

Compact Hydraulic Actuator

Force Simulator EHF-JF Series



For Testing the Endurance of Various Parts and Components



Lightweight and Easy to Install

The 20 kN \pm 100 mm model weighs only 25 kg. The aluminum body (20 kN model) makes it easy to transport or reinstall on a different testing system. This gives it the flexibility to be used for evaluating a variety of components, large structural members, or parts.



Compact

The small size of the actuator requires less space for attaching it to samples. Hydraulic lines are connected using quick couplers. This makes it easy to configure testing systems.

With Dynamic Actuator Capacities of 5 kN, 10 kN, 20 kN, 30 kN, and 50 kN, the Compact Actuators Support a Wide Range of Tests

Uses Low-Friction Dust Seals

Specialized seals are used to achieve high accuracy for small forces and minimize oil leakage.

Accommodates Various Types of Testing

Brackets for attaching various optional equipment can be mounted at the front, center, or tail. Load can be applied to samples from a variety of angles.



Long-Stroke Actuator

\pm 50 mm, \pm 100 mm, or \pm 150 mm. Long-stroke actuators can even simulate forces over long stroke distances.

\pm 0.5 % Test Force Accuracy

Test force accuracy is guaranteed to within \pm 0.5 % of the indicated value

Satisfies Requirements for a Diverse Range of Fields

It can be used to evaluate strength, verify or rationalize designs, or evaluate the safety and reliability of a variety of items via dynamic and fatigue testing, simulation testing, or actual dynamic waveform input testing.

- Automobiles
- Motorcycles
- Construction equipment



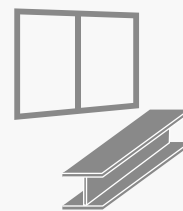
- Aircraft
- Ships
- Trains



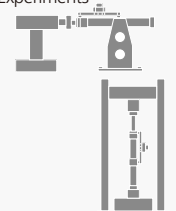
- Drinking water
- Light-gauge steel structures
- Prefabricated buildings
- Two-by-four method buildings



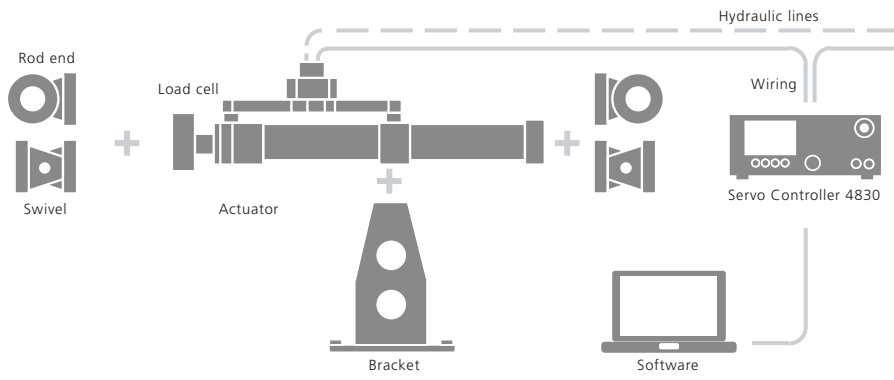
- Parts materials
- Pipes
- Shape steel
- New materials
- Chassis
- Aluminum materials



- Schools
- Research laboratories
- Industrial testing laboratories
- Training
- Experiments

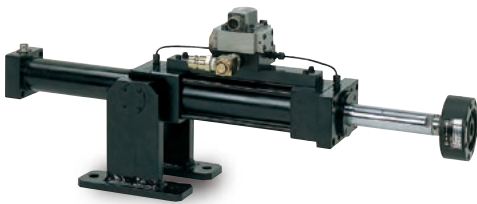


System Example



AF Series Portable Air-Cooled Hydraulic Power Supply Unit

This air-cooled hydraulic power supply unit requires no cooling water. Also, all of the required hydraulic equipment is installed in a case mounted on caster wheels so that it can be relocated easily.



● With a trunnion bracket



● With vertical and left/right rotation mechanisms



● With vertical movement and vertical rotation mechanisms



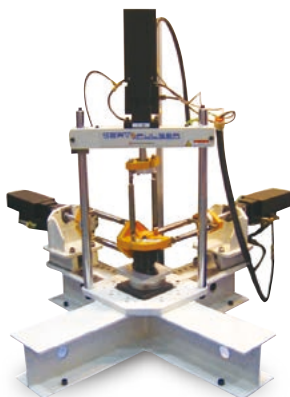
● Bed Endurance Evaluation System

This system allows testing of bed mattresses or other large samples. By installing an EHF-J system on a reaction frame, loads can be repeatedly applied from perpendicular directions.



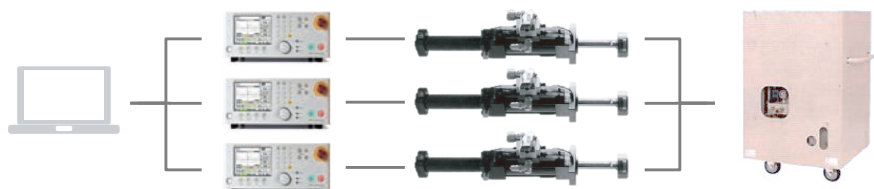
● Part Endurance Evaluation System

This system features a reaction frame with a hydraulically actuated crosshead installed on a large surface plate. The actuator can be adjusted to any angle or left/right position. Therefore, it can be used as a general-purpose system for testing the endurance of various parts and components.



● XYZ 3-Axis Engine Mount Testing System

This system is capable of applying synchronized loads in three directions, X, Y, and Z. It can also be used to accurately reproduce actual load profiles experienced by vehicles during travel.

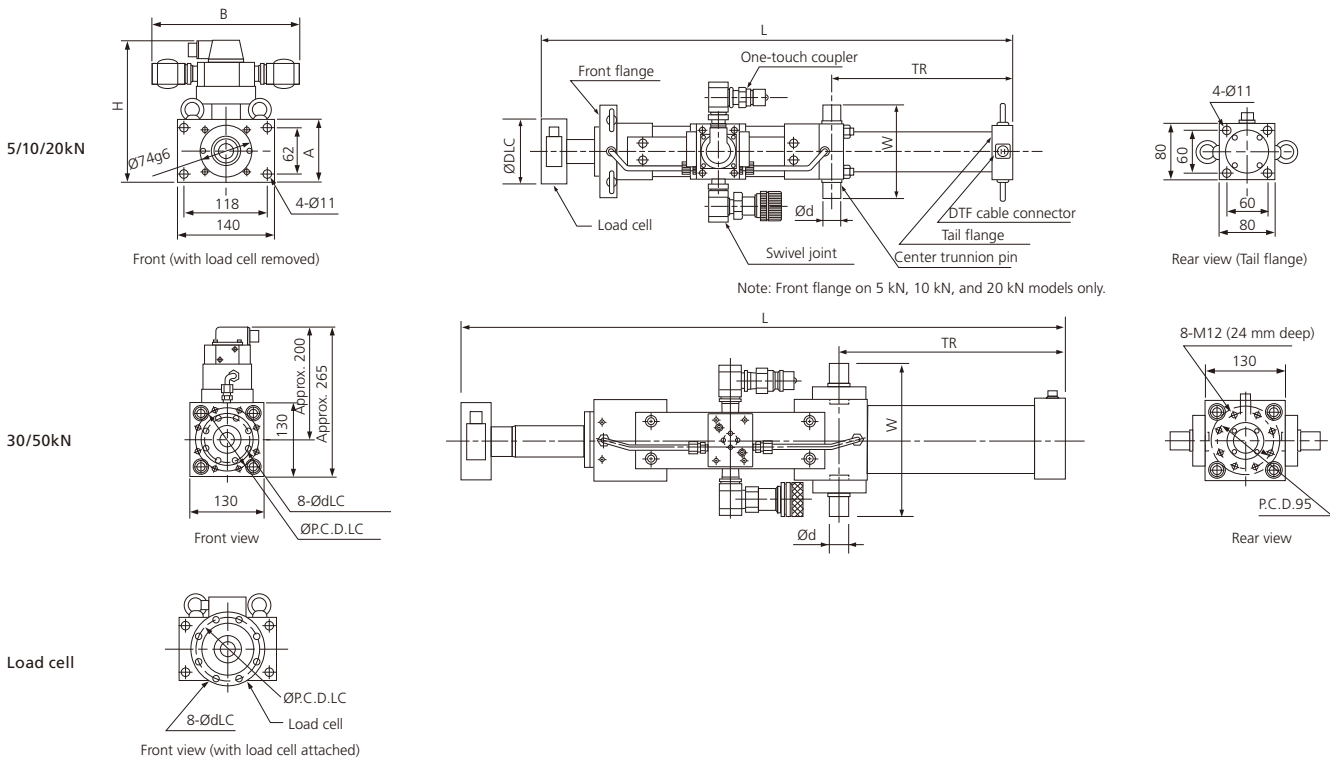


Specifications

Model	EHF -JF5kNV-XX-A10	EHF -JF10kNV-XX-A10	EHF -JF20kNV-XX-A10	EHF -JF30kNV-XX-A10	EHF -JF50kNV-XX-A10
Max. dynamic test force	±5kN	±10kN	±20kN	±30kN	±50kN
Max. static test force	Approx. ±7 kN	Approx. ±13 kN	Approx. ±27 kN	Approx. ±39 kN	Approx. ±63 kN
Load cell	SCL-5kN	SCL-10kN	SCL-20kN	SFL-30kN	SFL-50kN
Piston stroke	Select from ±50 mm, ±100 mm, or ±150 mm				
Cycle speed and amplitude	See amplitude characteristics charts.				
Controlled items	Test force and stroke (two can be added as options)				
Test force	Range	24-bit rangeless			
	Indication accuracy	Within ±0.5 % of indicated value or ±0.02 % of maximum dynamic test force, whichever is greater			
Applicable hydraulic power supply unit	AF-10B, AF-20B				
Hydraulic lines	1/2" hoses with couplers on both ends and protected with spiral wire guards				
Power requirements	Varies depending on the hydraulic power supply unit (see pages 34 and 35).				

Note: In actual model names, the "XX" is substituted with the actuator stroke value. Select from the table below.

Testing Machine Main Unit Dimensions

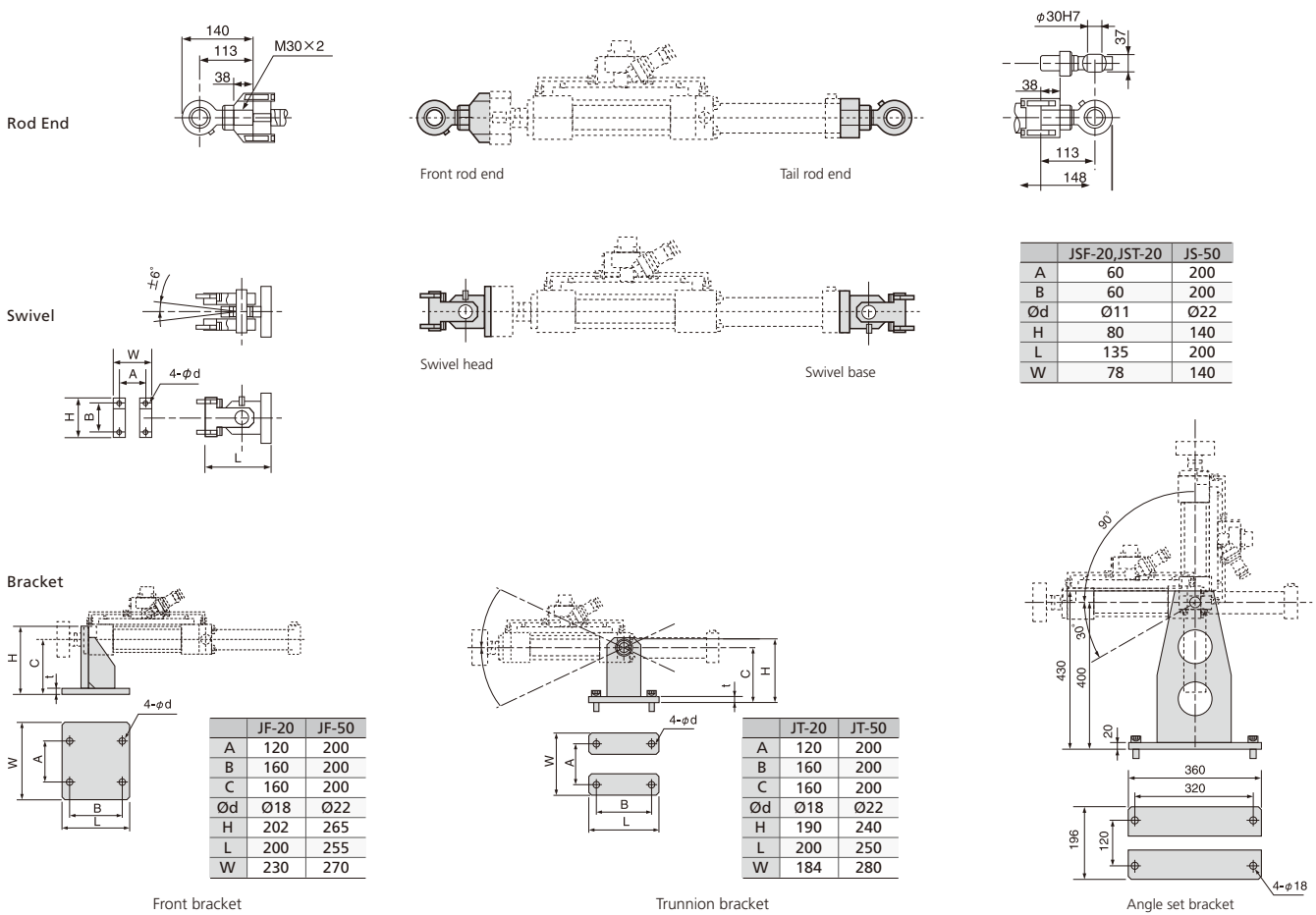


Capacity		5kN			10/20kN			30/50kN		
Actuator stroke		±50mm	±100mm	±150mm	±50mm	±100mm	±150mm	±50mm	±100mm	±150mm
Weight (kg)		17	20	26	21	25	28	74	84	94
Dimensions (mm)	L	565	815	1065	570	820	1070	715	965	1215
	W	140			140			245		
	Ød	25			25			30		
	TR	169	269	369	176	276	376	278	378	478
	ØDLC	100			100			125		
	ØP.C.D.L.C	85			85			110		
	ØdLC	9			9			13		
	B	210			210			—		
H	196			200			—			
A	80			84			—			

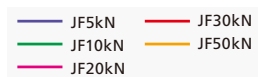
Optional Bracket

The optional brackets indicated below can be installed on the front flange, center trunnion, or tail flange. For details on where to install and dimensions, see the figure below.

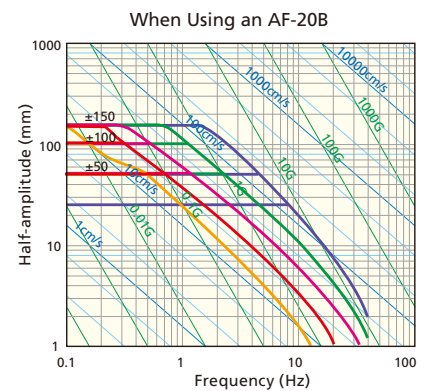
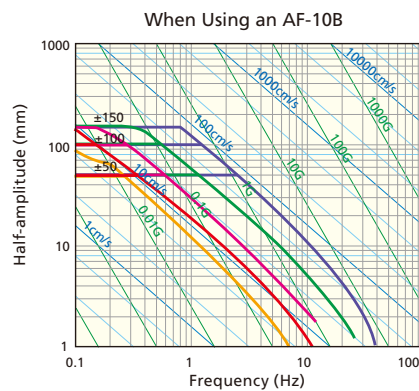
Optional bracket		Rod end			Swivel			Bracket		
		Set	Front	Tail	Set	Front	Tail	Front	Trunnion	Angle set
Model name	±5 to 20 kN	JRS-20	JRF-20	JRT-20	JSS-20	JSF-20	JST-20	JF-20	JT-20	JA-20
	30/50kN	-	-	-	If the base and head are used in combination, purchase two sets.	JS-50		JF-50	JT-50	-



Amplitude Characteristics (60 Hz)



- The above characteristic curves indicate the relation between half-amplitude and cycle speed, given sine wave motion at the rated load level.
- The above indicates the amplitude characteristics given a 60 Hz power supply. Characteristics with a 50 Hz power supply will be about 5/6 of indicated values.
- The above characteristics do not include the frame or load cell characteristics. Compensate for the influence of these factors to determine actual amplitude characteristics.
- The indicated characteristics values were calculated based on typical characteristics of the servo valve being used, which may result in a difference of about 10% on the frequency axis.
- There may be limitations on testing frequencies, depending on jig, sample, or other characteristics.



Controller for Dynamic and Fatigue Testing Systems

Servo Controller 4830

Controller for Dynamic and Fatigue Testing Systems Servo Controller 4830

Dramatically Improves Accuracy in Evaluating Endurance and Dynamic Strength of Samples Ranging From Materials to Actual Samples

This controller is designed specifically for dynamic testing machines based on Shimadzu's long history of supplying dynamic and fatigue testing systems and based on feedback from many of our customers. It boasts high performance and exceptionally user-friendly operability. Equipped with a 24-bit high-resolution analog-digital converter, and featuring excellent reproducibility of load waveforms due to fully digital control, it can accommodate a wide variety of dynamic testing requirements.

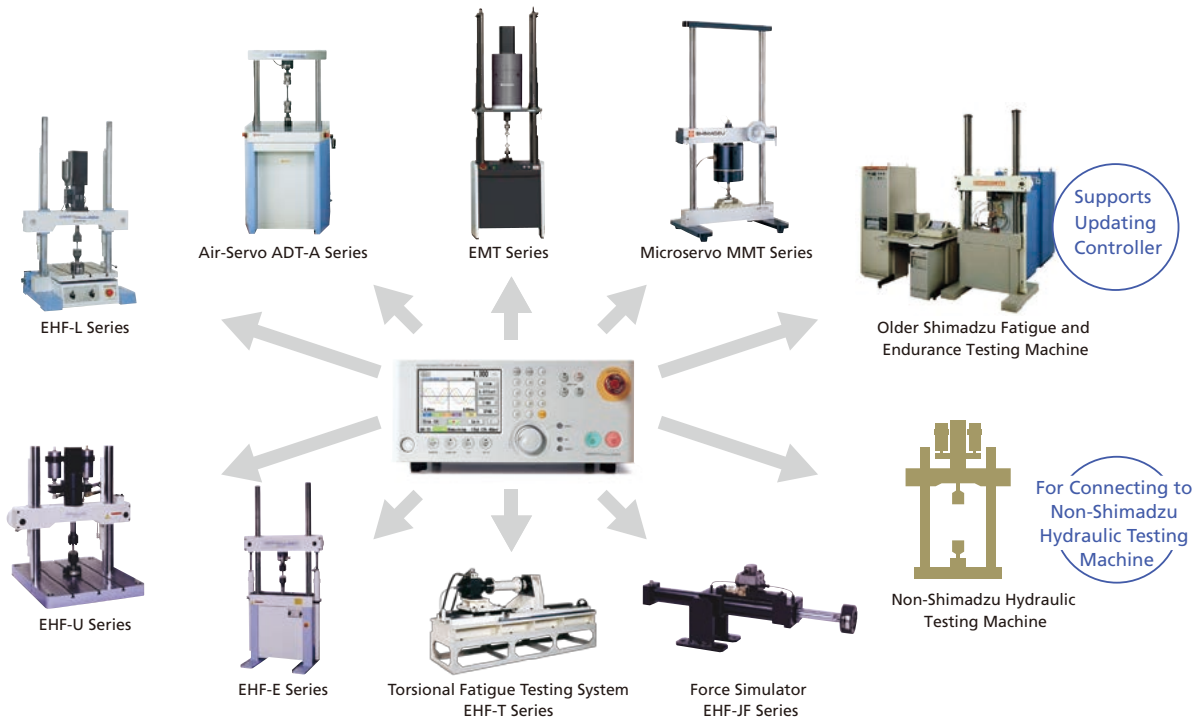


Connectivity to the Entire Family of Shimadzu Dynamic and Fatigue Testing Machines and Non-Shimadzu Hydraulic Testing Machines

Note: Excludes HITS series and USF-2000 models.

The controller can be connected to Servopulser series electric-hydraulic, electromagnetic force, and pneumatic testing systems, jack systems (actuators), and various other testing machines.

It also can be used to update older Shimadzu systems, or controllers for non-Shimadzu hydraulic testing machines.





Very Easy to Operate

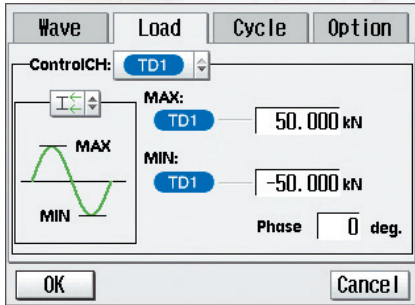
Testing parameters can be specified using the touch panel or jog dial. Test parameter settings, such as test force and displacement, can be changed at any time during tests.

Color Touch Panel

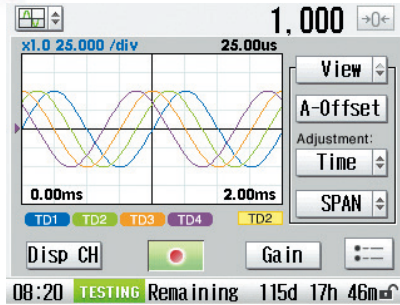
Enables all parameters to be specified and the test status to be monitored.

Jog Dial

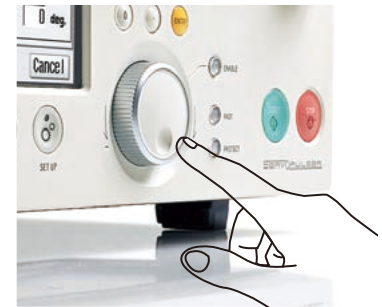
Allows use of an analog type interface to make subtle operating adjustments.



Loading Parameter Settings



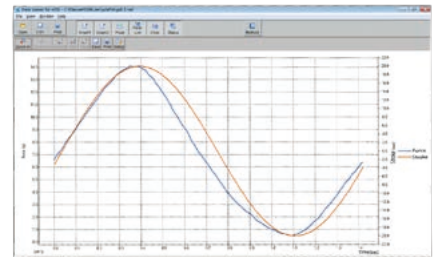
Waveform Display Functions



Jog Dial

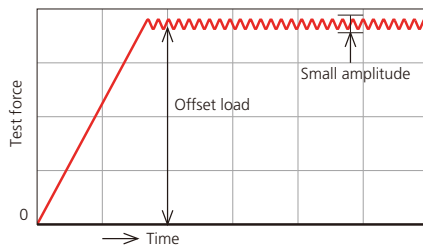
Autotuning and Automatic Gain Control Functions Ensure Loading Waveforms are Input Precisely

The autotuning function automatically determines the optimal parameters for controlling tests based on the actual test status and sample material. The automatic gain control function makes corrections so that peak values in loading cycles are consistent with parameter settings. Together, these functions help ensure precise loading waveforms. Consequently, even operators performing tests for the first time can automatically achieve highly accurate testing by simply setting parameters and starting testing.



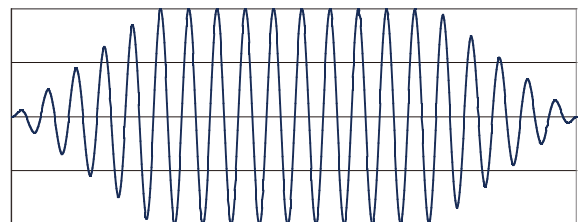
Offset Load Tests

Offset load testing makes it possible to accurately apply offset micro loads while applying large test force loads.



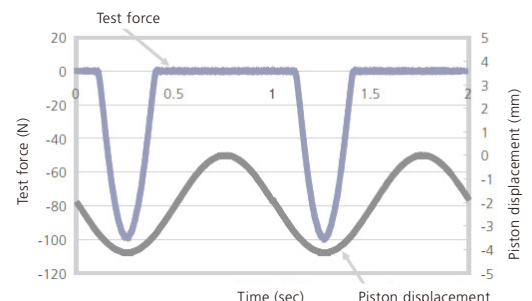
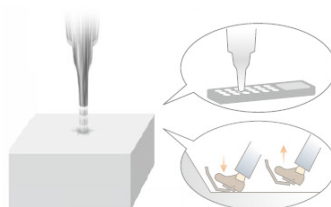
Slow Start/Stop

A slow start/stop time setting can be specified for tests. This eliminates operating differences between operators and helps ensure highly reproducible tests.



Push Test Function

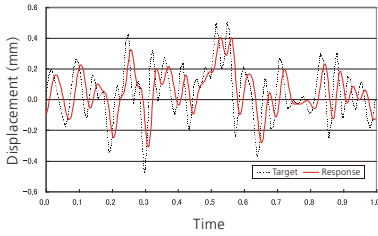
This allows controlling peak test force values in a stable manner, even for samples with "play" (where no test force is applied).



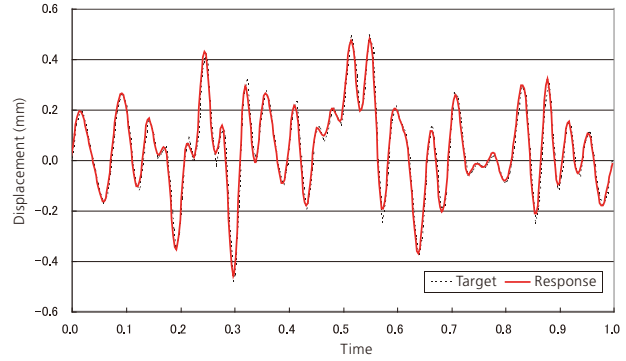
1 Hz Displacement Control with Target Test Force of -100 N

Waveform Distortion Correction Function

Because it can correct for loading mechanism-specific periodic strain, it can cancel out unwanted strain components and accurately control loads according to the target waveform.



The loading waveform is tracked to ensure consistency with the target waveform.

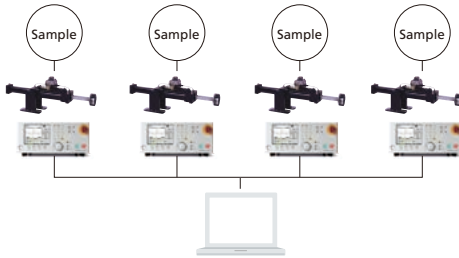


Broad Applicability

Up to four testing machines can be operated for synchronous testing. X-T, X-Y, peak graphs, and a variety of other waveforms can be displayed. By connecting to a computer via a USB cable, a wide variety of test settings and sophisticated data acquisition settings can be specified.

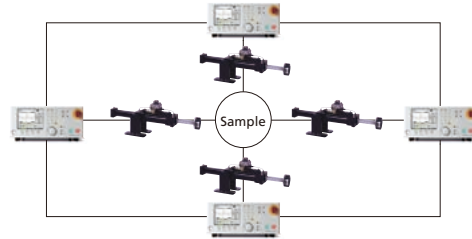
Multiple Tests

A single computer can be used to simultaneously perform up to four different tests using different test parameters. For example, four endurance tests can be performed in parallel to acquire peak values and cycle data.



Synchronized Testing

Control and measurements of up to four testing machines can be synchronized by synchronizing the controller connection. The phase can also be freely set for each actuator.



Specifications

Model	Servo Controller 4830
Display unit	5.7-inch color LCD
Control panel	Touch panel, function keys, jog dial, numeric keypad, test operation keys, power unit operation keys
Test waveforms	Sine, triangular, rectangular, haversine, haver-triangular, trapezoidal, ramp, 1/2 haversine, step, sweep, and random waves, external input, programmed waves (optional*), file waves (optional*)
Test frequency	0.00001 to 1000 Hz
Slow settings	Slow start/stop
Test parameter registration	Max. 9 parameters
Waveform display functions	Time, X-Y, and peak waveforms
Measurement functions	1 range (rangeless) 24-bit Max. 40 kHz sampling with 4 acquisition channels Linear correction (linearization) function
Size	W350 x D420 x H148 mm
Control method	Full digital two-degree-of-freedom PID
Control functions	Amplitude, average gain correction (AGC), PID autotuning, sample anti-overloading function (contact load), user-specified phase differential control by synchronized operation, waveform distortion correction*1(transfer function correction)
Limit functions	Measurement value 4-point limiter, cycle counter, external input
Communications functions	USB interface
Other functions	Calculation function (such as adding, subtracting, averaging, and stress/strain), push testing function, consumable consumption time management function
External input/output	Analog Output: 4 channels (± 10 V), Input: 1 channel (± 10 V) For monitoring or waveform input Digital Output: 8 channels Input: 8 channels
Control signal input	Test force (TD1), stroke (TD2), and external input (AUX) Note: Up to two amplifiers can be added as an option.
Power requirements	Single-phase AC 100 to 230 V*2 50/60 Hz 300 VA

*1 Only during software use

*2 The standard power cord included with the system is only for AC 100 V.



Updating older controllers to the latest model improves control performance and enables using the most up-to-date software.



Software for 4830

Easier, More Convenient, and More Sophisticated

Using systems in combination with dedicated software opens up a new world of testing. The dedicated software for the Servo Controller 4830 consists of basic software, add-on testing software, and GLUON 4830 fracture toughness testing software, which collectively support a variety of control and data analysis applications, such as basic fatigue testing, loading tests with simulated actual loads, and physical properties testing compliant with the latest standards.

Software	Single test	Multiple tests (simultaneous testing with 2 to 4 actuators)	Synchronized tests (measurement tests with synchronized control of up to 4 actuators)		
			2	3	4
Basic Software	Fatigue and Endurance Testing	⊙	⊙	○	○
	Program Function Testing	⊙	⊙	○	○
	Static Characteristics Testing	⊙	⊙	—	—
	Combination Testing	⊙	⊙	—	—
Add-On Software Note: Requires basic software	Static Testing	⊙	—	—	—
	Frequency-Sweep Testing	⊙	—	○	—
	Resonance Frequency Tracking Testing	⊙	—	○	—
	Multi-Axis Combination Sine Wave Testing (without waveform distortion correction)	⊙	—	○	○
	Multi-Axis Combination Sine Wave Testing (with waveform distortion correction)	⊙	—	☆	☆
Multi-Axis Working Waveform Simulation Testing	⊙	—	☆	☆	○
GLUON 4830	Crack Propagation Testing Software	⊙	—	—	—
	KIC/COD Testing Software	⊙	—	—	—
	JIC Testing Software	⊙	—	—	—

⊙ : Compatible ○ : Does not consider response results from other controllers (cannot be used if mutual interference is strong)
 ☆ : Considers response results from other controllers (mutual interference correction)
 — : Not compatible

Menu bar allows test operations such as starting and stopping, changing controls or resetting limits, etc.

Pause test Immediate waveform data acquisition button Dynamic characteristic values can be calculated for each cycle

Testing machine status display
Test in progress / stopped

Real-time measurement value display
Color-coded control parameters

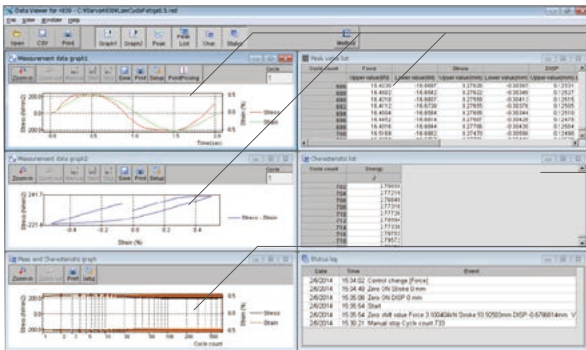
Cycle count vs. control parameter graph makes it possible to check reproducibility of test peaks

Plots S-S curves

Allows checking of waveforms in real time
Allows loading of waveform data from 1000 cycles

Test parameter confirmation window

Fatigue and Endurance Testing Window in Basic Software

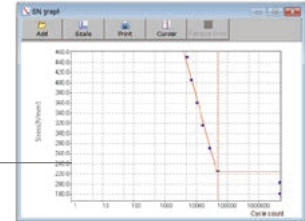


It is possible to confirm the input waveform, stress-strain curve, and various parameters for each acquisition cycle. Data for any specific point can also be extracted from any cycle waveform using the point picking function.

Dynamic characteristic values can be confirmed from each data acquisition cycle.

Peak value graph

S-N curves can be plotted automatically from test results.



● Basic Software



Fatigue and Endurance Testing

During fatigue/endurance tests, dynamic characteristics can be calculated, which allows S-N curves plotting. Data can be acquired for up to 10,000 cycles (during interval acquisition).



Combination Testing

Combining fatigue/endurance and static characteristics tests makes it possible to measure the changes in static spring constants.



Static Characteristics Testing

This allows users to apply static loads, such as tension or compression, to samples and measuring the static characteristic values (such as the static spring constant).



Program Function Testing

This allows users to combine the loading waveforms available in the controller, such as ramp and sine waves.

● Static Software



Static Testing

Available static tests include tensile, compression, 3-point bending, and 4-point bending. Various characteristic values can be calculated automatically. These include elasticity, upper yield point, lower yield point, yield strength, intermediate test force, intermediate displacement, maximum test force, break point, or energy.

● Frequency-Sweep and Resonance Frequency Tracking Test Software



Frequency-Sweep Testing

Makes it possible to sweep across to test dynamic characteristics over a range of frequencies, and allows endurance testing that repeats sweep cycles. Dynamic characteristic values can also be calculated for each frequency.



Resonance Frequency Tracking Testing

This makes it possible to automatically detect the resonance frequency of test samples before applying loads. The frequency can be automatically tracked if it is changed due to sample fatigue. Acceleration and strain values can be set directly and automatically readjusted even during testing.

● Multi-Axis Combination Sine Wave Testing Software



Multi-Axis Combination Sine Wave Testing

This allows use of multiple axes to perform tests with a combination of sine waves with different amplitudes.

● Multi-Axis Actual Waveform Testing Software



Multi-Axis Working Waveform Simulation Testing

This allows users to load actual working waveform data in CSV format, and to perform sophisticated simulation tests of actual loads by simply starting the test. A strain correction function helps ensure even the waveform details are reproduced precisely and accurately.

● Fracture Toughness Testing Software



Fracture Toughness Testing

Allows data analysis in compliance with the most up-to-date fracture toughness test standards. It supports crack propagation testing, KIC/CTOD testing, and JIC testing.

ASTM E647-13, ISO 12108:2012

Crack Propagation Testing

This is for evaluating the crack propagation behavior of notched samples. It is also ideal for introducing preliminary cracks for KIC and JIC testing.

ASTM E399-12, ISO 12737-96
BS 7448-1:1991, ASTM E1820-11

KIC/CTOD Testing

This is for evaluating fracture toughness values. It calculates CTOD values corresponding to the fracture mode and determines the validity of KIC values.

ASTM E1820-11, ASTM E813-89
JIS Z 2284-98

JIC Testing

This is for evaluating elastic fracture toughness values (JIC). It makes it easy to perform JIC tests, which involve complicated procedures.