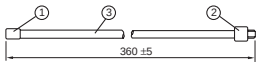

**B9600GN**




**B9600NZ**




**B9600NX**



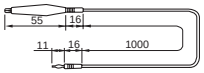

| No. | Description | Remarks |
|---|---|---|
| ① | Testing shank | Metal shank with ø6 screw |
| ② | Fastening nut | ABS resin |
| ③ | PVC-clad | |

## Others

Unit: mm

**B9303XE**

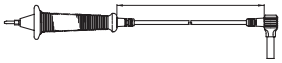
**3218 03**



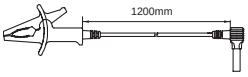

## Probes

Unit: mm

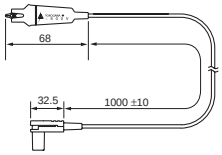
**98001**



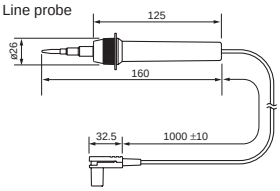

**98002**



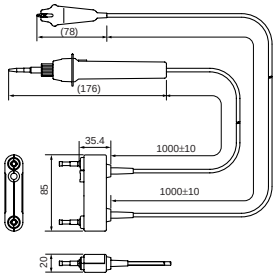

**98007** Earth probe




Line probe




**98050**



# Earth Tester/Leakage Current Tester/Illuminance Meter

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

### 323511
Earth Tester

- 3 terminal measurement of earth resistance
- Accurate, wide-range logarithmic scale
- AC potentiometer bridge, synchronous detector
- Portable yet rugged and shockproof

#### 323511 Specifications

Measuring Range:
  Earth Resistance: 0 to 10 to 100 to 1,000 Ω
  Earth Voltage: 0 to 30 V
Scale:
  Earth Resistance: 3-digit logarithmic continuous scale on measuring dial
  Earth Voltage: Uniform scale on galvanometer
Accuracy:
  Earth Resistance: ±5% of 2 Ω in the range of 0 to 2 Ω
  ±2.5% of 20 Ω in the range of 2 to 20 Ω
  ±2.5% of 200 Ω in the range of 20 to 200 Ω
  ±5% of 1,000 Ω in the range of 200 to 1,000 Ω
  Earth Voltage: ±5% of full scale value
Measuring Frequency: 500 Hz

### 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<br>Earth Voltage: 200V |
| Accuracy | Earth Resistance: 20Ω range: ±2%rdg±0.1Ω<br>200Ω range: ±2%rdg±3dgt<br>2000Ω range: ±2%rdg±3dgt<br>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<br>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 Illuminance Meters

Measuring range: 9.99 (51021)/99.9/999/ 9,990/99,900/999,000 lx
Accuracy: +/-(4% rdg + 1 dgt) (51011), +/-(2% rdg + 1 dgt) (51021)
Features: Timer hold, Ripple measurement, Average illuminance computation function

#### 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. (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<br>Type J : -200°C to 1000°C<br>Type E : -200°C to 700°C<br>Type T : -200°C to 400°C<br>Voltage input ±100 mV, ±1 V |
| Accuracy (only the main unit) | Thermocouple -200.0 to 100.1°C<br>: ±(0.1% of rdg + 0.7°C)<br>-100.0°C or above<br>: ±(0.1% of rdg + 1.0°C)<br>Voltage input ±(0.1% of rdg + 0.2% of range) |
| Measuring interval | Collector mode:<br>0.5 seconds or longer when 1 channel is used.<br>Logging mode:<br>1 second to 24 hours when 1 channel is used. |
| Data capacity | 5000 data items when used in collector mode only,<br>20000 data items when used in logging mode only. |
| External dimensions | Approx. 151(H) × 56(W) × 33(D) mm<br>(excluding protrusions)<br>Weight: Approx. 180 g<br>(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 |
| Printer | 97010 |
| AC adapter for printer (Europe) | 94006 |
| Thermal paper for printer (10 rolls) | 97080 |
| RS-232C cable for printer connection | 91010 |

## 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

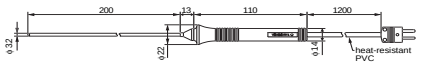
Temperature Probe (for type K)

| Model | Probe type | Measuring range | Accuracy | Response time (second) (90% response) | 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 | | 1200 (included cord) |

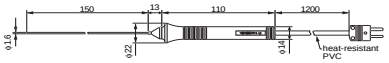
NOTE: 90030 is using polyimide to insulate from objects to be measured.
Manufacturers of polyimide are announcing not to apply polyimide directly for food, internal and body fluid.

## Dimensions

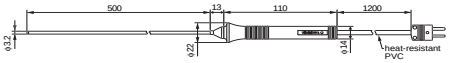
90020
Material:
SUS316




90021
Material:
SUS316




90022
Material:
SUS316

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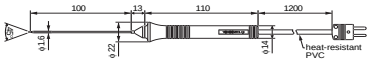
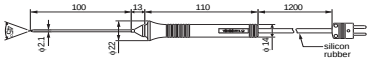
Material:
SUS316




90024
Material:
SUS316

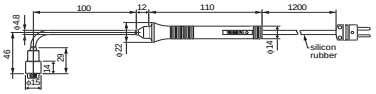



245907

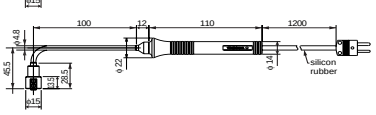

90030
Material:SUS316


90032
Material:SUS316


90031
Material:SUS316




90033
Material:SUS316



# 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.

## Used in testing laboratory and industrial test

### 2791 Series
Slide Resistors

Model 2791 is composed of resistance wire with an insulating coating wound on a frame of special ceramic and a sliding brush that maintains contract with the wire. Resistance is continuously variable and can be increased or decreased as desired.

### 2791 series Specifications

Available Models:

| Code | Nominal Value | Allowable Input Current |
|---|---|---|
| 279101 | 4,800 Ω | 0.18 A |
| 279102 | 1,400 Ω | 0.35 A |
| 279103 | 600 Ω | 0.5 A |
| 279105 | 170 Ω | 1.0 A |
| 279108 | 39 Ω | 2.0 A |
| 279110 | 10 Ω | 4.0 A |
| 279112 | 4.7 Ω | 6.0 A |

Allowable Deviation: ±20% of nominal value.
Insulation Resistance: More than 5 MΩ at 500 V DC between terminal and case.
Dielectric Strength: 1,000 V AC for one minute between terminal and case.

## 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

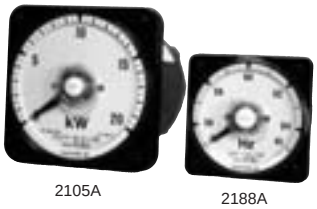
Portable Instruments

- 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 | 2109 |

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.

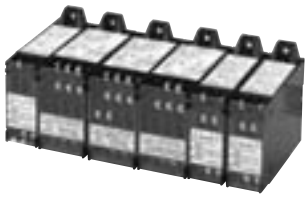
Line-up

- 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

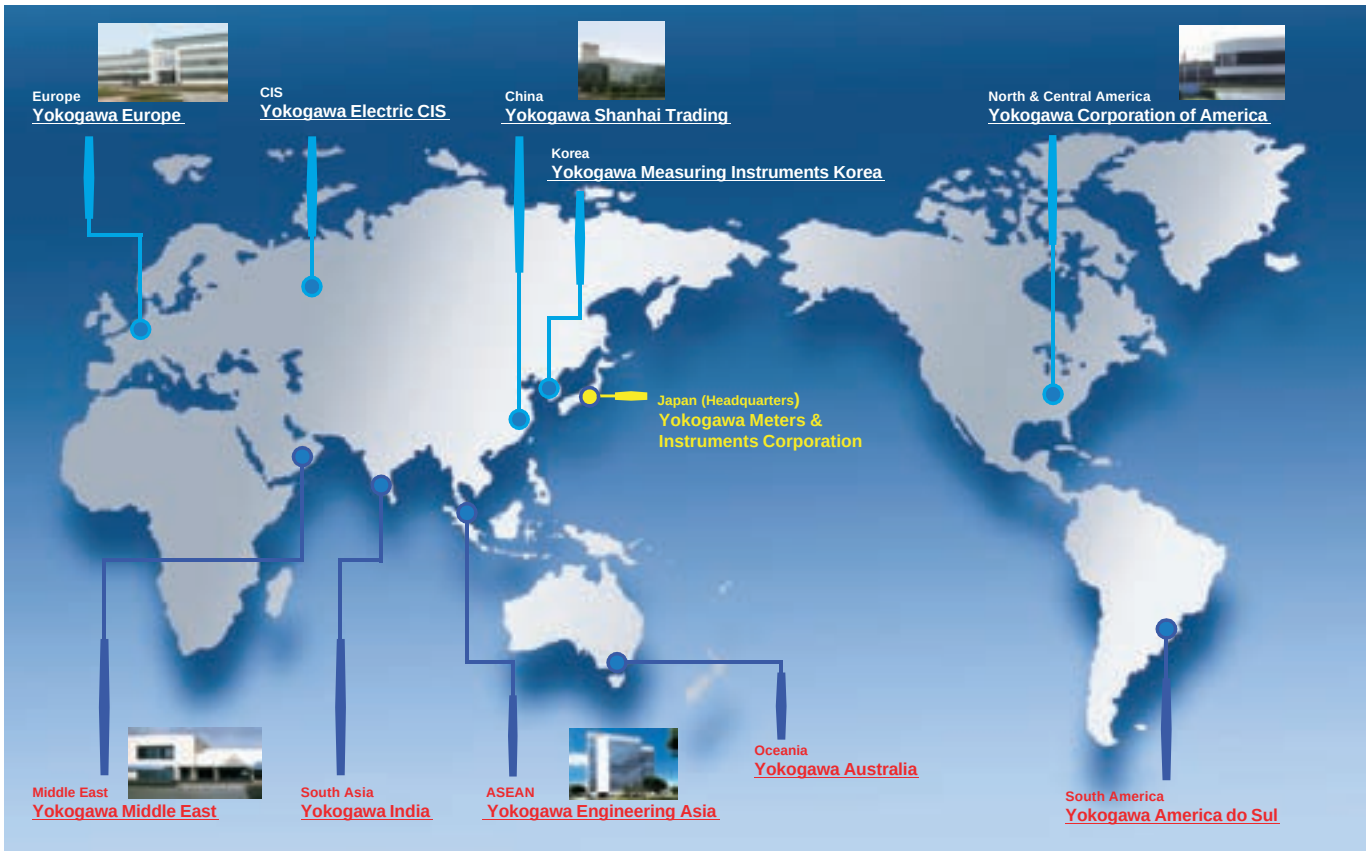
| | |
|---|---|
| DC-DC isolator | 2371A |
| AC Voltage, current (average rectified) | 2372A |
| AC Voltage, current (RMS rectified) | 2373A |
| AC Voltage, current (True RMS rectified) | 2374A |
| Power | 2375A |
| Reactive power | 2376A |
| Phase | 2377A |
| Power factor | 2377A |
| Frequency | 2378A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

Dimensions (mm)

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

# Worldwide Business Operations

## Yokogawa Meters & Instruments Global Network

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■ Some of products is handled by other channels.

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**Our Web site will help you find what you look for.**

## http://tmi.yokogawa.com/


- Digital Oscilloscopes
- Digital Power Analyzers
- Data Acquisition Equipment
- Optical Measuring Instructments
- Generators, Sources

- Meters
- Portable Data Stations
- Digital Multimeters/Circuit Testers
- Insulation Testers/Earth Tester
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- Clamp-on Testers
- Thermometers
- Calibrators
- DC Precision Measuring Instruments
- Environmental Measuring Instruments
- Other Test & Measurement Instruments

## http://www.yokogawa.com/ymi/

YOKOGAWA

Yokogawa Meters & Instruments Corporation

World Wide Web site at
**http://tmi.yokogawa.com**

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


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