

Servo-Electric Low Cycle Fatigue (LCF) Central Spindle Testing Machines Series LFMZ

These single screw electromechanical test systems are designed and optimized for Low Cycle Fatigue (LCF), Thermo Mechanical Fatigue (TMF) and all other slow speed static, slow strain rate and quasi-dynamic cyclic reverse-stress applications



Unique Electromechanical Drive Technology

The machine includes a central electromechanical drive (actuator) that provides, as servo-hydraulic test system, the in-line and backlash-free load train from the drive to the grips, to the load cell and to the alignment fixtures.

With an experience of more than 30 years we provide the backlash-free ball-screw drive system complete bedded in oil resulting in reduce friction, for the best control accuracy even at lowest stain levels and extend lifetime.

To reach the complete backlash-free load train the machine is equipped with a gearbox that can be pre-loaded to eliminate any backlash.

The machine is driven by a brushless AC Servomotor providing maintenance-free, high responsive and high accurate control at an extremely low noise level. The AC servomotor provides continuous testing up to nominal force.

Your Advantage

- Fluid-Free non-hydraulic Test System eliminating the need for hydraulic infrastructure and provides reduced installation and operating cost at low noise level
- Energy efficient with reduced footprint compared to hydraulic systems
- High stiffness load frame providing high axial and lateral stiffness
- Best possible control achieved by unique electric actuator with spindle bedded in oil, pre-loadable backlash-free gearbox and high-responsive AC servomotor driven by the high-speed closed loop controller with closed-loop control rate and data acquisition rate of 14.4 kHz.

- Specialized load frame design that allows the seamlessly integration of accessories, including everything required to perform LCF or TMF tests according to ASTM E606, ASTM E2368 in an easy-to-use and repeatable way.
- Alignment solution to measure and adjust the loadstring alignment.
- Dedicated software packages for LCF, TMF or other complex free-programmable tests.
- Long service life

Owing to over 50 years of experience in the production of a wide range of fatigue rated servo-electric testing machines all LFMZ systems integrates reliable w+b servo- electric closed-loop 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 fatigue slow motion testing including:

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

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 Ergonomical workspace

Another key attribute of these loading frames is to provide accessible space for installing and removing test specimens, grips or fixtures and other test accessories including high temperature furnace or inductive heating system at an ergonomically height and sufficient clear distance between the columns.

Latest Drive Technology

The LFMZ 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.

Unique Electric Drive for Long Service Life

The unique drive technology utilizes an all-electric drive with features for increased control accuracy and extended service life. The electric actuator includes the backlash free ball-screw drive with inline reducing gearbox and inline AC servomotor. The complete drive is without timing belt or any chain system.

The ball-screw is complete bedded in oil to reduce friction and reduce stick-slip behaviour that can be observed by the friction in a ball screw actuator. By reducing the friction, the service life can be extended considerable and the best control accuracy even at lowest stain levels will result. The installed backlash free, lifetime lubricated, pre-loaded, servo-gearbox assures that the system archives its best possible mechanical resolution combined with exceptional low minimum speeds control and best stability when operating the machine at high speed. Further advantages of the gear box are:

Adjusted to be free from backlash through ingenious design / ball-screw / gear connected via torsional rigid clamp coupling with is free from backlash / This highly dynamic gears features all the advantages of the toothed system for driving / Provides maximum angular momentum, maximum position accuracy and efficiencies / High overload safety.

High Responsive AC Servomotor

The central actuator is driven via a high responsive, maintenance-free AC servomotor that provides fast starts and stops, best control and highest accuracy at an extremely low noise level. These servomotors provide continuous high test speed up to nominal force for continuously operation.

Crosshead Positioning

Depending on your demands these test systems are available with manual crosshead lock and positioning, manual lock and hydraulic positioning or with hydraulic unlock and positioning.

Version -M: Manual crosshead lock and positioning

Version -HM: With manual crosshead lock and hydraulic height positioning

Version -HH: With hydraulic unlocking and hydraulic height positioning

This Version includes the Hydraulic Passive Clamping System for the movable upper crossheads.

The upper crosshead is clamped to the column without any hydraulic pressure applied. It guarantees highest operating safety compared with systems using hydraulic pressure to lock the crosshead to the columns as the clamping force will not drop if any leakage appears on the clamping cylinders.

Easy Test Set-Up Controls

The LFMZ Test Systems are available with centralized controls on the digital handset. The handset includes all functions to from test set up until the test is running.

- Display of up to three (3) channels (example Force / Piston Stroke / Strain)
- Zeroing of control and measurement channels
- Crosshead unclamping and height positioning
- Piston or Crosshead Movement via trimmfunction
- Adjustable piston or crosshead speed
- Opening and closing of hydraulic, pneumatic or motorized grips
- Display brightness adjustment
- Rotation of display
- Integrated Emergency STOP
- Key-Switch to activate the setting mode according to the new CE Machine directive for testing machines or actuators.



Operator Safety

Our LFMZ 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 LFMZ Test Systems are protected against overload and provide the ability to set limits for load, crosshead travel, strain or any other connected transducer preventing damage to your system, load cell and grip or fixtures. Mechanical end-stops and adjustable travel limits stop the crosshead at set points.

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.

Alignment Fixture

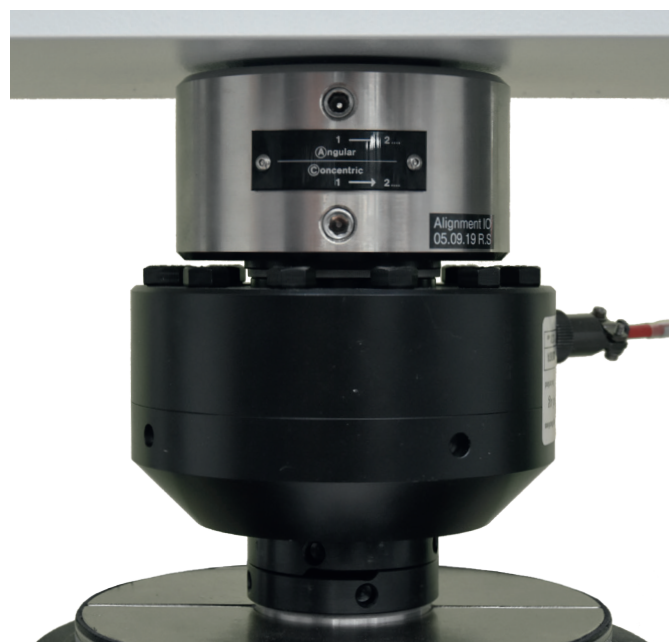
It has been recognised for many years that bending stresses associated with misalignment between the load axis and the axis of the parallel length of the test piece can significantly influence the magnitude of the material property under investigation in mechanical tests.

Sources of misalignment include inaccurate machining of the test piece, poor conformance of the test piece centre line with top and bottom grip centre lines, poor alignment in the loading train, inadequate test machine alignment and insufficient test machine lateral stiffness. Combinations of these sources of misalignment occur to various degrees in any test, depending on test piece machining tolerances and on the configuration of the loading system.

Many international standards as ASTM E1012, ISO 23788, , NASM1312, MIL-STD-1312B or regulations like for example GE S-400 or GE S-450 refer to alignment issues or describe the practice for verification of test frame and specimen alignment under axial force applications. Furthermore Nadcap accreditation (audit criteria AC7101 & AC7122) define the verification of alignment based on ASTM E1012.

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 practice and 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.

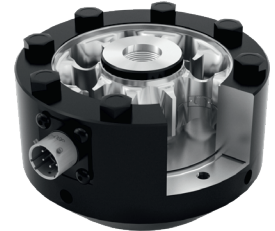


High Precision Fatigue Rated, Low Profile Tension & Compression Load Cell

These LFMZ test systems are equipped with a fatigue rated high precision low profile tension & compression Load Cell with eccentric load compensation for static, quasistatic and dynamic / fatigue materials testing. Based on the shear web principle these accurate load cells offer low linearity and hysteresis errors for accurate materials testing. These low-profile sensors are rotationally symmetrical, flat and convince by their versatility. Through a special mechanical adjustment process this load cells are insensitive to parasitic loads. This force transducers offers high-stiffness and high natural frequency.

Features:

- Temperature compensated strain gages
- High performance
- Eccentric load is compensated
- Very low temperature effect on output
- Low deflection
- High natural frequency
- Shunt calibration
- Barometric compensation
- Tension and compression
- Compact 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.

Grips

These test systems are available with a variety of grips which can be selected according to your requirements. The most popular grips are:

- Collet Grips
- WGR non-shift Wedge Grips
- High Temperature HTG Grips

Hydraulic Collet Grips for Fatigue Testing of Round Specimens

The HCG Hydraulic Collet Grips are the best solution for fatigue testing of round smooth shank specimen. They are well suited for any kind of fatigue testing including LCF, TMF, force controlled constant amplitude axial fatigue test according to ASTM E446, ISO 1099 or EN 6072 and constant amplitude strain controlled axial fatigue tests according to ISO 12106, BS 7270 and others.

This hydraulically actuated grips hold a specimen during testing with a constant gripping force regardless of the applied axial test force. The short and stiff grip design minimize lateral movement and provides superb alignment and repeatability that minimize the introduced bending strain that can invalidate your test results.

These grips permit an easy sample loading into to collet inserts.

The grips are accurate machined with main parts polished.

The amount of bending strain in the specimen is beside of the gripping methods also affected by the specimen design.

Better alignment can be achieved using smooth ended specimen as threaded specimens generally give poorer alignment with equally poorer reproducibility. Further as there are no threads or button ends to be machined the specimen reparation is less expensive.

These grips can be mounted on hydraulic or non-hydraulic static testing machines and dynamic rated systems.

Each grip has two hydraulic ports for the fluid, one for opening of the grip and one for closing / clamping. The hydraulic supply can be either from an existing hydraulic source or via stand-alone or in the machine integrated hydraulic pump and valve assembly.

In combination with extension rods and high-temperature hydraulic fluid the grips can be mounted in environmental chambers.

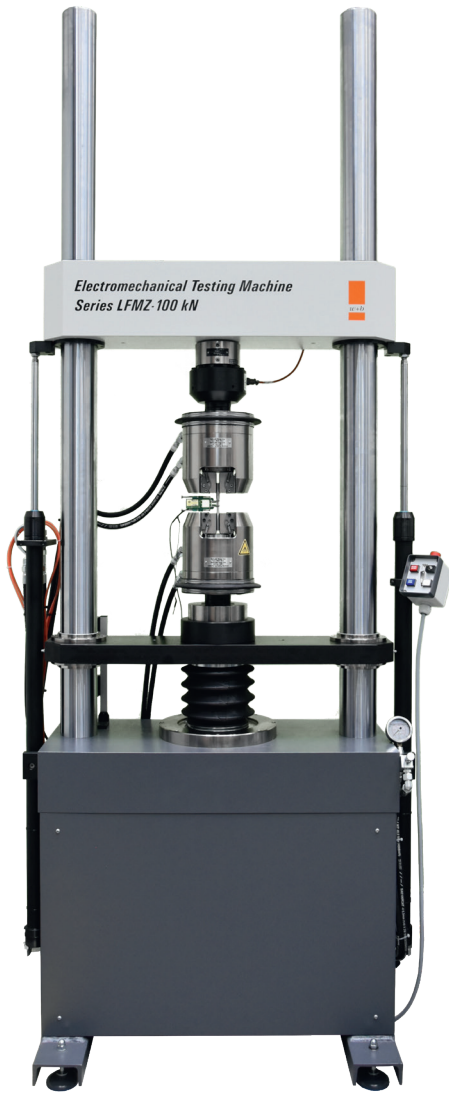
The grips are nickel plated, wear and corrosion resistant.

These Grips are produced up to 400 kN capacity. Built for years of trouble-free testing at its full rating!



Key Features

- Providing constant, lateral gripping force
- Superior alignment
- Stiff and short construction
- Easy specimen loading
- Quick changing of collets
- Inexpensive specimen production



Side-Loading Hydraulic Non-Shift Wedge Grips Series WGR-H

The hydraulic grips WGR-H Series are general-purpose grips for static, pseudo-static and dynamic (through-zero) testing which provides excellent sample grip on a variety of materials.

Their high lateral stiffness and constant lateral gripping force assure and maintaining excellent alignment. The WGR series is versatile, allowing the installation of inserts for flat and round specimen.

Each grip is hydraulically operated, with gripping force being applied via movement of the grip body relative to the wedge-shaped jaw faces. Thus, the wedge inserts remain stationary on the same vertical position when applying initial gripping force to sample while the body of the grip is moving.

This feature minimises the preload applied to the sample by the grips and minimize compressive force being applied prior to testing. The grip body wedge area is fitted with jaw guides, to ensure that the jaw faces remain square to each other and to the specimen. Each jaw face is located in the grip body by two extension springs, which allow the jaw faces to release the specimen after testing.

The open-front construction makes specimen insertion quick and easy. This translates into you spending less time inserting and aligning specimens and more time testing.

WGR series allows also the proper clamping of short specimens, minimizing material. This hydraulic non-shift wedge grips are designed for a wide clamping range of round and flat specimens. The inserts come in a variety of surfaces and shapes to meet your requirements. Standard inserts do a good job of gripping materials such as steel a.s.o. Compression platens or bending / folding devices may be fixed directly into the grips.

High Temperature Hydraulic LCF Grips

The HTG grips are the ideal choice for conducting high-temperature Low Cycle Fatigue (LCF) Tests in combination with high temperature furnace.

These grips with hydraulic specimen preload are specially designed for Low-Cycle Fatigue Testing or for any other reverse axial stress application up to 15 Hz or tension-only application.

The reverse rated grip extension with inside pushrod for specimen preloading and the exchangeable specimen adapters extend into the heated zone of the furnace. These parts are made of high-temperature super alloys with high strengths at high temperature.

The grip body, which remains outside of the furnace, is water cooled and isolate the hot parts of the grips from the actuator piston rod and from the load cell or other accessories. When hydraulic pressure is applied the grip piston moves and push the pushrod against the end of the specimen. The adjustable grips pressure defines the specimen preloading that can be set in relation to expected introduced compressive forces.

These grips can accommodate various sizes of threaded and button-end specimens. A view port in the grip extension helps to position the threaded specimen in the adapters.

All parts of the HTG grips are accurate machined with tight tolerances for improved and repeatable alignment.

Key Features

- Preloaded for full reverse application
- Replaceable inserts for various specimen sizes
- Suitable for threaded and button-end specimen
- Low thermal gradient
- Available in various sizes suiting different furnace



Everything from a Single Source

Thanks to our decades of experience in testing machine construction, maintenance and calibration, we can offer you an all-round service for your testing machines and systems. This minimizes failures and ensures compliance with standards. We offer preventive maintenance, on-site repairs, overhauls and repairs in our factory, machine relocations and recommissioning, spare parts, software updates & upgrades, training and modernizations.

More than 50 Years Experience

Owing to over 50 years of experience in the production of electromechanical test systems our servohydraulic test systems includes a numerous of features and achievements guaranteeing operational efficiency, safety and reliable testing with minimum down-time.

Modular & Flexible

The modular design enables us to adapt these tests systems to virtually any of your requirements.

Common customizations include:

- Other test speeds
- Extended vertical or horizontal test spaces
- Multifunctional T-slot base platen to clamp grips or fixtures, components or finished goods
- Additional second working space
- Extending to fully automatic robotic system

