Servohydraulic Axial/Torsional Test System

Series LFV-T

The LFV-T servohydraulic closed-loop Axial-Torsional Test Systems can apply axial, torsional and programmed in phase or out of phase axial-torsional loads and displacements on a wide array of specimens.
These Tests systems meet the full spectrum of dynamic, fatigue and monotonic applications on a wide array of specimens.

Axial / Torsional Testing

Multiaxial states of stress and strain are very common in-service life of components as wind turbine rotor blades, crankshaft, pressure vessels and many others. Consequently, limiting the evaluation of a material characteristic to uniaxial tests may lead to misrepresentation of the behavior of a material in real constructions. Indeed, using more realistic loading conditions, i.e. biaxial conditions, will lead to a more accurate representation of the expected behavior of the structure in-service.

w+b offers the wide range of axial/torsional test systems for static and dynamic biaxial testing. The modular designs are available as electromechanical or servohydraulic systems.

Owing to over 45 years of experience in the production of a wide range of dynamic and fatigue servohydraulic testing system in different force capacities and configurations meeting the requirements of quality control, production, product research and development our machines include a numerous of features and achievements guaranteeing operational efficiency, safety and reliable testing with minimum down-time.

Our LFV-T series product portfolio includes a variety of high-performance testing machines from low capacities to high force meet the full spectrum of dynamic, fatigue and monotonic applications.

All LFV-T servohydraulic systems integrates reliable w+b servo-controlled hydraulic actuation with high-resolution & high-speed digital closed loop controls, a broad portfolio of complement accessories and comprehensive Dion7 application software packages making these systems the suitable across the full spectrum of static and dynamic testing including:

- Tension
- Compression
- Bending
- Thermo Mechanical Fatigue (TMF)
- High Cycle Fatigue
- Low Cycle Fatigue (LCF)
- Fracture Toughness
- Fatigue Crack Growth
- Crack Propagation
- K1C / J1C
- Environmental Testing
- Stress and Strain Relaxation
- Component Durability
- Component Strength

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From Standard to Customized System

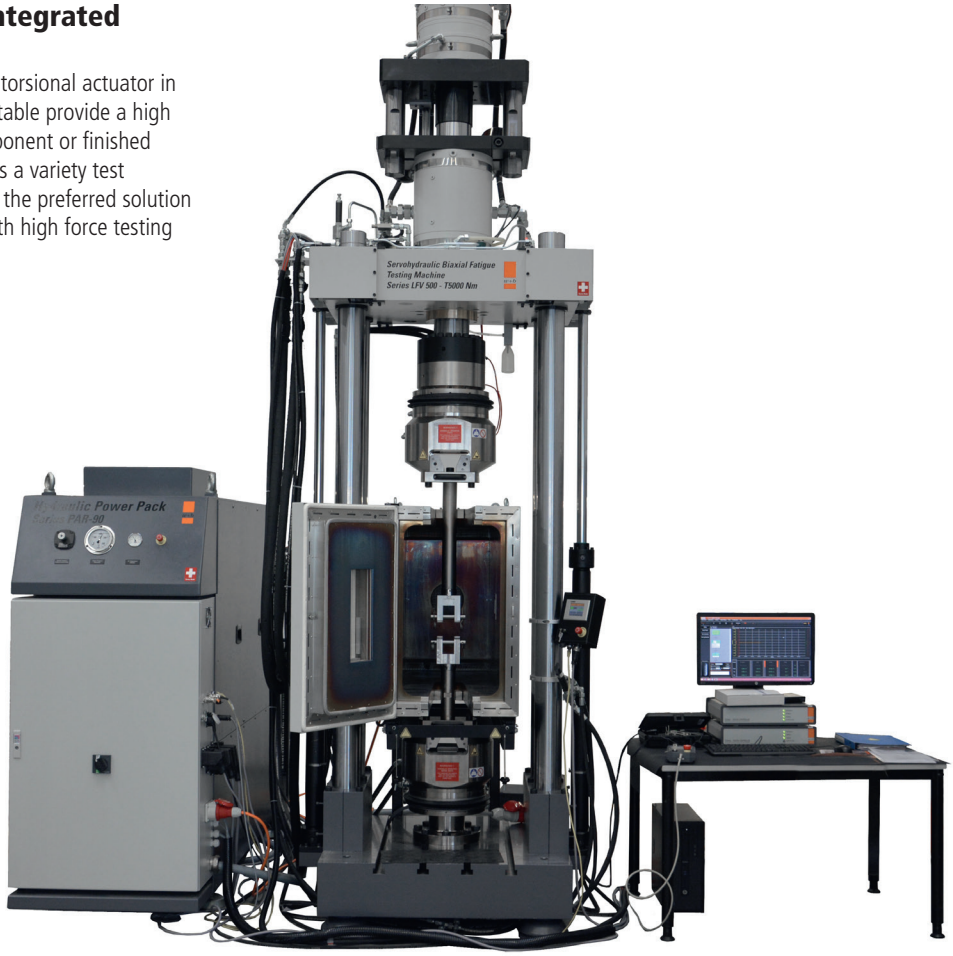
Walter+Bai AG offers a wide range of standardized, fully integrated, dynamic and fatigue axial-torsional testing systems in rigid 2- or 4-column designed for mechanical testing across a broad range of industries.
Our portfolio includes a variety of high-performance testing machines from low capacities to high force meet the full spectrum of dynamic, fatigue and monotonic applications.
These servohydraulic closed-loop Axial-Torsional Test Systems can apply axial, torsional, and programmed in phase or out of phase axial-torsional loads and displacements on a wide array of specimens.
Our modular tests systems include load frames with actuator in the upper cross head or models with in the base integrated axial-torsional actuator.
If your test needs require a bespoke solution our in-hose design team will design and build the frame, fixtures, and accessories so that if will meet your requirements in the best possible way.

Systems with Actuators integrated in the Machines Base

The Floor-Standing Tests Systems with axial-torsional actuator in the machine base provide complete testing solutions from static to dynamic biaxial testing. They are also ideal to integrate test accessories for non-ambient testing such as environmental chamber, high temperature furnace or inductive heating systems.

Systems with Actuators integrated in the Crosshead

The Floor-Standing Systems with axial-torsional actuator in the upper crosshead with lower T-slot table provide a high degree of flexibility for materials, component or finished goods testing. This configuration offers a variety test possibility making these systems often the preferred solution for test labs, universities, and those with high force testing requirements.



Compact System with integrated Hydraulic Power Supply

For those application with lower force / torque ratings we are offering the compact series of axial-torsional servohydraulic test systems with actuator in the upper crosshead and integral T-slot table for various static to dynamic axial / torsional requirements as materials testing, medical device, biomaterial and other component or finished good testing.

Versatile and Highly Configurable Load Frame Design

Our servohydraulic test systems are developed to a high degree and cover a wide variety of fatigue testing for various modes of loading and test specimen configuration. Our load frames, actuators, hydraulic components and sensoric have evolved through use in the filed over decades.
The modular design offers options such as two and four-column frames, crosshead clamping and movement options, hydostatic actuator bearings with selectable servovalve options to acceleration compensated transducers.

Combine according to your Requirements

The axial force and torsional torque requirements vary with your test requirements.
This modular test systems can combine the optimum axial force and torque capacity to suits your demanding requirements.
By selecting the best suitable axial and torsional drives you will minimize your power consumption and increase your lab efficiency.

High Stiffness / High efficiency

Our axial-torsional load frames are designed with high axial, torsional and lateral stiffness. Increased load frame stiffness means higher efficiency as the amount of energy needed to overcome the frame deformation is low and the bulk of the displacement will be absorbed by the specimen. To increase the stiffness low deformed crosshead and base platen and generous selected columns for increased stiffness is included.
This results in increased load frame weights which improves the natural frequency of the load frame and reduces vibration introduced into laboratory floor / building.

The Column are inductive hardened, polished and hard chromium-plated.
Hardened surface: avoids any indentation while the crosshead is clamped.
Polished execution: accurate straightness of the column allows the parallel height adjustment.
Hard chromium-plated column reduces corrosion of the column and ease cleaning. The column must not be lubricated with oil.

Excellent Alignment

Precise machined load frame parts, accurately assembled and aligned and high stiffness assures that the loading train with the testing machine have excellent alignment of the load line with the specimen to prevent premature specimen warping or buckling under high loads.

Accessible and Ergonomically Workspace

Another key attribute of our loading frames is to provide accessible space or installing and removing test specimens, grips or fixtures and other test accessories at in ergonomic way and position.
If your test needs require a bespoke workspace design our in-hose design team will design and build the frame, fixtures, and accessories so that if will meet your requirements in the best possible way.

Convenient Test Space Adjustment

These test system offers convenient hydraulic crosshead positioning to accommodate the suitable workspace. The upper crosshead is locked to the column by a passive clamping system that offers safe clamping without any hydraulic pressure applied. It guarantees highest operating safety as compared with systems using hydraulic pressure to clamp the clamping force will not drop if any leakage appears on the clamping cylinders. The passive clamping system will only be pressurized to unclamp and during the height adjustment.
The crosshead positioning control is done through the handset minimizing human interfaces. The handset control lets you operate the crosshead lifts, locks, and grips to assist in specimen installation procedures. The handset also contains the emergency stop switch and the actuator rod speed control.

Latest Drive Technology

The LFV Test Systems are closed loop controlled through the latest high-resolution, highspeed digital control system PCS8000. The PCS8000 ultra-high-speed closed loop control and data acquisition rate on all channels combined with 24-bit high resolution transducer conditioning rate is achieved by a 64-bit processor running at 1 GHz.

Advanced Closed-Loop Control

As control channel available are any connected inputs as well as virtual (calculated) channels that might open many new opportunities to your application. The versatile concept of the PCS8000 is based on latest technology and supports applications with virtually no limits.

Expandable

Testing Machines powered by two-channel PCS8000 you will be ready for your test demands of today & tomorrow. The test systems can be equipped with up to 26 amplifier cards for control or data-acquisition and up to 20 virtual channels operating at full rate. All physical and virtual channels can be used as data-acquisition as well as control channels. Additional 24 digital outputs and 16 digital inputs to control external devices are provided.

Operator Safety

Our LFV-T series of test systems fully comply with the safety requirements of the EC Machinery Directive and are supplied with the related EC Declaration.

Specimen & System Safety

Specimen Protect function prevents your specimen from being damaged during setup and gripping. The LFV-T Test Systems are protected against overload and provide the ability to set limits for load, piston stroke travel, strain or any other connected transducer preventing damage to your system, load cell and grip or fixtures.

Machine Safety

Provides highest level of machine safety including overload protection of the frame, overload protection of the load cell, two-channel safety circuit according to the machinery directive.

Configurable & Extendable

The modular design enables us to adapt these tests systems to virtually any of your requirements. Configure your test system to meet your unique needs of today and extend it in the future when your test needs would change.

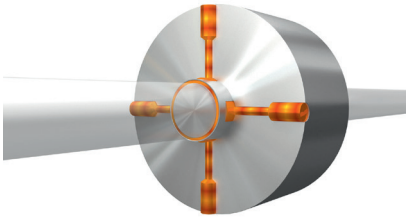
Axial-Torsional Actuator combination consists of an AHA double acting, double ended, equal area axial actuator with hydrostatic bearings combined with the Torsional Actuator Series ATA.

This combination is well suited for static to dynamic applications with precise servo control requirement. The system pressure is 280 bars (alternative available 210 bars), the static rated torques are reached at 250 bars.
The torsional axial- and radial hydrostatic actuator is equipped with a high resolution, digital angle transducer (ADT) for angle measurement and closed-loop control.
These torque-generating, high-performance torsional cylinders are designed for applications with precise servo control requirement. The hydrostatically supported, balanced double-vane rotor design ensure zero actuator backlash during revers testing and is well suited for high speeds and therefore particular suitable for static to dynamic materials and component testing. The hydrostatic bearing guarantees a hysteresis-free operation in the rated load range. Additional plastic coatings provide additionally emergency running properties when exceeding the maximum side loads and protect the damaging of the drive.
Additionally for longest service-life these actuators have additional plastic coating of the bearings and the piston rod.

The axial actuator is a double acting, double ended, equal are Servo Actuator with Hydrostatic Pocket Bearings in Round (no tie rod) design. These linear actuator with hydrostatic bearings offers the best friction free static and dynamic performance, allows high side-loads and emergency running, and provides virtually unlimited service life. They represent the high-end solution with virtually service-free operation.
Additionally, these actuators have integrated cushioning. Cushioning of some sort is required to decelerate a cylinder's piston before it strikes the end cap. Reducing the piston velocity as it approaches the end cap lowers the stresses on cylinder components and reduces vibration transmitted to the machine structure.
Additionally for longest service-life these actuators have additional plastic coating of the bearings and the piston rod.
The hydrostatic bearings of the rotary and axial actuators are oil supply for rotary and axial actuators hydrostatic bearings is actuator internal provided.

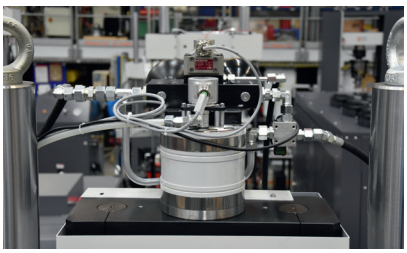
Hydrostatic bearings are primarily used because of the following characteristics:

- High loading and performance permissible
- Considerable static rigidity and high damping
- No starting friction and very low friction at low and high speeds
- No wear
- Little heat produced



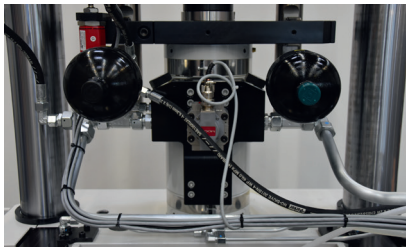
Digital Angular & Axial Displacement Transducers

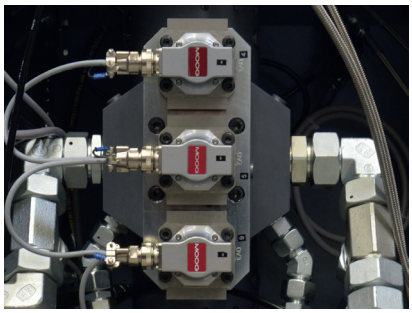
The actuator is equipped with digital coaxial mounted angular displacement transducer (ADT) attached through torsion-resistant clutch directly to the rotary actuator shaft and with digital axial displacement transducer. Using this system, the actuators angular and axial positions are measured and then fed as an actual signal via the measuring amplifiers to the digital controller for position data acquisition and control signal. The digital displacement transducers provide noise free digital signal, better linearity compared to LVDT's and is insensitive against any disturbance.



Servo-valve manifold platen & Servo-valves

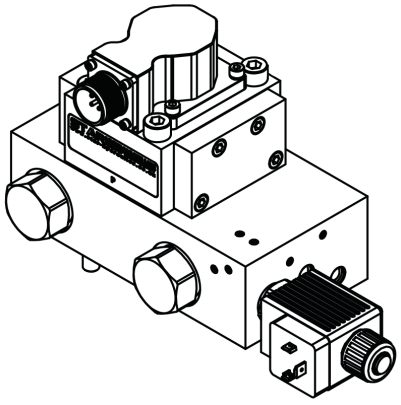
According to the dynamic performance requirements the machines are equipped with suitable servo-valve manifold platen and Servo-valves. The servo-valve unit is mounted direct on the axial and torsional actuators for the highest possible response and most accurate test control.
Commonly used Moog servo-valves are Series 761 (one (1) to four (4) valves), 791 or 792 valves which are suitable for electrohydraulic position, speed, pressure or force control systems with high dynamic response requirements.
If the machine will be used in a wide range of application from monotonic static testing over LCF up to HCF testing electric operated servo-valve manifold blocs are available. These platens are designed for more than one valve, commonly one valve with low-flow rate for static and quasi-static application with low oil-flow demand and valve(s) with larger flow-rate for those application that requires higher oil-low (example HCF Tests). The valve(s) with the larger oil-flow can be electrically deactivated in order only the valve with lower oil-flow is active. This electrically operated dual manifold-blocs are available for servo-valve combinations with Moog 761 series or combinations with high-flow Moog 791 or 792 series combined with Moog 761 series.





Actuator Chamber Isolation Platen

When start-up or safety requirements make it necessary to isolate the servovalve from the actuator, the sandwich isolation platen can be installed (option) and triggered electrically.
Reaction time: ≤0.1 Second.
This module contains 2 pilot-to-open logic valves and a 3-way normally closed solenoid.
When either the solenoid is de-energised or there is a loss in supply pressure the logic valves isolate the servovalve control ports and thus lock the actuator in position.



Crossport relief valve (CRV) and dual port relief valve (DRV)

Optional when required we are offering CRV or DRV manifolds for limiting high-pressure situations caused by rapid acceleration or deceleration of an inertial load.

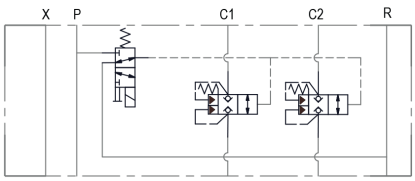
- CRV's relieve one control port to the other
- DRV's relieve either control port to tank

Adjustable metering orifice (AMO) manifolds

May be optionally used to add hydraulic damping for improved dynamic performance in a servosystem. The bypass orifice is incorporated into a manifold between the servovalve and the motion device. Can be adjusted to set the optimum performance after final installation.

Control Port Shut of Platen

This platen provides a convenient method of closing the output of a 4-way servo valve. In applications that use multiple servovaves on a single actuator it is possible to have unwanted offset at the main spool making for an inefficient setup. The platen provides the user a way to quickly isolate each of the valve's output and therefor allowing accurate nulling of any remaining valves connected to the actuator. Two indicators provide the user clear identification of the open or closed position.



Flushing platen

Flushing platen employed in place of valve when initially cleaning hydraulic fluids

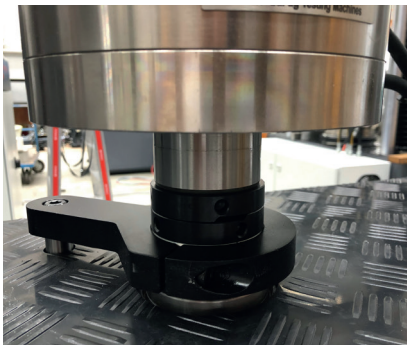
- Mount in place of the valve when filtering hydraulic fluid prior to use in the system
- Helps eliminate the possibility of servovalve contamination new system flushing or fluid replacement operations

Close coupled accumulators

To minimize hydraulic pressure fluctuations are mounted direct on the servo-valve manifold direct at the actuator.
Processes with a high dynamic response require the use of membrane accumulators of sufficient size in the pressure and return lines in the direct vicinity of the servo valve.
The optimal size of the installed accumulators in the pressure and return line varies with the actuator and hydraulic power pack size.

Interface to Grips & Fixtures with Spiral Washer and Stud

The grips provide an internal thread that allows a backlash free connection of the grips to your testing machine with spiral washer and connector stud. The washer/stud connection provides backlash-free connection between the grip and the testing machine.



Active Air Damping System (Option)

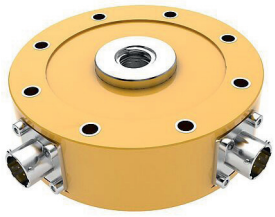
For test systems used for high cycle fatigue testing, systems with high accelerations or test systems located closed to sensitive devices optionally available are active air damping systems on which the load frame is placed. This system absorbs most of the load frame vibrations, noise as well as elastic storage decoupling. The air damping system can be connected to customer's laboratory compressed air system or an independent air supply compressor is optionally available.

Alignment Fixture AF

For applications where very accurate specimen alignment is required, including LCF, TMF , HCF and others, the fixture to align the specimen is used.
In combination with this alignment fixture for material testing machines accurate and productive alignment adjustments during verification practiceand while the load train is pre-loaded can be performed. Mounted mostly between the crosshead and the load cell the alignment fixture provides full concentricity and angularity adjustment. Alignments are not lost when small changes in alignment occur because the alignment fixture remains preloaded all the times. As the alignment fixture remains preloaded at all times, alignments are not lost when small changes in alignment occur as during preloading process.
The fixture is designed for use with the alignment verification accessories consisting of strain gauged specimen, electronics and software.

Axial/Torsional Transducers

We are offering different transducers for force and torque measurements and closed loop control. Depending on the selected model, either with actuator on the upper crosshead or in the lower base platen and your test requirements we will offer one of the following transducers.



Flange Style Axial-Torsional Transducer

These Axial Torsion load / torque transducers are compact devices for measuring axial load and torque. These sensors provides high outputs on both outputs making it very suitable for cyclic applications with large numbers of cycles. The flange style coupling provides a robust method of load attachment and ease of alignment in axial-torsional systems.
Custom versions have been produced with outputs for Thrust (Z), X-Moment, Y-Moment and Torsion (T) for specialized applications e.g. testing of composite components.

Flange Style Axial-Torsional Transducer with built-in Accelerometer

The flange style axial-torsional transducer is available with integrated accelerometer for inertial compensation in combination with our PCS8000 digital controller and Dion7 Software when mounted on the actuator's piston rod end.

Combined Force and Torque Transducer

The combination of an axial force transducers and torque transducers results in axial-torsional transducers that are ideal for use as reference transducers in our tension-torsion testing machines. These testing devices can handle static to dynamic tensile and compressive forces in combination with torsional vibrations.
These transducer combinations provide lowest possible crosstalk of combined transducers as each transducer have its independent transducer body.

Combined Force and Torque Transducer with built-in Accelerometer(s)

These transducers can be supplied with built-in accelerometer either for axial force, for torque or for both directions.
The accelerometer(s) provide in combination with our PCS8000 digital controller and Dion7 Software inertial compensation when mounted on the actuator's piston rod end.

w+b Materials Testing Systems

w+b offers the comprehensive range of accessories for static, dynamic and fatigue testing on materials and engineering components. Besides the general purpose components, hundreds of application-focused accessories are available for the full spectrum of mechanical testing in different environmental conditions.
Typical testing accessories include hundreds of grips & fixtures, clamps, joints, contacting and non-contacting extensometers, load cells, load frame accessories, environmental simulation chambers, furnaces, vacuum systems, hydraulic supplies & componetns, digital controllers with data acquisition accessories, application software.

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