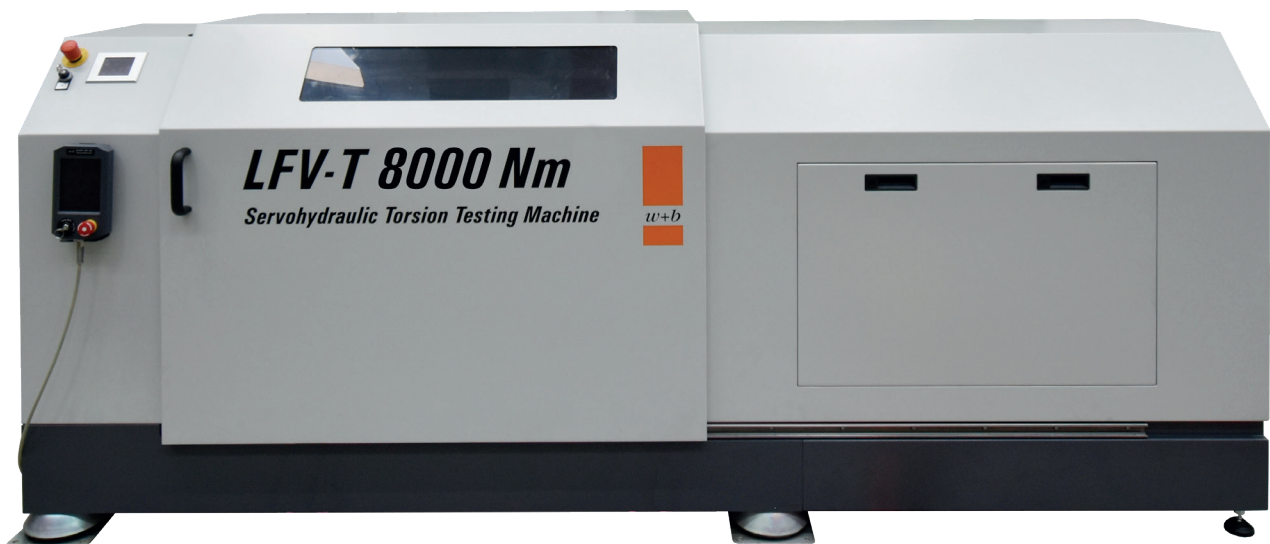


## Servohydraulic Medium Capacity Torsion Testing Machines

### Series LFV-T up to 16 kNm

Walter+Bai AG Testing Machines supplies torsional test systems for static and dynamic torsion tests to determine the mechanical properties of engineering components and testing of full-size parts as shafts, axles, twist drills couplings, clutches or drive line components for the Oil and Gas Industry, Steam and Diesel Engines, Gas Turbines, for Wind Turbines, Ship-building / Marine Industry or for calibration purpose of torque transducers. Depending on the dynamic requirements we supply electromechanical or servohydraulic tests systems.

The Medium Capacity LFV-T Series of torsion testing machines are dynamic rated servohydraulic test systems with horizontally oriented axis for easy specimen loading from front or top.



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.

#### From Standard to Customized System

Walter+Bai AG offers a wide range of standardized, fully integrated, dynamic and fatigue torsional testing systems 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 torque meet the full spectrum of dynamic, fatigue and monotonic applications. These servohydraulic closed-loop Torsional Test Systems can apply torque and angle closed-loop controlled tests on a wide array of specimens, components, and finished goods.

If your test needs require a bespoke solution our in-house design team will design and build the frame, fixtures, and accessories so that it will meet your requirements in the best possible way.

## Medium Capacity LFV-T Series Systems up to 16000 Nm

The horizontal load frame is rigid designed with high torsional stiffness. This design makes specimen loading quick & safe and more efficient as loading from front or for heavy parts from top in combination with a crane is possible.

The increased frame stiffness provides high efficiency as the amount of energy needed to overcome the frame deformation in each loading cycle is less.

These test systems integrates high-resolution and high-speed w+b controls, fatigue rated hydraulic frame up to 16 kNm, a broad portfolio of complement accessories and easy-to-use Dion7 application software package for accurate and repeatable monotonic to fatigue testing across a wide range of applications and materials including:

- Metals, Wire Rods, Fasteners, Tools, Shafts, Axles, Couplings, Clutches, Drive line components, Calibration of torque transducers, Engineering components, Finished goods

The test system incorporates the safety device satisfy the requirements of EG Machinery Directive 2006/42/EG. The front door of the LFV-T is well guided on rails and can be conveniently opened by sliding it to the side.

The LFV-T series is modular constructed and can be configured with a variety of grips and fixtures, environmental chamber, different software packages and other accessories to suits your specific testing needs.

## Key Features

- Covering static to fatigue testing
- Comply with EG Machinery Directive 2006/42/EG
- High torsional stiffness
- Motorized test space adjustment
- Torsional cylinder with hydrostatically supported balanced double-vane rotor design
- High precision torque transducer
- Quick & safe specimen loading



## High Stiffness Load Frame

The load frame is characterized by its very high torsional rigidity and high natural frequency making it suitable for a variety of tests in a wide frequency range. The high stiffness is achieved by the machines torsional rigid base platen and supports. Increased stiffness means higher efficiency as the amount of energy needed to overcome the frame deformation in each loading cycle is fewer what results in high efficiency and reduces the operating costs. The torsional stiff load frame results in increased load frame weights which improves the natural frequency of the load frame and reduces vibration introduced into laboratory floor / building.

## 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.

## Free Movable Supports

The systems torque transducer is attached to the fixed support whereas the high-performance torsional cylinder is mounted on the horizontal movable support which can be positioned at any location along the linear slide.

The movable support is guided on heavy ball rail guides which are backlash-free preloaded. The large distance of the guides ensures torsional rigidity and provides high rotation stiffness and accurate alignment.

## Motorized Test Space Adjustment

The test space adjustment is motorized by pressing forward/backwards buttons on the touch screen panel.

## Accessible and Ergonomically Workspace

Another key attribute of our LFV-T load frames is to provide accessible space for installing and removing test specimens, grips or fixtures and other test accessories in an ergonomic way and position.

The working height can be made according to your requirements by producing the machine's base with a height that suits your requirements.

## Ergonomic Working

The horizontal load frame design makes specimen loading from top through laboratory crane possible that is quick & safe and more efficient as loading from front.

## Convenient Test Space Adjustment

These test system offers convenient test space positioning to accommodate the suitable workspace. The movable support is locked to the base platen and can be unlocked to adjust the test space.

The test space positioning control is done through the handset minimizing human interfaces. The handset control lets you operate the test space setting and locks.

The handset also contains the emergency stop switch and the torsional actuator speed control.

## Accurate Torque Transducer

The system's torque transducer is attached to the fixed crosshead whereas the high-performance torsional cylinder is mounted on the horizontal movable crosshead which can be positioned at any location along the linear slide. The test space adjustment is motorized by pressing forward/backwards buttons on the touch screen panel.

The test space large and therefore perfect for evaluating the reliability and endurance of long parts and structures.

## Features

- For static and dynamic moments
- Very high-cycle fatigue resistant up to 100% of nominal load
- Extremely robust against side forces and bending moments
- Rotational-symmetric design of the FE-optimised sensor element
- Low-profile, robust construction
- High natural frequency
- Fatigue proof
- Excellent long term stability

Additional Axial Measurement Channel to observe the axial load applied on the load cell and drive. In case of max. allowable axial load is reached the system stops.

## Latest Drive Technology

The LFV-T 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.

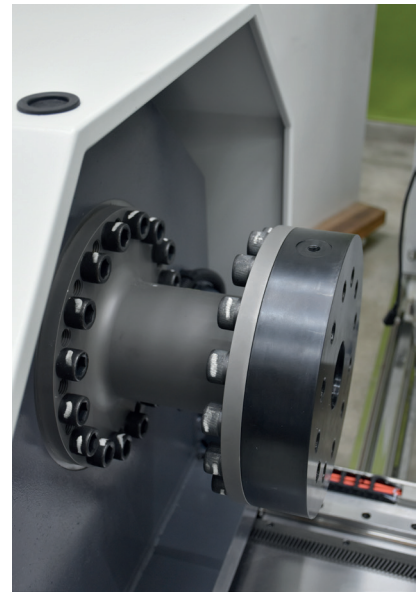
The LFV-T Test Systems are protected against over-torque and provide the ability to set limits for torque, angle, strain or any other connected transducer preventing damage to your system, torque transducer and grip or fixtures.

## 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.

## Seamlessly Integration of Accessories

The LFV series allows the seamlessly integration of a variety of grips and fixtures, extensometers, environmental simulation chambers and furnaces, different software packages and other accessories to suit your specific testing needs.



## Torsional Actuators ATA with Hydrostatic Bearings



This series of LFV-T test system incorporates the torque-generating high-performance torsional cylinder with hydrostatically supported balanced double-vane rotor design ensuring zero actuator backlash during revers testing and is well suited for high speeds. The system static rated torques are reached at 250 bars.

The torsional actuators ATA series are used to apply torques to standard samples, structures, components or finished goods. These torque-generating, high-performance 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 dynamic materials and component testing. The hydrostatic bearing guarantees a hysteresis-free operation in the rated load range. Additional plastic coatings provides additionally emergency running properties when exceeding the maximum side loads and protect the damaging of the drive.

The torsional actuators are in standard equipped with a high resolution, digital angle transducer (ADT) for angle measurement and closed-loop control. The servovalve ports will be made suitable for your required dynamic performance. Further mounting and fixtures are available including reaction brackets and fixturing. The standard torque range of this torsional actuators goes up to 80 kNm (80000 Nm) with 100° rotational angle. Solutions for higher torques and rotational angles can be provided as custom solutions.

### Digital Angle Transducer (ADT)

The torsional actuator is in standard equipped with a high resolution, digital angle transducer (ADT) for angle measurement and closed-loop control. The servovalve ports will be made suitable for your required dynamic performance.

### 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 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 to higher frequencies, 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 one valve with larger flow-rate for those application that requires higher oil-flow (typically cyclic fatigue & 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:  $\leq 0.1$  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) manifolds

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 servovalves 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

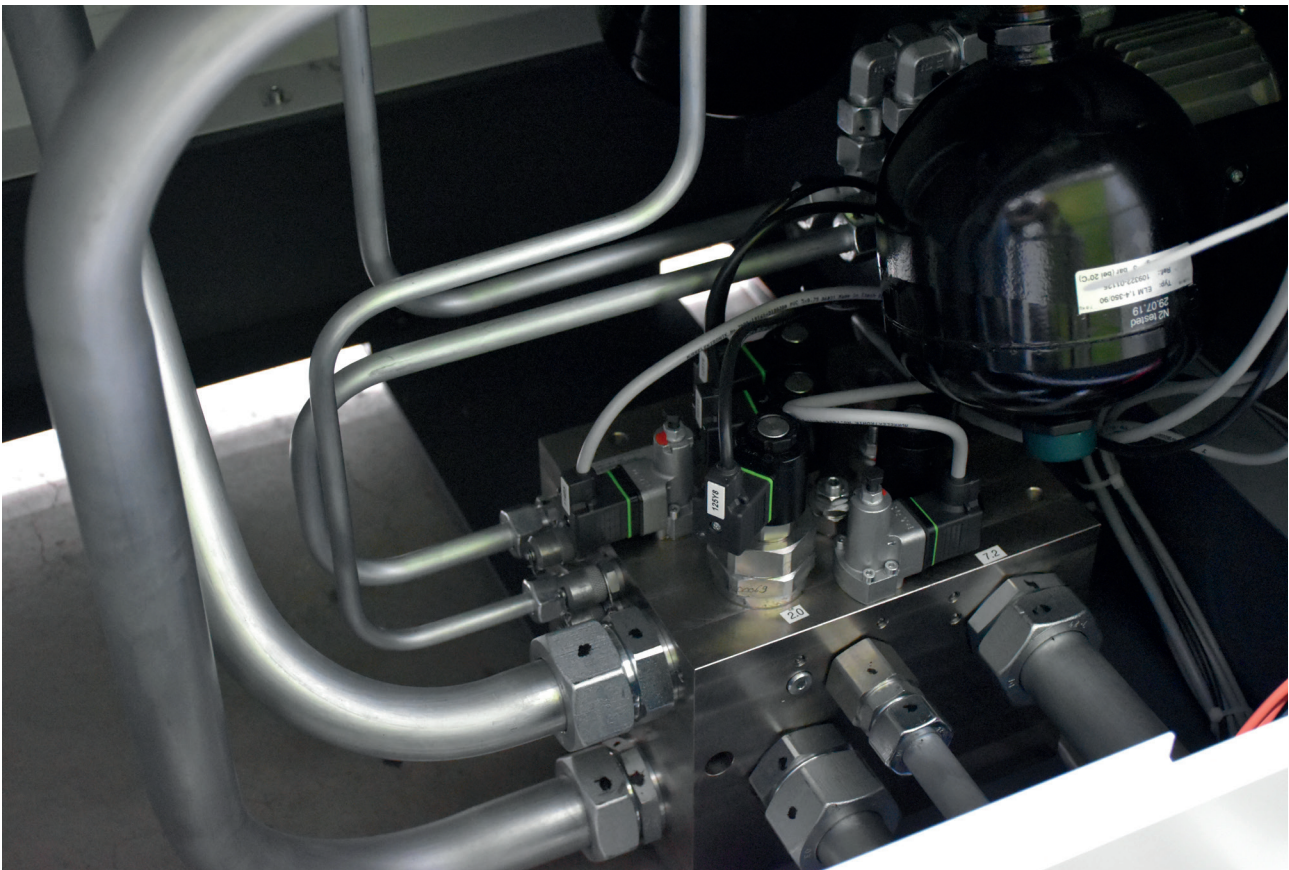
Flushing platen employed in place of valve when initially cleaning hydraulic fluids

- 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.

## Hydraulic Service Manifolds

Hydraulic Service Manifolds output module to isolate the torque drive form the hydraulic power pack. Our manifolds provide independent control of the hydraulic pressure and flow applied to individual testing machine from a hydraulic oil supply. These units provide switched modes: Off/Low/High with ramping between pressure levels with smooth pressure transition between the high- and low-pressure modes and additional adjustable low-oil-flow that reduce the maximum piston speed during set-up mode. The Service Manifold Control Module for the PCS8000 digital controller operated the HSM direct from the PCS8000 controller. Thanks to this function, no additional electrical control board or SPC is needed. This module simplifies the installation, offers a maximum of flexibility in the future in extending and minimizing interference-prone cable connections. In case of an emergency stop an electrical security connection between Controller and Service Manifold takes part scope of supply.

**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.



## Service Friendly

The test system is constructed in such a way that it provides good access for maintenance and service works.

## Specification

Model		LFV-T2000	LFV-T2000 Extended	LFV-T4000	LFV-T4000 Extended	LFV-T8000	LFV-T8000 Extended	LFV-T16000	LFV-T16000 Extended
Torque Range	Nm	±2000	±2000	±4000	±4000	±8000	±8000	±16000	±16000
Test Space (between connecting adapters)	mm	0-800	0-1200	0-800	0-1200	0-800	0-1200	0-800	0-1200
Height of test axis, from base platen	mm	500							
Standard mounting flange	mm	Ø286 (others available)							
Torque Accuracy Grade	ISO 7500-1	0.5							
Torque Resolution	Bit	24							
Usable Torsional Angle	Degree	100° (±50°)							
Additional Damping	Degree	±10°							
Angle Resolution	Degree	0.005° (16 Bit)							
Angle Accuracy	ISO 9513	0.5							
Max. permissible angular velocity for the torsional actuator	°/sec.	1500							
Closed Loop Control Rate	Hz	Adjustable up to 14400							
Data Acquisition Rate	Hz	Adjustable up to 14400							
Max. permissible axial Force (Fax)*	kN	13	13	17	17	26	26	32	32
Max. permissible radial Force (Frad)*	kN	4	4	9	9	14	14	25	25
Frame Width (length)	mm	3710	4510	3710	4510	3710	4510	3710	4510
Frame Depth	mm	870	870	870	870	870	870	870	870
Frame Height	mm	1250	1250	1250	1250	1250	1250	1250	1250
Frame Weight	kg	4690	4990	4840	5140	4980	5280	5060	5360
Load Frame Stiffness at max. separation	kNm/degree	>800	>540	>800	>540	>800	>540	>800	>540
Operating Temp. Range	°C	5 to 40							
Humidity Range	%	5-92 non-condensing							

\*Option for higher permissible axial and radial forces available