

# High Accuracy Power Analysis. Anywhere, Anytime.



Upgrade New current sensors

Engineered for more accurate power measurement

Improved frequency bandwidth and accuracy







# Full-featured compatibility with current sensors

Current sensing has a substantial impact on power measurement accuracy as well as work efficiency. Hioki designs and develops its current sensors in-house for maximum compatibility with power analyzers and advanced power measurement capability.

# Get started making measurements right away

# Standard current sensor power supply and recognition functionality

The PW3390 supplies power to current sensors and automatically sets the appropriate scaling ratio for each. Simply connect sensors and get started making measurements.

# Accurately measure highfrequency, low-powerfactor power

# Current sensor automatic phase correction function

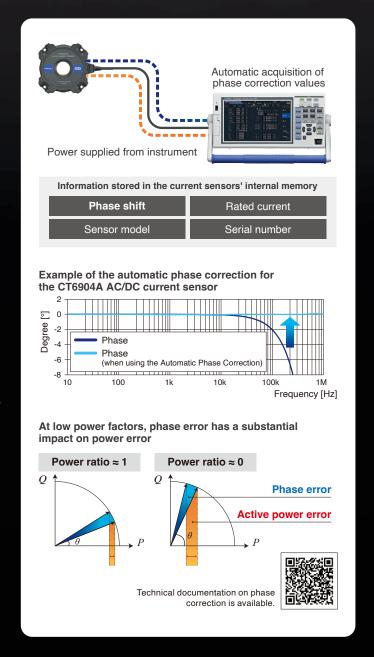
Correcting phase error is important in order to accurately measure high-frequency, low-power-factor power. The PW3390 automatically acquires each current sensor's phase characteristics and performs phase correction with a resolution of 0.001°. As a result, the instrument is able to realize current sensors' full performance without requiring a troublesome configuration process.

# Record measurement conditions

# Automatic acquisition of current sensor information

When you connect a current sensor to the PW3390, the instrument automatically acquires its model and serial number.

Detailed measurement conditions can be recorded along with measurement data.





# 4 Extensive product line

EV inverter system R&D Evaluation of reactor and transformer loss





Pass-through sensors offer the ultimate level of accuracy, frequency band, and stability. Broadband measurement of up to 10 MHz and the ability to measure large currents of up to 2000 A make these sensors ideal for use in state-of-the-art R&D.

WLTP-compliant fuel economy (electricity cost) performance testing





This clamp-style sensor lets you quickly and easily connect the instrument for measurement. It's used in testing of assembled vehicles where it would be difficult to cut wires. Capable of withstanding temperatures of -40°C to 85°C, the device can be used in the hot environment of an engine compartment.

Evaluation of reactor and transformer loss Evaluation of inverters in energy-saving household appliances





Our proprietary DCCT method allows our 50 A direct-wired sensor to deliver world-class accuracy and bandwidth.

# Are you making measurements under conditions that approach the actual operating environment?

Broadly speaking, there are two ways to detect current: the current sensor method and the direct wiring method. Current sensors let you evaluate equipment accurately under wiring conditions that approach the actual operating environment.

# Measurement example using the current sensor method Power converter Short wiring

Power

supply

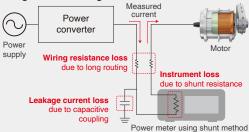
Signal converted to voltage

Small insertion loss
Little effect from routing

PW3390

A current sensor is connected to the wiring on the measurement target. This reduces the effects of wiring and loss on the side of the measurement instrument. This allows measurements with wiring conditions that are close to the actual operating environment of a highly efficient system.

# Measurement example using the direct wiring method



The wiring of the measurement target is routed for connecting to the current input terminal. However, this results in an increase in the influence of power loss from wiring resistance and capacitive coupling, and meter loss ing due to shunt resistance. All of this loss leads to larger degradation in accuracy.

# High Accuracy and Mobility. A New Value for Power Analysis.

The first-generation Power Analyzer 3390 debuted in 2009 with a collection of the latest measurement technologies packed into a compact design.

Pair with Hioki current sensors and take them anywhere to immediately make highly accurate measurements.

This was the unique value of the 3390.

Now, Hioki has enhanced this value while refining the measurement technology even further.

Proper accuracy and bandwidth to precisely measure inverter output.

Phase shift function for the exact measurement of high frequency, low power factor power.

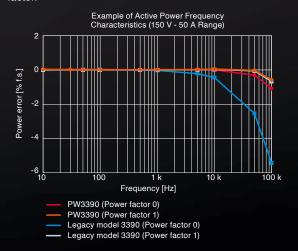
A broad current sensor lineup that expands the range of measurement possibilities.

Refinements that empower you to conduct precise power analysis in any situation.



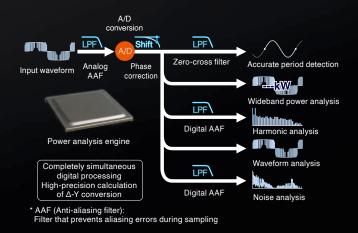
# Complete Pursuit of Measurement Accuracy and High Frequency Characteristics

The PW3390 delivers 4 input channels and ±0.04% basic accuracy for power - the top instrument in its class. Achieve more precise measurements of the power and efficiency of high efficiency equipment used in power electronics. Further, a 200 kHz measurement band and flat amplitude and phase characteristics up to high frequencies enable the precise measurement of power at top frequency levels and low power factor.



# Power Analysis Engine That Achieves High-Speed Simultaneous Calculation on 5 Systems

Precisely capture input waveforms with 500 kS/s high-speed sampling and a high resolution 16-bit A/D converter. The power analysis engine performs independent digital processing for 5 systems: period detection, wideband power analysis, harmonic analysis, waveform analysis, and noise analysis. High-speed simultaneous calculation processing enables both precise measurements and a 50 ms data refresh rate.



# **Current Sensors for the Thorough Pursuit of High Accuracy. Achieve Superior Accuracy for High-Frequency, Low Power Factor Power.**

# High Accuracy Pass-Through Sensor

Pass-through sensors deliver accuracy, broad-band performance, and stability. Measure currents of up to 1000 A with a high degree of accuracy across a broad range of operating temperatures.



# High Accuracy Clamp Sensor

Clamp for quick and easy connections. A rich lineup of sensors includes small sensors for narrow spaces and high-current sensors.



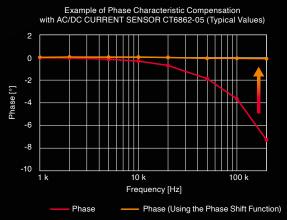
# High Accuracy Direct Wiring Sensor

Newly developed DCCT method delivers expansive measurement range and superior measurement accuracy at a rating of 50 A.



## **Built-in Current Sensor Phase Shift Function**

Equipped with new virtual oversampling technology. Achieve phase shift equivalent to 200 MS/s while maintaining a high speed of 500 kS/s, as well as a high resolution of 16 bits. Set and correct the phase error of the current sensor at a resolution of 0.01°. Use of the phase shift function results in a dramatic reduction of measurement error. This allows the measurement of high-frequency, low-power factor power included in the switching frequency of inverter output, which is difficult to measure with conventional equipment.



 Virtual oversampling:
 Technology that uses a sampling frequency several hundred times higher than the actual sampling frequency to perform virtual deskewing





# In the Laboratory or in the Field

# Take Highly Accurate Measurements Even in Tough Temperature Conditions

Severe temperature environments, such as engine rooms with intense temperature changes and constant temperature rooms, can hinder high accuracy measurements. Hioki provides a lineup of high-accuracy through-type and high-accuracy clamptype current sensors with excellent temperature characteristics and wide operating temperature ranges.

The PW3390 can operate from a low temperature environment of -10°C to a high temperature of 40°C, allowing you to take it to measure in various environments.



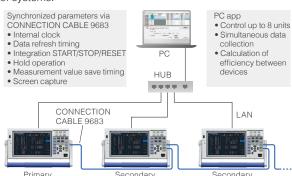
# Max. 6000 A Measurement on 50 Hz/60 Hz Lines

The CT7040 AC FLEXIBLE CURRENT SENSOR series can measure commercial power lines up to 6000 A, including solar power conditioner output. Even thick cables can be wired easily among crowded wiring or in narrow locations.



# Acquire Data from up to 8 Synchronized Units (32 Channels)

When you connect CONNECTION CABLE 9683 to multiple PW3390 units, the control signals and internal clocks synchronize. From the primary unit, you can control the measurement timing on the PW3390 units that are set as secondaries. With interval measurement, you can save synchronized measurement data to a CF card or a PC to achieve simultaneous measurements across a larger number of systems.



# Achieve High Accuracy Measurement Even in the Field

Dramatically compact and light-weight form factor achieved by concentrating the calculation functions in the power analysis engine. Highly accurate measurements normally achieved in the laboratory are now also possible in the field.



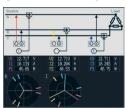
# **External Power Supply Not Needed for Sensor Connections**

Power can be supplied to the current sensor from the main unit, so there is no need to provide a separate external power supply for the current sensor. Connected sensors are recognized automatically, for reliable and quick measurements.



# Wiring Displays and Quick Setup Lets You Begin Measuring Immediately

Perform wiring while checking wiring diagrams and vectors on the screen. Optimum settings are performed automatically simply by selecting a connection and using the guick setup function.



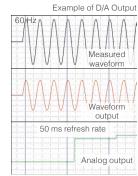
# Extensive Interface for Linking with External Devices

Wide variety of built-in interfaces, including LAN, USB (communication, memory), CF cards, RS-232C, synchronization control, and external control.

D/A output\* delivers analog output at 50 ms for up to 16 parameters. The voltage and current waveform\*\* for each channel can also be output.







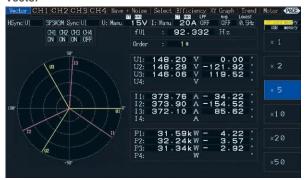
- \* Built-in for PW3390-02 and PW3390-03
- \*\* During waveform output, accurate reproduction is possible at an output of 500 kS/s and with a sine wave up to 20 kHz.

# Switch Screens with a Single Touch, Accessing a Variety of Power Analysis Methods

The power analysis engine allows the simultaneous, parallel calculation of all parameters. Access a variety of analysis methods simply by pressing the page keys to switch screens.

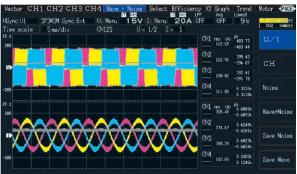


### Vector



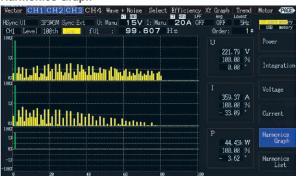
Confirm the voltage/current/power/phase angle for each harmonic order on a vector graph and as numerical values.

### Waveform



Display voltage/current waveforms for 4 channels at a high speed of 500 kS/s or a maximum length of 5 seconds. Waveform data can be saved.

### **Harmonics Graph**



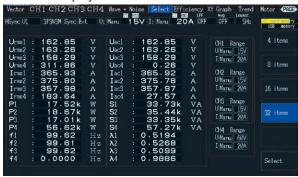
Display harmonics up to the 100th order for voltage/current/power in bar graphs. Confirm the numerical data for the selected order at the same time.

## **Efficiency and Loss**



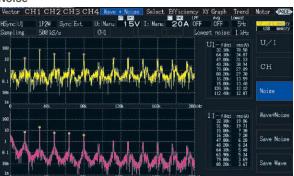
Using active power values and motor power values, confirm efficiency  $\eta$  [%] and loss [W] and total efficiency for each inverter/motor on a single unit at the same time.

### **Selection Display**



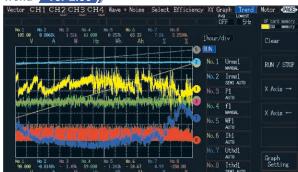
Select 4/8/16/32 display parameters individually for each screen, and summarize them on a single screen.

### Noise



Display FFT results for voltage and current as graphs and numerical values, up to a maximum of 200 kHz. This is perfect for the frequency analysis of inverter noise.

# Trend | Ver 2.00 |



Choose up to eight measurement parameters and display a graph of their variations over time. You can also save a screenshot of the graph.

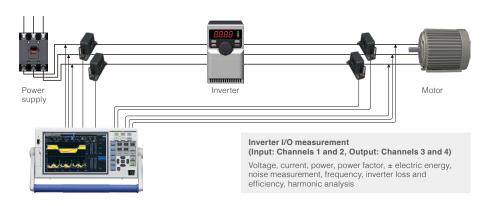
# X-Y Graph



Create inverter characteristic evaluations and motor torque maps. Select the desired parameter to display an X-Y plot graph.

# **Applications**

# **Measure the Power Conversion Efficiency of Inverters**

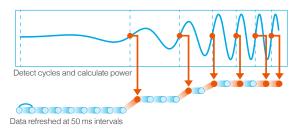


# **Key features**

- Isolated input of voltage and current on each of 4 channels for simultaneous measurement of the primary and secondary power of inverters
- Simultaneous measurement of all important parameters for secondary analysis of inverters, such as RMS value, MEAN value, and fundamental components
- Easy wiring with current sensors.
   Reliable confirmation of wiring with vector diagrams
- Current sensors reduce effects of common mode noise from inverters during power measurement
- Simultaneous measurement of noise components, in addition to the harmonic analysis required for the measurement of inverter control

# Highly Accurate and Fast 50 ms Calculation of Power in Transient State

Measure power transient states, including motor operations such as starting and accelerating, at 50 ms refresh rates. Automatically measure and keep up with power with fluctuating frequencies, from a minimum of 0.5 Hz.

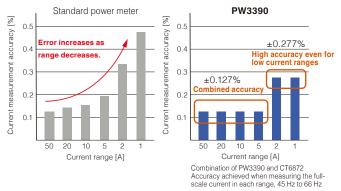


Automatic detection of fundamental wave even if the frequency fluctuates, from low to high frequencies

# Achieve high accuracy measurement, including in low current ranges

When used with a high accuracy current sensor\*1, the PW3390 delivers exceptional accuracy\*2. Achieve high accuracy measurement regardless of range, from high to low currents, even for loads that exhibit significant fluctuation.

# Example of combination accuracy with current sensor



- Pass-through type: CT6872, CT6873, CT6875A, CT6876A, CT6877A Clamp type: CT6841A, CT6843A, CT6844A, CT6845A, CT6846A Direct connection type: PW9100A
- \*2 At DC and 50 Hz/60 Hz

# Evaluate high-frequency noise from an inverter

Vor 2.00 /

The enhanced noise analysis functionality provided by Version 2.00 of the instrument's firmware lets you perform frequency analysis of noise components from DC to 200 kHz, display and automatically save the top 10 points, and manually save the FFT spectrum. This functionality is an effective tool for evaluating conductive noise from 2 kHz to 150 kHz generated by inverters and switching power supplies.



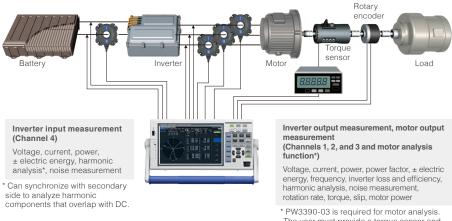
# Visually assess temporal fluctuations in efficiency

Ver 2.00 //

The trend display lets you graph user-selected measurement parameters such as efficiency and frequency over periods of time ranging from dozens of seconds to half a month. This capability makes it possible to visually assess fluctuations, including of transient states in which measured values fluctuate abruptly and steady states in which they exhibit minuscule fluctuations. Graphs can be saved as screenshots, and values can be automatically saved.



# **Analyze and Measure EV/HEV Inverter Motors**



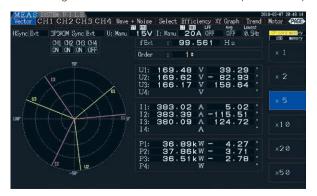
# \* PW3390-03 is required for motor analysis. The user must provide a torque sensor and rotation sensor.

### **Key features**

- Easy wiring and highly accurate measurements with the use of a passthrough type current sensor
- Simultaneous measurement of all important parameters for secondary analysis of inverters, such as RMS value, MEAN value, and fundamental components
- 3. 0.5 Hz to 5 kHz harmonic analysis without external clock
- Total measurement of inverter motors with built-in motor analysis function
- Measurement of the voltage, torque, rotation rate, frequency, slip, and motor power required for motor analysis with a single unit
- More precise measurements of electrical angle with incremental type encoders

# Electric Angle Measurement of Motors (PW3390-03 only) Ver 2.00 //

The PW3390-03 features a built-in electric angle measurement function required for vector control via dq coordinate systems in high-efficiency synchronized motors. Make real-time measurements of phase angles for voltage and current fundamental wave components based on encoder pulses. Further, zero-adjustment of the phase angle when induced voltage occurs allows electric angle measurement based on the inductive voltage phase. Version 2.00 of the firmware introduces the ability to display and manually set phase zero-adjustment values, making it possible to measure electrical angle using a user-selected zero-adjustment value. Electric angle can also be used as an Ld and Lq calculation parameter for synchronized motors.



Display motor electric angles on the vector screen

# 

Motor analysis screen (Torque, rotation rate, motor power, slip)
For CH B, enter the Z-phase pulse of the encoder to measure electric angle, and
enter the B-phase pulse to measure rotation direction.

# Evaluate inverter motor efficiency and loss

Evaluate efficiency and loss for an inverter, motor, and overall system by simultaneously measuring the inverter's input and output power and the motor's output. You can also create an efficiency map or loss map in MATLAB using measurement results recorded by the PW3390 at each operating point.\*MATLAB is a registered trademark of Mathworks, Inc.

# 

Speed(rpm)

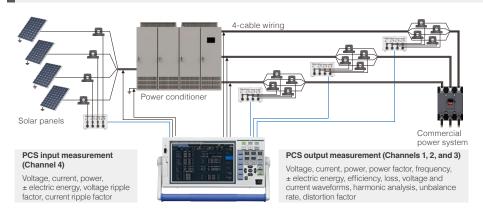
# Transfer to Data Logger via Bluetooth® wireless technology

Connect the PW3390 and a data logger (with support of LR8410 Link) via Bluetooth® wireless technology to wirelessly transmit 8 parameters of measurement values from the PW3390 to the data logger. In addition to the voltage, temperature, humidity, and other parameters measured by the multichannel data logger, you can also integrate the measurement values of the PW3390 and observe and record them in real time



<sup>\*</sup> Connection requires the serial - (Bluetooth® wireless technology) conversion adapter and power supply adapter recommended by Hioki. Please inquire with your Hioki distributor.

# Measure the Efficiency of PV Power Conditioners (PCS)



### **Key features**

- built-in channels, standard. Simultaneously measure the I/O characteristics of power conditioners.
- Current sensors can measure even large currents with high accuracy. Reliable confirmation of wiring with vector diagrams.
- Measure the amount of power sold/ purchased from power conditioner output on interconnected systems with a single unit.
- DC mode integration function, which responds quickly to input fluctuations such as with solar power, built in.
- Measure ripple factor, efficiency, loss, and all other parameters that are required for the measurement of power conditioners for solar power with a single unit.

# HIOKI's Current Measurement Solutions for Large Currents of 1000 A or More

Introducing a lineup of sensors taking measurements up to 6000 A for 50 Hz/60 Hz, and up to 2000 A for direct current. The CT9557 SENSOR UNIT lets you add the output waveforms from multiple high accuracy sensors. Use multi-cable wiring lines to take highly accurate measurements of up to 8000 A.

|  |                |                                      | Blue: High accuracy se               | nsor Black: Normal sensors |  |
|--|----------------|--------------------------------------|--------------------------------------|----------------------------|--|
| Recommended<br>current sensor<br>by measurement target |                | DC powe                              | System power<br>50 Hz/60 Hz          | Inverter secondary power   |  |
| Single-cable<br>or bundled<br>wiring                   | 1000 A or less | CT6876A or CT6846A                   |                                      |                            |  |
|  | 2000 A or less | CT6877A or CT7742                    | CT6877A or CT7642                    | CT6877A                    |  |
|  | 6000 A or less | _                                    | CT7044/CT7045/CT7046                 | _                          |  |
| 2-cable wiring   | 2000 A or less | CT9557+CT6876A×2 or CT9557+CT6846A×2 |                                      |                            |  |
|  | 4000 A or less | CT9557+CT6877A×2                     |                                      |                            |  |
| 3-cable wiring   | 3000 A or less | CT9557+CT6876A×3 or CT9557+CT6846A×3 |                                      |                            |  |
|  | 6000 A or less | CT9557+CT6877A×3                     |                                      |                            |  |
| 4 coble wiring   | 4000 A or less | CT9557-                              | CT9557+CT6876A×4 or CT9557+CT6846A×4 |                            |  |
| 4-cable wiring   | 8000 A or less | CT9557+CT6877A×4                     |                                      |                            |  |



CT6876A (AC/DC 1000 A)
Pass-through type; Wideband, high accuracy



CT6877A (AC/DC 2000 A)
Pass-through type; Wideband, high accuracy



CT6846A (AC/DC 1000 A) Easy-connect clamp type





Add waveforms from multiple current sensors



CT7742 (AC/DC 2000 A) Stable measurement of DC without zero offset



CT7642 (AC/DC 2000 A)
Wider frequency characteristics than the
CT7742



CT7044/ CT7045/ CT7046 (AC 6000 A)
Flexible, for easy connections even in narrow gaps

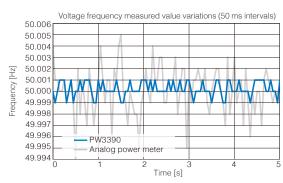
# **Support for PCS Parameters**

Simultaneously display the parameters required for PCS, such as efficiency, loss, DC ripple factor, and 3-phase unbalance rate. Easily check the required measured items for improved test efficiency. By matching the measurement synchronization source for both input and output, you can perform DC power measurements that are synchronized with the output AC as well as stable efficiency measurements.



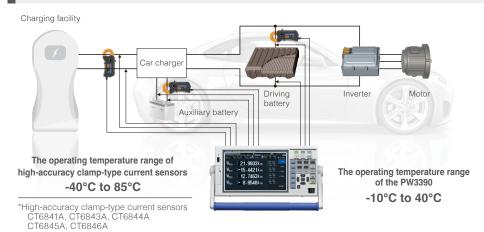
# ±0.01 Hz\* Basic Accuracy for Voltage Frequency Measurements

Perform the frequency measurements that are required for various PCS tests with industry-leading accuracy and stability. Take highly accurate frequency measurements on up to 4 channels simultaneously, while also measuring other parameters at the same time.



\* If you require even higher accuracy for frequency, please inquire with your local Hioki distributor.

# **Test Automobile Fuel Economy**



### **Key features**

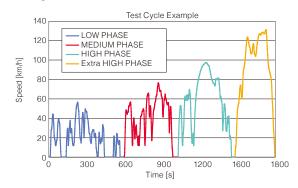
- Accurately measure recharge and discharge power with excellent basic accuracy and DC accuracy.
- 4 built-in channels, standard. Support for multiple recharge and discharge measurements, including auxiliary batteries.
- Easily achieve highly accurate measurements with clamp sensors, which can be used in a wide range of operating temperatures.
- Perform the -7°C low temperature test (WLTP standards) in the same environment as the automobile.



Scan QR Code to Watch Video Illustrating Fuel Economy Evaluation of an Automobile

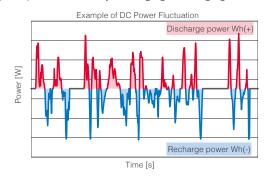
# Evaluate WLTC Mode Performance - A New Fuel Economy Standard

Taking fuel economy measurements that comply with WLTP standards requires the precise measurement of current integration and power integration for the recharging/discharging of each battery in the system. High accuracy clamp current sensors, the excellent DC accuracy of the PW3390, and the ability to integrate current and power at 50 ms intervals are extremely effective in meeting this application. Furthermore, the operating temperature range of the PW3390 has now been extended to reach -10°C, enabling the WLTP measurement in -7°C environments.



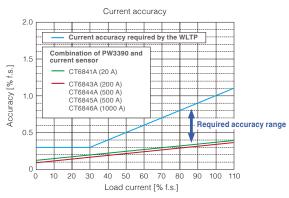
# **Current and Power Integration Function** by Polarity

DC integration measurement integrates the recharging power and discharging power by polarity for every sample at 500 kS/s, and measures positive-direction power magnitude, negative-direction power magnitude, and the sum of positive- and negative-direction power magnitude during the integration period. Accurate measurement of recharging power and discharging power is possible even if there is rapid repetition of battery recharging/discharging.



# High-accuracy Current Sensors That Are Ideal for Vehicle Measurement

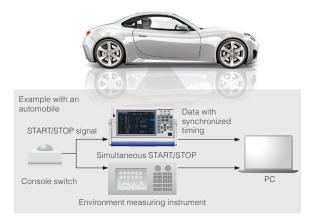
Clamp-type current sensors satisfy the current accuracy requirements imposed by the WLTP, as illustrated in the graph below. Sensors can be easily affixed without cutting cables in circuits under measurement, and they're available with a broad range of ratings (20 A to 1000 A) so that you can choose the right model based on vehicle type and measurement locations.



f.s. = Current sensor's rated current (If using a current sensor with a rated current of 500 A, 100% f.s. is 500 A.)

# Link to Peripheral Devices via External Control

Use external control terminals to START/STOP integration and capture screen shots. This makes it easy to control operations from console switches and link to the timing of other instruments when measuring the performance of an actual automobile.



# **External Appearance**

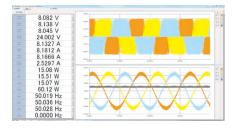


# Software

Download software, drivers, and the Communications Command Instruction Manual from the Hioki website. https://www.hioki.com

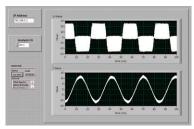
# PC Communication Software – PW Communicator

PC Communicator is a free application that connects to the PW3390 via a communications interface (LAN, RS-232C, or GP-IB), making it easy to configure the instrument's settings and to monitor or save measured values and waveform data from a computer. The software can simultaneously connect to up to 8 Hioki power measuring instruments, including the PW3390, Power Analyzer PW6001, Power Meter PW3335, PW3336, and PW3337, and it can provide integrated control over multiple models. The software can also be used to simultaneously save measurement data on the computer and calculate efficiency between instruments.



### LabVIEW driver

Use the bundled LabVIEW driver to build a measurement system via a simple programming interface that lets you place icons on a window and connect them with lines. Multiple sample programs for configuring settings and downloading data are available, so you can get started right away.



\*LabVIEW is a registered trademark of National Instruments.

### **GENNECT One SF4000**

The SF4000 is a free application software that lets you display and save measurement data on a PC in real-time after connecting the PW3390 to the PC via Ethernet.

The application is also compatible with other Hioki measuring instruments such as Memory HiLogger LR8450 and the Wireless Logging Station LR8410, letting you connect up to 30 units at the same time to monitor, graph and display lists of measured values from multiple instruments all at once and in real-time. This is especially effective for performing a total analysis of power, temperature and other factors of equipment.



# Remote control using an web browser

Use the PW3390's HTTP server function to connect to a computer via a LAN interface. You can configure settings or check data from a remote location using a virtual control panel that is displayed in the browser window.



# Power analyzer lineup

| Model           |   | PW4001   | PW3390   |  |
|-----------------|---|--|--|--|
| Appearance      |   | 1000000  |  |  |
|                 | Measurement frequency band                | DC, 0.1 Hz to 600kHz   | DC, 0.5 Hz to 200 kHz  |  |
|                 | Basic accuracy for 50/60 Hz power         | ±(0.03% of reading + 0.01% of range)                         | ±(0.04% of reading + 0.05% of range)                             |  |
|                 | Accuracy for DC power                     | ±(0.03% of reading + 0.01% of range)                         | ±(0.05% of reading + 0.07% of range)                             |  |
|                 | Accuracy for 10 kHz power                 | ±(0.2% of reading + 0.05% of range)                          | ±(0.2% of reading + 0.1% of range)                               |  |
|                 | Accuracy for 50 kHz power                 | ±(0.4% of reading + 0.1% of range)                           | ±(0.4% of reading + 0.3% of range)                               |  |
| တ               | Number of power measurement channels      | 4 channels   | 4 channels   |  |
| meter           | Voltage, current ADC sampling             | 16-bit, 2.5 MHz  | 16-bit, 500 kHz  |  |
| n tparameters   | Voltage range                             | 6 V, 15 V, 30 V, 60 V, 150 V, 300 V, 600 V, 1500 V           | 15 V, 30 V, 60 V, 150 V, 300 V, 600 V, 1500V                     |  |
| Measuremen      | Current range                             | 40 mA to 8000 A (6 ranges, based on sensor)                  | 40 mA to 8000 A (6 ranges, based on sensor)                      |  |
|                 | Common-mode voltage rejection ratio       | 50 Hz/60 Hz: 80 dB or greater                                | 50/60 Hz: 80 dB or greater                                       |  |
|                 | Temperature coefficient                   | 0.005 %/°C   | 0.01%/°C   |  |
|                 | Voltage input method                      | Isolated input, resistor voltage division                    | Isolated input, resistor voltage division                        |  |
|                 | Current input method                      | Isolated input from current sensor                           | Isolated input from current sensor                               |  |
|                 | External current sensor input             | Yes (ME15W)  | Yes (ME15W)  |  |
|                 | Power supplied to external current sensor | Yes  | Yes  |  |
|                 | Data update rate                          | 1 ms, 10 ms, 50 ms, 200 ms                                   | 50 ms  |  |
| age<br>out      | Maximum input voltage                     | AC 1000 V, DC 1500 V, ±2000 V peak                           | 1500 V, ±2000 V peak   |  |
| Voltag<br>input | Maximum rated line-to-ground voltage      | AC 600 V/DC 1000 V CAT III<br>AC 1000 V/DC 1500 V CAT II     | 600 V CAT III<br>1000 V CAT II                                   |  |
| Analysis        | Number of motor analysis channels         | Maximum 2 motors *1  | 1 motor*1  |  |
| Anal            | Motor analysis input format               | Analog DC, frequwncy, pulse                                  | Analog DC, frequency, pulse                                      |  |
|                 | Current sensor phase shift calculation    | Yes (Auto)   | Yes  |  |
|                 | Harmonics measurement                     | Yes (4 for each channel)                                     | Yes  |  |
| uo              | Maximum harmonics analysis order          | 500th  | 100th  |  |
| Function        | Harmonics synchronization frequency range | 0.1 Hz to 600 kHz  | 0.5 Hz to 5 kHz  |  |
| ш               | User-defined calculations                 | Yes  | -  |  |
|                 | Delta conversion                          | Yes (Δ-Y, Y-Δ)   | Yes (Δ-Y)  |  |
|                 | D/A output                                | Yes *1 16ch (waveform output, analog output)                 | Yes *1 16ch (waveform output, analog output)                     |  |
| Display         | Display                                   | 10.1" WVGA TFT color LCD                                     | 9" WVGA TFT color LCD  |  |
|                 | Touch screen                              | Yes  | -  |  |
|                 | External storage media                    | USB 3.0  | USB 2.0, CF card   |  |
| 8               | LAN (100BASE-TX, 1000BASE-T)              | Yes  | Yes<br>(10BASE-T and 100BASE-TX only)                            |  |
| Interface       | RS-232C                                   | -<br>  | Yes (maximum 38,400 bps)   |  |
| _ =             | External control                          | Yes  | Yes  |  |
|                 | Synchronization of multiple instruments   | Yes (up to 8 instruments)                                    | Yes (up to 8 instruments)  |  |
| Di              | CAN or CAN FD                             | Yes 361 mm(14.21 in.) x 176 mm(6.93 in.) x 135 mm(5.31 in.), | -<br>340 mm (13.39 in.) × 170 mm (6.69 in.) × 156 mm (6.14 in.), |  |
|                 | sions, weight (W×H×D)                     | 4.6 kg(162.26 oz.)   | 4.6 kg (162.26 oz.)  |  |
| Interna         | al Memory                                 | 16 GB  | -  |  |

# **Specifications**

# **Basic Specifications**

Accuracy guaranteed for 6 months (and 1.25 times specified accuracy for one year)

|  | (3P3W2M, 3P3W  |  |  | re (1P3W), 3-pha   | se 3-wire  |
|--|--|--|--|--|--|
|  |  | CH1  | CH2  | CH3  | CH4  |
|  | Pattern 1  | 1P2W   | 1P2W   | 1P2W   | 1P2W   |
|  | Pattern 2  | 1P:  |  | 1P2W   | 1P2W   |
|  | Pattern 3  | 3P3\   |  | 1P2W   | 1P2W   |
|  | Pattern 4  | 1P:  | 3W   | 1PC  |  |
|  | Pattern 5  | 3P3\   | W2M  | 1PS  | 3W   |
|  | Pattern 6  | 3P3\   |  | 3P3\   |  |
|  | Pattern 7  |  | 3P3W3M   |  | 1P2W   |
|  | Pattern 8  |  | 3P4W   |  | 1P2W   |
| Number of input channels   | Voltage: 4 chann   | els U1 to U4, Cu   | urrent: 4 channe   | els I1 to I4   |  |
| Measurement input  | Voltage: Plug-in   |  |  |  |  |
| terminal type  | Current: Dedicat   |  | ` `  | )  |  |
| Input methods  | Voltage: Isolated<br>Current: Insulate   |  |  | ut)  |  |
| Voltage range  | 15 V/30 V/60 V/1   |  |  | ,  |  |
|  | (Selectable for e  | ach measured   | wiring system. A   | UTO range avail  | able.)   |
| Current range  | 2 A / 4 A / 8 A / 2  |  |  |  | 9272-05, 20 /  |
| (): Sensor used  | 0.04 A / 0.08 A /<br>0.4 A / 0.8 A / 2 A   |  |  | (2 A sens<br>(20 A ser   |  |
| ( ). Selisti useu  | 4 A / 8 A / 20 A /   |  |  | (200 A se  |  |
|  | 40 A / 80 A / 200  | A / 400 A / 800  | A / 2 kA   | (2000 A  | sensor)  |
|  | 0.1 A / 0.2 A / 0.5<br>1 A / 2 A / 5 A / 1   |  |  | (5 A sens<br>(50 A ser   |  |
|  | 10 A / 20 A / 50 A   | A / 100 A / 200 A  | / 500 A  | (500 A se  |  |
|  | 20 A / 40 A / 100  |  | A / 1 kA   | (1000 A s  |  |
|  | 400 A / 800 A / 2<br>400 A / 800 A / 2   |  |  |  | and CT7742)<br>, CT7045,   |
|  |  |  |  | and CT7  | 046)   |
|  | 400 A / 800 A / 2  |  |  | (100 uV//  |  |
|  | 40 A / 80 A / 200<br>4 A / 8 A / 20 A /  |  |  | (1 mV/A s<br>(10 mV/A  |  |
|  | 0.4 A / 0.8 A / 2 A  | A/4A/8A/20   | A  | (100 mV/   | A sensor)  |
|  | (Selectable for e  |  |  |  |  |
| Power range  | 0.6000 W to 90.0 range, current ra   |  |  | ly by the combina  | ation of voltag  |
| Effective measuring  | Voltage, Current   | • •  |  | 10   |  |
| range  | voltage, Current   | , Fower. 1% to 1   | 10% of the rang  | e  |  |
| Total display area   | Voltage, Current   | , Power: from ze   | ro-suppression   | range setting to   | 120%   |
| Zero-suppression   | Selectable OFF,  |  |  |  |  |
| ranges   |  |  | be displayed e   | ven with no meas   | surement inpu  |
| Zero adjustment  |  |  |  | nal offset at or be  |  |
| 14//   |  |  |  | ffset at or below ±  | :10% f.s. ±4 m   |
| Waveform peak<br>measurement range   | Within ±300% of  | each voltage ar  | id current range   | •  |  |
| Waveform peak  | Within ±2% f.s. o  | of voltage and cu  | rrent display ac   | curacy   |  |
| measurement accuracy   |  |  | , ,  | ,  |  |
| Crest factor   | 300 (relative to n   |  |  |  |  |
|  | 3 (relative to volt  |  |  |  |  |
| Input resistance<br>(50 Hz/60 Hz)  | Voltage input sect<br>Current sensor in  |  | 2 MΩ ±40 kΩ (di<br>1 MΩ ±50 kΩ   | fferential input and   | d insulated inpi   |
| Maximum input voltage  | Voltage input sec  | -  | 1500 V, ±2000  | Vpeak  |  |
| , ,  | Current sensor in  | nput section :   | 5 V, ±10 Vpeak   | •  |  |
| Maximum rated voltage  |  |  |  |  |  |
| to earth   | Measurement ca<br>Measurement ca   |  |  |  |  |
| Measurement method   | 1  |  |  | rrent, simultaneo  |  |
|  | zero-crossing ca   |  |  | . ,  |  |
| Sampling   | 500 kHz/16 bit   |  |  |  |  |
| oampiing   | 000 101 127 10 810   |  |  |  |  |
|  | DC, 0.5 Hz to 20   | 0 kHz  |  |  |  |
| Measurement<br>frequency range   | DC, 0.5 Hz to 20   | 0 kHz  |  |  |  |
| Measurement<br>frequency range<br>Synchronization  | DC, 0.5 Hz to 20<br>0.5 Hz to 5 kHz  |  | ant fragues /C '   | 5 Hz/4 Hz/6 Hz/5   | Hz/40 Hz/00 11   |
| Measurement<br>frequency range<br>Synchronization<br>frequency range   | DC, 0.5 Hz to 20<br>0.5 Hz to 5 kHz<br>Selectable lower  | limit measureme  |  |  |  |
| Measurement<br>frequency range<br>Synchronization<br>frequency range   | DC, 0.5 Hz to 20<br>0.5 Hz to 5 kHz<br>Selectable lower<br>U1 to U4, I1 to I4.   | limit measureme  |  |  |  |
| Measurement<br>frequency range<br>Synchronization<br>frequency range   | DC, 0.5 Hz to 20<br>0.5 Hz to 5 kHz<br>Selectable lower<br>U1 to U4, I1 to I4,<br>pulse input),<br>DC (50 ms or 100  | limit measureme<br>, Ext (with the mo  | otor evaluation i  | nstalled model ar  | nd CH B set fo   |
| Measurement<br>frequency range<br>Synchronization<br>frequency range   | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower  U1 to U4, I1 to I4, pulse input), DC (50 ms or 100 Selectable for ea   | limit measureme<br>, Ext (with the me<br>o ms fixed)<br>ach measuremen   | otor evaluation i  | nstalled model ar  | nd CH B set fo   |
| Sampling Measurement frequency range Synchronization frequency range Synchronization source  | DC, 0.5 Hz to 20<br>0.5 Hz to 5 kHz<br>Selectable lower<br>U1 to U4, I1 to I4,<br>pulse input),<br>DC (50 ms or 100  | limit measureme, Ext (with the mo  | otor evaluation i  | nstalled model ar  | nd CH B set fo   |
| Measurement<br>frequency range<br>Synchronization<br>frequency range   | DC, 0.5 Hz to 20 0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4, pulse input), DC (50 ms or 100 Selectable for ea the same synchr The zero-crossing Two filter levels (i  | limit measureme , Ext (with the modern measurement on ization source griller automatics strong or mild)  | otor evaluation i<br>it channel (U/I fo<br>)<br>ally matches the o   | nstalled model ar<br>or each channel m   | nd CH B set fo<br>neasured using<br>J or I is selecte  |
| Measurement<br>frequency range<br>Synchronization<br>frequency range   | DC, 0.5 Hz to 20 0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 100 Selectable for ea the same synchr The zero-crossing Two filter levels (i Operation and acc   | limit measureme , Ext (with the moderation of the measurement on ization source glitter automatica strong or mild)   | otor evaluation i<br>it channel (U/I fo<br>)<br>ally matches the o   | nstalled model ar<br>or each channel m<br>digital LPF when U<br>zero-crossing filte  | nd CH B set fo<br>neasured using<br>J or I is selecte<br>er is disabled (o   |
| Measurement<br>frequency range<br>Synchronization<br>frequency range   | DC, 0.5 Hz to 20 0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4, pulse input), DC (50 ms or 100 Selectable for ea the same synchr The zero-crossing Two filter levels (i  | limit measureme , Ext (with the modern measurement on ization source griller automatical strong or mild) curacy are undeteccuracy are detections.  | otor evaluation i<br>it channel (U/I fo<br>)<br>ally matches the o   | nstalled model ar<br>or each channel m<br>digital LPF when U<br>zero-crossing filte  | nd CH B set fo<br>neasured using<br>J or I is selecte<br>er is disabled (o   |
| Measurement<br>frequency range<br>Synchronization<br>frequency range<br>Synchronization source   | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower  U1 to U4, I1 to I4 pulse input), DC (50 ms or 10( Selectable for ea the same synchr The zero-crossing Two filter levels (i Operation and ac Operation and ac   | limit measureme , Ext (with the modern measurement on ization source griller automatical strong or mild) curacy are undeteccuracy are detections.  | otor evaluation i<br>it channel (U/I fo<br>)<br>ally matches the o   | nstalled model ar<br>or each channel m<br>digital LPF when U<br>zero-crossing filte  | nd CH B set fo<br>neasured using<br>J or I is selecte<br>er is disabled (o   |
| Measurement frequency range Synchronization frequency range Synchronization source   | DC, 0.5 Hz to 20 0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 10( Selectable for earthe same synchr The zero-crossing Two filter levels ( Operation and ac input is 30% f.s. 6 50 ms   | limit measureme , Ext (with the m ) ms fixed) ch measuremen onization source strong or mild) zuracy are undete couracy are dete or above.  | otor evaluation i<br>it channel (U/I fo<br>)<br>ally matches the o<br>ermined when the<br>rmined when U  | nstalled model ar<br>or each channel m<br>digital LPF when U<br>zero-crossing filte<br>or I is selected ar   | nd CH B set fo<br>neasured using<br>J or I is selecte<br>er is disabled (o   |
| Measurement frequency range Synchronization frequency range Synchronization source   | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 10( Selectable for ea the same synchr Thre zero-crossing Two filter levels (c Operation and ac input is 30% f.s. of 50 ms  50 ms  | limit measureme, Ext (with the m. 0 ms fixed) ch measuremen onization source filter automatics strong or mild) ouracy are undete ouracy are dete or above.  Hz/100 kHz (sele y defined at 60 l   | otor evaluation i at channel (U/I fo ) ) ally matches the ormined when the rmined when U actable for each 1z or below (Ad  | nstalled model ar<br>or each channel m<br>digital LPF when U<br>zero-crossing filte<br>or I is selected ar<br>wiring system)   | nd CH B set fo<br>neasured using<br>J or I is selecte<br>er is disabled (o   |
| Measurement frequency range Synchronization frequency range Synchronization source   | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 100 Selectable for ea the same synchr The zero-crossin The zero-crossin Two filter levels (c Operation and act Operation and set So ms  OFF/500 Hz/5 kf 500 Hz: Accuracy S kHz: Accuracy  | limit measureme, Ext (with the m.<br>O ms fixed) ich measuremen onization source g filter automatica strange or mild) buracy are undetecuracy are deteor above.  Hz/100 kHz (sele y defined at 601 defined at 500 the defined at | otor evaluation i<br>t channel (U/I for<br>)<br>ally matches the or<br>rmined when the<br>rmined when U or<br>exctable for each<br>rdz or below (Ad  | r each channel mr<br>digital LPF when U<br>zero-crossing filte<br>or I is selected an<br>wiring system)<br>d ±0.1% f.s.)   | nd CH B set fo<br>neasured using<br>J or I is selecte<br>er is disabled (o<br>nd measured  |
| Measurement frequency range Synchronization frequency range Synchronization source   | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 100 Selectable for ea the same synchr The zero-crossin Two filter levels (i operation and act operation and act input is 30% f.s. c. 50 ms  OFF/500 Hz/5 kt Cocuracy 100 kHz: Accuracy 100 kHz: Accuracy  | limit measureme, Ext (with the m.<br>O ms fixed) ch measuremen onization source g filter automatica strong or mild) uzuracy are undete couracy are dete or above.  Hz/100 kHz (sele y defined at 60 t defined at 500 t cy defined at 200 cy defined at 2 | otor evaluation i<br>t channel (U/I for<br>)<br>ally matches the or<br>rmined when the<br>rmined when U or<br>exctable for each<br>rdz or below (Ad  | nstalled model ar<br>or each channel m<br>digital LPF when U<br>zero-crossing filte<br>or I is selected ar<br>wiring system)   | nd CH B set fo<br>neasured using<br>J or I is selecte<br>er is disabled (o<br>nd measured  |
| Measurement frequency range Synchronization frequency range Synchronization source  Data update interval LPF  Zero-crossing filter   | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 100 Selectable for ea the same synchr The zero-crossing Two filter levels (c) Operation and act Operation and act Operation and act Operation Selectable for ea Selecta | limit measureme, Ext (with the m. D ms fixed) Ich measuremen onization source filter automatice strong or mild) zuracy are undete couracy are dete or above.  Hz/100 kHz (sele defined at 60 I defined at 500 b cy defined at 200 b cy defined at 200 b  | otor evaluation in the channel (U/I for ) ally matches the commined when the remined when U dectable for each 12 or below (Ad 12 or below (Ad 12 or below (Ad 12 or below (Ad 14 or below (Ad 15 or below (Ad 15 or below (A   | r each channel m<br>rigital LPF when L<br>zero-crossing filte<br>or I is selected an<br>wiring system)<br>d ±0.1% f.s.)  | nd CH B set for<br>neasured using<br>J or I is selecte<br>er is disabled (o<br>nd measured   |
| Measurement frequency range Synchronization frequency range Synchronization source  Data update interval LPF  Zero-crossing filter   | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 10t Selectable for ea the same synchr Thre zero-crossing Two filter levels (c Operation and ac input is 30% f.s. of 50 ms  OFF/500 Hz/5 kH 500 Hz: Accurac 5 kHz: Accuracy 100 kHz: Accurac Off, mild or stron Voltage/current z  | limit measureme, Ext (with the m. 0 ms fixed) ch measuremen onization source filter automatics strong or mild) curacy are underscuracy are deteor above.  Hz/100 kHz (sele y defined at 60 I defined at 200 I cy defined at 200 I g  | otor evaluation i t channel (U/I for ) ally matches the c rmined when the rmined when U ectable for each 1/2 or below (Ad 1/2 or below (Ad hing comparison   | r each channel m<br>rigital LPF when L<br>zero-crossing filte<br>or I is selected an<br>wiring system)<br>d ±0.1% f.s.)  | nd CH B set fo<br>neasured using<br>J or I is selecte<br>er is disabled (o<br>nd measured  |
| Measurement frequency range Synchronization frequency range Synchronization source  Data update interval  LPF  Zero-crossing filter Polarity discrimination  | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 10t Selectable for ea the same synchr Thre zero-crossing Two filter levels (cooperation and ac input is 30% f.s. of 50 ms  OFF/500 Hz/5 kH SOO Hz: Accuracy 100 kHz: Accuracy Off, mild or stron Voltage/current Zero-crossing filt   | limit measureme, Ext (with the m. 0 ms fixed) ch measuremen onization source filter automatics strong or mild) ouracy are undete or above.  Hz/100 kHz (sele y defined at 60 I defined at 200 I cy defined at 200 I gg zero-crossing tire ter provided by or   | otor evaluation i t channel (U/I for ) ) it thannel (U/I for ) it  | r each channel mr each channel mr each channel mr digital LPF when L zero-crossing filte or I is selected ar wiring system) d ±0.1% f.s.) Add 1% rdg. at or n method   | nd CHB set for the |
| Measurement frequency range Synchronization frequency range Synchronization source Synchronization source Data update interval LPF  Zero-crossing filter Polarity discrimination Basic measurement | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 100 Selectable for ea the same synchr The zero-crossing Two filter levels (i operation and act  | limit measureme, Ext (with the moon measuremen) Dims fixed) Ich measuremen Dims fixed) Ich measuremen Dims fixed) Ich measuremen Dims fixed) University or mild) University or mild) University or mild) University or mild Un   | otor evaluation i  It channel (U/I for i) Illy matches the ormined when the ormined when U i  ectable for each 12 or below (Ad 12 or below kHz or below (For i) Inning comparisor digital LPF mean value rectif  | reach channel m digital LPF when L zero-crossing filte or I is selected an wiring system) d ±0.1% f.s.) Add 1% rdg. at or n method ication RMS equiv.  | nd CHB set for seasured using Jor I is selecte ris disabled (o ld measured above 10 kHz  |
| Measurement frequency range Synchronization frequency range Synchronization source Synchronization source Data update interval LPF  Zero-crossing filter Polarity discrimination Basic measurement | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 10t Selectable for ea the same synchr Thre zero-crossing Two filter levels (cooperation and ac input is 30% f.s. of 50 ms  OFF/500 Hz/5 kH SOO Hz: Accuracy 100 kHz: Accuracy Off, mild or stron Voltage/current Zero-crossing filt   | limit measureme, Ext (with the m. D. ms fixed) ch measuremen onization source filter automatics strong or mild) zuracy are understand at 200 Hz/1/100 kHz (seld y defined at 500 Hz/1/100 kHz (seld y defined at 500 Hz/1/100 kHz (seld y defined at 500 Hz/1/1/100 kHz (seld y defined at 500 Hz/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1  | otor evaluation i t channel (U/I for ) illy matches the c rmined when the rmined when U octable for each  12 or below (Ad  12 or below (Ad  13 or below (Ad  14 or below (Ad  15 or below (Ad  15 or below (Ad  16 or below (Ad  17 or below (Ad  18 | r each channel m r each channel m digital LPF when L zero-crossing filte or I is selected ar wiring system) d ±0.1% f.s.)  Add 1% rdg. at or n method ication RMS equiv  | nd CHB set for reasured using or I is selecte or is disabled (o d measured  above 10 kHz   |
| Measurement frequency range Synchronization frequency range Synchronization source Synchronization source Data update interval LPF  Zero-crossing filter Polarity discrimination Basic measurement | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 100 Selectable for ea the same synchri The zero-crossing Two filter levels ( Operation and ac input is 30% f.s. of 50 ms  OFF/500 Hz/5 kH 500 Hz: Accuracy Off, mild or stron Voltage/current z Zero-crossing fili Frequency, RMS AC component, w voltage waveform voltage inpule fact  | limit measureme , Ext (with the m ) ms fixed) Ich measuremen or militarion source gfilter automatice strong or mild) uracy are undete couracy are dete or above.  12/100 kHz (sele y defined at 60 I defined at 60 I defined at 500 I erro-crossing tir ter provided by or voltage, voltage roltage simple ave peak 4, voltage upeal   | otor evaluation i  It channel (U/I for )  Illy matches the commined when the remined when U of the remined when V of the remined whe | r each channel mr digital LPF when L zero-crossing filte or I is selected an wiring system) d ±0.1% f.s.) Add 1% rdg. at or n method cication RMS equivalently with the country of the cou | and CHB set for seasured using Or I is selecte or is disabled (o Id measured  above 10 kHz  valent, voltage omponent, nonic distortion nean value  |
| Measurement<br>frequency range<br>Synchronization<br>frequency range   | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4, pulse input), DC (50 ms or 100 Selectable for ea with esame synchr The zero-crossin from fitter levels of Operation and aco Operation and Accuracy 100 kHz: A | limit measureme , Ext (with the m ) ms fixed) ch measuremen onization source filter automatic strong or mild) ouracy are undete ouracy are dete or above.  Hz/100 kHz (sele y defined at 500 l cy defined at 500 l gg zero-crossing tir ter provided by v voltage, voltage r upeak +, voltage v or, voltage undeal peak +, voltage v or, voltage undeal  | t channel (U/I for )  It channel (U/I for )   | r each channel mr each channel mr each channel mr digital LPF when L zero-crossing filte or I is selected ar wiring system) d ±0.1% f.s.) add 1% rdg. at or n method ication RMS equivalent and control was considered and control to the control of t | ad CHB set for the seasured using Jor I is selected in its disabled (or diseasured above 10 kHz  |
| Measurement frequency range Synchronization frequency range Synchronization source Synchronization source Data update interval LPF  Zero-crossing filter Polarity discrimination Basic measurement | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 100 Selectable for ea the same synchri The zero-crossing Two filter levels ( Operation and ac input is 30% f.s. of 50 ms  OFF/500 Hz/5 kH 500 Hz: Accuracy Off, mild or stron Voltage/current z Zero-crossing fili Frequency, RMS AC component, w voltage waveform voltage inpule fact  | limit measureme, Ext (with the m. D ms fixed) Ich measuremen onization source filter automatice strong or mild) urargy are undete couracy are dete or above.  Tz/100 kHz (sele defined at 500 l defined at 500 l cy defined at 600 l cy defined at 500 l cy voltage, voltage r oltage simple ave peak +, voltage l peak +, voltage l cy voltage unbal equivalent, curre  | t channel (U/I for ) ally matches the comming when the remined when the remined when U obtained when U obtaine | reach channel mr digital LPF when L zero-crossing filte or I is selected an wiring system) d ±0.1% f.s.) Add 1% rdg. at or n method ication RMS equivalented wave outlage total ham 6 current, current imple a th, current simple a sak +, current wave  | and CHB set for seasured using Jor I is selecte or is disabled (o d measured  above 10 kHz  ralent, voltage omponent, nonic distortion nean value werage, currer eform peak  |
| Measurement frequency range Synchronization frequency range Synchronization source Synchronization source Data update interval LPF  Zero-crossing filter Polarity discrimination Basic measurement | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 100 Selectable for ea the same synchr The zero-crossin Two filter levels (i, Operation and ac Operation and ac Operation and ac input is 30% f.s. of 50 ms  OFF/500 Hz/5 kG 500 Hz; Accurac Off, mild or stron Voltage/current z Zero-crossing filf Frequency, RMS AC component, ovoltage waveful voltage vipel feat fundamental wave -, current total har active power, app  | limit measureme, Ext (with the m. D ms fixed) Ich measuremen onization source g filter automatice strong or mild) uracy are undete couracy are dete or above.  Hz/100 kHz (sele y defined at 60 0 cy defined at 20 0 g zero-crossing tir ter provided by v voltage, voltage r oltage simple ave peak +, voltage v or, voltage unbal equivalent, curre e component, cur mornet power, r old geron collection of source or component, cur mornet of collection of source or component, cur mornet power, r or control citsortion, arent power, roll citsortion, arent power, rearet power   | t channel (U/I for ) illy matches the commined when the remined when the remined when U is catable for each 12 or below (Ad 12 | reach channel m digital LPF when L zero-crossing filte or I is selected ar wiring system) d ±0.1% f.s.) Add 1% rdg. at or n method ication RMS equiv. ddamental wave or voltage total ham so current, current rat, t, current simple a eak +, current wave tor, current wave tor, current wave tor, current wave tor, current wave f ractor, voltage or lace or lace or voltage to a   | ad CHB set for the seasured using or I is selecter is disabled (or id measured above 10 kHz abov |
| Measurement frequency range Synchronization frequency range Synchronization source Synchronization source Data update interval LPF  Zero-crossing filter Polarity discrimination Basic measurement | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 100 Selectable for ea the same synchn The zero-crossing Two filter levels ( Operation and ac input is 30% f.s. ( 50 ms  OFF/500 Hz/5 kh 500 Hz: Accurac S kHz: Accurac Off, mild or stron Voltage/current z Zero-crossing fili Frequency, RMS: AC component, w voltage waveform voltage inple fact rectification RMS Lundamental waw -, current total har active power, app   | limit measureme , Ext (with the m , Ext (with the m ) ms fixed) Ich measuremen on interest of the measuremen or above.  12/100 kHz (sele y defined at 60 l defined at 500 l y defined at 500 l y defined at 20 g  12/100 kHz (sele y defined at 500 l y defined at 5   | otor evaluation i  t channel (U/I for) ) tlly matches the c  rmined when the rmined when U  extable for each rlz or below (Ad | r each channel mr digital LPF when L zero-crossing filte or I is selected an wiring system) d ±0.1% f.s.) and 1% rdg. at or n method cication RMS equivalent and amental wave or voltage total harm tt, current current rt, current simple each +, current simple each +, current unbala or factor, voltage p irection current unbala ir factor, voltage p irection current unbala  | and CHB set for seasured using Jor I is selecte or is disabled (o id measured  above 10 kHz  |
| Measurement frequency range Synchronization frequency range Synchronization source Synchronization source Data update interval LPF  Zero-crossing filter Polarity discrimination Basic measurement | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 100 Selectable for ea the same synchr The zero-crossin Two filter levels (i, Operation and ac Operation and ac Operation and ac input is 30% f.s. of 50 ms  OFF/500 Hz/5 kG 500 Hz; Accurac Off, mild or stron Voltage/current z Zero-crossing filf Frequency, RMS AC component, ovoltage waveful voltage vipel feat fundamental wave -, current total har active power, app  | limit measureme, Ext (with the m. D ms fixed) ch measuremen onization source g filter automatica strong or mild) curacy are undetecuracy are deteor above.  Hz/100 kHz (sele y defined at 60 l cy defined at 50 l cy defined at 20 l cy defined at 20 l cy defined at 50 l cy defined at 50 l cy defined at 50 l cy defined at 20 l cy oltage, voltage root, voltage, voltage imple ave e component, cur monic distortion, arrent power, rear lee, power phase   | t channel (U/I for the control of th | r each channel m digital LPF when L zero-crossing filte or I is selected ar wiring system) d ±0.1% f.s.) and 1% rdg. at or n method ication RMS equivalental wave or voltage total ham sourrent, current r t, current simple eak +, current way ter, current unbala or factor, voltage to prirection current m e- and negative-c   | ad CHB set for the seasured using of the seasured using of the seasured using of the seasured above 10 kHz ab |
| Measurement frequency range Synchronization frequency range Synchronization source Synchronization source Data update interval LPF  Zero-crossing filter Polarity discrimination Basic measurement | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 100 Selectable for ea the same synchr The zero-crossin Two filter levels (c Operation and act Operation and act Operation and set O | limit measureme , Ext (with the m ) ms fixed) Ich measuremen omization source filter automatice strong or mild) urarcy are undete couracy are dete or above.  12/100 kHz (sele y defined at 60 i defined at 60 i defined at 500 i cy defined at 20 gerero-crossing tir ter provided by t voltage, voltage roltage simple ave por, voltage roltage simple ave por, voltage meal equivalent, curre component, cur monic distortion, arent power, are   | otor evaluation i  It channel (U/I for ) Illy matches the our Illy matches I | r each channel m digital LPF when L zero-crossing filte or I is selected an wiring system) d ±0.1% f.s.) Add 1% rdg. at or n method ication RMS equi ndamental wave or current, current m t, current wave tor, current undale f factor, voltage total harm or an expension of the control transport of the control transport f actor or the control gather factor or the con | ad CHB set for the control of the co |
| Measurement frequency range Synchronization frequency range Synchronization source Synchronization source Data update interval LPF  Zero-crossing filter Polarity discrimination Basic measurement | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 100 Selectable for ea the same synchr The zero-crossing Two filter levels (i operation and act Input is 30% f.s. (i operation and act Input is 20% f.s. (i operat | limit measureme , Ext (with the m ) ms fixed) Ich measuremen omization source filter automatice strong or mild) urarcy are undete couracy are dete or above.  12/100 kHz (sele y defined at 60 i defined at 60 i defined at 500 i cy defined at 20 gerero-crossing tir ter provided by t voltage, voltage roltage simple ave por, voltage roltage simple ave por, voltage meal equivalent, curre component, cur monic distortion, arent power, are   | otor evaluation i  It channel (U/I for ) Illy matches the our Illy matches I | r each channel m digital LPF when L zero-crossing filte or I is selected an wiring system) d ±0.1% f.s.) Add 1% rdg. at or n method ication RMS equi ndamental wave or current, current m t, current wave tor, current undale f factor, voltage total harm or an expension of the control transport of the control transport f actor or the control gather factor or the con | ad CHB set for the control of the co |
| Measurement frequency range Synchronization frequency range Synchronization source Synchronization source Data update interval LPF  Zero-crossing filter Polarity discrimination Basic measurement | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 100 Selectable for ea the same synchr The zero-crossing Two filter levels (c. Operation and act Operation and act Operation and act input is 30% f.s. 50 ms  OFF/500 Hz/5 kb 500 Hz: Accuracy 100 kHz: Accu | limit measureme , Ext (with the m , Ext (with the m ) ms fixed) ch measuremen on interest of the measuremen of the measu   | t channel (U/I for ) and the channel (U/I for )  | r each channel m digital LPF when L zero-crossing filte or I is selected an wiring system) d ±0.1% f.s.) Add 1% rdg. at or n method ication RMS equi ndamental wave or current, current m t, current wave tor, current undale f factor, voltage total harm or an expension of the control transport of the control transport f actor or the control gather factor or the con | ad CHB set for seasured using or I is selecter is disabled (a did measured above 10 kHz above 10 kHz above 10 kHz aralent, voltage omponent, nonic distortion enan value werage, currer efform peak ance factor, hase angle agnitude, lirection currer wer magnitude,  |
| Measurement frequency range Synchronization frequency range Synchronization source Synchronization source Data update interval LPF  Zero-crossing filter Polarity discrimination Basic measurement | DC, 0.5 Hz to 20  0.5 Hz to 5 kHz Selectable lower U1 to U4, I1 to I4 pulse input), DC (50 ms or 100 Selectable for ea the same synchn The zero-crossing Two filter levels ( Operation and ac input is 30% f.s. of 50 ms  OFF/500 Hz/5 kH 500 Hz: Accuracy SkHz: Accuracy Off, mild or stron Voltage/current ac Zero-crossing fili Frequency, RMS: AC component, w voltage waveform voltage ripple fact rectification RMS Lundamental wav , current total har active power, app current phase an negative-directior magnitude, positive-a (PW3390-03)  | limit measureme , Ext (with the m , Ext (with the m ) ms fixed) Ich measuremen of miseasuremen   | otor evaluation i t channel (U/I fo ) illy matches the c rmined when the rmined when U ectable for each rlz or below (Ad rlz or below rean value rectif reage, voltage fur waveform peak -, rent waveform peak - rent waveform peak - rent waveform peak - rent waveform de, sum of positiv rent waveform peak - rent waveform pe | r each channel mr digital LPF when L zero-crossing filte or I is selected an wiring system) d ±0.1% f.s.) and 1% rdg. at or n method cication RMS equivalent and amental wave or voltage total harm tt, current current rt, current simple as ak +, current unbals or factor, voltage p triection current unbals or factor, voltage p attained and engative-direction current me- and negative-direction current unbals or factor, voltage p attained in ector current unbals or factor, voltage p attained in ector current unbals or factor, voltage p attained in ector current unbals or factor, voltage p attained in ector current unbals or factor, voltage p attained in ector current unbals or factor, voltage p attained in ector current unbals or factor curr | ad CHB set for the seasured using or I is selecte or is disabled (or id measured above 10 kHz ab |

| res for frequencies other truracy figures for phase ver factor of zero and the uracy figures for voltage of $0.5$ Hz to $10$ Hz are uracy figures for voltage of $0.5$ Hz to $10$ Hz are uracy figures for voltage upency range of $10$ Hz to uracy figures for voltage upency range of $30$ kHz uracy figures for voltage uracy figures for voltage upency range of $100$ k uracy figures for voltage uracy figures for voltage under $10$ Hz $10$ H  | ge and current are defined for han DC are defined for Urms. difference values are define the Urms. difference values are define to LPF disabled.  9, current, and active power provided as reference value and active power values in to 16 Hz are provided as reference and active power values in to 100 kHz are provided as reference and active power values in extra to 200 kHz are provided as a land active power values in extra to 200 kHz are provided as land active power values in extra to 200 kHz are provided as 100 kHz to 200 kHz are provi   | and Irms. ed for full-scale input with a values in the frequency uss. excess of 220 V in the rence values. excess of 750 V in the reference values. cxcess of (22,000f [kHz]) V in streference values. excess of (22,000f [kHz]) V in streference values. excess of 1000 V are the frequency range of 45 Hz e phase difference accuracy uracy (at 2 V f.s.)  |
|--|--|--|
| GHz ≤ f < 30 Hz  Hz ≤ f < 45 Hz  Hz ≤ f < 45 Hz  Hz ≤ f ≤ 66 Hz  Hz ≤ f ≤ 16 Hz  Hz ≤ f ≤ 10 kHz  kHz < f ≤ 10 kHz  kHz < f ≤ 10 kHz  kHz < f ≤ 100 kHz  O kHz < f ≤ 200 kHz  G Hz   | ±0.05% rdg. ±0.1% f.s. ±0.05% rdg. ±0.1% f.s. ±0.04% rdg. ±0.1% f.s. ±0.1% rdg. ±0.1% f.s. ±0.1% rdg. ±0.1% f.s. ±0.1% rdg. ±0.1% f.s. ±0.2% rdg. ±0.1% f.s. ±1.0% rdg. ±0.3% f.s. ±20% f.s. Active power (P) ±0.05% rdg. ±0.07% f.s. ±0.05% rdg. ±0.1% f.s. ±0.2% rdg. ±0.5% f.s. ±1.5% rdg. ±0.5% f.s. ±1.5% rdg. ±0.5% f.s. ±20% f.s. are given in kHz. ge and current are defined for han DC are defined for Urms. difference values are defined to than DC are defined for Urms. difference values are defined to than DC are defined for Urms. difference values are defined to than DC are defined to than DC are defined for Urms. difference values are defined to than DC are defined to the dC are given in kHz.  are given in kHz. ge and current are defined to than DC are defined to the dC are provided as reference values in the transportation of the dC are provided as and active power values in expect and   | ±0.05% rdg. ±0.1% f.s. ±0.05% rdg. ±0.1% f.s. ±0.05% rdg. ±0.1% f.s. ±0.04% rdg. ±0.1% f.s. ±0.1% rdg. ±0.1% f.s. ±0.1% rdg. ±0.1% f.s. ±0.3% rdg. ±0.2% f.s. ±1.0% rdg. ±0.3% f.s. ±20% f.s. Phase difference ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.09° ±0.62° ±     |
| Hz ≤ f < 45 Hz  Hz ≤ f ≤ 66 Hz  Hz ≤ f ≤ 66 Hz  Hz < f ≤ 10 kHz  kHz < f ≤ 30 Hz  kHz < f ≤ 200 kHz  i Hz ≤ f ≤ 45 Hz  Hz ≤ f ≤ 66 Hz  Hz ≤ f ≤ 66 Hz  Hz ≤ f ≤ 66 Hz  Hz ≤ f ≤ 10 kHz  kHz < f ≤ 10 kHz  i Hz ≤ f ≤ 66 Hz  Hz ≤ f ≤ 10 kHz  kHz < f ≤ 10 kHz  i Hz ≤ f ≤ 10 kHz  kHz < f ≤ 10 kHz  i Hz ≤ f ≤ 10 kHz  kHz < f ≤ 10 kHz  i Hz ≤ f   | ±0.05% rdg. ±0.1% f.s. ±0.04% rdg. ±0.05% f.s. ±0.1% rdg. ±0.1% f.s. ±0.2% rdg. ±0.1% f.s. ±0.2% rdg. ±0.1% f.s. ±0.3% rdg. ±0.2% f.s. ±1.0% rdg. ±0.3% f.s. ±20% f.s. Active power (P) ±0.05% rdg. ±0.07% f.s. ±0.05% rdg. ±0.1% f.s. ±0.2% rdg. ±0.5% f.s. ±0.2% rdg. ±0.5% f.s. ±0.2% rdg. ±0.5% f.s. ±0.4% rdg. ±0.5% f.s. ±0.4% rdg. ±0.5% f.s. ±0.4% rdg. ±0.5% f.s. ±0.1% rdg. ±0.5% f.s. ±0.1% rdg. ±0.1% f.s. ±0.1% rdg. ±0.1% f.s. ±0.0% f.s. ±1.5% rdg. ±0.5% f.s. ±20% f.s. are given in kHz. ge and current are defined for han DC  | ±0.05% rdg. ±0.1% f.s. ±0.04% rdg. ±0.05% f.s. ±0.1% rdg. ±0.1% f.s. ±0.2% rdg. ±0.1% f.s. ±0.2% rdg. ±0.3% f.s. ±1.0% rdg. ±0.3% f.s. ±20% f.s. Phase difference - ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.09° |
| Hz ≤ f ≤ 66 Hz  Hz < f ≤ 1 kHz  Hz < f ≤ 10 kHz  kHz < f ≤ 50 kHz  kHz < f ≤ 100 kHz  NHz < f ≤ 100 kHz  0 kHz < f ≤ 200 kHz  0 kHz < f ≤ 200 kHz  1 Hz ≤ f < 30 Hz  Hz ≤ f < 45 Hz  Hz ≤ f < 66 Hz  Hz ≤ f < 66 Hz  Hz ≤ f ≤ 66 Hz  Hz ≤ f ≤ 60 kHz  Hz ≤ f ≤ 100 kHz  WHz < f ≤ 100 kHz  UHz ≤ f ≤ 100 kHz  Hz ≤ f ≤ 200 kHz  UHz < f ≤ 100 kHz  WHz < f ≤ 100 kHz  UHz < f ≤ 50 kHz  UHz < f ≤ 100 kHz  UHz < f ≤ 50 kHz  | ±0.04% rdg. ±0.05% f.s. ±0.1% rdg. ±0.1% f.s. ±0.2% rdg. ±0.1% f.s. ±0.2% rdg. ±0.2% f.s. ±1.0% rdg. ±0.3% f.s. ±20% f.s. Active power (P) ±0.05% rdg. ±0.07% f.s. ±0.05% rdg. ±0.1% f.s. ±0.05% rdg. ±0.5% f.s. ±1.0% rdg. ±0.3% f.s. ±1.5% rdg. ±0.5% f.s. ±1.5% rdg. ±0.5% f.s. ±1.5% rdg. ±0.5% f.s. ±1.5% rdg. ±0.5% f.s. ±1.5% rdg. ±0.1% f.s. ±1.5%   | ±0.04% rdg. ±0.05% f.s. ±0.1% rdg. ±0.1% f.s. ±0.2% rdg. ±0.1% f.s. ±0.3% rdg. ±0.2% f.s. ±1.0% rdg. ±0.3% f.s. ±2.0% f.s. ±1.0% rdg. ±0.3% f.s. ±20% f.s.  Phase difference - ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.09° ±0.09° ±0.00° ±0 |
| Hz < f ≤ 1 kHz  Hz < f ≤ 10 kHz  kHz < f ≤ 10 kHz  kHz < f ≤ 10 kHz  kHz < f ≤ 100 kHz  O kHz < f ≤ 200 kHz  O kHz < f ≤ 200 kHz  O kHz < f ≤ 30 Hz  Hz ≤ f < 30 Hz  Hz ≤ f < 45 Hz  Hz ≤ f ≤ 66 Hz  Hz ≤ f ≤ 66 Hz  Hz ≤ f ≤ 100 kHz  kHz < f ≤ 10 kHz  kHz < f ≤ 10 kHz  whz < f ≤ 10 kHz  hz ≤ f ≤ 60 Hz  Hz ≤ f ≤ 60 Hz  Hz ≤ f ≤ 10 kHz  | ±0.1% rdg. ±0.1% f.s.<br>±0.2% rdg. ±0.1% f.s.<br>±0.3% rdg. ±0.2% f.s.<br>±1.0% rdg. ±0.3% f.s.<br>±20% f.s.<br>Active power (P)<br>±0.05% rdg. ±0.1% f.s.<br>±0.05% rdg. ±0.1% f.s.<br>±0.05% rdg. ±0.1% f.s.<br>±0.05% rdg. ±0.1% f.s.<br>±0.04% rdg. ±0.1% f.s.<br>±0.04% rdg. ±0.05% f.s.<br>±0.1% rdg. ±0.1% f.s.<br>±0.2% rdg. ±0.3% f.s.<br>±1.5% rdg. ±0.5% f.s.<br>±20% f.s.<br>are given in kHz.<br>ge and current are defined for han DC are defined for Urms<br>difference values are define<br>±0.1% rdg. ±0.5% f.s.<br>±0.2% rdg. ±0.5% f.s.<br>±0.0% rdg. ±0.0% f.s.<br>±0.0 | ±0.1% rdg. ±0.1% f.s. ±0.2% rdg. ±0.1% f.s. ±0.2% rdg. ±0.1% f.s. ±0.3% rdg. ±0.2% f.s. ±1.0% rdg. ±0.3% f.s. ±20% f.s.  Phase difference - ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±(0.06°f+0.02)° ±(0.005°f+0.4)° ±(0.022°f-1.3)°  r Udc and Idc, while accuracy and Irms. excess of 220 V in the rence values. excess of 220 V in the reference values. excess of 750 V in the reference values. excess of 1000 V are the frequency range of 45 Hz er phase difference accuracy excess of 1000 V are the frequency range of 45 Hz er phase difference accuracy excess of 1000 V are the frequency range of 45 Hz er phase difference accuracy excess of 200 V in the reference values.  The frequency range of 45 Hz er phase difference accuracy excess of 1000 V are the frequency range of 45 Hz er phase difference accuracy   |
| Hz < $\le$ 10 kHz<br>kHz < $\le$ 50 kHz<br>kHz < $\le$ 50 kHz<br>kHz < $\le$ 100 kHz<br>0 kHz < $\le$ 100 kHz<br>0 kHz < $\le$ 100 kHz<br>0 kHz < $\le$ 200 kHz<br>3 Hz $\le$ 64 Hz<br>Hz $\le$ 66 Hz<br>Hz $\le$ 66 Hz<br>Hz $\le$ 65 kHz<br>kHz < $\le$ 100 kHz<br>uses off in above tables a useave figures for DC voltars for Frequencies other transcriptions for DC voltars for frequencies other transcriptions for DC voltars for frequencies of the transcriptions for DC voltars for frequencies of the transcriptions for DC voltars for frequencies of the transcriptions for Voltage of 0.5 Hz to 10 Hz are transcriptions for voltage unency range of 30 kHz transcriptions for voltage in excess of tor voltage of 100 kHz transcriptions for voltage of 100 kHz 100 Hz < $\le$ 5 kHz:±0.3° kHz < $\le$ 200 kHz:±1° 30 kHz:±1° 30 kHz < $\le$ 200 kHz:±10 kHz < $\le$ 200 kHz:±1° 30 kHz < $\le$ 200 kHz < $\le$ 30 kHz < $\ge$ | ±0.2% rdg. ±0.1% f.s. ±0.3% rdg. ±0.2% f.s. ±1.0% rdg. ±0.2% f.s. ±1.0% rdg. ±0.3% f.s. ±20% f.s. Active power (P) ±0.05% rdg. ±0.07% f.s. ±0.05% rdg. ±0.1% f.s. ±0.05% rdg. ±0.1% f.s. ±0.05% rdg. ±0.1% f.s. ±0.05% rdg. ±0.1% f.s. ±0.1% rdg. ±0.1% f.s. ±0.4% rdg. ±0.1% f.s. ±0.2% rdg. ±0.1% f.s. ±0.2% rdg. ±0.1% f.s. ±0.2% rdg. ±0.5% f.s. ±2.2% f.s. are given in kHz. ge and current are defined for han DC are defined for Urms. difference values are defined to runa to the control of  | ±0.2% rdg. ±0.1% f.s.  ±0.3% rdg. ±0.2% f.s. ±1.0% rdg. ±0.2% f.s. ±1.0% rdg. ±0.3% f.s. ±20% f.s.  Phase difference  - ±0.08° ±0.08° ±0.08° ±0.08° ±0.06° f.s. ±0.08° ±0.08° ±0.08° ±0.08° ±0.09° ±0.62° ±0.62° ±0.62° ±0.022*f-1.3)° r Udc and Idc, while accuracy and Irms. et do for full-scale input with a values in the frequency use. Lexcess of 220 V in the reference values. Lexcess of 250 V in the referenc |
| kHz < f ≤ 50 kHz  kHz < f ≤ 100 kHz  0 kHz < f ≤ 200 kHz  0 kHz < f ≤ 200 kHz  6 Hz ≤ f < 30 Hz  Hz ≤ f < 45 Hz  Hz ≤ f < 45 Hz  Hz ≤ f < 45 Hz  Hz ≤ f < 10 kHz  kHz < f ≤ 100 kHz  100 kHz < f ≤ 200 kHz  kHz < f ≤ 100 kHz  0 kHz < f ≤ 500 kHz  kHz < f ≤ 100 kHz  0 kHz < f ≤ 100 kHz  0 kHz < f ≤ 500 kHz  0 kHz < f ≤ 200 kHz  0 kHz < f ≤ 500 kHz  0 kHz  0 kHz < f ≤ 500 kHz  0 kHz   | ±0.3% rdg. ±0.2% f.s. ±1.0% rdg. ±0.3% f.s. ±20% f.s. Active power (P) ±0.05% rdg. ±0.07% f.s. ±0.05% rdg. ±0.1% f.s. ±0.05% rdg. ±0.1% f.s. ±0.05% rdg. ±0.1% f.s. ±0.1% rdg. ±0.1% f.s. ±0.1% rdg. ±0.1% f.s. ±0.1% rdg. ±0.1% f.s. ±0.2% rdg. ±0.1% f.s. ±0.2% rdg. ±0.5% f.s. ±0.2% rdg. ±0.5% f.s. ±0.2% rdg. ±0.5% f.s. ±1.5% rdg. ±0.5% f.s. ±20% f.s. are given in kHz. ge and current are defined for han DC are defined for Urms. difference values are defined as reference values and active power provided as reference values and active power values in to 100 kHz are provided a send active power values in to 100 kHz are provided a difference values. Do V, add the following to the rent and active power values in so. 300 V, add the following to the rent and active power accuracy figures. Note that separate con and active power values in so.   | ±0.3% rdg. ±0.2% f.s. ±1.0% rdg. ±0.3% f.s. ±20% f.s.  Phase difference ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.06° f+0.02)° ±0.62° ±(0.06°f+0.02)° ±(0.022°f-1.3)°  r Udc and Idc, while accuracy and Irms. ad for full-scale input with a values in the frequency uses. r excess of 220 V in the reference values. rescess of (22,000/f [kHz]) V in is reference values. rescess of (22,000/f [kHz]) V in the reference values. rescess of 220 V in the reference values. rescess of 220 V in the reference values.   |
| kHz < f ≤ 100 kHz  0 kHz < f < 200 kHz  10 kHz < f < 200 kHz  11 ≤ f < 30 Hz  12 ≤ f < 45 Hz  12 ≤ f < 45 Hz  13 ≤ f < 66 Hz  14 ≤ f < 66 Hz  14 ≤ f < 10 kHz  15 ≤ f < 10 kHz  16 ≤ f < 10 kHz  17 ≤ f < 10 kHz  18 ≤ f < 60 Hz  19 ≤ f < 10 kHz  19 ≤ f < 10 kHz  10 kHz < f ≤ 200 kHz  10 kHz < f ≤ 200 kHz  10 kHz < f < 50 kHz  10 kHz < f < 10 tHz  10 kHz  10 kHz < f < 10 tHz  10 kHz  10 kHz < f < 10 tHz  10 kHz  10 k   | ±1.0% rdg, ±0.3% f.s. ±20% f.s. Active power (P) ±0.05% rdg, ±0.07% f.s. ±0.05% rdg, ±0.1% f.s. ±0.05% rdg, ±0.1% f.s. ±0.05% rdg, ±0.1% f.s. ±0.04% rdg, ±0.1% f.s. ±0.1% rdg, ±0.1% f.s. ±0.2% rdg, ±0.1% f.s. ±0.2% rdg, ±0.5% f.s. ±0.2% rdg, ±0.5% f.s. ±0.4% rdg, ±0.5% f.s. ±0.4% rdg, ±0.5% f.s. ±0.4% rdg, ±0.3% f.s. ±1.5% rdg, ±0.5% f.s. ±20% f.s. are given in kHz. ge and current are defined for than DC are defined for Ums. difference values are define and current are defined to rums. difference values are define and current are defined are and active power values in to 100 kHz are provided as reference values in expensive the process of the provided as reference values in expensive the provided as part to 200 kHz are provided as and active power values in expensive the provided as the provided as the provided as the provided as a part to 200 kHz are provided as and active power values in expensive the provided as the pro   | ±1.0% rdg. ±0.3% f.s.  ±20% f.s.  Phase difference  -  ±0.08°  ±0.08°  ±0.08°  ±0.08°  ±0.62°  ±0.62°  ±(0.005*H0.4)°  ±(0.005*H0.4)°  ±(0.005*H0.4)°  xidous for full-scale input with a revalues in the frequency use.   |
| 0 kHz < f ≤ 200 kHz  10 kHz < f ≤ 200 kHz  11 kz ≤ f < 30 Hz  12 kz ≤ f < 45 Hz  13 kHz ≤ f ≤ 66 Hz  14 kz ≤ f ≤ 10 kHz  15 kHz ≤ f ≤ 10 kHz  16 kHz ≤ f ≤ 10 kHz  17 kHz ≤ f ≤ 10 kHz  18 kHz ≤ f ≤ 200 kHz  19 kHz ≤ f ≤ 200 kHz  19 kHz ≤ f ≤ 200 kHz  10 kHz ≤ f ≤ 200 kHz ≥ f ≤ 200 k   | ±20% f.s.  Active power (P) ±0.05% rdg, ±0.07% f.s. ±0.05% rdg, ±0.1% f.s. ±0.05% rdg, ±0.1% f.s. ±0.05% rdg, ±0.1% f.s. ±0.04% rdg, ±0.05% f.s. ±0.1% rdg, ±0.1% f.s. ±0.2% rdg, ±0.1% f.s. ±0.2% rdg, ±0.1% f.s. ±0.2% rdg, ±0.5% f.s. ±1.5% rdg, ±0.5% f.s. ±1.5% rdg, ±0.5% f.s. are given in kHz, ge and current are defined for than DC are defined for Urms, difference values are define at DC are defined for Urms of the defined for   | ±20% f.s.  Phase difference  - ±0.08° ±0.08° ±0.08° ±0.08° ±(0.06°f+0.02)° ±(0.005°f+0.4)° ±(0.002°f+0.3)° rUdc and Idc, while accuracy and Irms. and Irms values in the frequency ues excess of 220 V in the rence values excess of 120 V in the rence values excess of 1000 V are - exce                               |
| bitz ≤ f < 30 Hz  Hz ≤ f < 45 Hz  Hz ≤ f < 66 Hz  Hz ≤ f ≤ 66 Hz  Hz ≤ f ≤ 66 Hz  Hz ≤ f ≤ 10 kHz  Hz ≤ f ≤ 50 kHz  Hz ≤ f ≤ 10 kHz  Hz ≤ f ≤ 10 kHz  Hz ≤ f ≤ 10 kHz  Hz ≤ f ≤ 20 kHz  Hz ≤ f ≤ f ≥ f ≥ f ≥ f ≥ f ≥ f ≥ f ≥ f ≥ f  | Active power (P) ±0.05% rdg, ±0.07% f.s. ±0.05% rdg, ±0.1% f.s. ±0.05% rdg, ±0.1% f.s. ±0.05% rdg, ±0.1% f.s. ±0.04% rdg, ±0.05% f.s. ±0.1% rdg, ±0.1% f.s. ±0.2% rdg, ±0.1% f.s. ±0.2% rdg, ±0.3% f.s. ±1.5% rdg, ±0.5% f.s. ±2.0% f.s. active power subsequence of the second of the sec   | Phase difference  - ±0.08° ±0.08° ±0.08° ±0.08° ±(0.06°*f+0.02)° ±(0.005°*f+0.4)° ±(0.002°*f+0.3)°  - **Tutc and ldc, while accuracy and Irms.   |
| SHz ≤ f < 30 Hz  Hz ≤ f < 45 Hz  Hz ≤ f < 45 Hz  Hz ≤ f < 66 Hz  Hz ≤ f ≤ 66 Hz  Hz ≤ f ≤ 10 kHz  kHz < f ≤ 10 kHz  kHz < f ≤ 10 kHz  kHz < f ≤ 100 kHz  uses off in above tables is  usery figures for DC volta  res for frequencies other truacy figures for PC volta  ger of 10 Hz or 10 Hz  uracy figures for voltage  uracy figures for voltage  usency range of 30 kHz to 10 Hz  uracy figures for voltage  usency range of 10 kz  uracy figures for voltage  usency range of 10 kz  uracy figures for voltage  usency range of 10 kz  uracy figures for voltage  usency farge for voltage  usency farge for voltage  usency farge for voltage  frequency range of 100 k  thz ≤ f ≤ 50 kHz:±10.3°  kHz ≤ f ≤ 200 kHz:±10.3°  kHz ≤ f ≤ 200 kHz:±10.3°  chtz ≤ f ≤ 200 kHz:±10.3°  d urrent sensor accure  of current sensor accure  ver, and phase differen  defined for current me-  sor specifications).   | ±0.05% rdg. ±0.07% f.s. ±0.05% rdg. ±0.1% f.s. ±0.05% rdg. ±0.1% f.s. ±0.05% rdg. ±0.1% f.s. ±0.04% rdg. ±0.05% f.s. ±0.1% rdg. ±0.1% f.s. ±0.2% rdg. ±0.1% f.s. ±0.2% rdg. ±0.3% f.s. ±1.5% rdg. ±0.3% f.s. ±1.5% rdg. ±0.5% f.s. ±20% f.s. are given in kHz. ge and current are defined for han DC are defined for Urms. difference values are defined to runs. to the control of the contr   | ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±(0.06*f+0.02)° ±0.62° ±(0.005*f+0.4)° ±(0.022*f-1.3)° r Udc and Idc, while accuracy and Irms. et for full-scale input with a values in the frequency les. excess of 220 V in the reference values. excess of (22,000f [kHz]) V in its reference values. excess of 1000 V are the frequency range of 45 Hz e phase difference accuracy et accuracy (at 2 V f.s.) res for current, active hibination accuracy figures   |
| SHz ≤ f < 30 Hz  Hz ≤ f < 45 Hz  Hz ≤ f < 45 Hz  Hz ≤ f < 66 Hz  Hz ≤ f ≤ 66 Hz  Hz ≤ f ≤ 10 kHz  kHz < f ≤ 10 kHz  kHz < f ≤ 10 kHz  kHz < f ≤ 100 kHz  uses off in above tables is  usery figures for DC volta  res for frequencies other truacy figures for PC volta  ger of 10 Hz or 10 Hz  uracy figures for voltage  uracy figures for voltage  usency range of 30 kHz to 10 Hz  uracy figures for voltage  usency range of 10 kz  uracy figures for voltage  usency range of 10 kz  uracy figures for voltage  usency range of 10 kz  uracy figures for voltage  usency farge for voltage  usency farge for voltage  usency farge for voltage  frequency range of 100 k  thz ≤ f ≤ 50 kHz:±10.3°  kHz ≤ f ≤ 200 kHz:±10.3°  kHz ≤ f ≤ 200 kHz:±10.3°  chtz ≤ f ≤ 200 kHz:±10.3°  d urrent sensor accure  of current sensor accure  ver, and phase differen  defined for current me-  sor specifications).   | ±0.05% rdg. ±0.1% f.s. ±0.05% rdg. ±0.1% f.s. ±0.05% rdg. ±0.1% f.s. ±0.04% rdg. ±0.15% f.s. ±0.1% rdg. ±0.1% f.s. ±0.2% rdg. ±0.1% f.s. ±0.2% rdg. ±0.5% f.s. ±1.5% rdg. ±0.5% f.s. ±2.2% f.s. = 2.2%   | ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±(0.06°f+0.02)° ±(0.05°f+0.4)° ±(0.022°f-1.3)°  r Ude and Ide, while accuracy and Irms, and for full-scale input with a revalues in the frequency use. excess of 220 V in the reference values, and excess of 750 V in the reference values, and excess of 122,000f [kHz]) V in size federence values, and excess of 1000 V are the frequency range of 45 Hz e phase difference accuracy figures for current, active restor current, active rebination accuracy figures   |
| Hz ≤ f < 45 Hz  Hz ≤ f < 66 Hz  Hz ≤ f ≤ 66 Hz  Hz < f ≤ 10 kHz  Hz < f ≤ 10 kHz  kHz < f ≤ 10 kHz  kHz < f ≤ 10 kHz  kHz < f ≤ 100 kHz  in the second of  | ±0.05% rdg. ±0.1% f.s. ±0.04% rdg. ±0.05% f.s. ±0.1% rdg. ±0.196 f.s. ±0.1% rdg. ±0.196 f.s. ±0.2% rdg. ±0.1% f.s. ±0.2% rdg. ±0.3% f.s. ±1.5% rdg. ±0.3% f.s. ±2.0% f.s. are given in kHz. ge and current are defined for han DC are defined for Jrms. difference values are define ± LPF disabled. e, current, and active power particular of the provided as reference values and active power values in the LP disabled. The disabled of the provided as reference values and active power values in the LP disabled of the provided as reference values and active power values in the LP disabled of the provided as the   | ±0.08° ±0.08° ±0.08° ±0.08° ±0.08° ±(0.06°f+0.02)° ±(0.005°f+0.4)° ±(0.002°f+1.3)°  r Ude and Ide, while accuracy and Irms, and for full-scale input with a revalues in the frequency use. excess of 220 V in the reference values, and excess of 750 V in the reference values, and excess of 120,000f [kHz]) V in size federence values, and excess of 1000 V are the frequency range of 45 Hz e phase difference accuracy figures for current, active hibination accuracy figures   |
| Hz ≤ f ≤ 66 Hz  Hz < f ≤ 1 kHz  Hz < f ≤ 1 kHz  Hz < f ≤ 10 kHz  kHz < f ≤ 50 kHz  kHz < f ≤ 50 kHz  kHz < f ≤ 50 kHz  kHz < f ≤ 100 kHz  0 kHz < f ≤ 200 kHz  uracy figures for Dc voltas  uracy figures for Dc voltas  uracy figures for voltage  ge of 0.5 Hz to 10 Hz ar  uracy figures for voltage  guency range of 10 Hz to  uracy figures for voltage  upency range of 10 Hz to  uracy figures for voltage  voltage in excess of 60  0 Hz < f ≤ 20 kHz ±0.3°  kHz < f ≤ 20 kHz ±0.3°  kHz < f ≤ 20 kHz ±0.3°  kHz < f ≤ 20 kHz ±0.3°  thz ≤ f voltage in excess of 60  uracy figures for phase 6  Hz are provided as reference value  voltages in excess of 60  voltages in excess of 61  uracy figures for phase 6  Hz are provided as reference value  voltages in excess of 61  voltages in excess of 61  voltages in excess of 64  voltages in excess of 65  voltages in excess of 66  volt   | ±0.04% rdg. ±0.05% f.s. ±0.1% rdg. ±0.1% f.s. ±0.2% rdg. ±0.1% f.s. ±0.2% rdg. ±0.3% f.s. ±1.5% rdg. ±0.5% f.s. ±2.20% f.s. are given in kHz. ge and current are defined for than DC are defined for Ums. difference values are define a LPT disabled. e. current, and active power provided as reference value and active power values in to 10 kHz are provided as reference values in expectation of the value of value o   | ±0.08° ±0.08° ±0.08° ±0.08° ±0.62° ±0.62° ±(0.005°f+0.4)° ±(0.022°f-1.3)° rudo and ldc, while accuracy and Irms. and for full-scale input with a revalues in the frequency use. rexcess of 220 V in the rence values. rexcess of (22,000f [kHz]) V in serference values. rexcess of 1750 V in the reference values. rexcess of 1000 V are the frequency range of 45 Hz are part of the requency range of 45 Hz are part of the requency range of 45 Hz are part of 1000 V are the frequency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 45 Hz are part of 1000 V are the requency range of 1 |
| Hz < f ≤ 1 kHz  Hz < f ≤ 10 kHz  kHz < f ≤ 10 kHz  kHz < f ≤ 10 kHz  kHz < f ≤ 100 kHz  kHz < f ≤ 100 kHz  Uracy figures for DC volta  res for frequencies othert  uracy figures for phase  rer factor of zero and the  uracy figures for voltage  geo f 0.5 Hz to 10 Hz are  uracy figures for voltage  geo f 0.5 Hz to 10 Hz are  uracy figures for voltage  geo f 0.5 Hz to 10 Hz are  uracy figures for voltage  uracy figures for voltage  intequency range of 10 lz to  uracy figures for voltage  vided as reference value  vided as reference value  vided as reference value  for the provided as reference value  kHz < f ≤ 20 kHz:±0.3°  kHz < f ≤ 20 kHz:±0.3°  kHz < f ≤ 20 kHz:±0.3°  id urrent sensor accurr  urer, and phase differen  defined for current mesor specifications).  | ±0.1% rdg. ±0.1% f.s. ±0.2% rdg. ±0.1% f.s. ±0.4% rdg. ±0.3% f.s. ±1.5% rdg. ±0.5% f.s. ±1.5% rdg. ±0.5% f.s. ±20% f.s. are given in kHz. ge and current are defined for han DC are defined for Urms. difference values are define at DC are defined for Urms. difference values are define at DC are defined for Urms. difference values are define at DC are defined for Urms. difference values are define at DC are defined for Urms. difference values in the LT dC dC Mt zer provided as reflerence values in extended as the dC dC Mt zer provided as and active power values in extended as and active power values.   | ±0.08° ±(0.06°f+0.02)° ±(0.06°f+0.49)° ±(0.005°f+0.49)° ±(0.002°f+1.3)°  '' Ude and Ide, while accuracy and Irms. and Irms. and Irms. and Irms. 'values in the frequency ues. n excess of 220 V in the rence values. n excess of 750 V in the rence values. n excess of 122.00/f [kHz] V in streference values. n excess of 122.00/f [kHz] V in streference values. n excess of 1000 V are the frequency range of 45 Hz the phase difference accuracy irracy (at 2 V f.s.)  res for current, active hbination accuracy figures   |
| Hz < f ≤ 10 kHz<br>kHz < f ≤ 50 kHz<br>kHz < f ≤ 50 kHz<br>kHz < f ≤ 50 kHz<br>LHz < f ≤ 100 kHz<br>0 kHz < f ≤ 200 kHz<br>uracy figures for DC volta<br>res for frequencies other truracy figures for phase<br>ref factor of zero and the<br>uracy figures for voltage<br>ge of 0.5 Hz to 10 Hz are<br>uracy figures for voltage<br>ge of 0.5 Hz to 10 Hz are<br>uracy figures for voltage<br>frequency range of 100 k<br>uracy figures for voltage<br>frequency range of 100 k<br>uracy figures for voltage<br>voltage is reference value<br>uracy figures for voltage<br>frequency range of 100 k<br>kHz < f ≤ 50 kHz:±0.3°<br>kHz < f ≤ 20 kHz:±0.3°<br>kHz < f ≤ 20 kHz:±0.3°<br>chtz < f = 20 kHz:±0.3°   | ±0.2% rdg. ±0.1% f.s. ±0.4% rdg. ±0.3% f.s. ±1.5% rdg. ±0.5% f.s. ±2.0% f.s. æe given in kHz. ge and current are defined for han DC are defined for Urms difference values are define æe to the transparence of the transparence en provided as reference value æe and active power values in 16 Hz are provided as reference æe and active power values in to 100 kHz are provided as æe and active power values in en to 100 kHz are provided as en and active power values in en to 100 kHz are provided as en and active power values in en to 100 kHz are provided as en and active power values in en to 100 kHz are provided as en and active power values difference values. Output  Output  Output  De values  Output  De values  Do V, add the following to the erent and active power accurate ent to the transport accurate ent to active power accurate ent to accurate the transport accurate ent to accurate the transport accurate ent to accurate the transport accurate the tra   | ±(0.06*f+0.02)° ±0.62° ±(0.005*f+0.4)° ±(0.002*f+1.3)° t(0.002*f+1.3)°  **TUde and ldc, while accuracy and Irms. et for full-scale input with a values in the frequency use.  **Description of the received with the received with the received with the reference values.  **Description of the values of the values of the values.  **Description of the values of values.  **Description of of v |
| kHz < f ≤ 50 kHz  kHz < f ≤ 100 kHz  00 kHz < f ≤ 200 kHz  uses off in above tables a uses off frequencies other table uracy figures for Obta uracy figures for obta uracy figures for obta uracy figures for volta uracy figures u   | ±0.2% rdg. ±0.1% f.s. ±0.4% rdg. ±0.3% f.s. ±1.5% rdg. ±0.5% f.s. ±2.0% f.s. æe given in kHz. ge and current are defined for han DC are defined for Urms difference values are define æe to the transparence of the transparence en provided as reference value æe and active power values in 16 Hz are provided as reference æe and active power values in to 100 kHz are provided as æe and active power values in en to 100 kHz are provided as en and active power values in en to 100 kHz are provided as en and active power values in en to 100 kHz are provided as en and active power values in en to 100 kHz are provided as en and active power values difference values. Output  Output  Output  De values  Output  De values  Do V, add the following to the erent and active power accurate ent to the transport accurate ent to active power accurate ent to accurate the transport accurate ent to accurate the transport accurate ent to accurate the transport accurate the tra   | ±0.62° ±(0.005°f+0.4)° ±(0.002°f+1.3)° r Udc and Idc, while accuracy and Irms. ad for full-scale input with a values in the frequency ues. excess of 220 V in the rence values. excess of 750 V in the reference values. xcess of (22,000/f [kHz]) V in ts reference values. excess of (24,000/f [kHz]) V in the reference values. the excess of 1000 V are the frequency range of 45 Hz the phase difference accuracy tracy (at 2 V f.s.) the phase difference accuracy tracy (at 2 V f.s.)   |
| kHz < f ≤ 50 kHz  kHz < f ≤ 100 kHz  00 kHz < f ≤ 200 kHz  uses off in above tables a uses off frequencies other table uracy figures for Obta uracy figures for obta uracy figures for obta uracy figures for volta uracy figures u   | ±0.4% rdg. ±0.3% f.s. ±1.5% rdg. ±0.5% f.s. ±20% f.s. are given in kHz. ge and current are defined for han DC are defined for Urms. difference values are define to LPF disabled. e, current, and active power provided as reference values and active power values in 16 Hz are provided as refere and active power values in to 100 kHz are provided as that to 200 kHz are provided as and active power values in so difference values. 00 V, add the following to the verent and active power values and active power values in so so verence values. verence values. verence values outside the ference values outside the ference values. verence values outside the ference values outside the ference values. verence values outside the ference values outside the ference values. verence values outside the ference values. verence values outside the ference values outside the ference values are verence values outside the ference values outside   | ±0.62° ±(0.005°f+0.4)° ±(0.002°f+1.3)° r Udc and Idc, while accuracy and Irms. ad for full-scale input with a values in the frequency ues. excess of 220 V in the rence values. excess of 750 V in the reference values. xcess of (22,000/f [kHz]) V in ts reference values. excess of (24,000/f [kHz]) V in the reference values. the excess of 1000 V are the frequency range of 45 Hz the phase difference accuracy tracy (at 2 V f.s.) the phase difference accuracy tracy (at 2 V f.s.)   |
| kHz < f ≤ 100 kHz  0 kHz < f ≤ 200 kHz  uses of f in above tables :  uses of fin above tables :  uracy figures for DC volta  tes for frequencies other t  uracy figures for phase  of 10 kHz  uracy figures for voltage  ge of 0.5 Hz to 10 Hz  uracy figures for voltage  usency range of 10 Hz to  uracy figures for voltage  usency range of 30 kHz  uracy figures for voltage  usency range of 30 kHz  uracy figures for voltage  uracy figures for voltage  usency range of 100 k  0 hz of 5 kHz  uracy figures for voltage  frequency range of 100 k  0 hz of 5 kHz  uracy figures for by  10 hz of 5 kHz  uracy figures for voltage  10 Hz   | ±1.5% rdg. ±0.5% f.s.  ±20% f.s.  are given in kHz. ge and current are defined for han DC are defined for Ums. difference values are define  1.PF disabled. e, current, and active power  1.Provided as reference value  2. and active power values in  1.6 Hz are provided as reference values are define  3. and active power values in  1.6 Hz are provided as a reference  3. and active power values in  5. and active power values in  5. difference values outside the  1. and 1   | ±(0.005*f+0.4)°  ±(0.022*f-1.3)°  r Udc and Idc, while accuracy and Irms. ad for full-scale input with a values in the frequency use. excess of 220 V in the rence values. r excess of (22,000f [kHz]) V in the reference values. excess of (22,000f [kHz]) V in ser ference values. excess of 1000 V are the frequency range of 45 Hz e phase difference accuracy expected by the phase of th |
| D kHz < f ≤ 200 kHz  uses of f in above tables a uracy figures for DC volta uracy figures for DC volta verse for frequencies other turacy figures for phase ge of 0.5 Hz to 10 Hz are uracy figures for voltage ge of 0.5 Hz to 10 Hz are uracy figures for voltage guency range of 10 Hz to turacy figures for voltage guency range of 10 Hz to turacy figures for voltage uracy figures for voltage vided as reference value uracy figures for voltage turacy figures for voltage turacy figures for voltage turacy figures for voltage turacy figures for voltage uracy figures   | ±20% f.s.  are given in kHz. ge and current are defined for han DC are defined for Irms. difference values are define e LPF disabled. e, current, and active power e provided as reference value and active power values in to 16 Hz are provided as reference value and active power values in to 100 kHz are provided as a nad active power values in and active power values in es and active power values in es and active power values in es difference values outside the ference values. Do V, add the following to the rent and active power accu acy to above accuracy figur ce. Note that separate con e. Note that separate con   | ±(0.022*f-1.3)°  r Udc and Idc, while accuracy and Irms. ad for full-scale input with a values in the frequency use. excess of 220 V in the rence values. n excess of 750 V in the reference values. n excess of (22,000/f [kHz]) V in streference values. n excess of 1000 V are the frequency range of 45 Hz e phase difference accuracy uracy (at 2 V f.s.)  res for current, active hibination accuracy figures  |
| ues of f in above tables a uracy figures for DC volta turacy figures for DC volta turacy figures for pC volta turacy figures for phase ver factor of zero and the uracy figures for voltage go of 0.5 Hz to 10 Hz are uracy figures for voltage usency range of 10 Hz to uracy figures for voltage usency range of 10 Hz to uracy figures for voltage usency range of 100 kz turacy figures for voltage uracy figures for voltage vided as reference value voltages in excess of 6 Hz are provided as reference value the voltages in excess of 60 Hz < f ≤ 20 kHz:±0.5° kHz < f ≤ 70 kHz < f ≤ 7  | are given in kHz. ge and current are defined for than DC are defined for Ums. difference values are define t LPF disabled. , current, and active power s provided as reference value a and active power values in to 16 Hz are provided as refe- a and active power values in to 100 kHz are provided as refe- and active power values in to 100 kHz are provided as and active power values in and active power values in to 100 kHz are provided as and active power values in to 100 kHz are provided as and active power values in to 100 kHz are provided as and active power values in between the total control of the ference values. Do V, add the following to the rent and active power accur acy to above accuracy figur ce. Note that separate con ce.  | rudo and ldc, while accuracy and Irms.  ed for full-scale input with a values in the frequency uss.  e xoess of 220 V in the rence values.  e xoess of 750 V in the reference values.  e xoess of (22,000/f [kHz]) V in serference values.  e xoess of 1000 V are  en frequency range of 45 Hz  e phase difference accuracy  irracy (at 2 V f.s.)  res for current, active hibination accuracy figures   |
| uracy figures for DC volta rest of frequencies other turacy figures for phase rer factor of zero and the ruracy figures for voltage go of 0.5 Hz to 10 Hz are uracy figures for voltage guency range of 10 Hz to uracy figures for voltage upency range of 10 Hz to uracy figures for voltage upency range of 30 kHz uracy figures for voltage frequency range of 100 k uracy figures for voltage uracy figures for voltage vided as reference value voltages in excess of 6 Hz are provided as reference value for the voltages in excess of 60 Hz < f $\leq$ 20 kHz: $\pm$ 0.3° kHz < f $\leq$ 20 kHz: $\pm$ 0.3° kHz < f $\leq$ 20 kHz: $\pm$ 0.3° kHz < f $\leq$ 20 kHz: $\pm$ 0.3° current sensor accurate for current for the DC current for current for the DC current for current for current for current for current for the DC current for   | ge and current are defined for han DC are defined for Urms. difference values are define the Urms. difference values are define to LPF disabled.  9, current, and active power provided as reference value and active power values in to 16 Hz are provided as reference and active power values in to 100 kHz are provided as reference and active power values in extra to 200 kHz are provided as a land active power values in extra to 200 kHz are provided as land active power values in extra to 200 kHz are provided as 100 kHz to 200 kHz are provi   | and Irms. and Irms. and Irms. and to full-scale input with a values in the frequency uss. a excess of 220 V in the rence values. a excess of 750 V in the reference values. ccess of (22,000/f [kHz]) V in us reference values. are excess of 1000 V are the frequency range of 45 Hz the phase difference accuracy uracy (at 2 V f.s.) ares for current, active rebination accuracy figures   |
| 6 R.H. or less<br>rm-up time: 30 min. or r<br>ut: Within the specified<br>with the sync source<br>zero ground voltage<br>adjustment and with<br>the synchronization  | ranges when the fundame<br>e, for sine wave input, powe<br>, within effective measurer<br>in the range in which the fu<br>source conditions  | 23°C ±3°C (73°F ±5°F), ental wave is synchronized er factor of one, or DC inpu- ment range after zero-   |
| asurement jacks and cha<br>6 f.s. or less (in 400 A/r  | assis)<br>m magnetic field, DC and 5   | 50 Hz/60 Hz)   |
|  |  |  |
| V, current and active p  | ower not more than ±6% f.  | .s.,   |
|  |  |  |
|  | e voltage range × the rated  | u primary-side current of th   |
|  | ve power not more than ±6  | 5% f.s.,   |
| ere f.s. current is the ra   | ted primary-side current of  | f the current sensor   |
|  | e voltage range × the rated  | d primary-side current of th   |
|  |  |  |
|  | UIIS   |  |
| , ,  |  |  |
|  |  |  |
| ·  |  |  |
|  |  | or " Hz" unmeasurable time   |
| Hz/1 Hz/2 Hz/5 Hz/10   | Hz/20 Hz   |  |
| ms (measurement-free   | uency-dependent at 45 Hz   | and below)   |
|  |  |  |
| 05% rdg., ±1 dgt. (under   | other conditions)  | _  |
| h sine wave of at least 30   |  | roolo magaurament ranga  |
| 000 Hz to 9.9999 Hz, 9   |  |  |
|  | 01% rdg./°C (for DC, ac<br>01% rdg./°C (for DC, ac<br>01% f.s. or less (with 100 k<br>susurement jacks and oh,<br>s.f.s. or less (in 400 A//<br>er than φ = ±90°: ±(1-c) en<br>en φ = ±90°: ±(1-c) en<br>ver f.s. current is the ra-<br>active power equals the<br>rent sensor<br>0 V/m, current and active<br>per f.s. current is the ra-<br>active power equals the<br>rent sensor<br>ement Specification<br>ir (f1 to f4)<br>set U/I for each measurement and active<br>per f.s. current is the ra-<br>active power equals the<br>rent sensor<br>ement Specification<br>ir (f1 to f4)<br>set U/I for each measurement and active<br>per active power equals the<br>per f.s. current is the ra-<br>active power equals the<br>rent sensor<br>ement Specification<br>ir (f1 to f4)<br>set U/I for each measured<br>between the fire of  | 01% rdg./°C (for DC, add ±0.01% f.s./°C) 11% f.s. or less (with 1000 V @50 Hz/60 Hz applied subrement jacks and chassis) s.f.s. or less (in 400 A/m magnetic field, DC and 5 er than φ = ±90°: ±(1-cos (φ+Phase difference a en φ = ±90°: ±cos (φ+Phase difference a accuracy V, current and active power not more than ±6% for f.s. current is the rated primary-side current o active power equals the voltage range x the rate rent sensor 0 V/m, current and active power not more than ±6 ere f.s. current is the rated primary-side current o active power equals the voltage range x the rate rent sensor equals the voltage range x the rate rent sensor   |

### -3. Integration Measurement Specifications

| Measurement mode          | Selectable between RMS or DC for each wiring mode  |
|---------------------------|--|
| Measurement items         | Current integration (lh+, lh-, and lh), active power integration (WP+, WP-, and WP) lh+ and lh- only for DC mode measurements, and lh only for RMS mode measurements   |
| Measurement method        | Digital calculation from each current and active power phase (when averaging, calculates with previous average value) In DC mode: calculates current value at every sample, and integrates instantaneous power independent of polarity In RMS mode: Integrates current effective values between measurement intervals, and polarity-independent active power value |
| Measurement interval      | 50 ms data update interval   |
| Measuring range           | Integration value: 0 Ah/Wh to ±9999.99 TAh/TWh<br>Integration time: No greater than 9999h59m   |
| Integration time accuracy | ±50 ppm ±1 dgt. (-10°C to 40°C (14°F to 104°F))  |
| Integration accuracy      | ± (current and active power accuracy) ± integration time accuracy  |
| Backup function           | Integration automatically resumes after power outages.   |

|   | aromoni opoomoanor   |                     |                   |      |
|---|--|---------------------|-------------------|------|
| Number of                                   | 4 channels   |                     |                   |      |
| measurement channels                        | Harmonic measurements not available for multiple systems with different frequencies.   |                     |                   |      |
| Measurement items                           | Harmonic ms voltage, harmonic voltage percentage, harmonic voltage phase angle,<br>harmonic mrs current, harmonic current percentage, harmonic current phase angle,<br>harmonic active power, harmonic power percentage, harmonic voltage-current phase<br>difference, total harmonic voltage distortion, total harmonic current distortion,<br>voltage unbalance factor, current unbalance factor |                     |                   |      |
| Measurement method                          | Zero-crossing synchronous calculation (all channels in same window), with gap<br>Fixed 500 kS/s sampling, after digital anti-aliasing filter<br>Equal thinning between zero crossings (with interpolation calculation)   |                     |                   |      |
| Harmonic sync source                        | U1 to U4, I1 to I4, External (with motor analysis and CH B set for pulse input), DC selectable (50 ms or 100 ms)   |                     |                   |      |
| FFT calculation word length                 | 32 bits  |                     |                   |      |
| Anti-aliasing filter                        | Digital filter (automatically set based on synchronization frequency)  |                     |                   |      |
| Windows                                     | Rectangular  |                     |                   |      |
| Synchronization frequency range             | As specified for power measurements  |                     |                   |      |
| Data update interval                        | 50 ms (measurement-frequency-dependent at 45 Hz and below)   |                     |                   |      |
| Phase zero adjustment                       | Provided by key operation or e<br>Automatic or manual config<br>Phase zero-adjustment set  | uration of phase z  | ero-adjustment va | lues |
| THD calculation                             | THD-F/THD-R  |                     |                   |      |
| Highest order analysis and window waveforms | Synchronization frequency range  | Window<br>waveforms | Analysis order    |      |
|   | 0.5 Hz ≤ f < 40 Hz   | 1                   | 100th             | ]    |
|   | 40 Hz ≤ f < 80 Hz  | 1                   | 100th             |      |
|   | 80 Hz ≤ f < 160 Hz   | 2                   | 80th              | ]    |
|   | 160 Hz ≤ f < 320 Hz  | 4                   | 40th              |      |
|   | 320 Hz ≤ f < 640 Hz  | 8                   | 20th              |      |
|   | 640 Hz ≤ f < 1.2 kHz   | 16                  | 10th              | ]    |
|   | 1.2 kHz ≤ f < 2.5 kHz  | 32                  | 5th               | ]    |
|   | 2.5 kHz < f < 5.0 kHz  | 64                  | 3th               | ]    |

### Accuracy Voltage(U), Current(I), Active Power(P) Frequency 0.5 Hz ≤ f < 30 Hz ±0.4% rdg. ±0.2% f.s. 30 Hz ≤ f ≤ 400 Hz ±0.3% rdg. ±0.1% f.s. 400 Hz < f ≤ 1 kHz ±0.4% rdg. ±0.2% f.s. 1 kHz < f ≤ 5 kHz ±1.0% rdg. ±0.5% f.s. 5 kHz < f ≤ 10 kHz ±2.0% rdg. ±1.0% f.s. 10 kHz < f ≤ 13 kHz ±5.0% rdg. ±1.0% f.s. Not specified for sync frequencies of 4.3 kHz and higher Add the LPF accuracy to the above when using LPF.

## -5. Noise Measurement Specifications

| Calculation channels        | 1 (Select one from CH1 to CH4)   |
|-----------------------------|--|
| Calculation items           | Voltage noise/Current noise  |
| Calculation type            | RMS spectrum   |
| Calculation method          | Fixed 500 kS/s sampling, thinning after digital anti-aliasing filter                               |
| FFT calculation word length | 32 bits  |
| FFT data points             | 1000/5000/10,000/50,000 (according to displayed waveform recording length)                         |
| Anti-aliasing filter        | Automatic digital filter (varies with maximum analysis frequency)                                  |
| Windows                     | Rectangular/Hanning/flat-top   |
| Data update interval        | Determined by FFT points within approx. 400 ms, 1 s, 2 s, or 15 s, with gap                        |
| Highest analysis frequency  | 200 kHz/50 kHz/20 kHz/10 kHz/5 kHz/2 kHz   |
| Frequency resolution        | 0.2 Hz to 500 Hz (Determined by FFT points and maximum analysis frequency)                         |
| Noise amplitude measurement | Calculates the ten highest level and frequency voltage and current FFT peak values (local maxima). |
| Lower limit noise frequency | 0 kHz to 10 kHz  |
|                             |  |

# -6. Motor Analysis Specifications (Model PW3390-03)

| -0. WOLDI Allalysis             | opecifications (woder i wooso-oo)  |
|---------------------------------|--|
| Number of input channels        | 3 channels CH A: Analog DC input/Frequency input (selectable) CH B: Analog DC input/Pulse input (selectable) CH Z: Pulse input |
| Measurement input terminal type | Insulated BNC jacks  |
| Input impedance (DC)            | 1 MΩ ±100 kΩ   |
| Input methods                   | Isolated and differential inputs (not isolated between channels B and Z)   |
| Measurement items               | Voltage, torque, rotation rate, frequency, slip, and motor power   |
| Synchronization source          | U1 to U4, I1 to I4, Ext (with CH B set for pulse input), DC (50 ms/100 ms) Common to channels A and B                          |
| Measurement frequency source    | f1 to f4 (for slip calculations)   |
| Maximum input voltage           | ±20 V (during analog, frequency, and pulse input)  |
| Maximum rated voltage to earth  | 50 V (50 Hz/60 Hz)   |

# (1). Analog DC Input (CH A/CH B)

| (1). Allalog Do Input (OTT WOTT D) |   |  |
|------------------------------------|---|--|
| Measurement range                  | ±1 V, ±5 V, ±10 V (when inputting analog DC)  |  |
| Valid input range                  | 1% to 110% f.s.   |  |
| Sampling                           | 10 kHz/16 bits  |  |
| Response time                      | 1 ms (measuring zero to full scale, with LPF off)   |  |
| Measurement method                 | Simultaneous digital sampling and zero-crossing synchronous calculation system (cumulative average of intervals between zero crossings) |  |
| Measurement accuracy               | ±0.08% rdg. ±0.1% f.s.  |  |
| Temperature coefficient            | ±0.03% f.s./°C  |  |
|                                    | Not more than ±0.01% f.s. (with 50 V [DC or 50 Hz/60 Hz] between measurement jacks and PW3390 chassis)                                  |  |

| Effect of external magnetic field | Not more than ±0.1% f.s. (at 400 A/m DC and 50 Hz/60 Hz magnetic fields) |
|-----------------------------------|--|
| LPF                               | OFF/ON (OFF: 4 kHz, ON: 1 kHz)   |
| Total display area                | Zero-suppression range setting ±120%                                     |
| Zero adjustment                   | Zero-corrected input offset of voltage ±10% f.s. or less                 |
| Scaling                           | 0.01 ~ 9999.99   |
| Unit                              | CH A: V, N+ m, mN+ m, kN+ m, CH B: V, Hz, r/min                          |

## (2). Frequency Input (CH A only)

| Valid amplitude range      | ±5 V peak (5 V symmetrical, equivalent to RS-422 complementary signal)   |
|----------------------------|--|
| Max. measurement frequency | 100 kHz  |
| Measurement range          | 1 kHz to 100 kHz   |
| Data output interval       | According to synchronization source  |
| Measurement accuracy       | ±0.05% rdg., ±3 dgt.   |
| Total display area         | 1.000 kHz to 99.999 kHz  |
| Frequency range            | Select fc and fd for frequency range fc $\pm$ fd [Hz] (frequency measurement only) 1 kHz to 98 kHz in 1 kHz units, where fc + fd < 100 kHz and fc - fd > 1 kHz |
| Rated torque               | 1 ~ 999  |
| Unit                       | Hz, N <sub>*</sub> m, mN <sub>*</sub> m, kN <sub>*</sub> m   |

## (3). Pulse Input (CH B only)

| Detection level                | Low: 0.5 V or less; High: 2.0 V or more  |
|--------------------------------|--|
| Measurement range              | 1 Hz to 200 kHz (at 50% duty)  |
| Division setting range         | 1 ~ 60000  |
| Measurement frequency range    | 0.5 Hz to 5.0 kHz (limited to measured pulse frequency divided by selected no. of divisions) |
| Minimum detectable pulse width | 2.5 µs or more   |
| Measurement accuracy           | ±0.05% rdg., ±3 dgt.   |
| Motor poles                    | 2 ~ 98   |
| Max. measurement frequency     | 100 Hz, 500 Hz, 1 kHz, 5 kHz   |
| Pulse count                    | Integer multiple of half the number of motor poles, from 1 to 60,000                         |
| Unit                           | Hz, r/min  |
|                                | •  |

## (4). Pulse Input (CH Z only)

| Detection level                | Low: 0.5 V or less; High: 2.0 V or more   |
|--------------------------------|---|
| Measurement range              | 0.1 Hz to 200 kHz (at 50% duty)   |
| Minimum detectable pulse width | 2.5 $\mu$ s or more   |
|                                | OFF/Z Phase/B Phase (clear counts of CHB in rising edge during Z Phase, detect polar code for number of rotations during B Phase) |

## -7. D/A Output Option Specifications (Models PW3390-02 and PW3390-03)

| Number of output channels | 16 channels   |
|---------------------------|---|
| Output contents           | CH1 to CH8: Selectable analog/waveform outputs CH9 to CH16: Analog output   |
| Output items              | Analog output: Select a basic measurement item for each output channel.  Waveform output: Output voltage or current measured waveforms.   |
| Output connector          | One 25-pin female D-sub   |
| D/A conversion resolution | 16 bits (polarity + 15 bits)  |
| Output accuracy           | Analog output: Measurement accuracy ±0.2% f.s. (DC level) Waveform output: Measurement accuracy ±0.5% f.s. (at ±2 V f.s.), ±1.0% f.s. (at ±1 V f.s.) (rms level within synchronous frequency range) |
| Output update interval    | Analog output: 50 ms (according to input data update interval of selected parameter) Waveform output: 500 kHz   |
| Output voltage            | Analog output: ±5 V DC nom. (approx. ±12 V DC max.) Waveform output: ±2 V/±1 V switchable, crest factor of 2.5 or greater Setting applies to all channels.  |
| Output impedance          | 100 Ω ±5 Ω  |
| Temperature coefficient   | ±0.05% f.s./°C  |
|                           |   |

# -8. Display Specifications

| Display type | 9-inch TFT color LCD (800×480 dots)  |
|--------------|--|
|              | Measurement values: 200 ms (independent of internal data update interval) Waveforms, FFT: screen-dependent |

# -9. External Interface Specifications

### (1). USB Interface (Functions)

| Connector  | Mini-B receptacle ×1                        |  |
|--|---|--|
| Compliance standard  | nce standard USB2.0 (Full Speed/High Speed) |  |
| Class  | Individual (USB488h)                        |  |
| Connection destination   Computer (Windows10/Windows8/Windows7, 32bit/64bit) |   |  |
| Function   | Data transfer and command control           |  |

# (2). USB Memory Interface

| Connector                  | USB type A connector ×1   |
|----------------------------|---|
| Compliance standard        | USB2.0  |
| USB power supply           | 500 mA maximum  |
| USB storage device support | USB Mass Storage Class  |
| Function                   | Save and load settings files, Save waveform data Save displayed measurement values (CSV format) Copy measurement values and recorded data (from CF card) Save waveform data Save FFT spectrum for noise measurement Save/load screenshots |

### (3). LAN Interface

| Connector           | RJ-45 connector x 1  |  |
|---------------------|--|--|
| Compliance standard | IEEE 802.3 compliant   |  |
| Transmission method | 10BASE-T/100BASE-TX Auto detected  |  |
| Protocol            | TCP/IP   |  |
| Function            | HTTP server (remote operation), Dedicated port (data transfer and command control) |  |

### (4). CF Card Interface

| Slot                      | One Type 1   |  |
|---------------------------|--|--|
| Compatible card           | CompactFlash memory card (32 MB or higher)   |  |
| Supported memory capacity | Up to 2 GB   |  |
| Data format               | MS-DOS format (FAT16/FAT32)  |  |
| Recordable content        | Save and load settings files, Save waveform data Save displayed measurement values and auto-recorded data (CSV format) Copy measurements/recorded data (from USB storage) Save waveform data Save FFT spectrum for noise waveforms Save/load screenshots |  |

### (5) BS-232C Interface

| (5). H3-232C III(e)1  | 400  |  |  |
|---|--|--|--|
| Method RS-232C, [EIA RS-232D], [CCITT V.24], [JIS X5101] compliant<br>Full duplex, start-stop synchronization, 8-bit data, no parity, one sto<br>Hardware flow control, CR+LF delimiter |  |  |  |
| Connector   | D-sub9 pin connector x1  |  |  |
| Communication speeds  | 9600 bps, 19,200 bps, 38,400 bps   |  |  |
| Function  | Command control, Bluetooth® logger connectivity (simultaneous use not supported) |  |  |
| (6). Synchronizatio   | n Control Interface  |  |  |
| Signal contents   | One-second clock, integration START/STOP, DATA RESET, EVENT                      |  |  |
| Connector types   | IN: One 9-pin female mini-DIN jack, OUT: One 8-pin female mini-DIN jack          |  |  |
| Signal  | 5 V CMOS   |  |  |
| Max. input  | ±20 V  |  |  |
| Max. signal delay   | 2 μs (rising edge)   |  |  |
| (7). External Contro  | ol Interface   |  |  |
| Connector types   | 9-pin round connector ×1; also used as synchronization control interface         |  |  |
| Electrical specifications Logic signal of 0 V/5 V (2.5 V to 5 V), or contact signal (shorted/open)  |  |  |  |
| Function Integration start, integration stop, data reset, event (the event set as synchronization control function)  Cannot be used at the same time as synchronization control.        |  |  |  |

# Function Specifications -1. Control Functions

| -1. Control Functions   |  |  |  |
|-------------------------|--|--|--|
| AUTO range function     | Automatically selects voltage and current ranges according to measured amplitude on each phase.  Operating states: Selectable on or off for each phase system Auto-ranging span: Wide/Narrow (common to all wiring systems)  |  |  |
| Timing control function | Interval  OFF/50 ms/100 ms/200 ms/500 ms/1 s/5 s/10 s/ 15 s/30 s/1 min/5 min/10 min/15 min/30 min/60 min  Setting determines the maximum data-saving capacity Timing controls  OFF/Timer/RTC Timer : 10 s to 9999:59:59 [h:m:s] (in seconds) Real-time clock : Start and stop times (in minutes) |  |  |
| Hold function           | Stops all updating of displayed measurement values and waveforms, and holds display. Internal calculations such as integration and averaging, clock, and peak-over display continue to be updated.   |  |  |
| Peak hold function      | All measurement values are updated to display the maximum value for each measurement.  Displayed waveforms and integration values continue to be updated with instantaneous values.  |  |  |

### -2. Calculation Functions

| Scaling calculation     | VT(PT) ratio and CT ratio: OFF/0.01 to 9999.99  |
|-------------------------|---|
| Average calculation     | OFF/FAST/MID/SLOW/SLOW2/SLOW3   |
| -                       | Exponentially averages all instantaneous measurement values including   |
|                         | harmonics (but not peak, integration, or FFT noise values). Applied to displayed  |
|                         | values and saved data.  |
|                         | Response speed (time remains within specified accuracy when input changes from 0 to 100% f.s.)                                    |
|                         | FAST: 0.2 s, MID: 1.0 s, SLOW: 5 s, SLOW2: 25 s, SLOW3: 100 s   |
| Efficiency and loss     | Efficiency n [%] and Loss [W] are calculated from active power values measured  |
| calculations            | on each phase and system.   |
|                         | For PW3390-03, motor power (Pm) is also applied as a calculation item.  |
|                         | Maximum no. of simultaneous calculations: Efficiency and loss, by three   |
|                         | formulas (Parameters are specified for Pin and Pout) Calculation method: Efficiency η = 100 × IPoutl/IPinl                        |
|                         | Loss = IPinI - IPoutI   |
| Λ-Y calculation         | For 3P3W3M systems, converts between line-to-line voltage and phase voltage   |
| 2 i daidalation         | waveforms using a virtual center point.   |
|                         | All voltage parameters including harmonics such as true rms voltage are calculated as   |
|                         | phase voltage waveforms.  |
|                         | U1s = (U1s-U3s)/3, U2s = (U2s-U1s)/3, U3s =(U3s-U2s)/3  |
| Selecting the           | TYPE1/TYPE2 (only valid when wiring is 3P3W3M)  |
| calculation method      | Select the calculation method used to calculate the apparent power and reactive   |
|                         | power during 3P3W3M wiring. Only affect measurement values S123, Q123, φ123, λ123   |
| Current sensor phase    | Compensation by calculating the current sensor's harmonic phase characteristics   |
| correction calculations | Correction points are set using frequency and phase difference (set separately  |
|                         | for each wiring mode).  |
|                         | Frequency: 0.001 kHz to 999.999 kHz (in 0.001 kHz increments)   |
|                         | Phase difference: 0.00 °. to ±90.00 °. (in 0.01 °. increments)  |
|                         | However, the time difference calculated from the frequency phase difference is limited to a maximum of 200 us in 5 ns increments. |
|                         | limited to a maximum of 200 us in 5 ns increments.  |
| -3. Display Functio     | ns  |
| Wiring Check screen     | The wiring diagram and voltage/current vectors are displayed for the selected   |
|                         | wiring ovetom(s)  |

# Wiring Check screen

| Wiring Check screen                    | The wiring diagram an wiring system(s). The correct range for t proper measurement of   | he wiring syst | em is shown |                |         |  |
|--|---|----------------|-------------|----------------|---------|--|
| Independent wiring system display mode | Displays power and harmonic measurement values for channels 1 to 4. A composite measurement line pattern is displayed for each system. Basic, voltage, current, and power measurement parameter, harmonic bar graph, harmonic list, and harmonic vector screens   |                |             |                |         |  |
| Display Selections screen              | Select to display any 4, 8, 16, or 32 of the basic measurement parameters.  Display layout: 4, 8, 16, or 32 parameters (4 patterns)   |                |             |                |         |  |
| Efficiency and Loss screen             | The efficiency and loss obtained by the specified calculation formulas are displayed numerically. Three efficiency and three loss values.   |                |             |                |         |  |
| Waveform &<br>Noise screen             | Voltage and current waveforms sampled at 500 kHz and noise meast are displayed compressed on one screen.  Trigger: Synchronized with the harmonic sync source Recording length: 1000/5000/10,000/50,000 x All voltage and curren Compression ratio: 1/1, 1/2, 1/5, 1/10, 1/20, 1/50 (peak-to-peak comprescription). |                |             | current channe |         |  |
|  | Recording speed/<br>Recording length  | 1000           | 5000        | 10,000         | 50,000  |  |
|  | 500 kS/s  | 2 ms           | 10 ms       | 20 ms          | 100 ms  |  |
|  | 250 kS/s  | 4 ms           | 20 ms       | 40 ms          | 200 ms  |  |
|  | 100 kS/s  | 10 ms          | 50 ms       | 100 ms         | 500 ms  |  |
|  | 50 kS/s   | 20 ms          | 100 ms      | 200 ms         | 1000 ms |  |
|  | 25 kS/s   | 40 ms          | 200 ms      | 400 ms         | 2000 ms |  |
|  | 10 kS/s   | 100 ms         | 500 ms      | 1000 ms        | 5000 ms |  |

| Trend screen    | Display a time-sequence graph of measured values for basic measurement parameters that have been selected as trend display parameters. Waveforms are graphed using peak-peak compression of data refresh rate data based on the time axis setting. Data is not stored. Number of graphed parameters: Up to 8 Time axis: 1.5 / 3 / 6 / 12 / 30 / s/div; 1 / 3 / 6 / 10 / 30 min./div.; 1 / 3 / 6 / 12 hour/div; 1 day/div. Vertical axis: Auto (configured so that the data in the screen display range fits on the screen) / semi-auto (user selects the zoom factor relative to the full-scale values for graphed parameters from the following: 1/8, 1/4, 1/2, x1, x2, x5, x10, x50, x100, x200, x500) /manual (user sets the maximum and minimum values for the display) |
|-----------------|---|
| X-Y Plot screen | Select horizontal and vertical axes from the basic measurement items to display on the XY graphs.  Dots are plotted at the data update interval, and are not saved.  Drawing data can be cleared.  Horizontal: 1 data item (gauge display available), Vertical: 2 data items (gauge display available)  |

## -4. Saving Functions

| •                      |   |
|------------------------|---|
| Auto-save function     | As the items to be saved, select any measured values including harmonics and noise value data of the FFT function. The selected items are stored to CF card during every measurement interval. (Storage to USB memory is not available.) Can be controlled by timer or real-time clock.  Max. no. of saved items: Interval-setting-dependent  -50 ms: 130 items -100 ms: 260 items -200 ms: 520 items  -500 ms: 1300 items -1 s: 2600 items -5 s to 60 min: 5000 items  Data format: CSV format   |
| Manual saving function | Save destinations: USB memory/CF card  • Measurement data  As the items to be saved, select any measured values including harmonics and noise value data of the FFT function.  Pressing the SAVE key saves each measurement value at that moment to the save destination.  File format: CSV format  • Screen capture  The COPY key captures and saves a bitmap image of the display to the save destination.  *This function can be used at an interval of 5 sec or more while automatic saving is in progress.  File format: Compressed BMP format  • Settings data  Settings information can be saved/loaded as a settings file.  File format: SET format (for PW3390 only)  • Waveform data  Saves the waveform being displayed by means of [Wave/Noise] display.  File format: CSV format |
|                        | Save the noise measurement FFT spectrum shown on the Waveform/Noise screen.<br>File format: CSV format  |

### -5. Synchronous Control Function

| Function               | Synchronous measurements are available by using sync cables to connect Model PW3390 (primary)secondary). When internal settings match, auto-save is available while synchronized.         |
|------------------------|---|
| Synchronized items     | Clock, data update interval (except for FFT calculations), integration start/stop, data reset, certain events   |
| Event items            | Hold, manual save, screen capture   |
| Synchronization timing | Clock, data update interval     Within 10 s after power-on by a secondary PW3390     Start/stop, data reset, event     Upon key-press and communications operations on the primary PW3390 |
| Synchronization delay  | Maximum 5 μs per connection. Maximum synchronization delay of an event is +50 ms  |
| -6. Bluetooth® Load    | ner Connectivity  |

|                   | Sends measured values wirelessly to logger by using a Bluetooth® serial conversion adapter. |
|-------------------|---|
| Supported devices | Hioki LR8410 Link-compatible loggers (LR8410, LR8416)                                       |
| Sent data         | Measured values assigned to the D/A CH9 to CH16 analog output parameters                    |

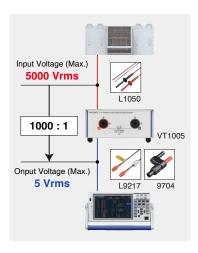
# -7. Other Functions

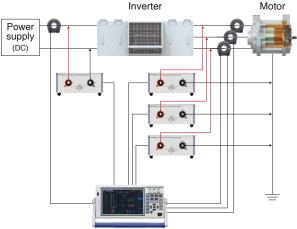
| Display language selection | Japanese, English, Chinese   |
|----------------------------|--|
| Beep sound                 | OFF/ON   |
| Screen color schemes       | COLOR1 (black)/2 (blue-green)/3 (blue)/4 (gray)/5 (navy blue)  |
| Start-up screen selection  | Wiring or Last-displayed screen (Measurement screens only)   |
| LCD backlight              | ON/1 min/5 min/10 min/30 min/60 min  |
| CSV file format            | CSV/SSV  |
| Real-time clock function   | Auto-calendar, leap-year correcting 24-hour clock  |
| RTC accuracy               | ±3 s per day @25°C (77°F)  |
| Sensor recognition         | Current sensors are automatically recognized when connected (Excluding the CT7000 series sensors)              |
| Warning indicators         | When peak over occurs on voltage and current measurement channels, When no sync source is detected             |
| Va., Iaal.                 | Warning indicators for all channels are displayed on all pages of the MEAS screen.                             |
| Key-lock                   | Toggles on/off by holding the ESC key for three seconds.   |
| System reset               | Returns all settings to factory defaults   |
| Power-on reset             | Returns all settings including language and communications settings, to factory defaults.                      |
| File operations            | Media content list display, format media, create folders, delete files and folders, copy between storage media |

# **General Specifications**

| Operating environment                 | Indoors, Pollution Degree 2, altitude up to 2000 m (6562.20 ft)  |  |  |  |  |
|---------------------------------------|--|--|--|--|--|
| Operating temperature<br>and humidity | Temperature: -10°C to 40°C (14°F to 104°F), Humidity: 80% RH or less (no condensation) -10°C to 50°C (14°F to 122°F), 80% RH or less (no condensation)     |  |  |  |  |
| Storage temperature and humidity      |  |  |  |  |  |
| Dustproof and waterproof              | IP20 (EN 60529)  |  |  |  |  |
| Applicable standards                  | Safety EN 61010<br>EMC EN 61326 Class A  |  |  |  |  |
| Power supply                          | 100 V to 240 V AC, 50 Hz/60 Hz, Maximum rated power: 220 VA<br>Anticipated transient overvoltage: 2500 V   |  |  |  |  |
| Backup battery life                   | Clock, settings and integration values (Lithium battery), Approx. 10 years, @23°C (73°F)   |  |  |  |  |
| Dimensions                            | 340 mm (13.39 in) W x 170 mm (6.69 in) H x 156 mm (6.14 in) D (excluding protrusions)  |  |  |  |  |
| Mass                                  | 4.6 kg (162.3 oz) with PW3390-03   |  |  |  |  |
| Product warranty period               | 3 year   |  |  |  |  |
| Accessories                           | Instruction Manual ×1, Measurement Guide ×1, Power cord ×1, USB cable (0.9 m (2.95 ft)) ×1, Input cord label ×2, D-sub connector ×1 (PW3390-02, PW3390-03) |  |  |  |  |

# Measure High Voltages of up to 5000 V



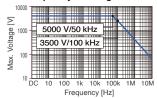


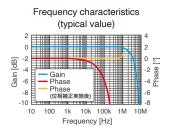
# The AC/DC High Voltage Divider VT1005 divides and outputs voltages of up to 5000 V. With the PW3390, the VT1005 can accurately measure high voltages of up to 5000 V.



AC/DC HIGH VOLTAGE DIVIDER VT1005

### Frequency derating curve

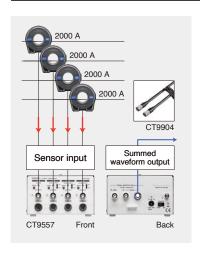


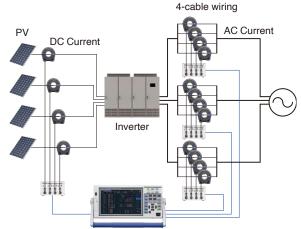


# VT1005 specifications

| v i rood opcomodiioni                    | •   |
|--|---|
| Maximum rated voltage                    | 5000 V rms, ±7100 V peak (Provided this falls within the frequency derating curve illustrated)  |
| Maximum rated voltage (line-to-ground)   | No measurement category: 5000 V AC/DC (7100 V peak, Anticipated transient overvoltage 0 V) Measurement category II: 2000 V AC/DC (Anticipated transient overvoltage 12000 V) Measurement category III: 1500 V AC/DC (Anticipated transient overvoltage 10000 V) |
| Measurement accuracy                     | ±0.08% (DC), ±0.04% (50 Hz/60 Hz), ±0.17% (50 kHz)  |
| Frequency flatness                       | Band where amplitude falls within ±0.1% range: 200 kHz (typical) Band where phase falls within ±0.1° range: 500 kHz (typical) (*5)  |
| Measurement bandwidth                    | DC to 4 MHz (Amplitude and phase accuracy specified up to 1 MHz)  |
| Voltage dividing ratio                   | 1000 : 1  |
| Common-mode voltage rejec-               | 50 Hz/60 Hz: 90 dB (typical),   |
| tion ratio (CMRR)                        | 100 kHz: 80 dB (typical)  |
| Operating temperature and humidity range | -10°C to 50°C (14°F to 122°F),<br>80% RH or less (non-condensing)   |
| Power supply                             | 100 V to 240 V AC (50/60 Hz)  |
| Dimensions (W x H x D)                   | Approx. 195.0 × 83.2 × 346.0 mm (7.68 × 3.28 × 13.62 in.)   |
| Weight                                   | Approx. 2.2 kg (77.6 oz.)   |
| Measurement method                       | Differential input  |
| Included accessories                     | - L1050-01 Voltage Cord (1.6 m/ 5.25 ft) - L9217 Connection Cord (insulated BNC, 1.6 m/ 5.25 ft) - 9704 Conversion Adapter (insulated-female BNC-to-banana plug)  |

# Measure Large Currents of up to 8000 A





The Sensor Unit CT9557 adds and outputs current sensor output from multi-wire lines. With the PW3390, the CT9557 can be used to accurately measure large currents of up to 8000 A (on a 4-wire line).



**SENSOR UNIT CT9557** 

# CT9557 specifications

| Connectable current sensor                         | Current sensors are listed on p. 16 - p. 18*.  |                  |  |  |  |
|--|--|------------------|--|--|--|
|  | DC   | : ±0.06% ±0.03%  |  |  |  |
|  | ~ 1 kHz  | : ±0.06% ±0.03%  |  |  |  |
| Summed waveform                                    | ~ 10 kHz                                       | : ±0.10%. ±0.03% |  |  |  |
| output accuracy<br>±(% of reading + % of full      | ~ 100 kHz                                      | : ±0.20% ±0.10%  |  |  |  |
| $\pm (\% \text{ or reading } + \% \text{ or run})$ | ~ 300 kHz                                      | : ±1.0% ±0.20%   |  |  |  |
| 564.67   | ~ 700 kHz                                      | : ±5.0% ±0.20%   |  |  |  |
|  | ~ 1 MHz  | : ±10.0% ±0.50%  |  |  |  |
| Operating temperature and                          | -10°C to 50°C (14°F to 122°F),                 |                  |  |  |  |
| humidity   | 80% RH or less                                 |                  |  |  |  |
| Power supply                                       | 100 V to 240 V AC (50 Hz/60 Hz)                |                  |  |  |  |
| Output connector                                   | HIOKI ME15W (male connector)                   |                  |  |  |  |
| Dimensions (W x H x D)                             | Approx. 116 mm W × 67 mm H × 132 mm D          |                  |  |  |  |
| Differsions (W X H X D)                            | (approx. 4.57 in. W x 2.64 in. H x 5.20 in. D) |                  |  |  |  |
| Weight   | Approx. 420 g (14.8 oz.)                       |                  |  |  |  |
| Included accessories                               | AC ADAPTER Z1002, Power cord                   |                  |  |  |  |

| Wiring               | Current | Using sensors                         |
|----------------------|---------|---------------------------------------|
| Single-cable         | 1000 A  | CT6876A<br>CT6846A                    |
| or bundled<br>wiring | 2000 A  | CT6877A                               |
| 2-cable              | 2000 A  | CT9557+CT6876A×2/<br>CT9557+CT6846A×2 |
| wiring               | 4000 A  | CT9557+CT6877A×2                      |
| 3-cable              | 3000 A  | CT9557+CT6876A×3/<br>CT9557+CT6846A×3 |
| wiring               | 6000 A  | CT9557+CT6877A×3/                     |
| 4-cable              | 4000 A  | CT9557+CT6876A×4/<br>CT9557+CT6846A×4 |
| wiring               | 8000 A  | CT9557+CT6877A×4                      |



Option
CONNECTION CABLE CT9904
Cable length: 1 m (3.28 ft)
CT9904 required to connect to PW3390.

<sup>\*</sup>When connecting CT7642, CT7742, CT7044, CT7045, CT7046, optional conversion cable CT9920 is required.

# **Current sensors High accuracy clamp**

|                                    |   |   | CT6831  | CT6830   |  |  |
|------------------------------------|---|---|---|--|--|--|
| Appearance                         |   | NEW   |   | NEW  |  |  |
| Ra                                 | ated current                                |   | 20 A AC/DC  | 2 A AC/DC  |  |  |
| Fre                                | equency band                                |   | DC to 100 kHz   | DC to 100 kHz  |  |  |
| Dia                                | ameter of measurable conductors             |   | Max. φ 5 mm (0.20 in.)  | Max. φ 5 mm (0.20 in.)   |  |  |
|                                    | U7001 Current (I) Combined Active power (P) | U700  | accuracy + Sensor accuracy  | U7001 accuracy + Sensor accuracy   |  |  |
|                                    | U7005 Current (I) Combined Active power (P) |   | Max. φ 5 mm (0.20 in.)  | U7005 accuracy + Sensor accuracy   |  |  |
| 5                                  |   | DC  | : ±0.3% ±0.10%  | DC : ±0.3% ±0.10%  |  |  |
| Accuracy                           |   | DC < f ≤ 66 Hz  | : ±0.3% ±0.01%  | DC < f ≤ 66 Hz : ±0.3% ±0.05%  |  |  |
| Acc                                | Sensor only (amplitude)*1                   | 66 Hz < f ≤ 500 Hz  | : ±0.3% ±0.02%  | 66 Hz < f ≤ 500 Hz : ±0.3% ±0.05%  |  |  |
|                                    | ±(% of reading +% of full scale)            | 500 Hz < f ≤ 1 kHz  | : ±0.5% ±0.05%  | 500 Hz < f ≤ 1 kHz : ±0.5% ±0.05%  |  |  |
|                                    | full scale is rated current of sensor       | 1 kHz < f ≤ 5 kHz   | : ±1.0% ±0.10%  | 1 kHz < f ≤ 5 kHz : ±1.0% ±0.10%   |  |  |
|                                    |   | 5 kHz < f ≤ 10 kHz  | : ±5.0% ±0.10%  | 5 kHz < f ≤ 10 kHz : ±5.0% ±0.10%  |  |  |
|                                    |   | 10 kHz < f ≤ 100 kHz  | : ±30% ±0.10%   | 10 kHz < f ≤ 100 kHz : ±30% ±0.10%   |  |  |
|                                    | ommon-Mode Rejection Ratio                  | 140 dB or greater (DC to 100 Hz), 130 dB or greater (100 Hz to 1 kHz)     |   | 140 dB or greater (DC to 100 Hz), 125 dB or greater (100 Hz to 1 kHz)  |  |  |
| (CI                                | MRR)  | (effect on outp   | ut voltage and common mode voltage)   | (effect on output voltage and common mode voltage)   |  |  |
| Fre                                | equency derating                            | <u> </u>  | T <sub>i</sub> : Ambient temperature  ≤ T <sub>i</sub> ≤ ±45°C)  100 1k 10k 100k  Frequency [Hz]  | 10  10  13 A (-40°C \( \frac{1}{2} \) \( 1 |  |  |
| Ou                                 | itput voltage                               |   | 0.1 V/A (= 2 V/20 A)  | 1 V/A  |  |  |
| Ор                                 | perating temperature and humidity*2         |   | to 85°C (-40°F to 185°F), 80% RH or less<br>C to 50°C (-77°F to 122°F), 80% RH or less  | Sensor: -40°C to 85°C (-40°F to 185°F), 80% RH or less<br>Multiplexer: -25°C to 50°C (-77°F to 122°F), 80% RH or less  |  |  |
| Storage temperature and humidity*2 |   | Sensor and multiplexer:<br>-25°C to 50°C (-77°F to 122°F), 80% RH or less |   | Sensor and multiplexer:<br>-25°C to 50°C (-77°F to 122°F), 80% RH or less  |  |  |
| Sta                                | andards                                     | Safet   | y: EN 61010, EMC: EN 61326  | Safety: EN 61010, EMC: EN 61326  |  |  |
| Ca                                 | able length                                 | Between multiplexe  | or to multiplexer: approx. 4 m (13.12 ft.)<br>to output connector: approx 0.2 m (0.66 ft.)  | Between sensor to multiplexer: approx. 4 m (13.12 ft.) Between multiplexer to output connector: approx 0.2 m (0.66 ft.)  |  |  |
| Dimensions                         |   |   | 4H $\times$ 14.2D mm (approx. 3.00W $\times$ 0.92H $\times$ 0.56D in.) 0H $\times$ 26.5D mm (approx. 3.15W $\times$ 0.79H $\times$ 1.04D in.) | Sensor: Approx. $76.5W \times 23.4 \text{ H} \times 14.2D \text{ mm}$ (approx. $3.00W \times 0.92\text{H} \times 0.56D \text{ in.}$ Multiplexer: Approx. $80W \times 20\text{H} \times 26.5D \text{ mm}$ (approx. $3.15W \times 0.79\text{H} \times 1.04D \text{ in.}$ )   |  |  |
| Mass                               |   |   |   | Approx. 160 g (5.64 oz.)   |  |  |

<sup>\*1:</sup>  $\pm(\%$  of reading + % of full scale) , full scale is rated current of sensor \*2: Non-condensing

|                     |  | СТ   | T6846A   | СТ   | 6845A  | СТ  | 6844A  |   |
|---------------------|--|--|--|--|--|---|--|---|
| Appearance          |  |  |  |  |  |   |  |   |
| Ra                  | ated current   |  | 1000   | A AC/DC  | 500  | A AC/DC   | 500 A  | AC/DC   |
| Fr                  | equency band   |  | DC t   | to 100 kHz   | DC t   | o 200 kHz   | DC to  | 500 kHz   |
| Di                  | ameter of measur   | rable conductors   | Max. φ 5   | 0 mm (1.97 in.)  | Max. φ 50  | 0 mm (1.97 in.)   | Max. φ 20  | mm (0.79 in.)   |
|                     | PW3390   | Current (I)  | DC<br>45 Hz ≤ f ≤ 66 Hz  | : ±0.25% ±0.09%<br>: ±0.24% ±0.07%   | DC<br>45 Hz ≤ f ≤ 66 Hz  | : ±0.25% ±0.09%<br>: ±0.24% ±0.07%  | DC<br>45 Hz ≤ f ≤ 66 Hz  | : ±0.25% ±0.09%<br>: ±0.24% ±0.07%  |
|                     | Combined*3   | Active power (P)   | DC<br>45 Hz ≤ f ≤ 66 Hz  | : ±0.25% ±0.09%<br>: ±0.24% ±0.07%   | DC<br>45 Hz ≤ f ≤ 66 Hz  | : ±0.25% ±0.09%<br>: ±0.24% ±0.07%  | DC<br>45 Hz ≤ f ≤ 66 Hz  | : ±0.25% ±0.09%<br>: ±0.24% ±0.07%  |
| Accuracy            | Sensor only (amplitude) ±(% of reading +% of full scale) full scale is rated current of sensor |  | DC DC < f ≤ 100 Hz 100 Hz < f ≤ 500 Hz 500 Hz < f ≤ 1 kHz 1 kHz < f ≤ 5 kHz 1 kHz < f ≤ 5 kHz 10 kHz < f ≤ 5 kHz 10 kHz < f ≤ 50 kHz | : ±0.2% ±0.02%<br>: ±0.2% ±0.01%<br>: ±0.5% ±0.02%<br>: ±1.0% ±0.02%<br>: ±2.0% ±0.02%<br>: ±3.0% ±0.02%<br>: ±3.0% ±0.02% | DC < f \le 100 Hz < f \le 500 Hz<br>100 Hz < f \le 500 Hz<br>500 Hz < f \le 1 kHz<br>10 kHz < f \le 5 kHz<br>5 kHz < f \le 5 kHz<br>10 kHz < f \le 20 kHz<br>20 kHz < f \le 50 kHz<br>50 kHz < f \le 100 kHz<br>50 | : ±0.2% ±0.02%<br>: ±0.2% ±0.01%<br>: ±0.3% ±0.02%<br>: ±0.5% ±0.02%<br>: ±1.0% ±0.02%<br>: ±1.5% ±0.02%<br>: ±1.5% ±0.02%<br>: ±1.5% ±0.02%<br>: ±3.5% ±0.02%<br>: ±3.5% ±0.05%  | DC  DC < f ≤ 100 Hz  100 Hz < f ≤ 500 Hz  500 Hz < f ≤ 1 kHz  1 kHz < f ≤ 5 kHz  5 kHz < f ≤ 10 kHz  10 kHz < f ≤ 50 kHz  50 kHz < f ≤ 100 kHz  100 kHz < f ≤ 300 kHz  100 kHz < f ≤ 300 kHz | : ±0.2% ±0.02%<br>: ±0.2% ±0.01%<br>: ±0.3% ±0.02%<br>: ±0.5% ±0.02%<br>: ±1.0% ±0.02%<br>: ±1.5% ±0.02%<br>: ±1.5% ±0.02%<br>: ±1.5% ±0.05%<br>: ±30% ±0.05% |
| _                   | perating Temper<br>aximum rated vo   |  |  | °C (-40°F to 185°F)  | -40°C to 85°C (-40°F to 185°F)  CATIII 1000 V  |   |  | (-40°F to 185°F)  |
| _                   | mensions   | bitage to earth  | CATIII 1000 V  238 (9.37") W × 116 (4.57") H × 35 (1.38") D mm  Cable length: 3 m (9.84 ft)  |  | CATIII 1000 V  238 (9.37") W × 116 (4.57") H × 35 (1.38") D mm  Cable length: 3 m (9.84 ft)  |   | 153 (6.02") W × 67 (2.   | 64") H × 25 (0.98") D mm<br>th: 3 m (9.84 ft)   |
| M                   | ass  |  | Approx.  | 990 g (34.9 oz)  | Approx. 860 g (30.3 oz)  |   | Approx. 400 g (14.1 oz)  |   |
| Derating properties |  | 1800   10 | min.) min.) 10k 10k 1M Frequency Pt2]  | 1990   | ntinuous)  | 770 A | )<br>nuous)<br>nuous)  |   |

\*3 ±(% of reading + % of range), range is PW3390 CT6846A: Add ±0.15% of the range for 20 A range or 40 A range. CT6845A: Add ±0.15% of the range or 20 A range. CT6844A: Add ±0.15% of the range for 10 A range or 20 A range.

|                     |  |   | CT6843A                        |   | СТ   | 6841A   | 92                          | 272-05                |
|---------------------|--|---|--------------------------------|---|--|---|-----------------------------|-----------------------|
| Appearance          |  | nce   |                                |   |  |   |                             |                       |
| Rat                 | ed current   |   | 200 Å                          | A AC/DC   | 20 A   | AC/DC   | 200 A/20                    | A AC switching        |
| Fre                 | quency band  |   | DC to                          | 500 kHz   | DC t   | to 1 MHz  | 1kHz                        | to 100 kHz            |
| Diar                | meter of measura   | able conductors   | Max. φ 20                      | mm (0.79 in.)   | Max. φ 20  | mm (0.79 in.)   | Max. φ 46 mm (1.81 in.)     |                       |
|                     | PW3390<br>Combined* <sup>4</sup>   | DC Current (I) DC 45 Hz ≤ f ≤ 66 Hz   |                                | : ±0.25% ±0.09%<br>: ±0.24% ±0.07%<br>: ±0.25% ±0.09%<br>: ±0.24% ±0.07%      | DC<br>45 Hz ≤ f ≤ 66 Hz<br>DC<br>45 Hz ≤ f ≤ 66 Hz | : ±0.25% ±0.12%<br>: ±0.24% ±0.07%<br>: ±0.25% ±0.12%<br>: ±0.24% ±0.07%      | PW3390 accura               | icy + Sensor accuracy |
| r                   |  | 1   | DC                             | : ±0.2% ±0.02%  | DC   | : ±0.2% ±0.05%  |                             | _                     |
|                     |  |   | DC < f ≤ 100 Hz                | : ±0.2% ±0.01%  | DC < f ≤ 100 Hz                                    | : ±0.2% ±0.01%  | 1 Hz ≤ f < 5 Hz             | : ±2.0% ±0.10%        |
| 5                   |  |   | 100 Hz < f ≤ 500 Hz            | : ±0.3% ±0.02%  | 100 Hz < f ≤ 500 Hz                                | : ±0.3% ±0.02%  | 5 Hz ≤ f < 10 Hz            | : ±1.0% ±0.05%        |
| Accuracy            |  |   | 500 Hz < f ≤ 1 kHz             | : ±0.5% ±0.02%  | 500 Hz < f ≤ 1 kHz                                 | : ±0.5% ±0.02%  | 10 Hz ≤ f < 45 Hz           | : ±0.5% ±0.02%        |
| Acc                 | Sensor only (amplitude) ±(% of reading +% of full scale) full scale is rated current of sensor |   | 1 kHz < f ≤ 5 kHz              | : ±1.0% ±0.02%  | 1 kHz < f ≤ 5 kHz                                  | : ±1.0% ±0.02%  | 45 Hz < f ≤ 66 Hz           | : ±0.3% ±0.01%        |
| `                   |  |   | 5 Hz < f ≤ 10 kHz              | : ±1.5% ±0.02%  | 5 Hz < f ≤ 10 kHz                                  | : ±1.5% ±0.02%  | 66 Hz < f ≤ 1 kHz           | : ±0.5% ±0.02%        |
|                     |  |   | 10 kHz < f ≤ 50 kHz            | : ±5.0% ±0.02%  | 10 kHz < f ≤ 50 kHz                                | : ±2.0% ±0.02%  | 1 kHz < f ≤ 5 kHz           | : ±1.0% ±0.05%        |
|                     |  |   | 50 kHz < f ≤ 100 kHz           | : ±15% ±0.05%   | 50 kHz < f ≤ 100 kHz                               | : ±5.0% ±0.05%  | 5 kHz < f ≤ 10 kHz          | : ±2.5% ±0.10%        |
|                     |  |   | 100 kHz < f ≤ 300 kHz          | : ±15% ±0.05%   | 100 kHz < f ≤ 300 kHz                              | : ±10% ±0.05%   | 10 kHz < f ≤ 50 kHz         | : ±5.0% ±0.10%        |
|                     |  |   | 300 kHz < f ≤ 500 kHz          | : ±30% ±0.05%   | 300 kHz < f ≤ 500 kHz                              | : ±15% ±0.05%   | 50 kHz < f ≤ 100 kHz        | : ±30.0% ±0.10%       |
|                     |  |   |                                | _   | 500 kHz < f < 1 MHz                                | : ±30% ±0.05%   |                             | _                     |
| Оре                 | erating Tempera  | ature   | -40°C to 85°C (-40°F to 185°F) |   | -40°C to 85°C (-40°F to 185°F)                     |   | 0°C to 50°C (32°F to 122°F) |                       |
| Max                 | ximum rated vo   | oltage to earth   | CATI                           | II 1000 V   | CATIII 1000 V                                      |   | CATIII AC600 V rms          |                       |
| Dim                 | nensions   | sions 153 (6.02") W × 67 (2.64") H × 25 (0.98") D mm<br>Cable length: 3 m (9.84 ft)   |                                | 153 (6.02") W × 67 (2.64") H × 25 (0.98") D mm<br>Cable length: 3 m (9.84 ft) |  | 78 (3.07") W × 188 (7.40") H × 35 (1.38") D mm<br>Cable length: 3 m (9.84 ft) |                             |                       |
| Mas                 | ss   |   | Approx. 3                      | 70 g (13.1 oz)  | Approx. 3  | 50 g (12.3 oz)  | Approx.                     | 450 g (15.9 oz)       |
| Derating properties |  | E 500 400 A |                                | 50  |  | 400<br>   |                             |                       |

 $<sup>^{*4}</sup>$   $\pm$ (% of reading + % of range) , range is PW3390 CT6843A: Add  $\pm$ 0.15% of the range for 0.4 A range or 0.8 A range. CT6841A: Add  $\pm$ 0.15% of the range for 0.4 A range or 0.8 A range.

 $\label{thm:custom} \text{Custom cable lengths also available. Please inquire with your Hioki distributor.}$ 

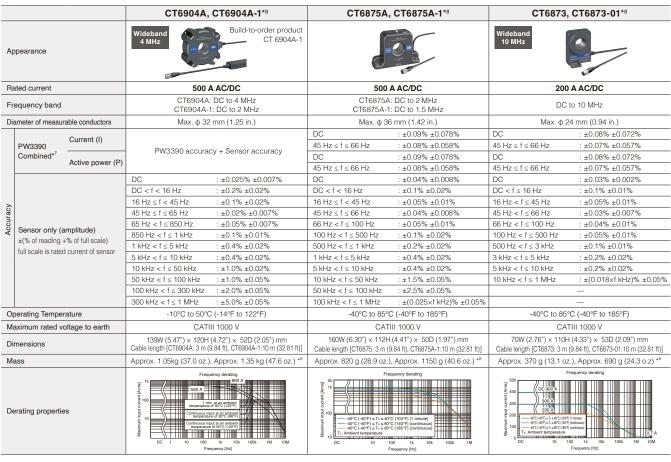
# Current sensors High accuracy pass-through

|            |                                       | CT6877A,                      | CT6877A-1*6  | CT6876A,   | CT6876A-1*6  | CT6904A-2  | , CT6904A-3*6  |                                  |
|------------|---------------------------------------|-------------------------------|--|--|--|--|--|----------------------------------|
| Appearance |                                       |                               |  |  |  | Wideband<br>4 MHz Build-to-order product<br>CT6904A-2<br>CT6904A-3 |  |                                  |
| Ra         | ated current                          |                               | 2000   | A AC/DC  | 1000   | A AC/DC  | 800 8  | A AC/DC                          |
| Fr         | equency band                          |                               | DC   | to 1 MHz   |  | DC to 1.5 MHz<br>: DC to 1.2 MHz                                   |  | 2: DC to 4 MHz<br>3: DC to 2 MHz |
| Di         | ameter of measu                       | rable conductors              | Max. φ 80  | mm (3.14 in.)  | Max. φ 36  | 6 mm (1.42 in.)  | Max. φ 32  | mm (1.25 in.)                    |
|            | PW3390<br>Combined*5                  | Current (I)  Active power (P) | DC<br>45 Hz ≤ f ≤ 66 Hz<br>DC  | : ±0.09% ±0.078%<br>: ±0.08% ±0.058%<br>: ±0.09% ±0.078% | DC<br>45 Hz ≤ f ≤ 66 Hz<br>DC  | : ±0.09% ±0.078%<br>: ±0.08% ±0.058%<br>: ±0.09% ±0.078%           | PW3390 accurac   | cy + Sensor accuracy             |
|            |                                       | / toure points (i )           | 45 Hz ≤ f ≤ 66 Hz  | : ±0.08% ±0.058%   | 45 Hz ≤ f ≤ 66 Hz  | : ±0.08% ±0.058%   |  |                                  |
|            |                                       |                               | DC   | : ±0.04% ±0.008%   | DC   | : ±0.04% ±0.008%   | DC   | : ±0.030% ±0.009%                |
|            |                                       |                               | DC < f < 16 Hz   | : ±0.1% ±0.02%   | DC < f < 16 Hz   | : ±0.1% ±0.02%   | DC < f < 16 Hz   | : ±0.2% ±0.025%                  |
| 5          |                                       |                               | 16 Hz ≤ f < 45 Hz  | : ±0.05% ±0.01%  | 16 Hz ≤ f < 45 Hz  | : ±0.05% ±0.01%  | 16 Hz ≤ f < 45 Hz  | : ±0.1% ±0.025%                  |
| Accuracy   |                                       |                               | 45 Hz ≤ f ≤ 66 Hz  | : ±0.04% ±0.008%   | 45 Hz ≤ f ≤ 66 Hz  | : ±0.04% ±0.008%   | 45 Hz ≤ f ≤ 65 Hz  | : ±0.025% ±0.009%                |
| CCL        | Sensor only (amplitude)               |                               | 66 Hz < f ≤ 100 Hz   | : ±0.05% ±0.01%  | 66 Hz < f ≤ 100 Hz   | : ±0.05% ±0.01%  | 65 Hz < f ≤ 850 Hz   | : ±0.05% ±0.009%                 |
| ٩          | ±(% of reading -                      |                               | 100 Hz < f ≤ 500 Hz  | : ±0.1% ±0.02%   | 100 Hz < f ≤ 500 Hz  | : ±0.1% ±0.02%   | 850 Hz < f ≤ 1 kHz   | : ±0.1% ±0.013%                  |
|            | full scale is rated current of sensor |                               | 500 Hz < f ≤ 1 kHz   | : ±0.2% ±0.02%   | 500 Hz < f ≤ 1 kHz   | : ±0.2% ±0.02%   | 1 kHz < f ≤ 5 kHz  | : ±0.4% ±0.025%                  |
|            |                                       |                               | 1 kHz < f ≤ 10 kHz   | : ±0.5% ±0.02%   | 1 kHz < f ≤ 5 kHz  | : ±0.5% ±0.02%   | 5 kHz < f ≤ 10 kHz   | : ±0.4% ±0.025%                  |
|            |                                       |                               | 10 kHz < f ≤ 50 kHz  | : ±1.5% ±0.05%   | 5 kHz < f ≤ 10 kHz   | : ±0.5% ±0.02%   | 10 kHz < f ≤ 50 kHz  | : ±1% ±0.025%                    |
|            |                                       |                               | 50 kHz < f ≤ 100 kHz   | : ±2.5% ±0.05%   | 10 kHz < f ≤ 50 kHz  | : ±2.0% ±0.05%   | 50 kHz < f ≤ 100 kHz   | : ±1.0% ±0.063%                  |
|            |                                       |                               | 100 kHz < f ≤ 700 kHz  | : ±(0.025×f kHz)% ±0.05%                                 | 50 kHz < f ≤ 100 kHz   | : ±3.0% ±0.05%   | 100 kHz < f ≤ 300 kHz  | : ±2.0% ±0.063%                  |
|            |                                       |                               | _  |  | 100 kHz < f ≤ 1 MHz : ±(0.03×f kHz)% ±0.05%  |  | 300 kHz < f ≤ 1 MHz : ±5.0% ±0.063%  |                                  |
| O          | perating Temper                       | rature                        | -40°C to 85°0  | C (-40°F to 185°F)                                       | -40°C to 85°C (-40°F to 185°F)   |  | -10°C to 50°C (-14°F to 122°F)   |                                  |
| M          | aximum rated v                        | oltage to earth               | CAT  | III 1000 V   | CATIII 1000 V  |  | CATIII 1000 V  |                                  |
| Di         | mensions                              |                               | 229W (9.02") × 232H (9.13") × 112D (4.41") mm<br>Cable length [CT6877A: 3 m (9.84 ft), CT6877A-1:10 m (32.81 ft)]  |  | 160W (6.30") × 112H (4.41") × 50D (1.97") mm<br>Cable length [CT6876A: 3 m (9.84 ft), CT6876A-1:10 m (32.81 ft)]   |  | 139W (5.47") × 120H (4.72") × 52D (2.05") mm<br>Cable length [CT6904A-2: 3 m (9.84 ft), CT6904A-3:10 m (32.81 ft)]   |                                  |
| M          | ass                                   |                               | Approx. 5 kg (176.4 oz.)   | , Approx. 5.3 kg (187.0 oz.) *6                          | Approx. 970 g (34.2 oz.), Approx. 1300 g (45.9 oz.) *6   |  | Approx. 1150 g (40.6 oz.), Approx. 1450 g (51.1 oz.) *6  |                                  |
| De         | Derating properties                   |                               | Frequency dentaling  Frequency |  | Frequency derailing  Frequency |  | Frequency derating 800 A |                                  |

\*5 ± (% of reading + % of range), range is PW6001

CT6877A/CT6877A-1: Add ±0.15% of the range for 40 A range or 80 A range; CT6876A/CT6876A-1: Add ±0.15% of the range for 20 A range or 40 A range

<sup>\*6</sup> The CT6877A-1, CT6876A-1, and CT6904A-3 have a 10 m cord. For the CT6877A-1, add ±(0.005 x f kHz)% of reading for amplitude accuracy and ±(0.015 x f kHz)° for phase accuracy for frequencies of 1 kHz < f ≤ 700 kHz. For the CT6876A-1, add  $\pm (0.005 \times f \text{ kHz})\%$  of reading for amplitude accuracy and  $\pm (0.015 \times f \text{ kHz})\%$  for phase accuracy for frequencies of 1 kHz < f  $\leq$  1 MHz. For the CT6904A-3, add  $\pm (0.015 \times f \text{ kHz})\%$  of reading for amplitude accuracy for frequencies of 50 kHz < f  $\leq$  1 MHz.



<sup>±(%</sup> of reading + % of range), range is PW3390

CT6875A/CT6875A-1: Add ±0.15% of the range for 10 A range or 20 A range; CT6873/CT6873-01: Add ±0.15% of the range for 4 A range or 8 A range.

1 The CT6904A-1, CT6875A-1, and CT6873-01 have a 10 m cord. For the CT6904A-1, add ±(0.015 × f kHz)% of reading for amplitude accuracy for frequencies of 50 kHz < f ≤ 1 MHz. For the CT6875A-1, add  $\pm (0.005 \times f \text{ kHz})\%$  of reading for amplitude accuracy and  $\pm (0.015 \times f \text{ kHz})\%$  for phase accuracy for frequencies of 1 kHz < f  $\leq$  1 MHz. For the CT6873-01, add  $\pm (0.015 \times f \text{ kHz})\%$  for phase accuracy for frequencies of 1 kHz < f  $\leq$  1 MHz.

|                                   |                                       | СТ6   | 863-05               | CT6872,  | CT6872-01*10   | СТ6   | 862-05                            |  |
|-----------------------------------|---------------------------------------|---|----------------------|--|--|---|-----------------------------------|--|
| Appearance                        |                                       |   |                      | Wideband<br>10 MHz   |  |   |                                   |  |
| R                                 | ated current                          | 200 A AC/DC   |                      | 50 A AC/DC   |  | 50 A AC/DC  |                                   |  |
| Fr                                | equency band                          | DC to 500 kHz   |                      | DC to 10 MHz   |  | DC to 1 MHz   |                                   |  |
| Diameter of measurable conductors |                                       | Мах. ф 24   | mm (0.94 in.)        | Max. φ 2   | 4 mm (0.94 in.)  | Мах. ф 24   | 1 mm (0.94 in.)                   |  |
|                                   | PW3390 Combined*9  Active power (P)   | PW3390 accurad  | cy + Sensor accuracy | DC<br>$45 \text{ Hz} \le f \le 66 \text{ Hz}$<br>DC<br>$45 \text{ Hz} \le f \le 66 \text{ Hz}$                 | : ±0.08% ±0.072%<br>: ±0.07% ±0.057%<br>: ±0.08% ±0.072%<br>: ±0.07% ±0.057% | PW3390 accuracy + Sensor accuracy   |                                   |  |
|                                   |                                       | DC  | : ±0.05% ±0.01%      | DC   | : ±0.03% ±0.002%   | DC  | : ±0.05% ±0.01%                   |  |
|                                   |                                       | DC < f ≤ 16 Hz  | : ±0.10% ±0.02%      | DC < f ≤ 16 Hz   | : ±0.1% ±0.01%   | DC < f ≤ 16 Hz  | : ±0.10% ±0.02%                   |  |
| 5                                 |                                       | 16 Hz ≤ f < 400 Hz  | : ±0.05% ±0.01%      | 16 Hz < f ≤ 45 Hz  | : ±0.05% ±0.01%  | 16 Hz ≤ f < 400 Hz  | : ±0.05% ±0.01%                   |  |
| Accuracy                          |                                       | 400 Hz ≤ f ≤ 1 kHz  | : ±0.2% ±0.02%       | 45 Hz < f ≤ 66 Hz  | : ±0.03% ±0.007%   | 400 Hz ≤ f ≤ 1 kHz  | : ±0.2% ±0.02%                    |  |
| Acc                               | Sensor only (amplitude)               | 1 kHz < f ≤ 5 kHz   | : ±0.7% ±0.02%       | 66 Hz < f ≤ 100 Hz   | : ±0.04% ±0.01%  | 1 kHz < f ≤ 5 kHz   | : ±0.7% ±0.02%                    |  |
|                                   | ±(% of reading +% of full scale)      | 5 kHz < f ≤ 10 kHz  | : ±1.0% ±0.02%       | 100 Hz < f ≤ 500 Hz  | : ±0.06% ±0.01%  | 5 kHz < f ≤ 10 kHz  | : ±1.0% ±0.02%                    |  |
|                                   | full scale is rated current of sensor | 10 kHz < f ≤ 50 kHz   | : ±2.0% ±0.02%       | 500 Hz < f ≤ 1 kHz   | : ±0.1% ±0.01%   | 10 kHz < f ≤ 50 kHz   | : ±1.0% ±0.02%                    |  |
|                                   |                                       | 50 kHz < f ≤ 100 kHz  | : ±5.0% ±0.05%       | 1 kHz < f ≤ 5 kHz  | : ±0.15% ±0.02%  | 50 kHz < f ≤ 100 kHz  | : ±2.0% ±0.05%                    |  |
|                                   |                                       | 100 kHz < f ≤ 300 kHz   | : ±10% ±0.05%        | 5 kHz < f ≤ 10 kHz   | : ±0.15% ±0.02%  | 100 kHz < f ≤ 300 kHz   | : ±5.0% ±0.05%                    |  |
|                                   |                                       | 300 kHz < f ≤ 500 kHz   | : ±30% ±0.05%        | 10 kHz < f ≤ 1 MHz   | : ±(0.012×f kHz)% ±0.05%   | 300 kHz < f ≤ 700 kHz   | : ±10% ±0.05%                     |  |
|                                   |                                       | _   |                      |  | _  |   | 700 kHz < f < 1 MHz : ±30% ±0.05% |  |
| 0                                 | perating Temperature                  | -30°C to 85°C   | (-22°F to 185°F)     | -40°C to 85°C (-40°F to 185°F), 80% RH or less   |  | -30°C to 85°C (-22°F to 185°F)  |                                   |  |
| M                                 | aximum rated voltage to earth         | CATI  | II 1000 V            | CATIII 1000 V  |  | CATIII 1000 V   |                                   |  |
| Di                                | mensions                              | 70W (2.76") × 100H (3.94") × 53D (2.09") mm<br>Cable length: Approx. 3 m (9.84 ft.)       |                      | 70W (2.76") × 110H (4.33") × 53D (2.09") mm<br>Cable length [CT6872: 3 m (9.84 ft), CT6872-01:10 m (32.81 ft)] |  | 70W (2.76") × 100H (3.94") × 53D (2.09") mm<br>Cable length: Approx. 3 m (9.84 ft.) |                                   |  |
| M                                 | ass                                   | Approx. 350 g (12.3 oz.)  |                      | Approx. 370 g (13.1 oz.), Approx. 690 g (24.3 o.z) *10   |  | Approx. 340 g (12.0 oz.)  |                                   |  |
| De                                | erating properties                    | Frequency derating  Education  Frequency derating  Frequency derating  Frequency derating |                      | Frequency derating    100   100 A  |  | Frequency derating  Frequency derating  Frequency derating                          |                                   |  |

 $<sup>^{*9}</sup>$  ±(% of reading + % of range) , range is PW3390

Custom cable lengths also available. Please inquire with your Hioki distributor.

# **Standard Sensor**

 $^{\star}$  CT9920 (sold separately) is required to connect PW3390 to the sensor with HIOKI PL14 on the output connector.

|   | AC/DC CURRENT SENSOR CT7642<br>AC/DC AUTO ZERO CURRENT SENSOR<br>CT7742                        | AC FLEXIBLE CURRENT SENSOR<br>CT7044, CT7045, CT7046  |  |
|---|--|---|--|
| Appearance                                  | 8181   |   |  |
| Rated current                               | 2000 A AC/DC   | 6000 A AC   |  |
| Frequency band                              | CT7642: DC to 10 kHz<br>CT7742: DC to 5 kHz  | 10 Hz to 50 kHz (±3 dB)   |  |
| Diameter of<br>measurable<br>conductors     | φ 55 mm (2.17 in) or less  | CT7044: φ 100 mm (3.94 in) or less<br>CT7045: φ 180 mm (7.09 in) or less<br>CT7046: φ 254 mm (10.00 in) or less |  |
| Basic accuracy                              | For DC, 45 Hz to 66 Hz<br>Amplitude: ±1.5% rdg. ±0.5% f.s.<br>For up to 66 Hz<br>Phase:±2.3 °  | For 45 to 66 Hz, with flexible cable core Amplitude: ±1.5% rdg. ±0.25% f.s. Phase:±1.0 °                        |  |
| Frequency<br>characteristics<br>(Amplitude) | 66 Hz to 1 kHz<br>±2.5% rdg. ±1.0% f.s.  | -   |  |
| Operating temperature                       | -25°C to 65°C (-13°F to 149°F)   | -25°C to 65°C (-13°F to 149°F)  |  |
| Effect of conductor position                | ±1.0% rdg. or less   | ±3.0% or less   |  |
| Effect of external magnetic fields          | In 400 A/m magnetic field (DC)<br>0.2% f.s. or less  | In 400 A/m magnetic field (50 Hz/60 Hz)<br>CT7044, CT7045: 2.0% f.s. or less<br>CT7046: 2.5% f.s. or less       |  |
| Output connector                            | HIOKI PL14*  | HIOKI PL14*   |  |
| Dimensions                                  | 64 mm (2.52 in) W x 195 mm (7.68 in) H<br>x 34 mm (1.34 in) D<br>Cable length: 2.5 m (8.20 ft) | Circuit box: 25 mm (0.98 in) W x 72 mm (2.83 in) H x 20 mm (0.79 in) D  Cable length: 2.5 m (8.20 ft)           |  |
| Mass  | 510 g (18.0 oz)  | CT7044: 160 g (5.6 oz)<br>CT7045: 174 g (6.1 oz)<br>CT7046: 186 g (6.6 oz)                                      |  |
| Derating properties                         | 2.5 k  | 12 k<br>8 10 k<br>4 8 k<br>10 6 k<br>10 10 k<br>10 10 10 1 k 10 k 100 k<br>10 100 1 k 100 k                     |  |

# **High Accuracy Sensor, Direct Wire Type**

Newly developed DCCT method allows world-class measurement range and measurement accuracy at a rating of 50 A. (5 A rating version also available. Please inquire with your Hioki distributor.)

|                                   | AC/DC CURRENT BOX<br>PW9100A-3   | AC/DC CURRENT BOX<br>PW9100A-4 |  |
|-----------------------------------|--|--------------------------------|--|
| Appearance                        | - mmm  |                                |  |
| Number of input channels          | 3ch  | 4ch                            |  |
| Rated current                     | 50 A AC/DC   |                                |  |
| Frequency band                    | DC to 3.5 MHz (-3 dB)  |                                |  |
| Basic accuracy                    | For 45 Hz to 65 Hz [Amplitude]: ±0.02% rdg. ±0.005% f.s. Phase: ±0.1° For DC [Amplitude]: ±0.02% rdg. ±0.007% f.s. |                                |  |
| Maximum rated<br>voltage to earth |  |                                |  |

PW3390 Combined

 $\pm$ (% of reading + % of range) , range is PW3390

|   | Current (I)    | Active power (P) |
|---|----------------|------------------|
| DC                                      | ±0.07% ±0.077% | ±0.07% ±0.077%   |
| $45 \text{ Hz} \le f \le 66 \text{ Hz}$ | ±0.06% ±0.055% | ±0.06% ±0.055%   |

Add ±0.12% of range for 1 A range or 2 A range.

Scan the QR code to view the PW9100A website product page



CT6873/CT6873-01: Add  $\pm$ 0.15% of the range for 1 A range or 2 A range. \*\*\*
The CT6872-01 has a 10 m cord. For the CT6872-01, add  $\pm$ (0.015 × f kHz)° for phase accuracy for frequencies of 1 kHz < f ≤ 1 MHz.

# **Model: POWER ANALYZER PW3390**

| Model No. (Order Code) | D/A output | Motor analysis |
|------------------------|------------|----------------|
| PW3390-01              | _          | _              |
| PW3390-02              | <b>✓</b>   | _              |
| PW3390-03              | V          | V              |

Accessories: Instruction Manual ×1, Measurement Guide ×1, Power cord ×1, USB cable ×1, Input cord label ×2, D-sub 25-pin connector ×1 (PW3390-02, PW3390-03)

- The separately sold voltage cord and current sensor are required for taking measurements.
- Specify the number of built-in channels and whether to include the Motor Analysis & D/A Output upon order for factory installation. Please contact your local Hioki sales subsidiary or branch for changes after shipment.



# Current measurement options (High accuracy: clamp type)

| Model No. (Order Code) | Model                      | Rated current     | Frequency band  | Cable length |
|------------------------|----------------------------|-------------------|-----------------|--------------|
| CT6831                 | AC/DC CURRENT PROBE        | 20 A rms          | DC to 100 kHz   | 4.2 m        |
| CT6830                 | AC/DC CURRENT PROBE        |                   | DC to 100 kHz   | 4.2 m        |
| CT6846A                | AC/DC CURRENT PROBE 1000 A |                   | DC to 100 kHz   | 3 m          |
| CT6845A                | AC/DC CURRENT PROBE        | 500 A rms         | DC to 200 kHz   | 3 m          |
| CT6844A                | AC/DC CURRENT PROBE        | 500 A rms         | DC to 500 kHz   | 3 m          |
| CT6843A                | AC/DC CURRENT PROBE        | 200 A rms         | DC to 700 kHz   | 3 m          |
| CT6841A                | AC/DC CURRENT PROBE        | 20 A rms          | DC to 2 MHz     | 3 m          |
| 9272-05                | CLAMP ON SENSOR            | 20 A/200 A rms AC | 1 Hz to 100 kHz | 3 m          |

# Current measurement options (High accuracy: pass-through, direct connection type)

| Model No. (Order Code) | Model                | Rated current | Frequency band | Number of channels<br>Cable length |
|------------------------|----------------------|---------------|----------------|------------------------------------|
| CT6877A                | AC/DC CURRENT SENSOR | 2000 A rms    | DC to 1 MHz    | 3 m                                |
| CT6877A-1              | AC/DC CURRENT SENSOR | 2000 A rms    | DC to 1 MHz    | 10 m                               |
| CT6876A                | AC/DC CURRENT SENSOR | 1000 A rms    | DC to 1.5 MHz  | 3 m                                |
| CT6876A-1              | AC/DC CURRENT SENSOR | 1000 A rms    | DC to 1.2 MHz  | 10 m                               |
| CT6904A-2*             | AC/DC CURRENT SENSOR | 800 A rms     | DC to 4 MHz    | 3 m                                |
| CT6904A-3*             | AC/DC CURRENT SENSOR | 800 A rms     | DC to 2 MHz    | 10 m                               |
| CT6904A                | AC/DC CURRENT SENSOR | 500 A rms     | DC to 4 MHz    | 3 m                                |
| CT6904A-1*             | AC/DC CURRENT SENSOR | 500 A rms     | DC to 2 MHz    | 10 m                               |
| CT6875A                | AC/DC CURRENT SENSOR | 500 A rms     | DC to 2 MHz    | 3 m                                |
| CT6875A-1              | AC/DC CURRENT SENSOR | 500 A rms     | DC to 1.5 MHz  | 10 m                               |
| CT6873                 | AC/DC CURRENT SENSOR | 200 A rms     | DC to 10 MHz   | 3 m                                |
| CT6873-01              | AC/DC CURRENT SENSOR | 200 A rms     | DC to 10 MHz   | 10 m                               |
| CT6863-05              | AC/DC CURRENT SENSOR | 200 A rms     | DC to 500 kHz  | 3 m                                |
| CT6872                 | AC/DC CURRENT SENSOR | 50 A rms      | DC to 10 MHz   | 3 m                                |
| CT6872-01              | AC/DC CURRENT SENSOR | 50 A rms      | DC to 10 MHz   | 10 m                               |
| CT6862-05              | AC/DC CURRENT SENSOR | 50 A rms      | DC to 1 MHz    | 3 m                                |
| PW9100A-3              | AC/DC CURRENT BOX    | 50 A rms      | DC to 3.5 MHz  | 3 ch                               |
| PW9100A-4              | AC/DC CURRENT BOX    | 50 A rms      | DC to 3.5 MHz  | 4 ch                               |

<sup>\*</sup> Build-to-order product

# Current measurement options (Standard Sensor)

| Model No. (Order Code) | Model  | Rated current | Frequency band  | Cable length |
|------------------------|--|---------------|-----------------|--------------|
| CT7742**               | AC/DC AUTO ZERO CURRENT SENSOR                         | 2000 A rms    | DC to 5 kHz     | 2.5 m        |
| CT7642**               | AC/DC CURRENT SENSOR                                   | 2000 A rms    | DC to 10 kHz    | 2.5 m        |
| CT7044**               | AC FLEXIBLE CURRENT SENSOR (\$\phi\$ 100 mm (3.94 in)) | 6000 A rms    | 10 Hz to 50 kHz | 2.5 m        |
| CT7045**               | AC FLEXIBLE CURRENT SENSOR (\$\phi\$ 180 mm (7.09 in)) | 6000 A rms    | 10 Hz to 50 kHz | 2.5 m        |
| CT7046**               | AC FLEXIBLE CURRENT SENSOR (φ 254 mm (10.00 in))       | 6000 A rms    | 10 Hz to 50 kHz | 2.5 m        |

<sup>\*\*</sup> CONVERSION CABLE CT9920 is required to connect to the PW3390.

# **CONVERSION CABLE CT9900**



Required to connect PW3390 to the current sensor with HIOKI PL23 on the output connector.

[Applicable products] CT6841, CT6843, CT6844, CT6845, CT6846, CT6862, CT6863, 9272-10

# **CONVERSION CABLE CT9920**



Required to connect PW3390 to the current sensor with HIOKI PL14 on the output connector.

[Applicable products] CT7742, CT7642, CT7044, CT7045, CT7046

## **CONNECTION CABLE CT9904**



Cable length: 1 m (3.28 ft) Required to connect the summing waveform output terminal of CT9557 to PW3390.

[Applicable products] CT9557

# **Voltage Measurement Options**



### **VOLTAGE CORD L9438-50**

banana-banana (red, black, 1 each), alligator clip, spiral tube, approx. 3 m (9.84 ft.) length CAT IV 600 V, CAT III 1000 V



### **VOLTAGE CORD L1000**

banana-banana (red, yellow, blue, gray, 1 each, black  $\times$ 4), alligator clip, approx. 3 m (9.84 ft.) length CAT IV 600 V, CAT III 1000 V



# **EXTENSION CABLE SET L4931**

banana-banana (red, black, 1 each), For extension of L9438-50 or L1000, approx. 3 m (9.84 ft.) length, With connector CATIV600 V, CATIII1000 V



## WIRING ADAPTER PW9000

When making a 3-phase 3-wire (3P3W3M) connection, this product allows you to reduce the number of voltage cords from 6 to 3.

CATIV600 V, CATIII1000 V



### AC/DC HIGH VOLTAGE DIVIDER VT1005

VT1005 divides and outputs voltages of up to 5000 V.



### **GRABBER CLIP L9243**

GRABBER CLIP (red, black, 1 each) Attaches to the tip of the banana plug cable CAT II 1000 V



### PATCH CORD L1021-01

for branching voltage input, banana branch to banana clip (red x 1), 0.5 m (1.64 ft.) length CAT IV 600 V, CATIII 1000 V



### PATCH CORD L1021-02

for branching voltage input, banana branch to banana clip (black × 1), 0.5 m (1.64 ft.) length CAT IV600 V, CATIII 1000 V



### **WIRING ADAPTER PW9001**

When making a 3-phase 4-wire (3P4W) connection, this product allows you to reduce the number of voltage cords from 6 to 4.

CATIV600 V. CATIII1000 V



### VOLTAGE CORD L1050-01, L1050-03

L1050-01: 1.6 m (5.25 ft), L1050-03: 3.0 m (9.84 ft)

# **Connection Options**



### **CONNECTION CORD** L9217, L9217-01, L9217-02

For motor analysis input and connection to VT1005, BNC-BNC. L9217: 1.6 m (5.25 ft), L9217-01: 3.0 m (9.84 ft), L9217-02: 10 m (32.81 ft)



### **CONNECTION CABLE 9683**

For synchronous measurement, Cable length: 1.5 m (4.92 ft)



### **CONVERSION ADAPTER 9704**

For connection to VT1005 BNC-to-banana plug



### **LAN CABLE 9642**

Supplied with straight to cross conversion connector, Cable length: 5 m (16.41 ft)



**RS-232C CABLE 9637** 

9pin-9pin cross Cable length: 1.8 m (5.91 ft)

## **Other Options**



PC CARD 512MB 9728 PC CARD 1GB 9729 PC CARD 2GB 9830

Use only PC Cards sold by HIOKI. Compatibility and performance are not guaranteed for PC cards made by other manufacturers. You may be unable to read from or save data to such cards.



# **CARRYING CASE 9794**

Carrying Case for PW3390 and 3390 448 mm (17.64 in) W x 618 mm (24.33 in) H x 295 mm (11.61 in) D

# Built-To-Order (Other) -

Please contact your Hioki distributor or subsidiary for more information.

D/A output cable D-sub 25-pin - BNC (male) Rackmount fittings (For EIA or JIS) PW9100A 5A-rated model

# Rackmount fittings



For EIA or JIS

# D/A output cable



D-sub 25-pin - BNC (male) 16 ch conversion, Cord length: 2.5 m (8.20 ft)



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