

Elastocon®

ALE-test system

Aeration and Liquid Exchange test system



The ALE-test system relaxation rig and the control box with a PLC touch screen.



The ALE-test system is purchased as a complement/accessory for use with a stress relaxation system for continuous testing.

The newest addition for ageing rubber materials during stress relaxation tests, is called the ALE-test and has been developed by Elastocon AB in Sweden. ALE-test stands for Aeration and Liquid Exchange test. This means that it is now possible to have both aeration and liquid exchange during a stress relaxation test.

The ALE-test system is purchased as a complement/accessory for use with a stress relaxation system for continuous testing.

Using the ALE-test system for relaxation means that a special relaxation rig is put inside the container in the same way as normal liquid test is performed. The difference is that this special stress relaxation rig has both a propeller for mixing in the air in the liquid, as well as for stirring the liquid in the container.

The liquid is pumped in at the bottom and out in the upper part of the container, this contributes to an even liquid distribution within the container together with the stirrer function and ensures that the sample is always fully covered by the liquid.

The inflow of the liquid is controlled from the PLC touch screen on the control box, and the air flow is controlled with the flowmeter on the same box.



The ALE-test rig has a propeller for mixing in the air in the liquid, as well as for stirring the liquid in the container.

Why use the ALE-test?

It is a known fact that the addition of air during testing provides a more realistic set of test conditions. More realistic because in the oil or fuel system of a vehicle you have some air present. You fill up the system with new oil or you change the oil. During all of these actions you change the environment for the sealing and hoses or whatever product you have.

The traditional condition for these tests is a closed container where the oxygen will be depleted in a short time and the degradation products will increase inside the container due to the closed environment.

The liquid, e.g. oil will oxidize and the amount of degradation products inside of the closed container will increase. This will lead to test conditions that are not the best match to the area of usage of the material.

This will be more and more important due to the use of the newer biofuels. The biofuels do not have the same ageing as the older qualities of fuels. Hence it is important to also renew the test procedure and test as close to reality as possible.

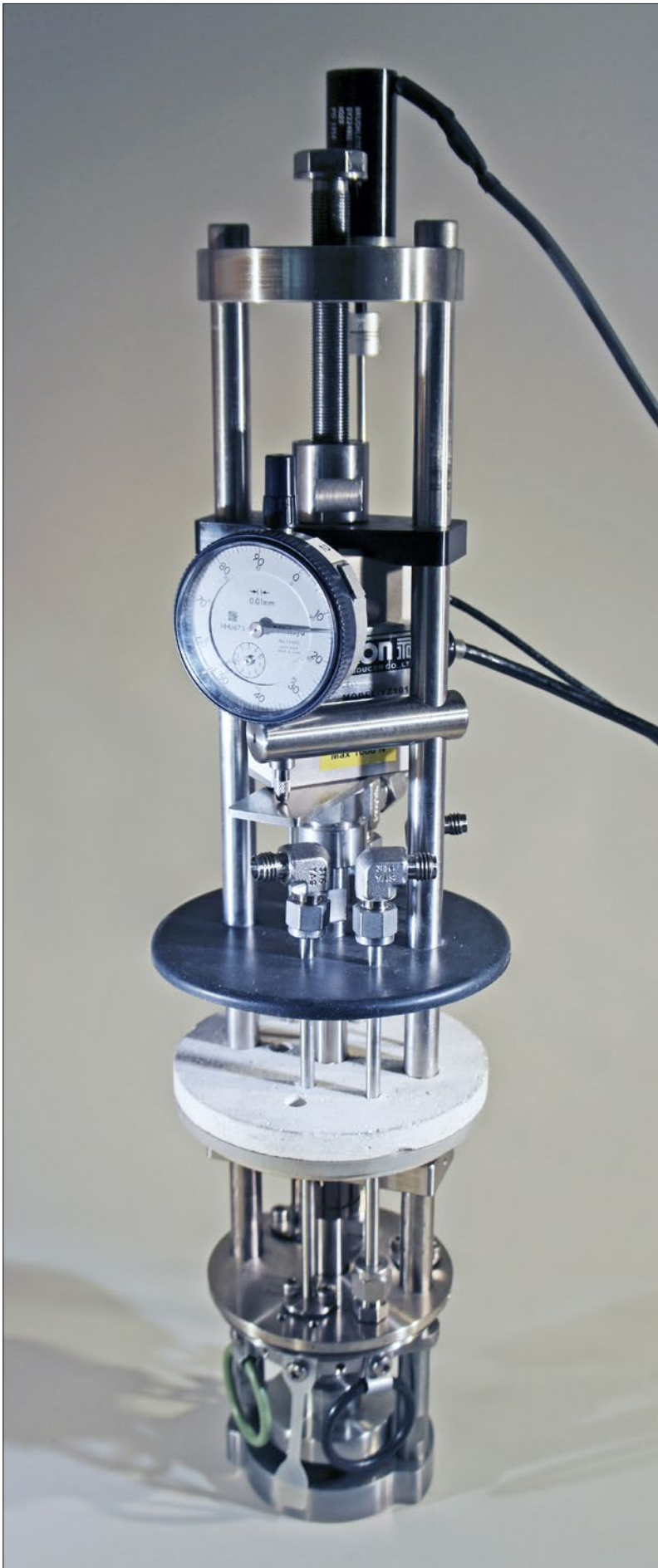
Previous studies have shown that aeration in the liquid during the test, will change the result for the rubber material.

At Elastocon a comparison study was made with two different materials. O-rings made of FKM and HNBR (peroxide cured) were tested in motor oil simultaneously in the traditional way and with the new ALE-test. Additional specimens were aged on the brackets on the test rigs.

These additional samples were used for testing volume change, hardness change, change in mass, thickness change and tensile test.

The study shows a difference between the results depending on which test system that was used (all other conditions where the same). The O-rings made of HNBR are more sensitive to the presence of air than the FKM O-rings. The HNBR O-rings showed a big difference in all of the tests between the two ageing methods.

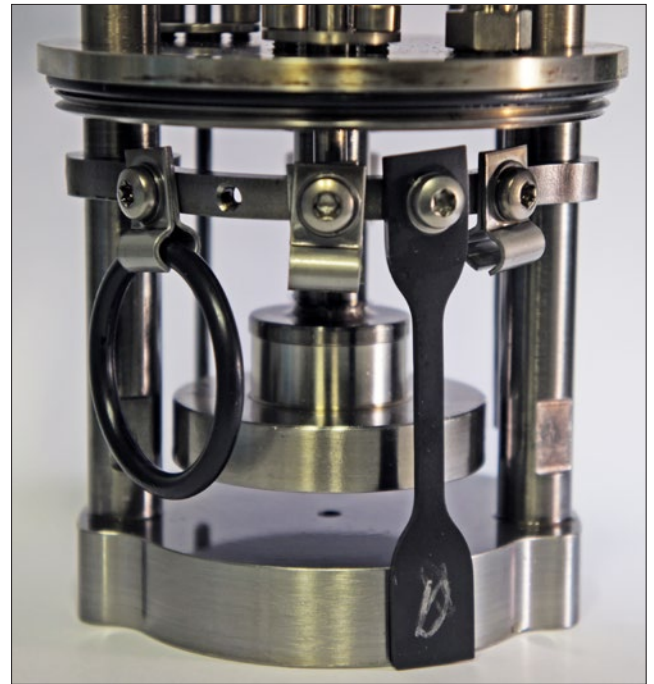
This makes it obvious that the new ALE-test should be preferred and recommended, especially for those materials that are affected during the presence of air and where the area of use of the material is in the presence of air.



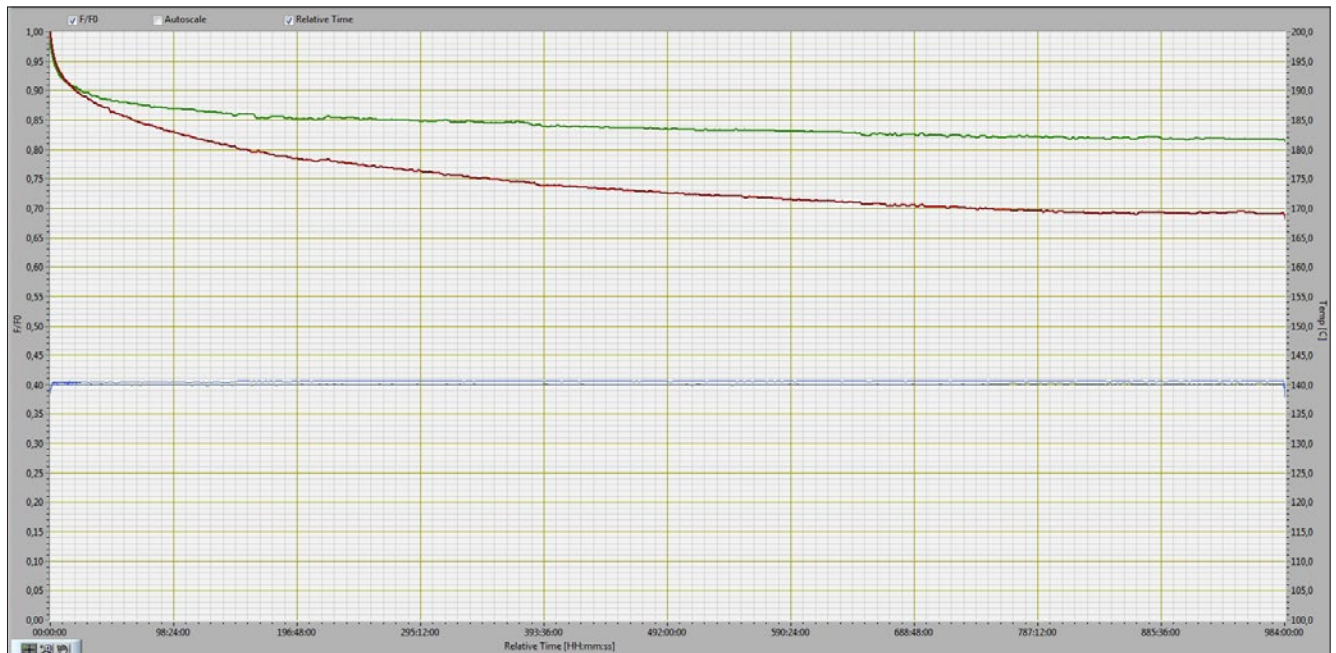
Features

- Non-volatile liquids only
- Only for compression tests at the moment.
- On the optional bracket on the rig can ageing of additional samples be performed during the stress relaxation test, either 5 small dumbbell shaped samples (i.e. ISO 37-2) or O-rings, alternatively 3 bigger O-rings.
- Choose to use liquid exchange or not
- Choose to use the aeration or not
- Choose to use the stirrer or not
- The rig is designed to be used with Elastocon optional cell ovens for stress relaxation system test, also the 2 ovens with cycling temperature as option.

The ALE-test instrument was developed at Elastocon in a joint project with SP Technical Research Institute of Sweden, AB Volvo, Volvo Cars, Scania and Lanxess. The project about ageing of elastomers in biofuels was financed by the Swedish Energy Agency and the participating companies.



Bracket for additional sample ageing. Fit all Elastocon stress relaxation rigs. To complement for ageing of additional samples in already existing system for testing in air, only the bracket is ordered.



Some results from the comparison study made at Elastocon that shows a HNBR material with 99,5 % hydrogenation, that is almost no double bonds left, peroxide cured and with ACN content of 34 %. A rather good common material for sealing in vehicles.

This material was tested in motor oil both in a traditional way with closed container and no liquid exchange and in the new ALE-rig with both liquid exchange and aeration during the 6 weeks test period.

The red line is the test in ALE-equipment and the green line in the traditional equipment.

Technical specifications, Stress Relaxation Rig, EB 02ALE

Relaxation rig for testing in compression with possibility to exchange liquid and air, temperatures up to 200 °C.

Range, in compression, N:	500, 1 000 or 2 000 (standard 1 000 N)
Tension, N:	100
Accuracy, %:	± 0,1 of full range
Resolution, compression, N:	0,05 or 0,1 or 0,2
Resolution, tension, N:	0,01
Dimensions, dia x h, mm:	120 x 450
Weight, kg:	4,5
Material:	Stainless steel
Temperature sensor:	Pt 100, 1/3 DIN
Temperature range, °C:	200

The equipment works with continuous stress relaxation measurements in compression.

The basic version can do tests according to ISO 3384 and ASTM D6147. The rig works together with the cell ovens EB 21, EB 22, EB 23 and the programmable temperature cell oven, EB 17, as well as the EB 23LTP.

Accessories to the rig

EB 02.05.1 Extension cord for load cells, 2.5 m.

EB 02.05.2 Extension cord for temperature sensor, 2.5 m.

Control Box EB 02.24

Dimensions, external, w x h x d, mm:	410 x 500 x 550
Weight, kg:	–
Power, w:	100
Voltage, V/phase/freq:	90-240 VAC / 1 / 50-60
Minimum/maximum ambient temperature:	-25 °C to +85 °C (95 % rh no condensation)
Air flow, min, ml/min:	0
Air flow, max, ml/min:	100
Liquid flow, min, ml/min:	0
Liquid flow, max, ml/min:	2,5
Propeller speed, min, rpm:	100
Propeller speed, max, rpm:	2 500
Max temp, liquid, °C:	200

ELASTOCON reserve the right to modify these specifications in part or in whole.

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