Elastocon®

Stress Relaxation System

for testing of stress relaxation

Stress Relaxation EB 02

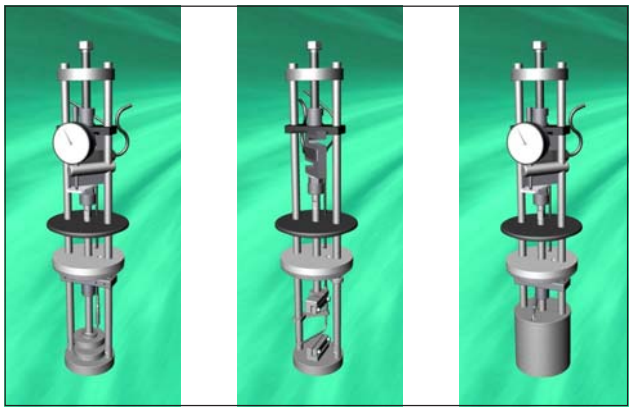
Relaxation system for continuous measurement in either compression or tension. Meets the requirements in ISO 3384, ISO 6914 and ASTM D6147.

The relaxation rigs are used in combination with the cell ageing ovens EB 01 or EB 07 or our new range of ovens when testing at elevated temperature.

New Cell Ovens for Stress Relaxation

We have now constructed special versions for use in relaxation testing.

The height of these ovens is lower and incorporates an integrated draught hood,* to eliminate variation in force measurements due to temperature and air effects.



Relaxation rigs arranged for different test methods.

Rig 1 is arranged for testing in compression according to ISO 3384.

Rig 2 is arranged for testing in tension according to ISO 6914 method A.

Rig 3 is arranged for testing in liquid according to ISO 3384.

* *The Draught Hood is used to eliminate variations in force measurements due to temperature and air effects in the surrounding environment.*

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Elastocon AB · Göteborgsvägen 99 · SE-504 60 BORÅS · Sweden · Phone +4633-22 56 30 · Fax +4633-13 88 71
E-mail: info@elastocon.se · www.elastocon.se

Cell Ovens for Stress Relaxation

Liquid circulator

Cycling cell oven

The ovens are available in the following versions:

- 4 cells with individual temperature control (EB 21)
- 6 cells with individual temperature control (EB 22)
- 6 cells with the same temperature and cycling between - 40 °C to 250 °C (EB 17)
- 4 cells with the same temperature control (EB 23)

Containers for testing of Stress Relaxation in liquids

Containers for testing of Stress Relaxation in tension

Available as an air tight container that can be used up to a pressure of 3 Bar.

Containers also available for liquid testing in tension.

The room temperature box is used when testing at room temperature to avoid variation in the load curve caused by temperature variation in the laboratory.

The box has room for 8 rigs.

Software for Relaxation Testing EC 05

This new software evaluates results from relaxation tests according to ISO 3384 and ISO 6914.

The software is user friendly and many functions can be done by a mouse click.

Simplified functions

- Switching between graphic presentation in absolute force in N or F/F0.
- Switching between absolute time or relative time.
- Easy to ”zero” the force.
- Easy to set F_0.
- All information in the same window.

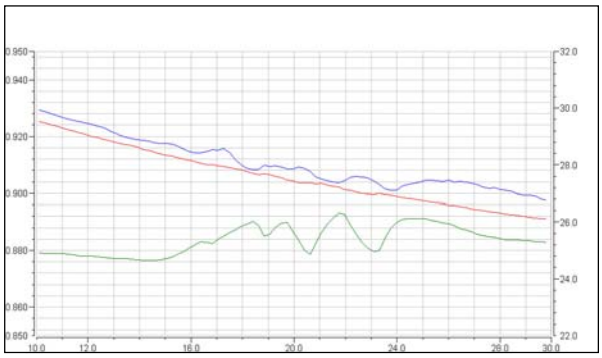
New functions

- Evaluation points showing relaxation at different times.
- End condition can be set as F/F_0 or time.
- Possibility to calculate the median value when testing double or triple test pieces.
- Calculated compensation for the load cell deformation can be switched on or off.
- Automatic increase of logging time interval.

We can also supply a separate ”Presentation” software which can be installed on other computers in the network. The operator can then check and evaluate the tests from the office computer.

Drought Hood EB 02.10

The Draught Hood is used to eliminate variations in force measurements due to temperature and air effects in the surrounding environment.



The graph shows a test run with and without the Drought Hood. The blue curves are the rigs without a hood and for the red curves a hood is used. The green curve is the room temperature.

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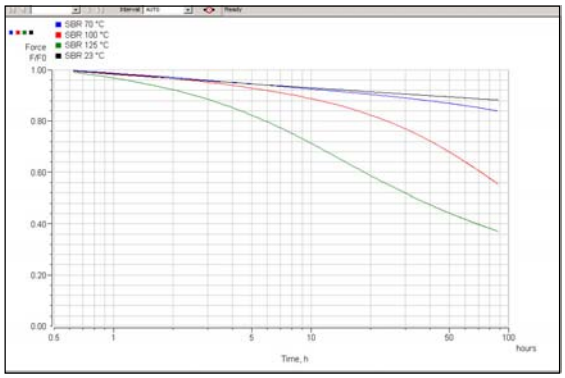
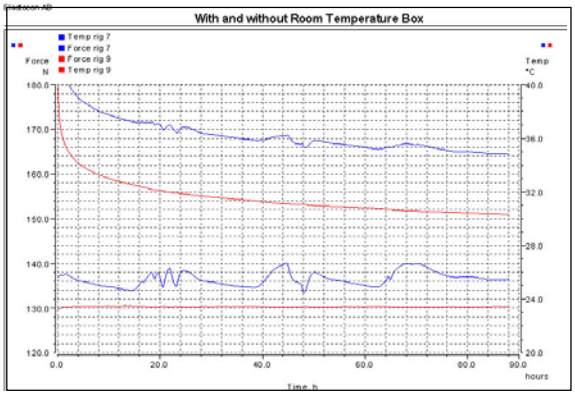
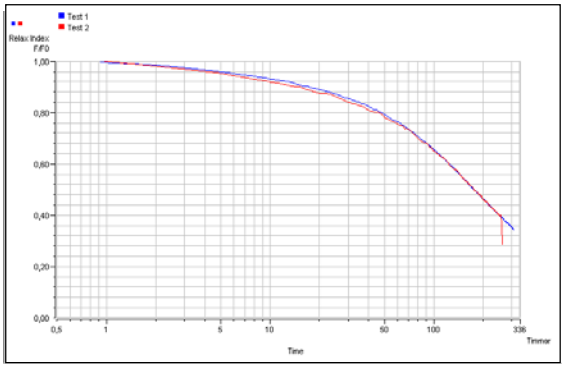


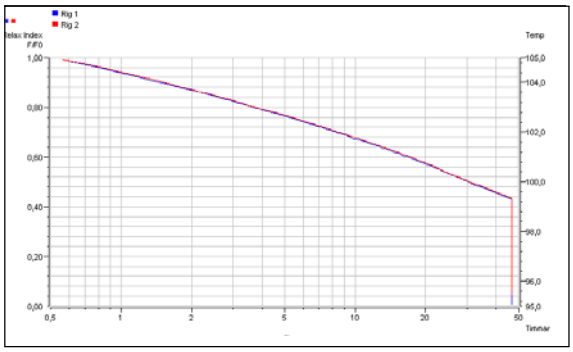
The graph shows F/F_0 curves for SBR tested at different temperatures.



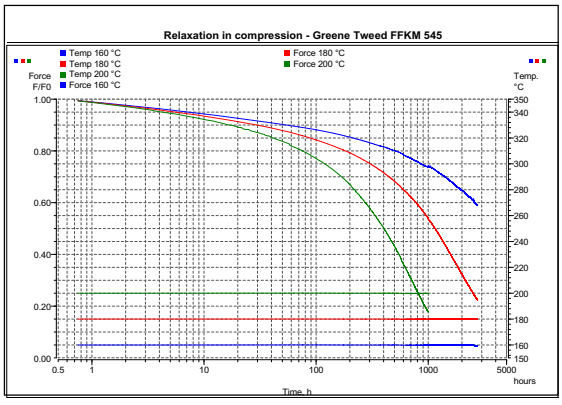
The blue curves shows the influence of room temperature variations in the force curve. The red curves shows a rig placed in the room temperature box.

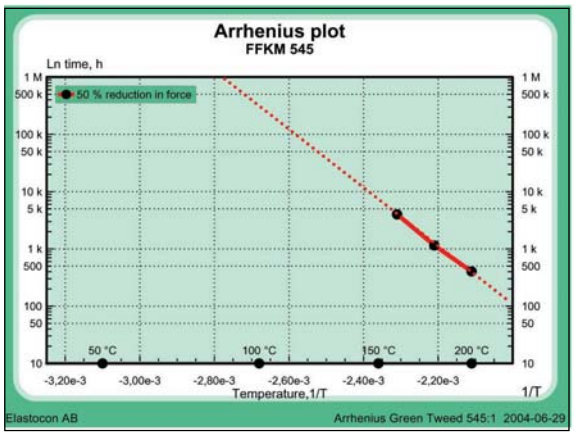


The graph shows the repeatability of the relaxation rigs. This graph is from two tests of the same compound run at different times.



The graph is a graph from two samples of the same compond run at the same time in different rigs.





The graph shows how to use relaxation data to estimate the life time of a rubber compound for rubber materials, according to the procedure in ISO 11346.

Data from relaxation tests done at three temperatures are plotted in a graph and the "end of life" is determined for each temperature. This data is then plotted in an Arrhenius graph with ln time against 1/T, where T is the temperature in Kelvin. A linear extrapolation can be done for lower temperatures to establish the estimated life time of the tested compound.

Automatic Creep and Relaxation Tester, EB 18

• For stress relaxation tests
• For creep tests

Test station for testing in compression and for testing in tension.

With EB 18 automatic Creep and Stress Relaxation tests can be done.

The instrument is based on our triple temperature oven EB 07, which means that each test station can run with an individual temperature.

The test rigs are based on our relaxation rig EB 02, but lowering and raising of the rigs is motor driven. The compression or tension of the samples is also motor driven with a servo motor.

The test rigs are built into a plastic cabinet made of polycarbonate and aluminium profiles. The cabinet is cooled by Peltier elements which keep a constant room temperature around the test stations.

This design gives the following advantages

For Creep tests

- Creep test can be done in both compression and tension.
- Utilising load cells and servo motors to apply and hold the load the EB 18 tester, eliminates the handling problems associated with dead load weights.
- The load in MPa or N is set in the software and the computer instructs the closed loop circuit of the servo motor and load cell amplifier to keep the set load. This means that the load is kept even if the computer fails.
- High accuracy in the displacement measurement.
- Results are presented in graphical or table formats as absolute creep or creep index. In order to study the actual sample failure the data logging rate is increased just before break occurs.
- Possibility of running new features such as load and temperature ramps controlled by the computer.
- Test can be made in liquids using a liquid container. (option)
- Versions with 3 or 6 test stations can be supplied.

For Stress Relaxation Tests

- Relaxation tests can be done in both compression and tension.
- Utilising load cells and servo motors to apply and hold the compression the EB 18, automatically compensates for the spring effect in the load cells.
- The compression or tension in mm or % is set in the software and the computer instructs the closed loop circuit of the servomotor and load cell amplifier to keep the set value.
- High accuracy in the displacement measurement.
- Results are presented in graphical or table formats as absolute relaxation in N or as F/F0 in absolute or relative time as well as linear or log time.
- Possibility of running new features such as load and temperature ramps controlled by the computer.
- Test can be made in liquids using a liquid container. (option)
- Versions with 3 or 6 test stations can be supplied.

Technical specification EB 18 (3 test stations)

Force range, N:	0 -1 000 (alternatively 100 ,500 or 2 000)
Force resolution, N:	0,1 (0,01, 0,05, 0,2)
Force accuracy, N:	0,2 (0,02, 0,1, 0,4)
Displacement range, mm:	50
Displacement resolution, mm:	0,0001
Displacement accuracy, mm:	0,003
Transport speed, mm/min:	0,1 -1 000
Testing speed, mm/min:	0,1-500
Compression plate, mm:	dia 50
Power, W:	900
Voltage, V/Hz:	220-240/50, or 110-120/60

Materials:

Compression plates:	Stainless steel
Compression rig:	Stainless steel and aluminium
Casing:	Powder painted steel
Size, w x d x h, mm:	500 x 370 x 870
Weight, kg:	52

Embedded PC specifications for NANO-8522E Board
EPIC SBC Intel / Celeron M CPU, 800 MHz
1 CRT/LCD adapter
1 LAN port
2 SATA connectors
Audio
4 serial ports - COM1 -> front mounted, COM2 -> 1 RS422/485, 3 and 4-wire
4 USB ports

Peripherals
1 17 ” LCD monitor 768x1024
1 PS2 - US keyboard
1 USB mouse

OP system
Windows XP professional embedded version

Technical Specification, Relaxation Tester, EB 02

Range, in compression, N:	1 000 or 2 000
tension, N:	100
Accuracy, %	± 0,1 of full range
Resolution, compression, N:	0,1 or 0,2
tension, N:	0,01
Dimensions, dia x h; mm	120 x 450
Weight;kg	approx 4,5
Material:	stainless steel
Temperature sensor:	PT 100, 1/3 DIN

The Equipment works with continuous stress relaxation measurements in both compression and tension. The basic version can do tests according to ISO 3384 in air. The rig works together with the cell ovens EB 01, EB 07 and the programmable Cell Oven EB 01 LTP, plus the new ovens EB 17, EB 21 and EB 22

EB 02.01	Container and pressure plate (with a hole in the center) for measurement in liquids, according to ISO 3384.
EB 02.01P	Sealed container for testing of stress relaxation in volatile liquids and coolants up to 3 Bar pressure.
EB 02.02	Grips for testing relaxation in tension, according to ISO 6914.
EB 02.03	Load Cell 100 N for tests in tension, including adapters.
EB 02.04	Expansion Sleeve for good heat transfer in the cell oven. (only for EB 01 and EB 07)
EB 02.08	Room Temperature Box, 23 °C, for testing at standard laboratory temperature. Keeps the temperature constant within ±0,2 °C. The box can take 8 rigs.
EB 02.10	Draught Hood, to eliminate variations in force measurement due to temperature and air effects. This hood is made of Plexiglass and has a temperature controlled system with a Peltier cooling element, capable of keeping the temperature within ± 0,2 °C. The hood fits both EB 01 and EB 07.
EB 02.12	Container for testing in liquids in tension.
EB 02.14-4	Amplifier box with inputs for 4 load cells and 4 PT 100 sensors. (4 rigs)
EB 02.14-6	Amplifier box with inputs for 6 load cells and 6 PT 100 sensors. (6 rigs)
EB 02.14-8	Amplifier box with inputs for 8 load cells and 8 PT 100 sensors. (8 rigs)
EB 01 LTP	Programmable temperature oven, -20 °C to +200 °C, a modified Cell Oven.
LF 460	Transient isolator, for avoiding disturbance from electrical noise (only 220-240 Vac 50/ 60Hz)
EC 05	This software evaluates results from relaxation tests according to ISO 3384 and ISO 6914

Technical Specification, Drought Hood EB 02.10

This hood is made of Plexiglass and has a temperature controlled system with a Peltier cooling element, capable of keeping the temperature within ± 0,2 ºC. The hood fits both EB 01 and EB 07.

Cooling power, W	50
Power supply	
Voltage in, V	110-240 VAC 50/60
Voltage out, V	= 24
Curent out, A	3 - 3,5
Weight: kg	8
Dimensions: w x d x h, mm	660 x 425 x 350

Technical specification	EB 17	EB 21- 22
Temperature range, °C:	- 40 - +250 °C	40 - 200 (HT 300 °C)
Temp. control, 40 - 200 °C, °C:	± 0,5	± 0,5
201 - 300 °C, °C:	± 1,0	± 1,0
Temp. variation in time and space, °C:	± 0,25	± 0,25
Temperature sensors:	PT 100, 1/3 DIN	PT 100, 1/3 DIN
No. of cells:	6	4 (EB 21) or 6 (EB 22)
Air speed, m/s:	<0,001	<0,001
Useful volume, l:	4 x 1,3	4 x 1,3 (EB 21) or 6 x 1,3 (EB 22)
Dimensions, inner, w x h x d, mm:	ø100 x 160	ø100 x 160
Dimensions, external, w x h x d, mm:	960 x 715 x 520	760 x 715 x 520 (EB 21) 960 x 715 x 520 (EB 22)
No. of temperatures:	1	4 (EB 21) or 6 (EB 22)
Weight, kg:	-	55 (EB 21) - (EB 22)
Voltage, V:	220 -240/1/50 (110-120/1/60)	220-240 / 1 / 50 (110-120/1/60)
Power, W:	300	900 (EB 21) or 1 300 (EB 22)
Air changes, changes/hour:	3 - 20	3 - 20
Standards:	ISO 188 method A, IEC 811	ISO 188 method A, IEC 811

Liquid circulator

Heating power, W	1 800	-
Cooling power at +20 °C, W	3 000	-
Cooling power at -40 °C, W	200	-
Temperature range °C	-47 °C - + 250 °C	-
Temperature stability °C	±0,05	-
Dimensions, external, w x l x h, mm:	400 x 550 x 1270	-
Bath volume,l	5,2	-
Pump flow rate,l/min	16-30	-

Common specifications:

- The ovens perform well inside the apparatus requirements in ISO 188, IEC 811 and other equivalent standards.
- The oven is controlled from a PLC (with a colour touch screen).
- Special design with controlled air exchange rate and low air speed.
- The casing consists of steel, painted with powder paint in bluegreen colour.
- The inner cells are made of aluminium.
- Temperature controller with 0,1°C setpoint (PLC) or liquid circulator EB 17.
- Fixed over temperature fuse.
- Flowmeters with needle valves, for setting the air exchange rate.
- The air speed is low and is dependent on the air exchange rate only, as specified in ISO 188 method A and IEC 811.
- Alarm for low air pressure (PLC).
- Built in air pump.
- Cooling channels in the casing for low surface temperature.
- Cooling fan for the electronics cabinet.
- Indication of power failure (PLC).
- Run-time meter (PLC).
- Countdown timer (PLC).
- Microfilter for the air which removes 99,99 % of all particles over 0,1 µm.

Technical data:

Containers for testing of stress relaxation in liquids:

Diameter, mm	90
Height, mm	96 + 32
Weight, kg	1,12
Material	Stainless steel
Seals	Fluoru rubber

Spare part

Set of 6 O-rings, EB02.01P.01

Options

- Monitoring software
- Network cable

ELASTOCON reserve the right to modify this specification in part or in whole.

C & M prüf tech
Steinbachstraße 133
A 3001 Mauerbach
Austria
T+43 (0) 1 577 24 18
F+43 (0) 1 577 24 18 15
office@cm-tech.at
www.cm-tech.at