



## Material Testing/Force Testing Machines

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## Differences

Clients often use the blanket term, “test stand” to describe both material testing machines and force testing machines, but there are actually some differences between the two. A force test stand uses force gauges or load cells and supplies you with precise load and extension measurement. They are offered in a complete selection of mechanical, motorized, pneumatic and digital testers.

Material testing machines are used for testing applications where more advanced information is required. Here is a simple analogy that will help; think of a ruler as a force tester and a micrometer as a material tester. A force tester will work fine for basic force measurement applications where you are mainly interested in peak loads and extension. A force tester will use a force gauge or load cell as the load measurement device. A material tester will use precision load cells and an internal or external extensometer for elongation measurement. Material testers are much more precise and generally offer more performance. Testing under constant loads or when using thermal chambers require a material tester.

## Quality Assurance

Test stands are used to help companies perform tests to ensure the quality of their products to their clients and reduce their liability as a supplier. Test stands are used to perform compression, tensile, and cycling tests. Companies who manufacture automotive components, medical devices, packaging, and springs often use test stands. These machines can help a Quality Engineer ensure and document that products are adhering to ASTM and end user standards. Another benefit that a test stand can provide is the ability to see a problem before it starts. If a product starts to drift towards an out of tolerance specification, the data provided by

the test stand alerts the engineers before a problem is present.

### **Use/Misuse**

Test stands are fairly expensive pieces of equipment used in the testing process and as such need to be treated with the utmost care. It is very common for users of these machines to over-range the measuring elements such as the load cells and other components. These accidents can typically be avoided with some precaution and a firm understanding of how each test stand operates. Without knowing exactly how to run a test or which options to set up, a costly mistake can occur which would stop the testing process you're trying to accomplish and require replacing expensive parts. Both cases cause more than just headaches in a manufacturing facility.

A common mistake people make with test stands is using the wrong load cell for the job. The "sweet spot" is about 50% of the load cell maximum capacity. In other words if you are using your test stand to run a tensile break test for a product that normally breaks at 100 lbs of tension, you should invest in a 200 lbs load cell. It is not uncommon to find end users running tests that do not exceed 20 lbs with a 200 lbs load cell. This is using the load cell towards the bottom of its range and can sometimes cause unintended failures or bad readings. Better accuracy, consistency, and reliability could be had with the investment in a 50 lbs load cell for a 20 lbs test.

By far the most frequent misuse of a test stand is to run the press too far either in compression or tension and destroy a load cell. It almost always is attributed to operator error. A load cell is rated to go slightly past its rated capacity, but it should be avoided at all costs. As mentioned in a previous Tangent Labs White Paper, load cells have a mechanical bridge inside that converts deformation to an electrical signal and translates that to a force. If these internal components are crushed or pulled too far, they are irreparable and the entire load cell must be replaced.

Anything from wiring the test stand wrong to dropping the load cell or force gage can cause it to fail and become unusable. The stands almost always allow the user to manually control how quickly the travel of the press runs up and down. Where a lot of accidents happen is when the user tries to ramp the press too fast without paying attention to the output of the load cell or force gage on the display. Some test stands take time to stop and traveling too fast towards the rated capacity can prevent the user from stopping the machine quick enough before a breakdown occurs. With a test stand that programs the test, this is less frequently an issue because the parameters for the test are set up before hand and the computer controls the travel and speed.

### **Summary**

Tangent Labs is the authorized distributor and service center for Lloyd Instruments, Chatillon, and Shimpo Instruments. It is important that a user have thorough knowledge of their test stand. While reading a manual is helpful, due to the complexity of these machines it is recommended that the user take advantage of training on these instruments by Tangent Labs' test stand experts!