# SHIMADZU
## Excellence in Science

Servo Controller for Fatigue and Endurance System

# Servo Controller 4830

# Next Generation of Superb User Friendly Multi-Function Controller

## Drastically enhances the accuracy of endurance and dynamic testing on materials and actual specimens

**SERVOPULSER**

## SERVO CONTROLLER
# 4830

The 4830 Controller serves as a multi-function, superb user friendly controller for servo-controlled materials testing machines. This controller offers all the functions and performances needed for the control and measurements in the testing of static and dynamic characteristics of materials, actual objects, or structures.

The 4830 Controller incorporates full digital control of all elements, including waveform generation, automatic gain control (AGC)*, hydraulic operation circuits, alarm functions, measurement amplifiers (test force and displacement), settings and display in engineering units, shockless control switching, and servoamplifiers.

The 4830 Controller LCD touchpanel improves compactness and ease-of-operation. The controller can be operated using the combination of the LCD touchpanel , function keys, numeric keys, or the jog dial that offers the sensation of analog operation. The operation screens are arranged by function and can be selected by extremely simple, one-touch operation of the function keys.

The 4830 Controller permits USB interface connection to PC (optional softwares required). This allows the synchronous test operation and waveform distortion correction of up to four units.

Note* This function automatically adjusts the setting signals to correct the amplitude.

## Load waveform generation with excellent reproducibility

Full digital controller with control parameter functions like autotuning and waveform distortion correction [note *1] to achieves true load waveform reproduction.

## Synchronous testing with up to four testing machines

Synchronous connection of controllers permit testing with up to four actuators. The phase correction function incorporated in the controller allows constant control of the phase difference between the feedback signals.

## Test force control for specimens with "free play" characteristics.

Achieves stable peak-value test force control for specimens where no test force is applied by using the automatic displacement control.

## World-class basic performance

The 24-bit high-resolution AD converter and detector-output linearization function achieve ±0.5% indicated-value accuracy with a standard system [note *2].

## Ease of operation

The controller is extremely user friendly to operate with function keys and graphical user interface on the color LCD touchpanel. The quick, interactive operation style allows even novices to operate the system within a short time.
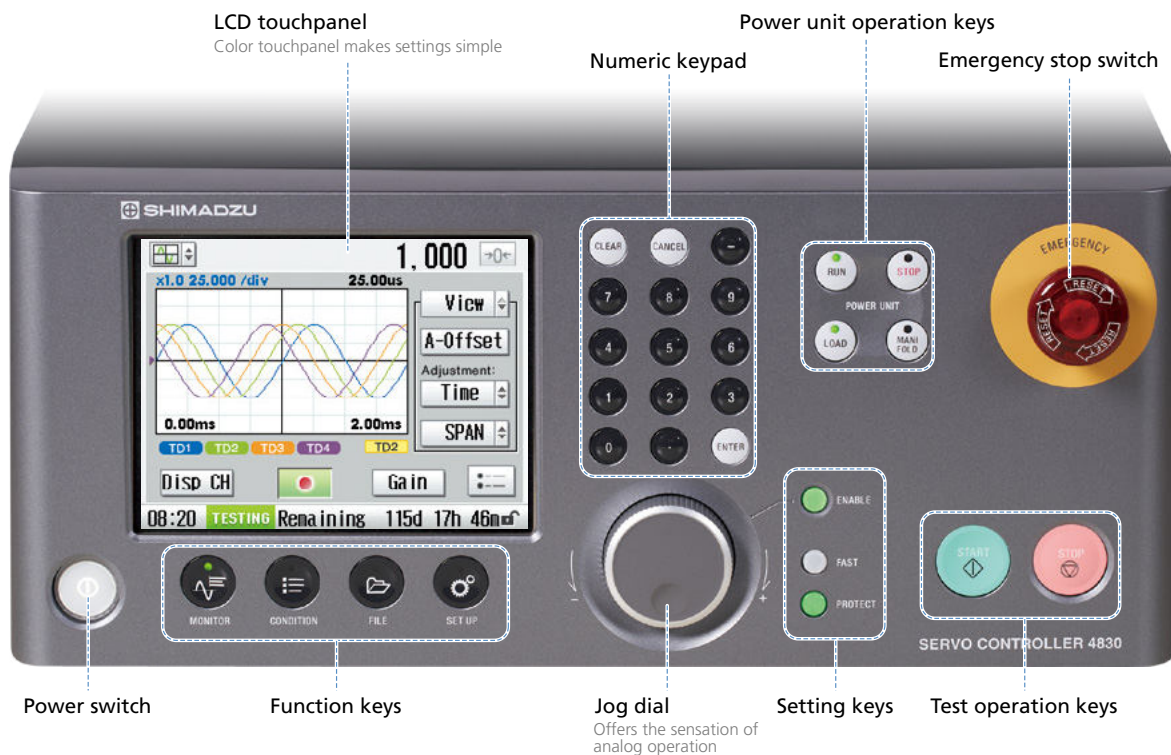
## Waveform display functions

Loading waveform display functions permit real-time display of time graphs, X-Y graphs, and peak graphs that permits digitally readout from these graphs.

## USB interface

USB interface connection to PC significantly enhances performance (optional softwares required).

Note*1 Requires optional Windows software
  *2 Incorporating standard Force Simulator or Servopulser E Series, U Series, or L Series.



LCD touchpanel
Color touchpanel makes settings simple

Numeric keypad

Power unit operation keys

Emergency stop switch

Power switch

Function keys

Jog dial
Offers the sensation of analog operation

Setting keys

Test operation keys

# Drastically Enhances Load-waveform Reproducibility

## Autotuning

Automatically determines the control parameters, which were previously based on operator's experience and pre-testing every time there is changed in specimen or test conditions.

Before autotuning

After autotuning
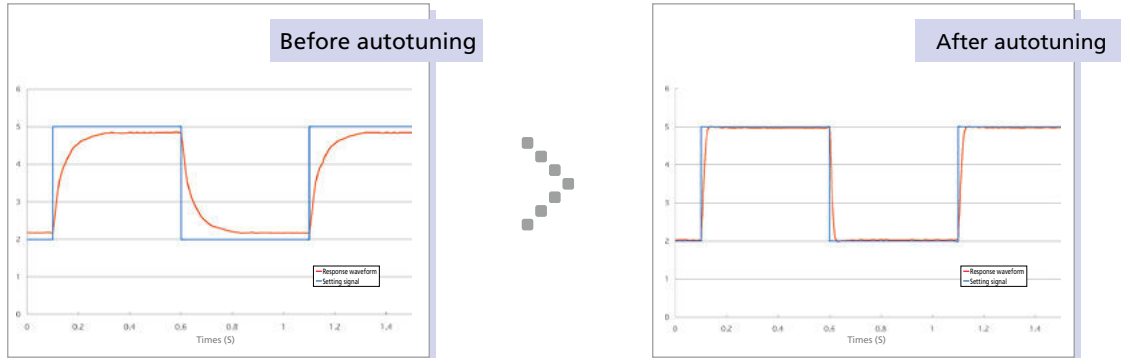
## Waveform Distortion Correction*

This function uses FFT to correct the amplitude and phase frequency components to achieve true load waveform reproduction when the waveform becomes distorted due to the specimen properties or time variations.

Graph before correction

Graph after correction
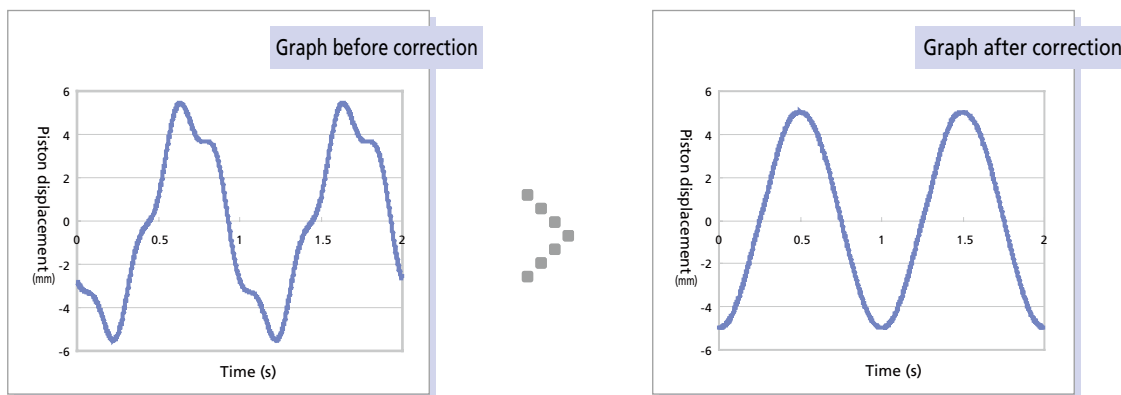
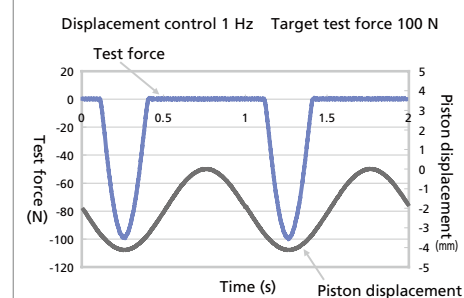Note* Requires optional Windows software

# Test Force Control for Specimens with "Free Play" Characteristics

## Permits Uniform Load "Push" Testing

Stability of test force control was previously not possible due to specimens with "free play" characteristics. The 4830 Controller automatically adjusts the displacement control until the set test force is reached.
It permits uniform load testing using the desired test-force peak value.

Example of uniform load "push" testing

Displacement control 1 Hz    Target test force 100 N

Test force

Test force (N)

Piston displacement (mm)

Time (s)                    Piston displacement

# Synchronous Testing with up to Four Testing Machines
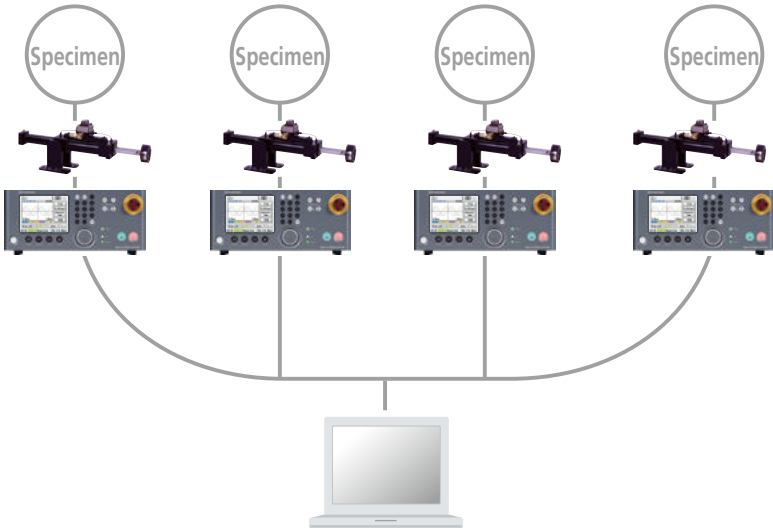
### Synchronous Testing

Simultaneously connection of controllers permit synchronous control and measurements with up to four actuators.
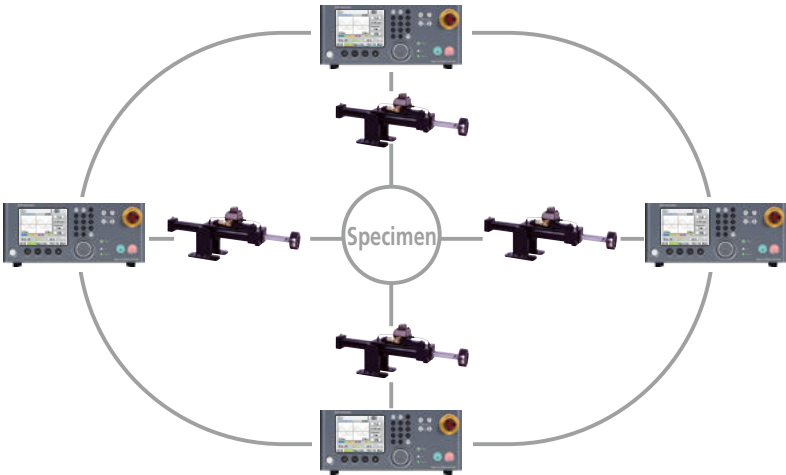
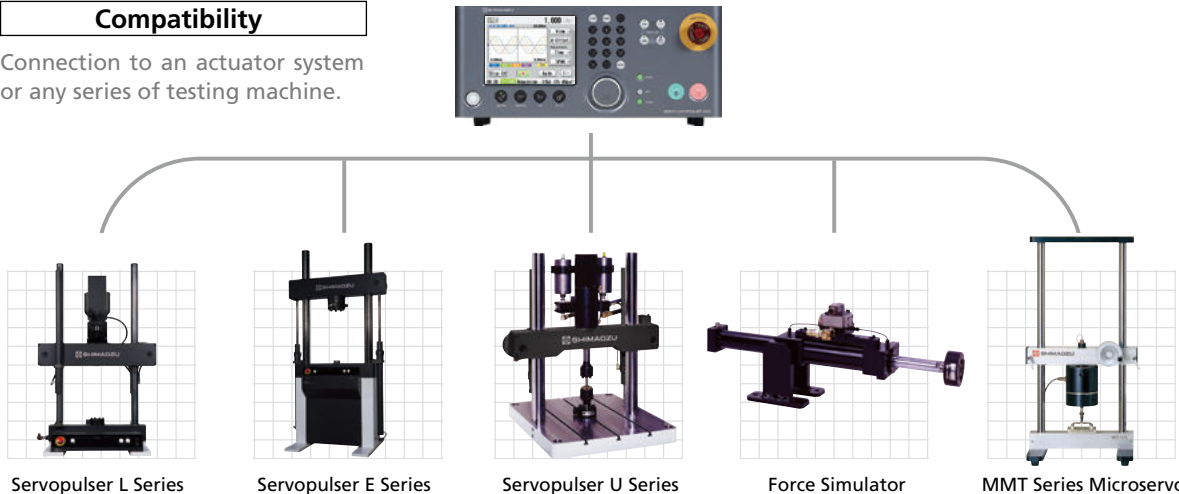Each actuator phase can be set as required.

### Multiple Tests

**Simultaneous up to 4 Tests**

Up to four tests, each with different test conditions, can be conducted simultaneously using a single PC. For example, collect peak values and cycle data from four endurance tests running in parallel. (Requires optional Windows software.)

### Compatibility

Connection to an actuator system or any series of testing machine.

Servopulser L Series     Servopulser E Series     Servopulser U Series     Force Simulator     MMT Series Microservo

# User Friendly Functions From Test Setup to Completion

**01**

## Test Setup

When mounting a specimen, the jog dial controls the piston with the function of analog operation. The touch-load function* prevents overloading of the specimen during mounting.

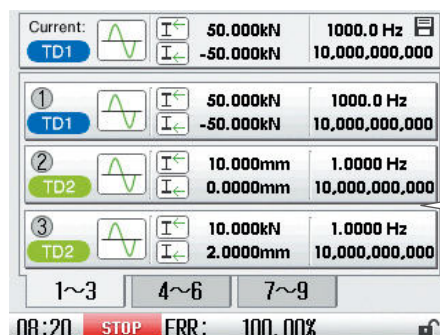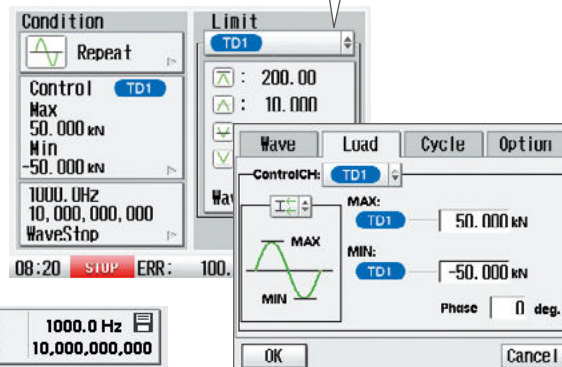* This function monitors test loads to prevent overloading.

**02**

## Setting Test Conditions

Interactive touchpanel operation simplified test conditions settings
The test-condition registration functions allow tests to be conducted with preset test conditions.

User friendly interactive settings

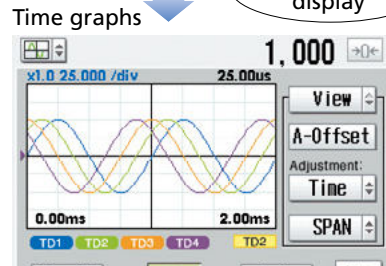Simply select a file to display the easy to read test-condition listings.

# 03 Testing

Numeric values or waveform can be displayed during test. Waveform display allows observation of the specimen condition during test as time graph, X-Y graph, or peak graph.
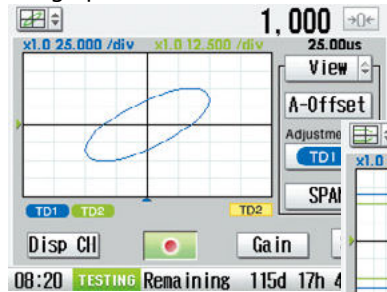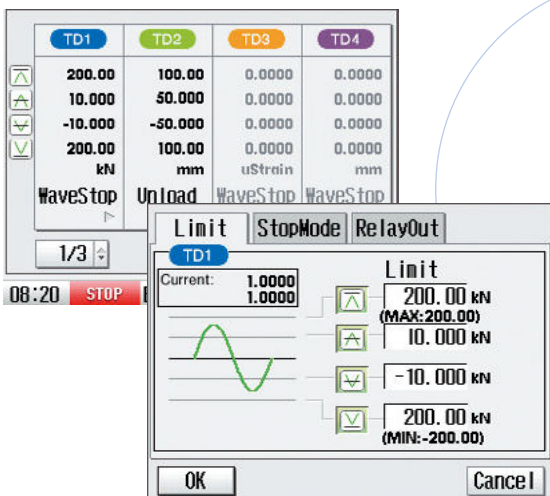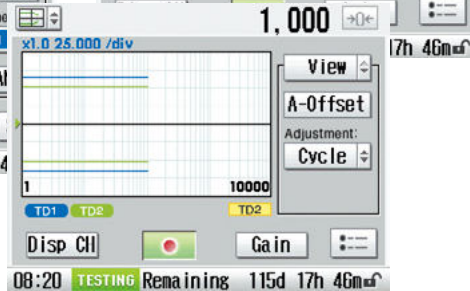
Numeric display



Waveform display

Time graphs



X-Y graphs



Peak graphs



# 04 Test Completion

The test completes upon achieving the preset limit condition such as achieving excessive measured value or the number of cycles. The stop mode function is selectable for power unit stop, waveform stop, waveform zero, displacement hold, unload, or manifold off during test completion. These stop modes protects the specimen during test completion.

# Software Further Enhances Test Performance

The dedicated software for the Servo Controller 4830 consists of basic software, add-on testing software, and GLUON 4830 fracture toughness testing software.
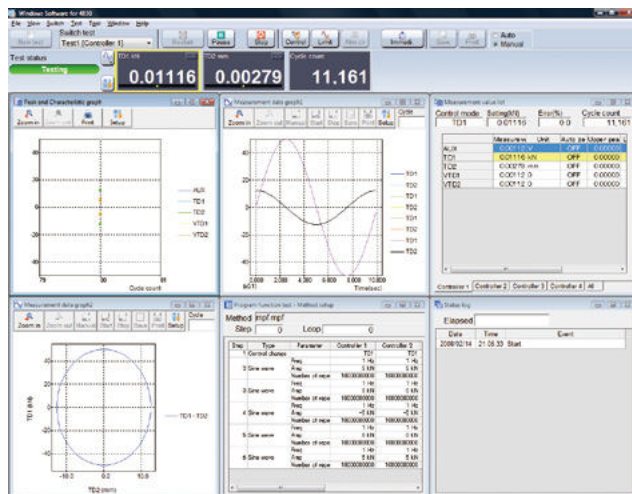*Windows software is optional

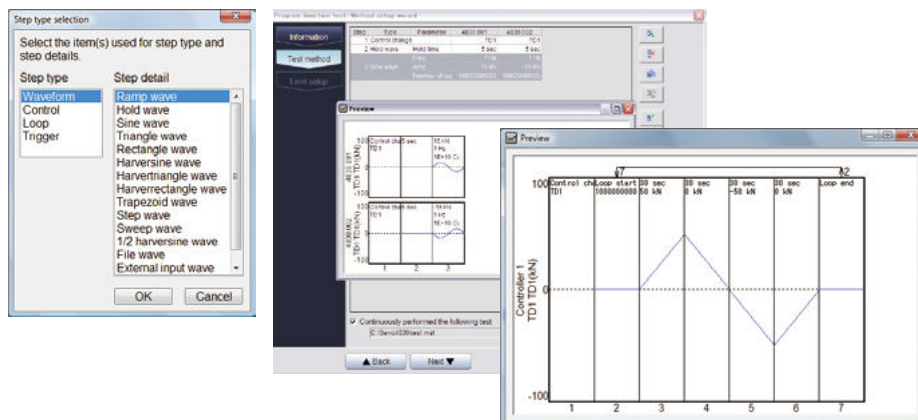| | |
|---|---|
| **Basic Software** | Fatigue and Endurance Testing |
| | Program Function Testing |
| | Static Characteristics Testing |
| | Combination Testing |
| **Add-On Software**<br>Note: Requires basic software | Static Testing |
| | Frequency-Sweep Testing<br>Resonance Frequency Tracking Testing |
| | Multi-Axis Combination Sine Wave Testing<br>(without waveform distortion correction) |
| | Multi-Axis Combination Sine Wave Testing<br>(with waveform distortion correction) |
| | Multi-Axis Working Waveform Simulation Testing |
| **GLUON 4830** | Crack Propagation Testing Software |
| | KIC/COD Testing Software |
| | JIC Testing Software |

## ■ Windows Software for 4830

### Setup Is Made Easy
The clear and user-friendly interface makes software operation easy.



### Programmable Waveforms (Program Function Testing)
Combination of ramp, sine and other waveforms with testing based on waveform data such as actual waves further extends the range of test applications.
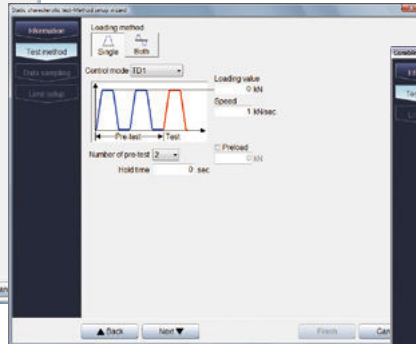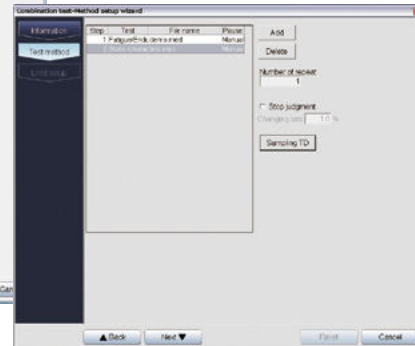
## Endurance and Static-characteristics Testings

Apart from the controller, the software permits independent or continuous testing.
Continuous testing is with the combination of endurance and static-characteristics testing.
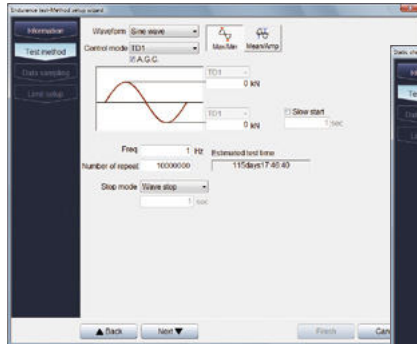

Endurance testing


Static-characteristics testing


Combination testing

## Setting made easy with wizard

Even beginners or novices can easily and accurately set the test conditions by following the Test Condition Wizard procedures.

## Mail notification

The mail notification function reduces the daily monitoring workload. It sends email at pre-determined intervals during testing or when testing stops due to alarm.

## USB interface

The USB interface permits easy plug & play connection to Notebook or Desktop PC.

# ■ GLUON 4830 -fracture toughness testing software

- Crack Propagation Testing Software
- KIC/COD Testing Software
- JIC Testing Software

| Model | | 4830 |
|---|---|---|
| P/N | | 347-39536 |
| **Loading waveform** | Standard waveforms | Sine, triangular, rectangular, haversine, havertriangular, haver-rectangular, trapezoidal, 1/2 haversine, ramp, step, sweep, random, external input |
| | Optional waveforms*[1] | Combination and file waveforms (any wave) |
| | Frequency | 0.00001 to 1000 Hz |
| | Ramp rate | $10^{-9}$ to 100 FS/s |
| | Hold time | 0 to $10^9$ s |
| | Cycle counter | $10^{10}$ |
| | Test-condition registration | 9 types max. |
| **Measurement amplifiers** | Type | Test force, displacement amplifiers (2 additional optional amplifiers can be added) |
| | Range | 24-bit, rangeless |
| | Functions | Auto-zero, auto-recognition, auto-calibration, virtual transducer*[4] |
| **Measurement functions*A** | Sampling frequency | 40 kHz max. *[2] |
| | No. of sampling channels | 8 CH max. *[2] |
| | No. of sampling points | 10000 data/channel max. *[3] |
| **Control functions** | Control method | Full digital correction control |
| | Controlled values | Test force, stroke, virtual transducer *[4] (2 channels can be added as options) |
| | Functions | Automatic gain control (AGC)*[5], autotuning, shockless control switching, touch-load function*[6], waveform distortion correction*[1], uniform load "push" test function |
| | Synchronous control | Up to 4 units (phase difference: 0 to 359°) |
| **Power unit functions** | Power unit | Start, stop, pressure rising, manifold ON/OFF |
| **Operation and display components** | Display panel | 5.7" color LCD |
| | Waveform display | Time graph, X-Y graph, peak graph |
| | Operation keys | Touch panel, power unit operation keys, function keys, numeric keys, jog dial, test operation keys, emergency stop switch |
| **Limit functions (safety features)** | Type | 4-point limiter*[7], power unit alarm, counter, external alarm |
| | Stop modes | Power unit stop, waveform stop, waveform zero, waveform mean value, unload, position hold |
| **Signal I/O** | Analog | 4CH (±10 V) output; 1CH (±10 V) input |
| | Digital | 8CH output; 8CH input |
| **Communication functions** | | USB 1.0 full-speed (12 Mbps) |
| **General performance (standard configuration) *B** | Test force accuracy | ±0.5% indicated value or ±0.02% dynamic rating, whichever is greater |
| | Displacement accuracy | ±1.0% indicated value or ±0.1% rated value, whichever is greater |
| | Control stability | Within ±0.1% rating for controlled amount |
| **Size and weight** | Dimensions (mm) | W350 x D420 x H148 mm *Height 165 mm including protrusions. |
| | Weight | Approx. 8 kg |
| **Power supply** | | 100 to 230 VAC, 50/60 Hz, 300 VA*[8] |

Note *1 When using software.

*2 4 CH maximum at sampling frequency of 1 kHz or higher.

*3 Using software. Controller alone stores up to 1000/CH data.

*4 Measurement and control based on the sum, difference, and mean values of measured values.

*5 This function adjusts the setting signals to correct the amplitude.

*6 This function monitors the test forces to prevent overloading.

*7 Upper and lower limits and reduced amplitude values can be set for the measured values.

*8 Power cable main plug is for 100 VAC only.

*A Optional Windows software required to store measured data.

*B Servopulser E Series, U Series, L Series, or Force Simulator standard system.

## Standard Configuration

| | | |
|---|---|---|
| 1 | Controller unit | 1 |
| 2 | Power cable | 1 |
| 3 | DC amplifier (internal, for test forces) | 1 |
| 4 | AC amplifier (internal, for strokes) | 1 |
| 5 | Servoamplifier (internal) | 1 |
| 6 | CAL cable (for DC amplifier) | 1 |
| 7 | CAL cable (for AC amplifier) | 1 |
| 8 | Digital I/O connector | 1 |
| 9 | Alarm connector | 1 |
| 10 | Spare fuse | 2 |
| 11 | LCD panel protective sheet | 2 |
| 12 | Instruction Manual | 1 |

## Options

| Name | P/N | Model |
|---|---|---|
| **Windows software for 4830** | 347-39703 | SW30-STDE |
| **DC amplifier** | 347-39503-41 | AMP30-DC |
| **AC amplifier** | 347-39503-42 | AMP30-AC |
| **VIN amplifier** | 347-39503-43 | AMP30-VIN |
| **VINS amplifier** | 347-39503-44 | AMP30-VINS |
| **Servoamplifier** | 347-39504-40 | AMP30-SV |
| **Sync PCB** | 347-39505-40 | BDA30-SYNC |
| **Hydraulic supply cable (3m)** | 347-39527-43 | CBL30-HYD-03M |
| **Hydraulic supply cable (5m)** | 347-39527-45 | CBL30-HYD-05M |
| **Hydraulic supply cable (7m)** | 347-39527-47 | CBL30-HYD-07M |
| **Hydraulic supply cable (10m)** | 347-39527-51 | CBL30-HYD-10M |
| **MMT control cable (1m)** | 347-39528-41 | CBL30-MMT-01M |
| **MMT control cable (2m)** | 347-39528-42 | CBL30-MMT-02M |
| **MMT control cable (5m)** | 347-39528-45 | CBL30-MMT-05M |
| **Sync cable (terminator)** | 347-39530 | CBL30-SYNC-TM |
| **Sync cable (1m)** | 347-39530-41 | CBL30-SYNC-01M |
| **Sync cable (2m)** | 347-39530-42 | CBL30-SYNC-02M |
| **Sync cable (3m)** | 347-39530-43 | CBL30-SYNC-03M |
| **Sync cable (5m)** | 347-39530-45 | CBL30-SYNC-05M |
| **Analog I/O cable (1m)** | 347-39531-41 | CBL30-AIO-01M |
| **Analog I/O cable (2m)** | 347-39531-42 | CBL30-AIO-02M |
| **Analog I/O cable (3m)** | 347-39531-43 | CBL30-AIO-03M |
| **Analog I/O cable (5m)** | 347-39531-45 | CBL30-AIO-05M |
| **CAL cable for DC amplifier** | 347-39534-40 | CBL-CAL-DC |
| **CAL cable for AC amplifier** | 347-39534-41 | CBL-CAL-AC |
| **CAL cable for magnetostrictive sensor** | 347-39534-42 | CBL-CAL-VINS |
| **CAL cable for capacitive displacement gauge** | 347-39534-43 | CBL-CAL-ACC |
| **Sensor cable for DC amplifier** | 347-39906-45 | CBL-SENS-DC-05M |
| **Sensor cable for AC amplifier** | 347-39907-45 | CBL-SENS-AC-05M |
| **Sensor cable for capacitive displacementgauge** | 347-39908-45 | CBL-SENS-C-05M |
| **Servo-valve cable (5m)** | 347-39909-45 | CBL-HYDSV-05M |

# SERVO CONTROLLER 4830

## Testing Systems for Automobile


T Series torsional fatigue tester


Endurance evaluation system for general components


300 Hz high-cycle fatigue and endurance tester


Vehicle body compression tester


Seat-belt anchorage tester


Body static strength tester


Shock-absorber tester


Axial force (tensile/compressive) and torsion compound tester


Internal pressure fatigue tester
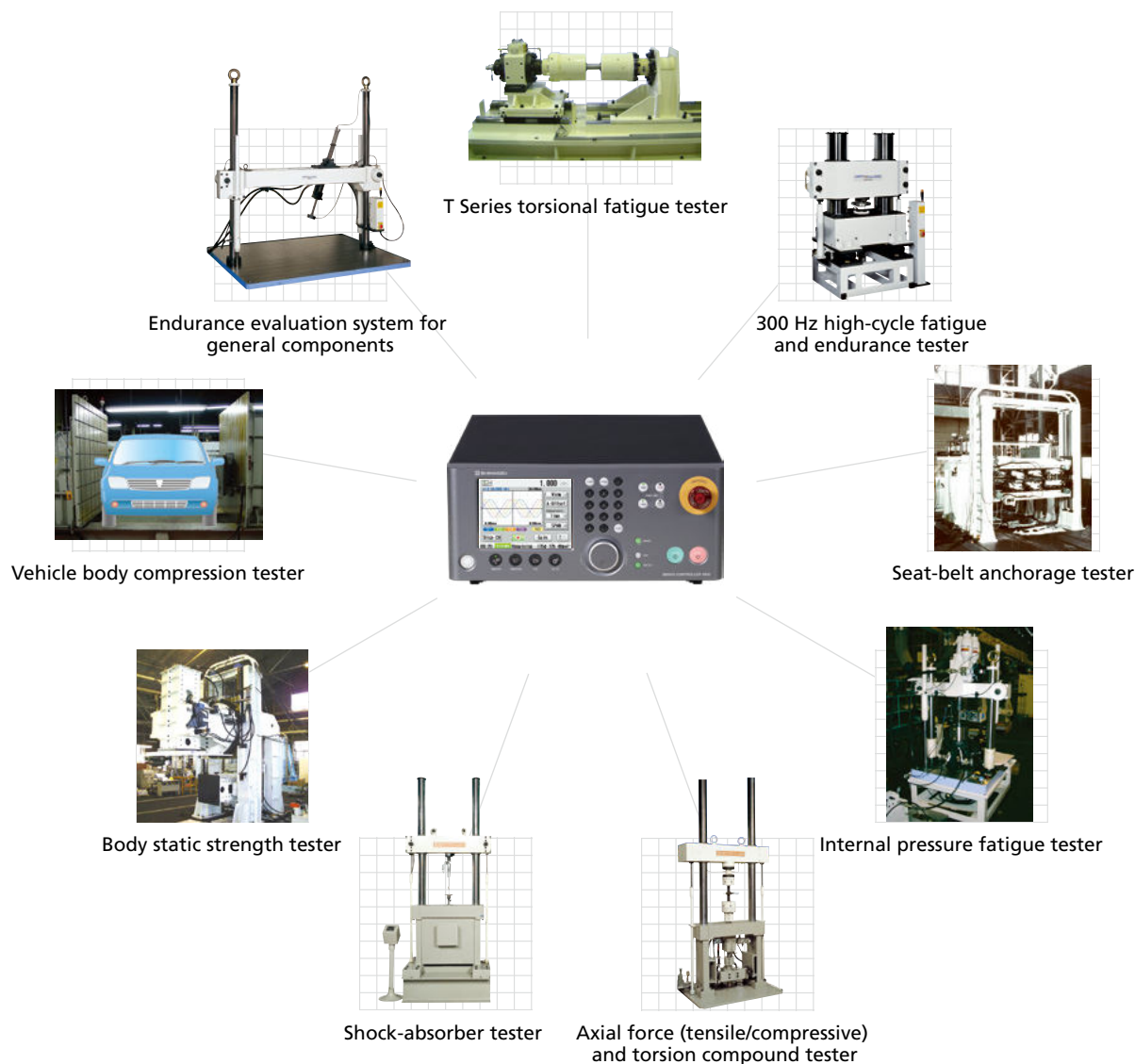
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