



Precision, Quality, Innovation

FORCE MEASUREMENT BEGINNERS GUIDE

What Makes a System

Test Stands

Software Options

Load Cells

Fixture Options



PRECISION,
QUALITY,
INNOVATION

Welcome to the Starrett Force Measurement Solutions Beginners Guide. Starrett Force Measurement and Material Test stands are ideal for compression and tension testing. Our test stands are constructed from the highest quality materials, provide exceptional stability, and are highly accurate and repeatable.

One the best features of the Force Measurement Solutions line of products is the sheer number of options and configurations available for our systems. There is a combination of components for virtually any application. This brochure breaks down the components of every test stand into simple terms to help users find the right test stand for their specific application needs.

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FORCE MEASUREMENT SOLUTIONS

System Composition.

Every Force Measurement and Material Test System, regardless of application, has the same basic components: a test stand, software, a load cell, and a fixture.



THE TEST STAND

The test stand is the part that performs the movement in a tension or compression test. It is controlled by the software and tablet or PC interface. Test stands come in a wide range of sizes and travel options, depending on the needs of the end user.

Read more about test stands on page 6.



THE FIXTURE

Fixtures are required on every test stand. These components securely hold a work piece in place during a test to ensure accurate and repeatable results every time. Fixtures are the largest category of components for a test system in order to properly accommodate the thousands of applications in which force and material testing is relevant.

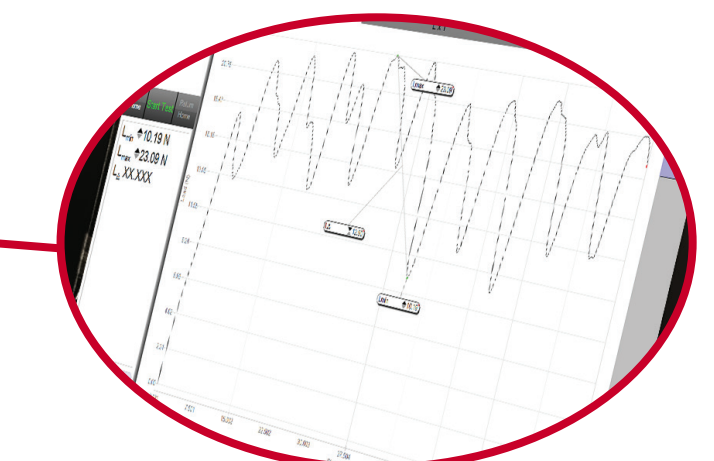
Read more about fixtures on page 12.



THE LOAD CELL

Load cells are required on every test stand. A load cell is a type of strain gage and is the part of the system which measures the amount of force being applied during a test. There are different formats of load cell, depending on test stand selection. Every type of load cell also comes in a range on load capacities, depending on the needs of the customer.

Read more about load cells on page 10.



THE SOFTWARE

Choosing the right software program is an integral part of every test system. There are several levels of software to choose from, depending on the type and level of complexity of the tests being performed.

Read more about software on page 8.

The Test Stands.

There are multiple models of test stand available from Starrett. Test stands come in multiple levels of load capacity and travel, depending on model and user needs.

THE FMM SERIES

The FMM series of test stands are the most economic version available from Starrett. They are compact and ideal for quick checks for incoming or in process inspection. Models come in a variety of travel options and load capacities, depending on user needs.

Available Capacities:

- 500N (110lbf)
- 1500N (330lbf)
- 2500N (550lbf)

Travel/Test Space Options:

- Short Travel - 15.6" (400mm)
- Standard Travel - 22" (559mm)
- Extended Travel - 32" (813mm)



THE FMS/MMS SERIES

The FMS/MMS series of test stands are highly accurate and easy to use. They are ideal for simple load, distance, and break applications as well as more complex material testing applications like tensile strength, stress or strain. The MMS edition is the material test version.

Available Capacities:

- 1000N (225lbf)
- 2500N (562lbf)
- 5000N (1124lbf)

Travel/Test Space Options:

- FMS1000/MMS1000 - 37.5" (953mm)
- FMS2500/MMS2500 - 49.5" (1257mm)
- FMS5000/MMS5000 - 49.5" (1257mm)

THE FMD/MMD SERIES

The FMD/MMD series of test stands are dual column stands, ideal for higher load capacity testing. They are ideal for simple load, distance, and break applications as well as more complex material testing applications like tensile strength, stress or strain. The MMD edition is the material test version.

Available Capacities:

- 10,000N (2250lbf)
- 30,000N (6750lbf)
- 50,000N (11,250lbf)

Travel/Test Space Options:

- FMD/MMD10K - 50" (1270mm)
- FMD/MMD30K - 49" (1245mm)
- FMD/MMD50K - 48" (1220mm)



Adjustable over-travel limits

Column

Load Cell Mount

Base Plate

Emergency Stop

Start/Stop Switch

Fixture Mount

Base

Manual Jog Switch

TEST STAND FEATURES

The Software.

Starrett Force and Material Test Systems have four software packages to choose from: L1, L2, L2 Plus, & L3.



L1 and L2 software displays on a stand-mounted tablet.



L2 Plus and L3 software are PC driven.

SOFTWARE OPTIONS

There are a number of different software options available, depending on the type and complexity of the tests being conducted.

L1 SOFTWARE - Great for quality control and incoming inspection. Engineered to meet the requirements for fast, efficient, and high-volume testing. L1 software is ideal for:

- Load Limit Testing
- Distance Limit Testing
- Break Limit Testing
- Cyclic Count Testing
- Cyclic Duration Testing
- Constant Load Testing
- Constant Distance Testing

L2 SOFTWARE - Economical and easy to use, L2 software is ideal for demanding force measurement testing.

L2 software is ideal for:

- Tension Testing
- Compression Testing
- Flexural Testing
- Cyclic Testing
- Shear Testing
- Friction Applications
- Coefficient of Friction Testing
- Spring Testing

L2 PLUS SOFTWARE - Ideal for demanding force measurement testing, L2 Plus software is optimized for quality and engineering personnel. Users can create complex test methods or use our standard templates.

L2 Plus software is ideal for:

- Tension Testing
- Compression Testing
- Flexural Testing
- Cyclic Testing
- Shear Testing
- Rate Control Testing
- Friction Applications
- Coefficient of Friction Testing
- Spring Testing
- Peel Testing

L3 SOFTWARE - L3 software systems are optimized for users involved with material testing and characterization; the research engineer, the design engineer, the quality control technician, the test technician and more. L3 software systems are capable of performing the same functions as the L1/L2/L2 Plus programs but also allow for advanced testing of material properties, such as Young's Modulus or Ultimate Tensile Strength. L3 software is ideal for:

- Stress Testing
- Strain Testing
- Elongation Testing
- Strength Testing
- Measure Offset Yield
- Measure Modulus : Elastic, Chord, Tangent
- Measure Energy, Work and Resilience

SOFTWARE OPTIONS

LOAD CELL OPTIONS - Starrett offers a full range of precision load cell sensors for force measurement, force analysis, and material testing applications. There are three main types of load cell, depending on the test stand being utilized and the type and complexity of tests being conducted.



BLC SERIES-

Starrett BLC load cell sensors are full-bridge, temperature compensated, strain gage instruments designed and optimized for basic force testing applications. These S-beam sensors feature high axial stiffness and minimal deflection at full capacity which leads to improved measurement accuracy. The BLC sensors are available in load capacities from 2lbf-500lbf (10N-2500N). They are general purpose sensors which are used exclusively on the FMM-series test stands.

MLC SERIES-

Starrett MLC load cell sensors are full-bridge, temperature compensated, strain gage instruments designed and optimized for material testing applications. These low profile sensors feature high axial stiffness and minimal deflection at full capacity which leads to improved measurement accuracy. The MLC sensors are available in a load capacity range of 28lbf-11,250lbf (125N-50,000N). They are general purpose sensors used on the FMS, MMS, FMD, and MMD-series test stands.



FLC SERIES-

Starrett FLC load cell sensors are full-bridge, temperature compensated, strain gage instruments designed for force measurement applications, but also suitable for some material testing applications. These S-beam sensors feature high axial stiffness and minimal deflection at full capacity which leads to improved measurement accuracy. They are designed for use on the FMS, MMS, FMD, and MMD-series test stands and come in three levels, depending on user needs.

FLC-E Series - "Economy" S-beam Sensors

When price is an issue, these general purpose load cell sensors are economical and suitable for most general purpose force measurement applications. They are available in a load capacity range of 5lbf-1124lbf (50N-5000N), depending on needs.

FLC-Series "Sealed" S-beam Sensors

These models are suitable for applications in non-laboratory environments where dirt, oil, dust and debris may be present. They are available in a capacity range of 112lbf-1124lbf (500N-5000N), depending on needs.

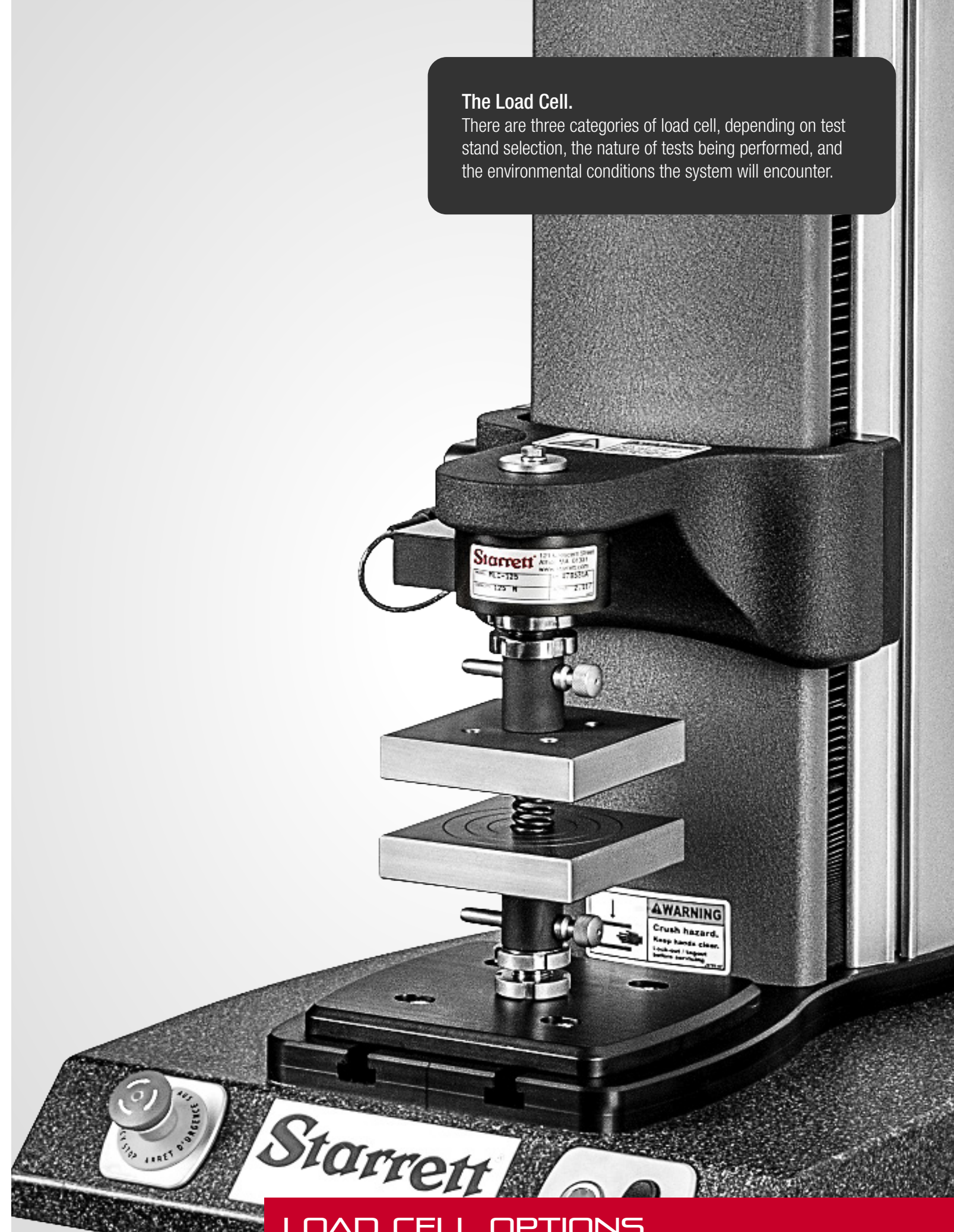
FLC-P Series - "Premium" S-beam Sensors

Ideal for low load applications, these sensors have a safe overload rating of 1000% of the sensor's load capacity. The FLC-P series is available in a load capacity range of 11lbf-56lbf (5N-250N), depending on needs.



The Load Cell.

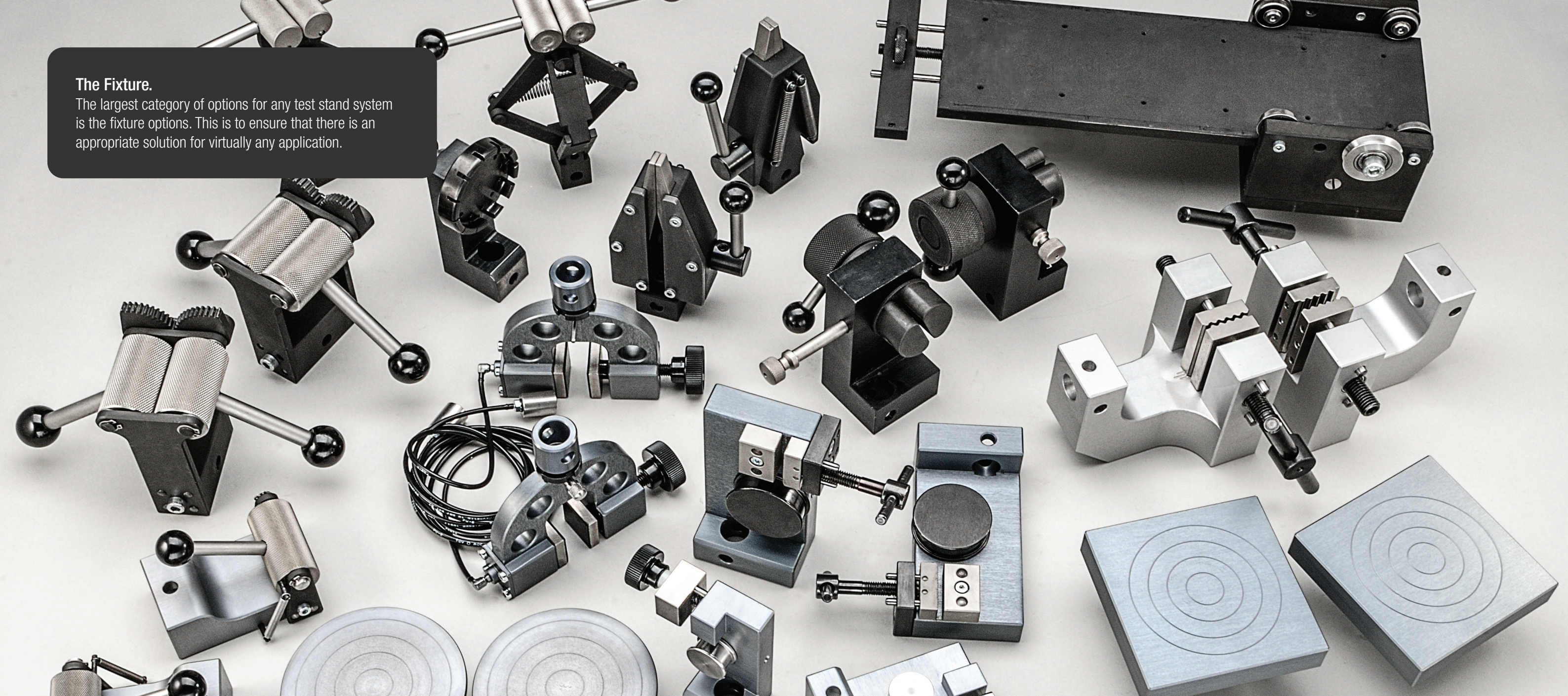
There are three categories of load cell, depending on test stand selection, the nature of tests being performed, and the environmental conditions the system will encounter.



LOAD CELL OPTIONS

The Fixture.

The largest category of options for any test stand system is the fixture options. This is to ensure that there is an appropriate solution for virtually any application.



Platens - Made for aluminum or steel for compression applications. Available in fixed or self-leveling for soft samples.



Vise-Action Fixtures - A very easy sample loading option. Jaw faces come in multiple sizes and surface finishes.



Rope and Bollard Fixtures - For testing rope, cable, filaments, yarn and more. Designed for proper sample alignment.



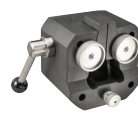
Flexural Fixtures - Used in 3 and 4 point bending testing. A flexible testing solution with adjustable spans.



Force Gage Adapters - Used to mate dissimilar threaded connections. Available in male-to-male or male-to-female.



Eccentric Rollers - An excellent self-tightening fixture for flat materials that deform under load.



Wedge-Action Fixtures - Designed for easy loading and alignment. Available in multiple jaw face finishes.



Button Fixtures - Designed to test the tensile strength of electrical connectors that are crimped onto wires.



Peel Fixtures - Suitable for determining adhesive strength. Fixed 90 degrees and adjustable models available.



Extensometers - Used in conjunction with Material Test L3 software. Long travel options are available.



Pneumatic Fixtures - Ideal for high volume testing and maintaining a consistent clamping pressure.



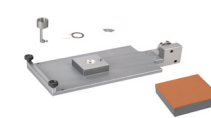
Spring Test Fixtures - Ensure correct alignment for accurate measurement of spring constants, tension, and length.



Syringe Test Fixtures - Designed to make loading and unloading easy, fixtures test tension and compression.



Scissor Fixtures - Self-tightening grips with a large variety of jaw faces available, great for elastomers, plastics, and more.



Coefficient of Friction (COF) - Meet ASTM, TAPPI, and ISO application standards for determining COF.



Food Texture Fixtures - Measure food characteristics like shear, brittleness, softness, crispness, and more.



Hook Adapters - A good general purpose option available in clevis and threaded mounting options.



Clevis Adapters - Used to secure most testing fixtures available. Provides quick and easy swapping of setups.

FIXTURE OPTIONS

STARRETT PRODUCT LINES

Band Saw Blades

Force Measurement

Jobsite & Workshop Tools

Laser Measurement

Metrology Equipment

Precision Granite

Precision Ground Solutions

Precision Measuring Tools

PTA & Hand Tools

Service

Special Gage

Webber Gage Blocks

FORCE MEASUREMENT SYSTEMS



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08/23

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