



MTS FSE MODULAR TRAINING



Product Overview

April 20, 2015 rev C

be certain.

MTS Overview

» The MTS Test Division provides two major types of servohydraulic systems.

- Load Frame systems



- Structural actuator components and systems



MTS Overview

- » A servo hydraulic system, regardless of its application or market segment will consist of the following devices
 - Hydraulic Power Unit (HPU)
 - Hydraulic Service Manifold (HSM) – Not present every system
 - Actuator – Structural or Load Frame
 - Servovalves
 - Transducers
 - » Load Cell – Measures Force
 - » LVDT – Measures Position
 - Controller

Hydraulic Power Unit

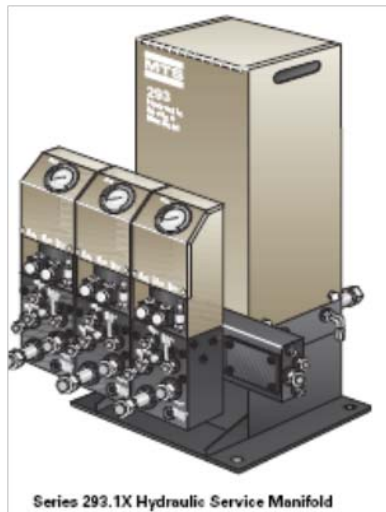
- » Provides hydraulic pressure and flow to the system.
- » Standard pressure is 3000 PSI
 - Higher pressures available
- » Available in various sizes (GPM)
- » Also known as the (HPU)



Series 505 Hydraulic Power Unit

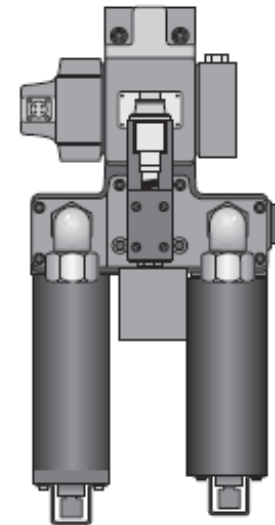
Hydraulic Service Manifold

- » Installed between the HPU and the system, the HSM turns oil pressure on and off to the actuator(s). Some models also provide low pressure and high pressure control.



Structural HSM

Load Frame
HSM



Hydraulic Actuator

- » Stand alone (as shown here) for structural system applications, or mounted into a load frame for material testing applications.
- » Actuators use the pressure and flow of the HPU to either extend or retract, thus applying either a controlled force or displacement.



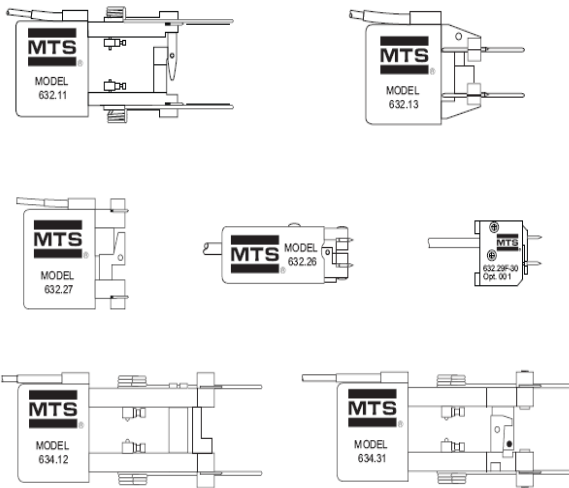
Servovalves

- » These are mounted on the HSM in a load frame system or directly mounted to the actuator of a structural system using a manifold block.
- » Servovalves are available in multiple sizes and frequency response capabilities.
- » Systems may contain a single servo valve or multiple servo valves. They may be the same, or have different flow ratings.*
- » * Requires manual port shut off valves.

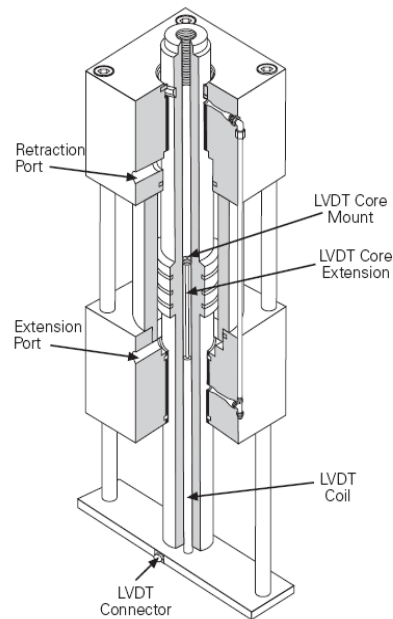


Feedback Devices

- » Systems also need some type of feedback device. This usually comes in the form of a load cell or LVDT. It can also be an extensometer, a pressure cell or even a Delta P.



Assorted Extensometers



Functional Diagram



Load Frames

- » Materials test systems typically have the actuator mounted into a load frame.
- » Testing is performed between the base of the load frame and adjustable cross head

Cross Head

Base



Load Cell

» Load cells provide force feedback to the controller.



Load Frame



Structural Systems Components

- » The load cell maybe mounted on the end of the actuator or at the reaction point.



- » The servo valve controls the actuator.



- » Free standing actuators typically have swivels attached to one or both ends.



Controllers

- » Controllers are the brain of the system
- » All transducers (feedback devices) go to the controller
 - The controller converts the transducers output to an engineering value
- » The controller output is connected to the servovalve to control the actuator
- » The controller sends the signals to turn on and off hydraulic oil
- » The controller provides closed loop control



Closed Loop Control

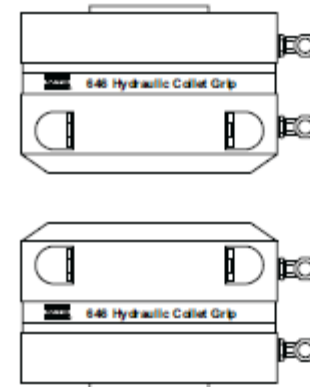
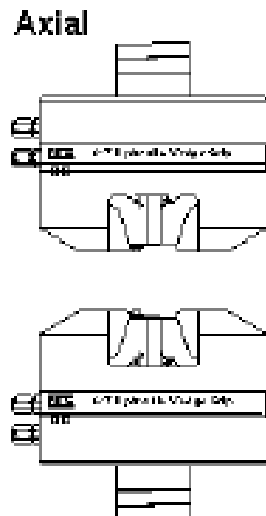
- » Our study of the mechanical components of a servo hydraulic system will also include discussions regarding closed loop theory and closed loop tuning.
- » With the exception of some special high rate systems, all MTS servo hydraulic systems operate as a closed loop system.

Extensometers

- » Extensometers are typically mounted on a materials test sample. They provide strain or elongation feedback from the specimen to the control system.
- » Can be used in units of Strain (In/in), % of strain or actual displacement (in or mm)

Grips

- » Servo hydraulic systems may also contain mechanical or hydraulic grips.



Series 646 Hydraulic Collet Grips

Grips

- » These grips hold the sample for testing.
- » Sizes vary depending on size of system and size of sample.
- » The gripping pressure controls gripping force and is adjustable by the operator.
- » Maximum gripping pressure is typically 0-3000 PSI for systems up to and including 22 Kip (100 Kn).
- » Larger systems have maximum gripping pressures up to 10,000 PSI.
- » A pressure intensifier is used for the higher pressure systems. Pressure intensifiers may be in a separate grip supply or incorporated into the load frame.

Complex Systems

- » MTS produces many specialized complex systems
 - These all contain the same basic components
 - » Actuators, servovalves, fixtures, HPU, HSM

- » Some examples of these are
 - Road Simulators
 - Elastomer characterization machines
 - Seismic simulators

- » These complex systems are beyond the scope of this training
 - Attend advanced training for these systems



Electromechanical Load Frames

- » MTS also manufactures non-servo-hydraulic systems.
- » Electromechanical Load Frames (E/M) are an example of this
- » Force is created by a motor which turns a mechanical component such as a lead screw to displace a moveable crosshead
- » These systems are used for monotonic – non cyclic testing
- » These systems also use load cells, grips, and other accessories



Electrodynamic Load Frames

- » Another example of a non servohydraulic load frame is the MTS Acumen electrodynamic load frame
- » These use an electric linear actuator to create force
- » These systems are used for dynamic cyclic tests



Systems

- » There are many other types and combinations of systems MTS manufactures.
- » These systems may require installation, calibration, routine maintenance, and repair.
- » Similar procedures apply to all systems
- » This training will cover the requirements for the basic components which are the building blocks of all MTS products.