SALES NOTE

ISO 37 – Tensile testing of rubber dumbbells

Summary of test

Standard(s)	ISO 37				
Material	Rubber, various colours				
Specimen geometry	Dumbbell, Types 1, 1a, 2, 3, 4. Types 1 & 1a are the most common.				
	1	1a	2	3	4
Maximum between grips (mm)	95	80	55	35	25
Thickness (mm)	2	2	2	2	1
Length of narrow section (mm)	33	20	25	16	12
Width of narrow section (mm)	6	5	4	4	2
G.L. (mm)	25	20	20	10	10
Test speed (mm/min)	500	500	500	500	500
Typical strain at failure	200% to 600%				
Typical strain at yield	10% to 100%				
Is modulus required	Only to define yield point via offset				
Class of extensometer	Class D for 1, 1A and 2, Class E for 3 and 4				
Can cross-head be used	No				
Is total elongation required	Yes				
Class of extensometer	Class D for 1, 1A and 2, Class E for 3 and 4				
Can cross-head be used	No				
Is Poisson's required	No				
Class of extensometer	NA				

Who does it

		Example customer / industry / market
QA/QC by material manufacturer	70%	Tyre manufacturer
R&D by manufacturer	10%	Tyre manufacturer
Education	20%	University

What extensometry is currently used

If the customer is using an extensometer it will either be a self-supporting high-elongation extensometer or a non-contact laser extensometer. These types of extensometer are used because of their long travel capability and because the weight of the extensometer is not supported by the specimen. The typical resolution of a laser extensometer is 10 to 12 microns. A gauge length of 10mm is common for latex rubber and 20mm or 25mm is common for vulcanised rubber. Some customers may resort to using the testing machine crosshead for strain measurement but in this case they will not be conforming to the standard and the strain data will have considerable error.

SALES NOTE

What issues will a customer typically face

Customers who are researching new materials may have a very limited supply of the material available for testing. This can make it desirable to use smaller geometry test specimens. However, if using traditional extensometry, testing the smaller geometry specimens whilst conforming to the standard is extremely challenging.

High-elongation extensometers

- Type 3 & 4 specimens are very challenging due to short G.L. Some customers may resort to using cross-head displacement which means they are not conforming to the standard
- For all specimen types, knife edges will cause stress concentration which may lead to premature failure. For materials that are sensitive to this the customer will either be seeing low strength & modulus values or they may resort to using cross-head displacement (in which case they are not conforming to the standard)
- Inertia of contact arms may also affect results. Low-modulus materials and small specimen geometries will be particularly sensitive to this. The result may be inaccurate results
- Specimens with high energy release can damage contacting type extensometers or at least are the cause of frequent servicing and down time
- Rubbers with release agent are often impossible to grip using the extensometer knife edges.
- Not easily used inside temperature chambers
- Gauge length setting blocks and or adjustment can lead to errors in measurement of uncertainty budget

Laser Extensometers

- Applying reflective tape and or other marking systems can be fiddly, particularly at small G.L.
- Reflective tape may detach at higher strains

Benefits of UVX Flexi

- Works well with all specimen types & G.L.s
- Non-contact - results will not be affected by the extensometer. This may show the material to be stronger/stiffer than previously thought
    - A rubber manufacturer can now sell it as a high spec product
    - A user of the material can rate his products to a higher level or optimise his product based on better material characterisation
- Target preparation is quick & simple (using ruler or a stencil)
- Compatible with temperature chambers
- Captures and preserves the permanent net record of the test as a video file with actual high resolution strain data embedded
- Supports “Witness testing” and post-test failure analysis

Example test results

An example test archive is available for this test (request it from your usual Imetrum contact if you do not already have this). An example load / strain plot from this is shown below.

SALES NOTE