

Application news: tensile test of aluminum samples including evaluation of Poisson's ratio

4 Equipment used for the tensile test:

- 4 Shimadzu AGX-V 100kN
- 4 jaws with inserts according to the type of sample
- 4 axial extensometer
- 4 transverse extensometer
- 4 software Trapezium X, modul Single (option)
- 4 videoextensometr (option)

4 Tensile testing machine for e-mobility

New cars entering the market are full of new materials and new technologies. One of the very widely used materials in electric cars is aluminum due to its low weight. In the past, aluminum had its limitations in strength compared to steel.

In recent years, however, the strength of materials based on aluminum has been gradually increasing, and the use of aluminum alloys in the automotive industry is gaining importance, especially in electric cars.

For material testing of metals, the Shimadzu AGX-V series tensile testing machine is the ideal testing machine. In our case, a project was realised in the automotive industry with a 100kN capacity frame and a large control panel. Thanks to this panel, it is possible to obtain all measured data directly on the machine and it is not necessary to use an additional PC and software (option). The machine is equipped with two extensometers/strain gauges – one extensometer for axial strain measurement, the other extensometer for transverse strain measurement.

4 Extensometer for Poisson's ratio

Using one extensometer, it is possible to evaluate not only the e-module, the yield strength or the offset yield $R_p 0,2$, but thanks to the second - the transverse extensometer, the contraction Z and, above all, Poisson's number. In our case, the tested material is an aluminum alloy used for electric motor blocks or battery trays.



Pic. 1: Shimadzu AGX-V 100kN

4 Poisson's ratio



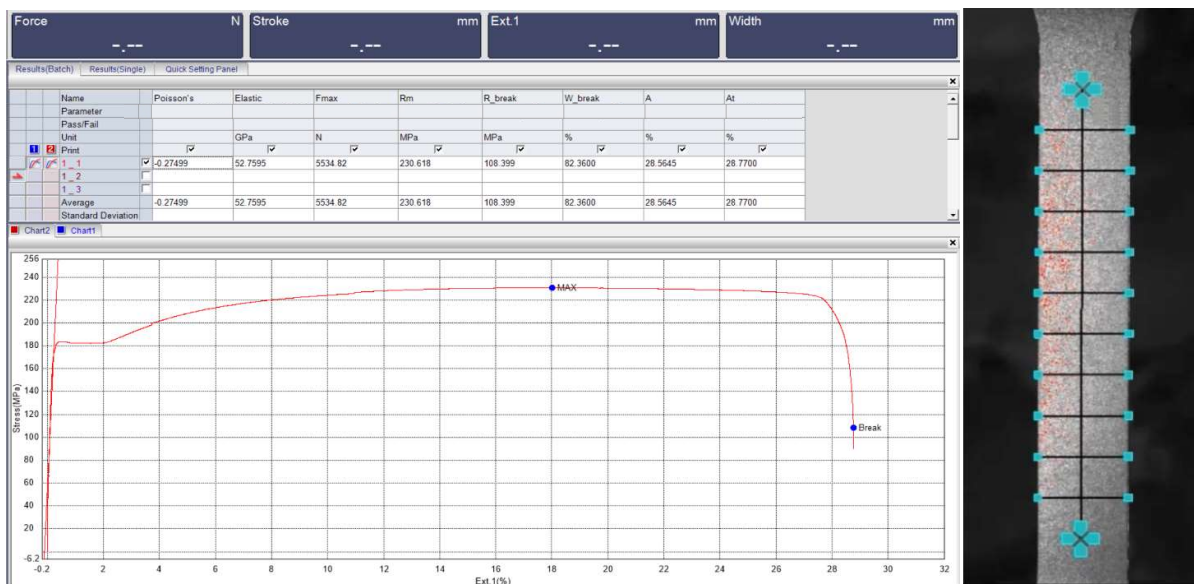
Pic. 2: Illustrative photo of two extensometers on a cylindrical sample with threaded heads.

Poisson's ratio/constant expresses the ratio of the relative axial elongation of the rod to its relative transverse contraction under tensile stress. Poisson's ratio is denoted by the Greek letter ν and is dimensionless. Poisson's number depends on the type of material. Physical measurement of Poisson's number is important to determine the magnitude and mechanism of deformation that will limit sample elongation under stress/loading of the sample.

The advantage of a mechanical extensometer is ease of use, accuracy, and very good price/value ration.

4 Videoextensometer for Poisson's ratio measurement

An alternative way to measure the sample and obtain Poisson's ratio is to use a videoextensometer, for example the TRViewX videoextensometer from Shimadzu. The videoextensometer enables non-contact measurements, provides more information (e.g. measurement of transverse deformation (contraction) at multiple points), but it is also possible to record the entire test.



Pic. 3: Test recording in the Trapezium software with a view into the videoextensometer window.

4 Next:

- [Autograph AGX-V: Precision Universal Testing Machine](#)
- [Tensile tests on metals with videoextensometer](#)
- [Videoextensometer](#)