

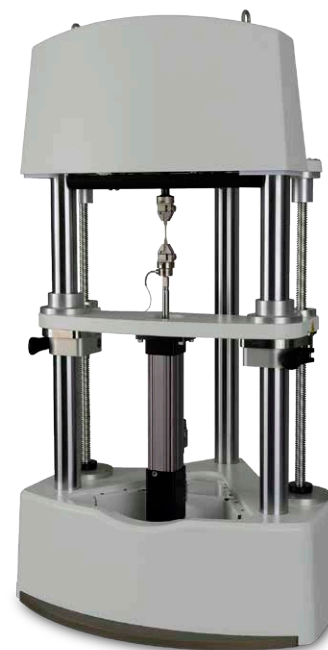
# ElectroForce® Extended Stroke Test Instruments

## Exceptional versatility, unlimited applications

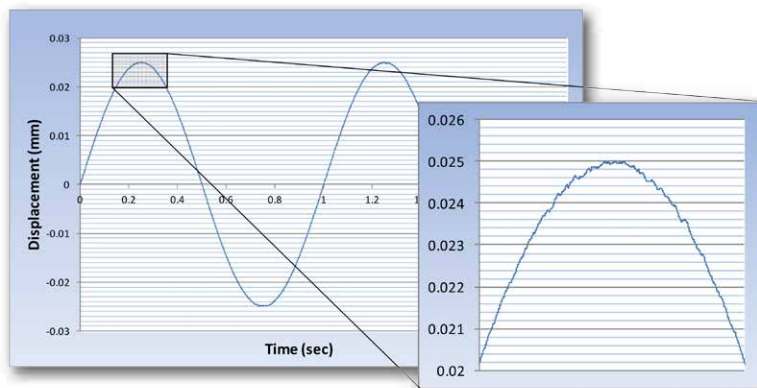
The fidelity, control and dynamic performance you expect from an ElectroForce® test instrument is now available with over 160 mm of displacement in a single instrument. These long stroke test systems, the ElectroForce 3200-ES (Extended Stroke) Series III and the ElectroForce LMI-ES TestBench, offer high-fidelity performance that is required for characterizing soft samples or achieving higher testing frequencies along with the longer displacement requirements associated with the static testing of highly elastic materials.

## Product Overview

The ElectroForce ES instruments combine two electromagnetic linear motor technologies to increase the range of displacement available on the ElectroForce 3200 and LMI TestBench by more than a factor of 10. The ES motor is mounted in the moveable crosshead of a 3200 test frame or, alternatively, it can be mounted on a TestBench reaction base. In both instances, the ES actuator replaces the microadjustor, which is typically used for positioning of the specimen, and opposes the ElectroForce motor.



ElectroForce® 3200 Extended Stroke Series III Test Instrument



50 µm peak-to-peak Waveform with an ElectroForce® Series III 3200 Test Instrument



Force vs. Displacement Curve with an ElectroForce® 3200 Series III Extended Stroke Test Instrument

## Extended Stroke System Benefits



### High-fidelity Performance

High accuracy, dynamic response with over 160 mm of displacement



### Real-time Test Control

Independent or synchronous control of the two actuators using advanced WinTest® controls



### Ease-of-use

Flexible test setup for a wide range of applications in a single table-top system



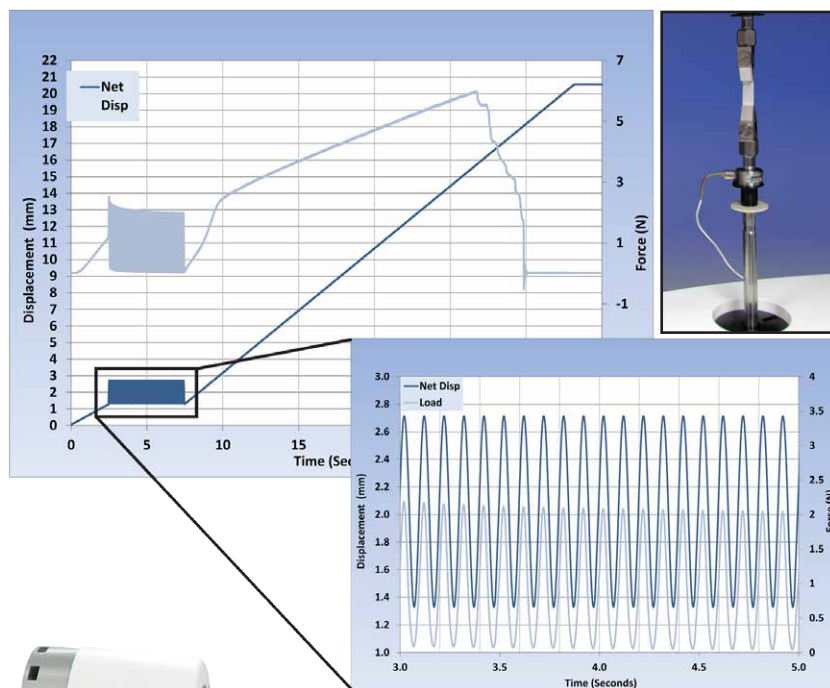
### Versatility

The extended stroke actuator upgrade can be retrofitted onto any existing ElectroForce 3200 or TestBench instrument

# Application Overview

The ElectroForce® ES family of instruments provides more than 160 mm of testing displacement that is beneficial for biomaterials and soft tissue applications in which high strains are often expected. In addition, there are many traditional material testing applications in which the ES motor is also advantageous. Applications include the characterization of materials and test protocols such as:

- Soft tissues including tendons and ligaments
- Compliant biomaterials including tissue engineered scaffolds
- Engineered polymers
- Rubbers and elastomers
- Thin films and membranes
- Suture pull-out testing



Preconditioning (10 Hz) and Pull-to-failure Test of PCL Scaffold



LMI-ES TestBench Test Instrument

## Flexible, Real-time Controls

WinTest® 7 controls provide the flexibility to utilize the ES motor in conjunction with the ElectroForce motor or independently, depending on the application. When used together, the ElectroForce and ES motors can be used to conduct cyclic creep tests in which the LMI motor applies a cyclic force (2 – 200 Hz) to the sample and the ES motor compensates for elongation that occurs during the test. WinTest 7 control software enables the user to program a block waveform, utilizing the conditional branching feature, to automatically adjust as the sample creeps beyond a user-defined value.

Extension DispE 75 mm									
Sine	Triangle	Square	Ramp	Block					
Edit					Block: Waveform	Control Channel: Waveform Definition	Conditional Statement	Move Type	
Delete					1 If Then	N/A - Logic Statement	If Disp Mean < -0.5 Then Jump to Step 4	N/A	N/A
Insert					2 If Then	N/A - Logic Statement	If Disp Mean > 0.5 Then Jump to Step 6	N/A	N/A
Acquisition					3 Jump to Step	N/A - Logic Statement	Jump to Step 1	N/A	N/A
Data Setup					4 Ramp	DispE 1 mm/Second to -0.5 mm	Double click to create.	Relative	N/A
					5 Jump to Step	N/A - Logic Statement	Jump to Step 1	N/A	N/A
					6 Ramp	DispE 1 mm/Second to 0.5 mm	Double click to create.	Relative	N/A
					7 Jump to Step	N/A - Logic Statement	Jump to Step 2	N/A	N/A
					8 None				
					9 None				
					10 None				
					11 None				

WinTest Block Waveform Cyclic Creep Compensation Setup with Conditional Branching