Elastocon®

Stress Relaxation and Creep System

for testing of stress relaxation and creep

We have designed special versions of cell ovens for use in relaxation testing.

Reduced height ovens designed specifically for the Elastocon relaxation rigs with an integrated draught hood, which eliminates variations in force measurements due to temperature and air effects.

Both oven and hood are controlled from a touch screen on the oven.

”Stress relaxation tests are very effective for conducting ageing tests, as substantial amounts of information result with little effort, especially when using the continuous measurement system”.

Stress relaxation tests are becoming more and more popular for determination of rubber properties.

From the beginning stress relaxation tests were used mainly in scientific projects at universities, but a growing use has been shown in recent years.

This may be caused by the introduction of stress relaxation tests in product standards, such as sealing rings for pipes.

The automotive industry has also started to specify stress relaxation tests for critical sealing products in the cars.

The present standard **ISO 3384-1,** includes two methods, A and B, which can both be used in air or liquids.

In method A, the compression is applied and all counter force measurements are made at the test temperature.

In method B, the compression is applied and all counter force measurements are made at standard laboratory temperature (23 °C).

The test pieces are stored at the test temperature.

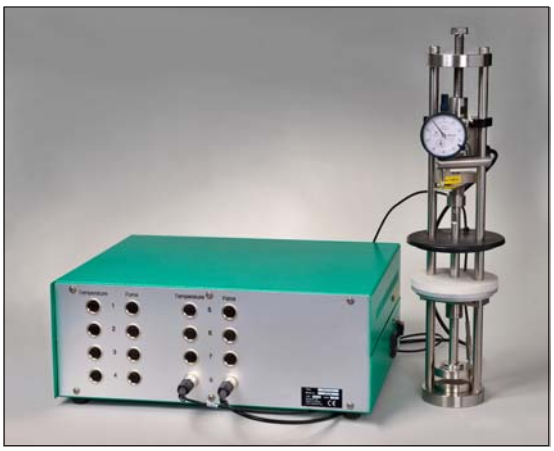
ISO 3384-2 is a new second part describing tests with temperature cycling.

ISO 6914 describes the testing of stress relaxation in tension. This can be done by two methods, either on continuously stretched samples or intermittently stretched samples.

One type of relaxation instrument is measures continuously and consists of a small rig with a load cell.

As temperature stability is a critical parameter, special ovens are available for testing at both elevated and ambient temperatures.

The rigs are connected to a data acquisition box connected to a computer for storing the force and temperature data.



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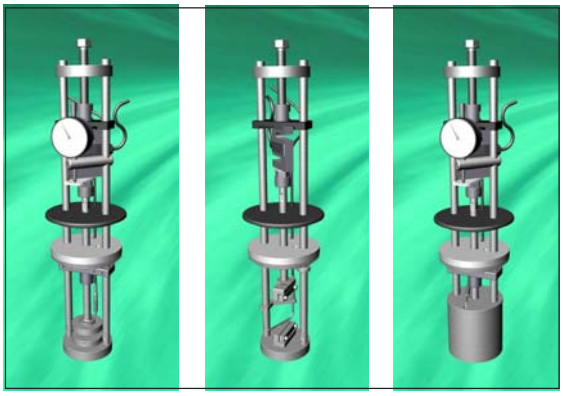
Stress Relaxation Tester, EB 02

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 our cell ageing ovens.



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.

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

Stress Relaxation system

Liquid containers

Available in standard version which are not air tight or as an air tight container that can be used up to a pressure of 3 Bar.

EB 02.01P *Air tight container (max 150 °C).*

EB 02.01 *Container for testing of Stress Relaxation in liquids.*

EB 02.12 *Container for testing of Stress Relaxation in tension in liquids.*

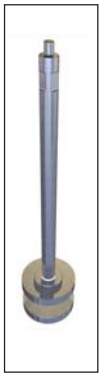
Amplifier box

EB 02.14 amplifier box for 2, 4, 6, 8 or 12 rigs

EB 02.14-x The amplifier box communicate via a network connection. This means that the amplifier can be directly connected to the network connector on a PC, or anywhere in a local ethernet network.

The box can also have up to 24 channels or connect 12 relaxation rigs.

With the amplifiers we can deliver load cells with the ranges of 100 N , 500 N, 1 000 N or 2 000 N, where the 100 N range is for testing in tension.



Compression plates

Tension Grips EB 02.02

Cell Ovens for Stress Relaxation

EB 21 4 cells with individual temperatures

The ovens are available in the following versions:
EB 21, 4 cells with individual temperature control.
EB 22, 6 cells with individual temperature control.
EB 23, 4 cells with the same temperature control.
EB 17, 6 cells with the same temperature and cycling between - 40 °C to +200 °C (HT +250 °C).

EB 17 6 cells with the same temperature and temperature cycling

EB 17, EB 21, EB 22 and EB 23

- 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).
- Integrated draught hood.
- 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.
- Temperature controlled cooling fan for the electronics cabinet.
- Indication of power failure (PLC).
- Run-time meter (PLC).
- Countdown timer (PLC).
- Individual cell identifier "Test name".
- Microfilter for the air which removes 99,99 % of all particles over 0,1 µm.

Liquid circulator

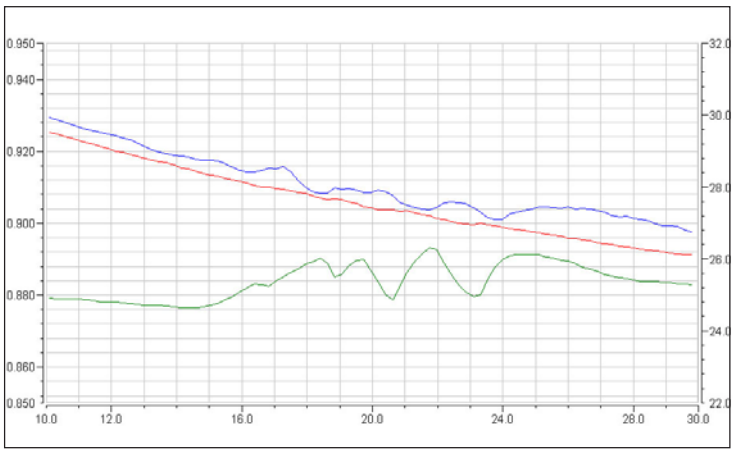
Temperature cycling oven

Temperature cycling is important within the automotive industry where the shrinkage of the seals is an important factor since this can lead to leakage.

The cell oven EB 17 has 6 cells with the same temperature. It is connected to a programmable liquid circulator controlled from the touch screen on the oven.

Oven for cycling between -40 ° and + 250 °C.

Room temperature box



This graph shows a test run with and without the Room temperature box when testing at 23 °C. The blue curves are the rigs without the box and for the red curves the box is used. The green curve is the room temperature.

EB 02.08 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 capacity of the box is 8 rigs. It can also be used for conditioning test pieces at 23 °C.

Cell Oven for Stress Relaxation

EB 01 LTP, with built in programmable water cooling. This version of the oven can operate between +20 °C to +200 °C, which is very interesting for testing stress relaxation. The cooling makes it possible to conduct automatic relaxation tests according to ISO 3384 method B, where the ageing is done at elevated temperature but the counter-force is measured at room temperature.

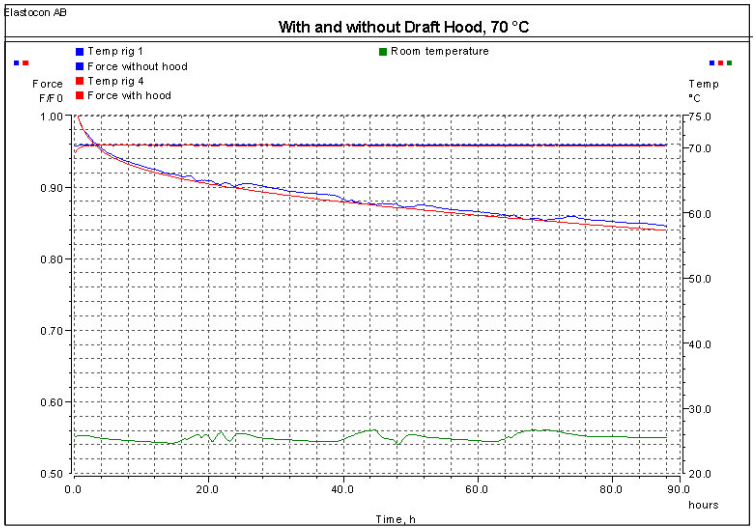
The temperature cycle is controlled from the PC-computer running the relaxation tests. This oven can function as a budget model of EB 17 with a smaller temperature range.

Note! *For testing Stress Relaxation you need to add both* ***EB 02.10*** *Draught Hood and* ***EB 02.04*** *Expansion sleeves (one per cell) to have the best conditions with this oven.*

Draught Hood, 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.



This graph shows a test run with and without the temperature 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.

Estimation of lifetime from relaxation tests

Stress relaxation tests are ideal for making lifetime estimations using an Arrhenius plot.

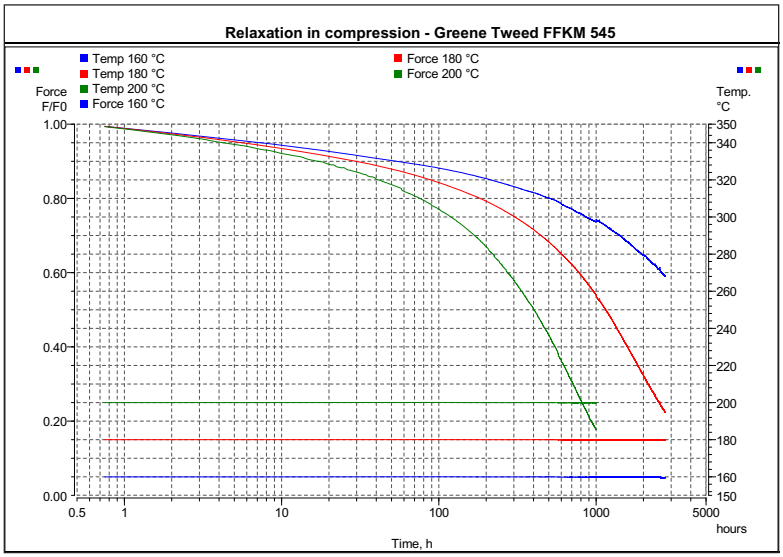
How to do an estimation of lifetime of rubber materials using an Arrhenius plot is described in the ISO standard ISO 11346.

When doing an Arrhenius plot, tests are made of a critical property at different times and at least at three test temperatures.

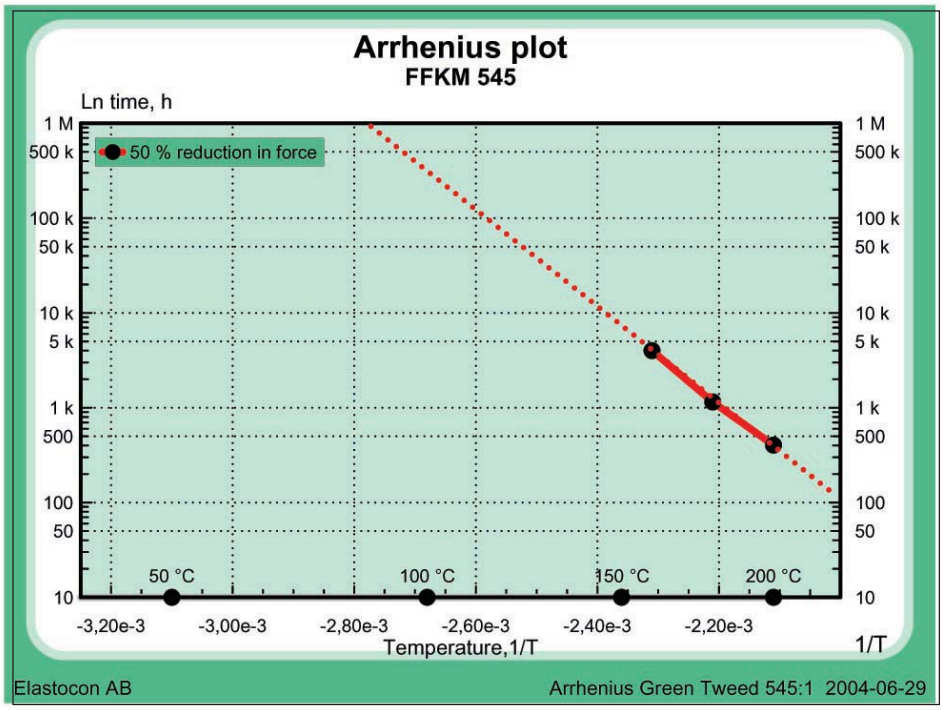
The tests are normally run until the properties are reduced to 50 % of the original value, see figure.

The time to reach this level is determined for each temperature.

The test temperatures are chosen so the test time for the highest temperature is at least one week and the time for the lowest temperature is about 3 - 9 months.



Stress Relaxation test at three temperatures of a per-flouro rubber



Arrhenius plot

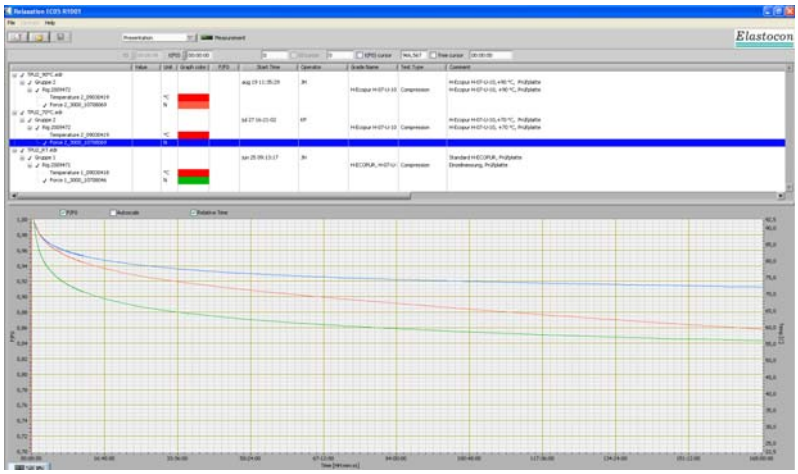
The times to reach the ”end of life” time for each temperature are plotted in an Arrhenius plot, which is a diagram with logarithmic, time on the Y-axis and 1/T on the X-axis, where T is the temperature in Kelvin, see figure.

A straight line is drawn through the points and extrapolated to the temperature of use, to obtain an estimation of the life-time of the tested material.

Software for Relaxation Testing, EC 05

This 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.

Presentation view



In the presentation view test data can be presented and compared and printed as a test report.

Functions

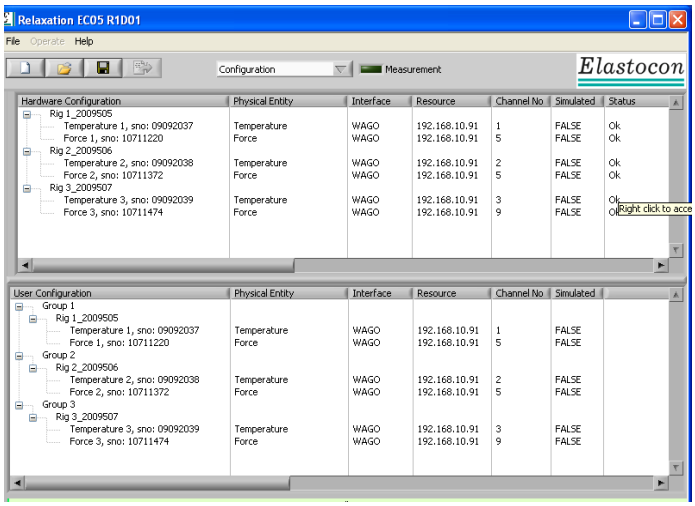
- Evaluation points showing relaxation at different times.
- End condition can be set as F/F_0 or time.
- Possibility to calculate the median value when testing double or triple test pieces.
- Calculated compensation for the load cell deformation can be switched on or off.
- Automatic increase of logging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

Viewer

We can also supply a separate "Viewer" software which can be installed on other computers in the network.

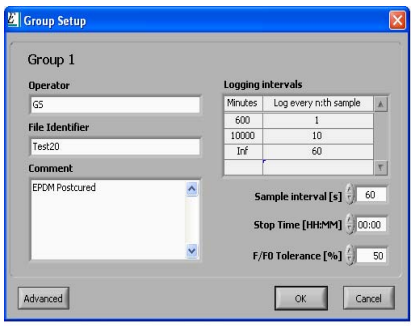
The operator can then check and evaluate the tests from the office computer.

Configuration view



In the Configuration view the user can combine one, two or three rigs to a group.
Data for the group is saved in one file. The software calculates the median results from the rigs in the group.

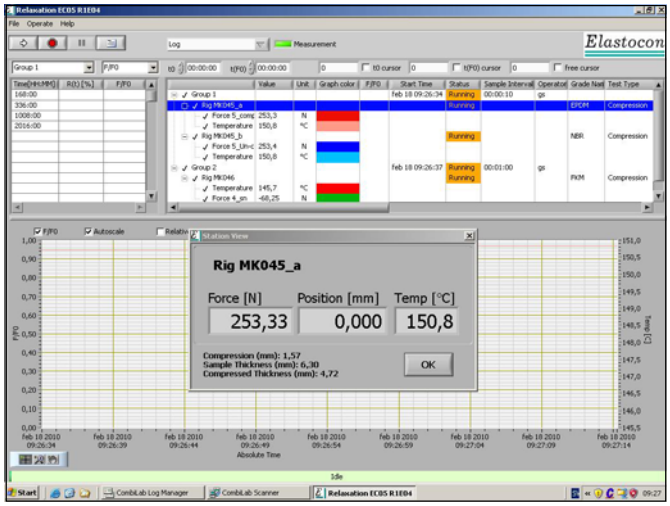
Group setup



In the group setup the file name is given together with comments.
The logging intervals are set in a table and will change automatically.
The end conditions are set as time, F/F_0 or a combination of both.

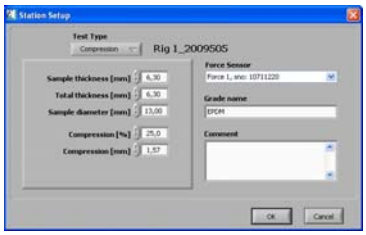
Software for Relaxation Testing, EC 05

Logging view



In the Logging view the user sets the logging details, the evaluation points, time for t_0 and F_0, the colour of curves and starts the test.

Station setup



In the Station setup the user sets the type of test, compression or tension and the test piece dimensions.

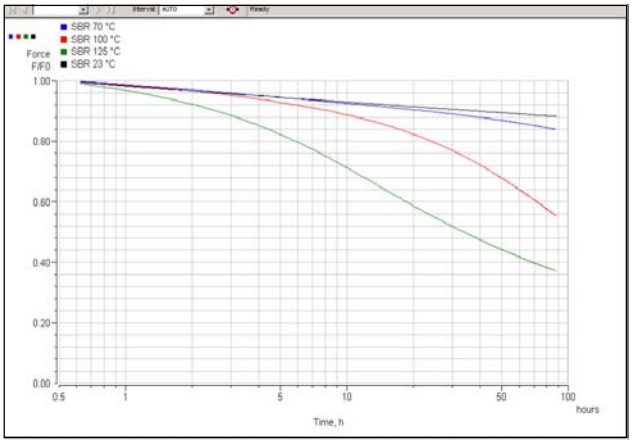
Evaluation points

Group 1 | F/F0

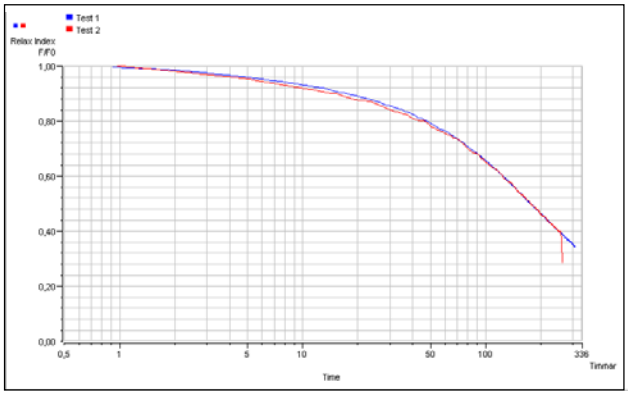
Time[HH:MM]	R(t) [%]	F/F0
168:00	19	0,81
336:00	25	0,75
1008:00	35	0,65
2016:00	41	0,59

For each Group (= File) times can be given when the software will calculate the percent relaxation and F/F_0.

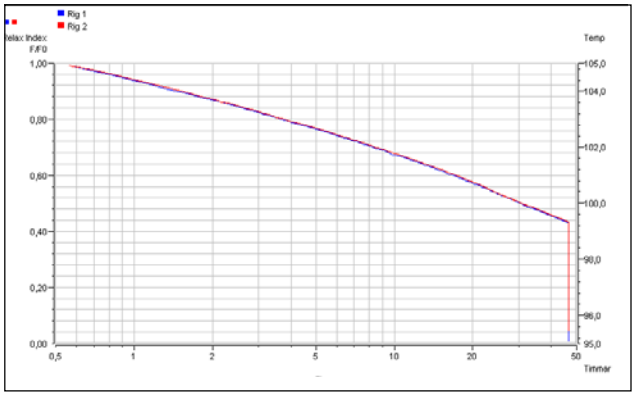
Examples of test results



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



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



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

Automatic Relaxation and Creep Tester, EB 18-II-3

• For stress relaxation tests • For creep tests

With EB 18-II-3 automatic Relaxation and Creep Tester, tests can be carried out automatically.

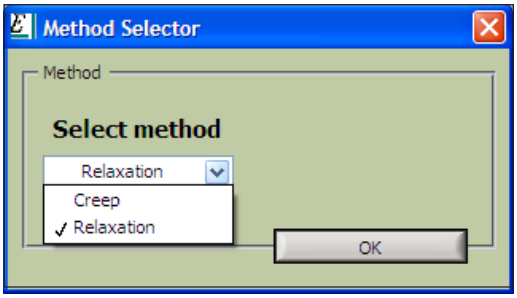
The instrument has an individual control of each test station.

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.

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

This design gives the following advantages

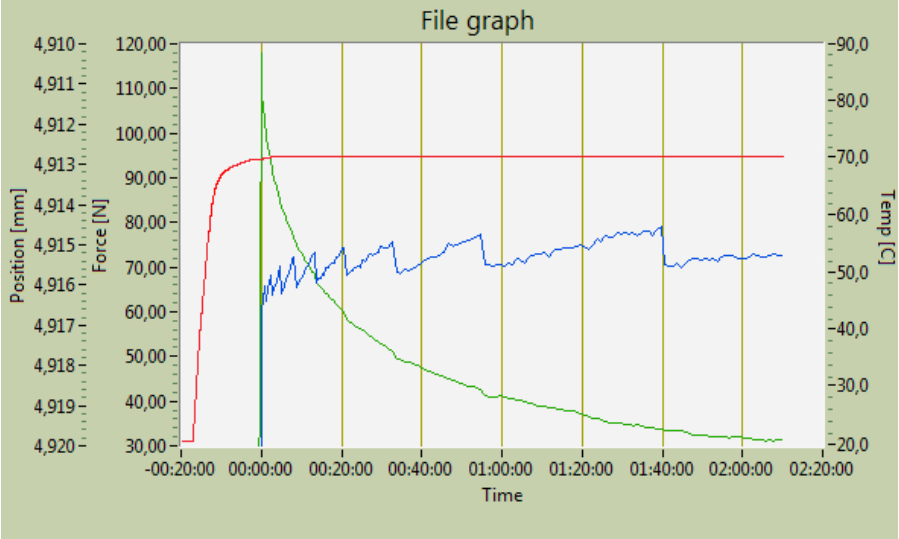


Both testing methods, stress relaxation and creep uses the same accessories. The shifting between the two test methods is done when the software is started.

The change between compression and tension consists of a simple rebuilding of the rigs, thoroughly described in the manual.

For Stress Relaxation Tests

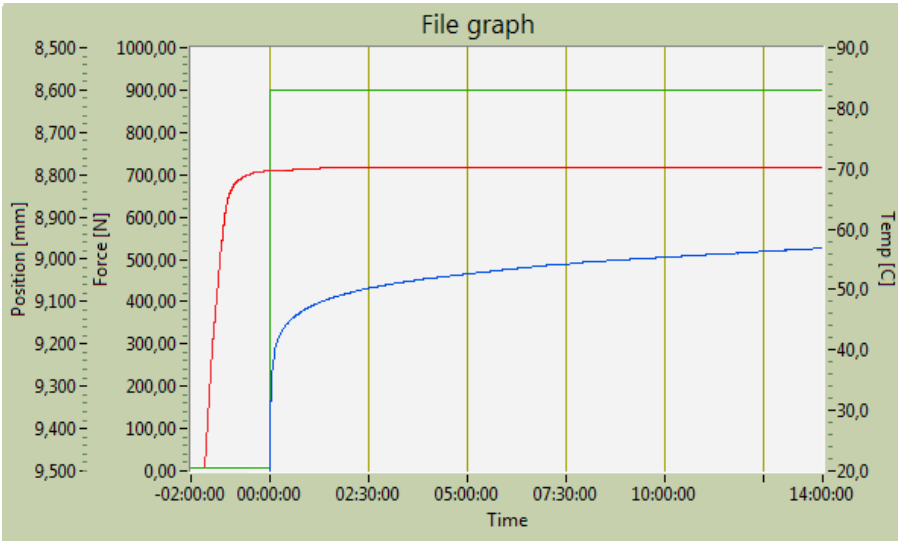
- Relaxation tests can be done in both compression and tension.
- Utilising load cells and servo motors to apply and hold the compression in the EB 18-II-3, automatically compensates for the spring effect in the load cells.
- The compression or tension in mm or % is set in the software and the computer instructs the closed loop circuit of the servo motor 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).



Relaxation test. *The red curve is the temperature, the green curve is the force and the blue curve shows the position and each step is an adjustment of 0,001 mm.*

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-II-3 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).



Creep test. *The red curve is the temperature, the green curve is the load and the blue curve is the creep.*

Automatic Creep Tester EB 15-II-10

Picture of previously model of Full Notch Creep Tester (FNCT)

The 10 test stations

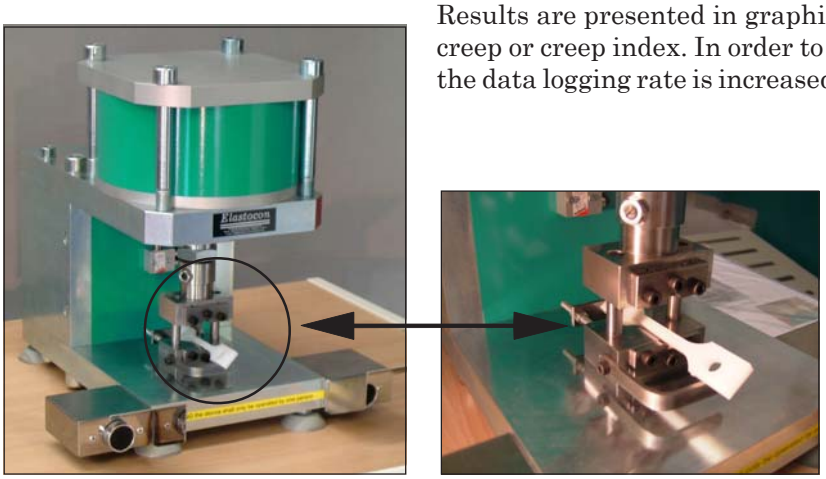
The instrument is offered in a number of customer defined configurations of test stations and load ranges. It is available for testing in liquids according to ISO 16770 (Full Notch Creep Test) or in air according to ISO 899.

Utilising load cells and servo motors to apply and hold the load, the Creep tester both eliminates the handling problems associated with dead weights, and offers the possibility of running new features such as load and temperature ramps controlled by the computer.

For ISO 899 the test stations are built into a precision air ageing oven for tight control of temperature and air flow.

Creep can be measured either by clip-on extensometers for dumbbell specimen or by the motor encoder for parallel specimens and for special dumbells.

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.

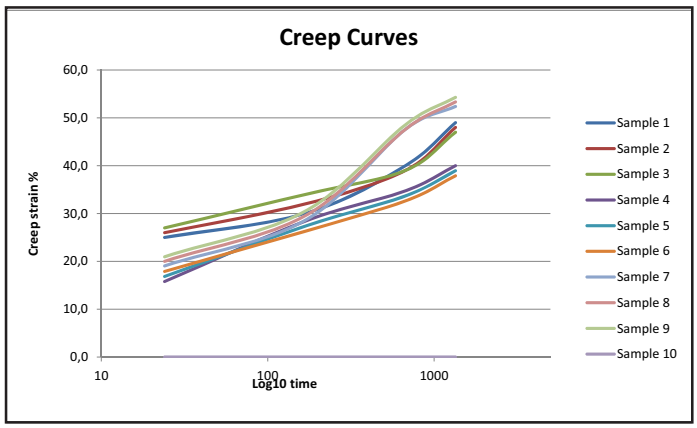


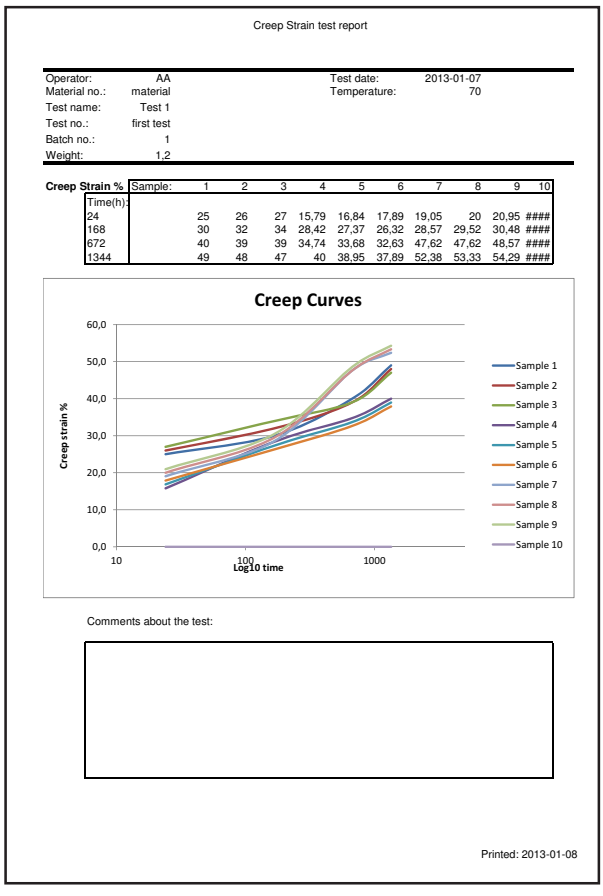
EP 02.02 Specimen Cutting Press with Notch attachment

Film Creep Tester EB 24

Film Creep Tester based on our Ageing Oven EB 10-II with a digital ruler system including a line laser pointer for manually measuring the creep. The ruler is connected to a computer and the values are fed into an Excel template which calculates the result and presents the graphs.

- Controlled air flow, 14 air changes /hour.
- Window, w x h 370 x 300 mm.
- Hooks to hang 10 test pieces 25 x 100 mm.
- Measuring system with laser pointer, 0,01 mm resolution, to measure elongation, range 300 mm.
- Software to feed the data into an Excel template, template included. This means the data is fed into an Excel template by pressing a button on the measuring scale. The test result is then calculated by the Excel template.
- PC computer with office software included.
- 10 Sets of grips to attach to the test pieces, together with weights, 1,3 kg and 2,3 kg.





Creep Strain test report

Operator:	AA				Test date:	2013-01-07			
Material no.:	material				Temperature:	70			
Test name:	Test 1								
Test no.:	first test								
Batch no.:	1								
Weight:	1,2								

Creep Strain %	Sample:	1	2	3	4	5	6	7	8	9	10
Time(h):											
24		25	26	27	15,79	16,84	17,89	19,05	20	20,95	####
168		30	32	34	28,42	27,37	26,32	28,57	29,52	30,48	####
672		40	39	39	34,74	33,68	32,63	47,62	47,62	48,57	####
1344		49	48	47	40	38,95	37,89	52,38	53,33	54,29	####

Comments about the test:

Printed: 2013-01-08

Excel template report

Elastometer, EF 02

• For compression tests on profiles
• For discontinuous stress relaxation tests

The test jigs for stress relaxation are simple in design but made with very high accuracy regarding surface finish and parallelism of the platens.

The discontinuous stress relaxation system has an economical advantage when many materials are to be tested during very long times.

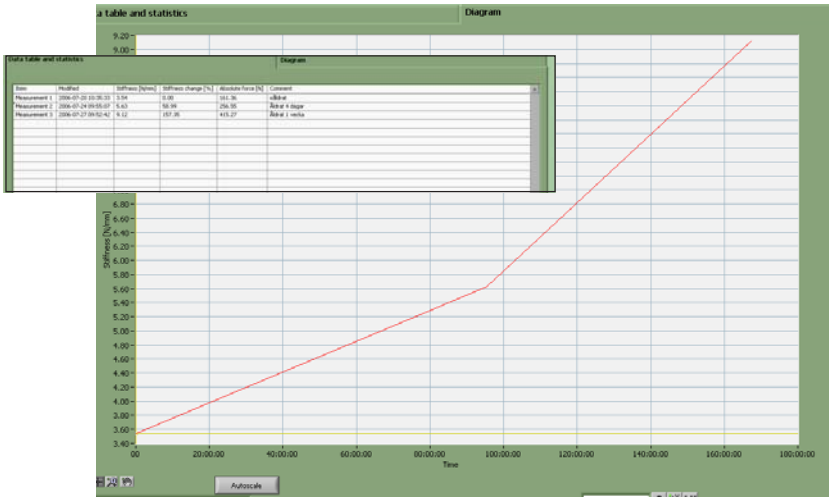
The instrument is a specialised compression tester controlled by a PC.

The software permits several types of tests to be performed, such as:

- discontinuous stress relaxation tests according to ISO 3384 method B.
- standard compression tests to measure modulus, such as in ISO 7743.
- customer specified tests on products like O-rings and profiles.

The results can be expressed in different ways:

- for stress relaxation as absolute force, relative force, F/F0, against time.
- for compression tests as MPa, N, and N/m length.
- for O-rings the result is expressed as N/mm average circumference.



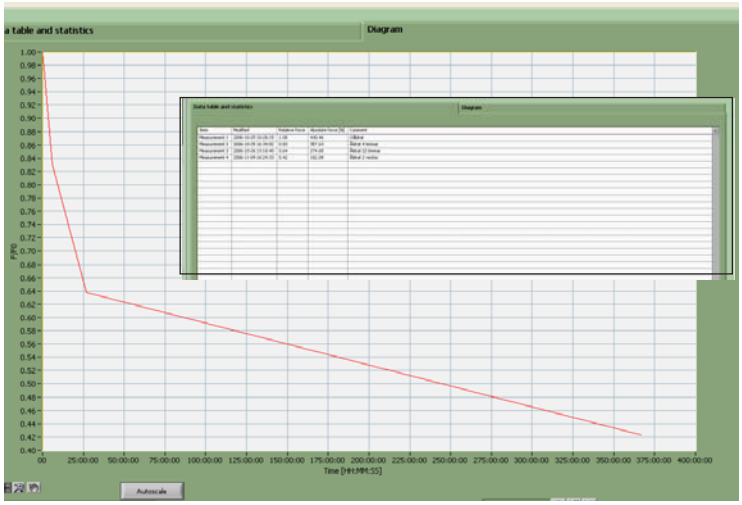
Stiffness change O-ring

The very accurate compression results are obtained due to the high accuracy in the displacement measurement, which includes a compensation for deformation in the load cell and in the instrument.

If equipped with the optional oven, test can be performed from -40 °C to +200 °C. This means that relaxation tests according to ISO 3384 method A can be performed when using the oven*. The precision of tests made according to Method B is also improved at 23 °C, if the oven is used.

A container for testing in liquids is also available (optional).

Computer included.



Discontinouos Relaxation NR

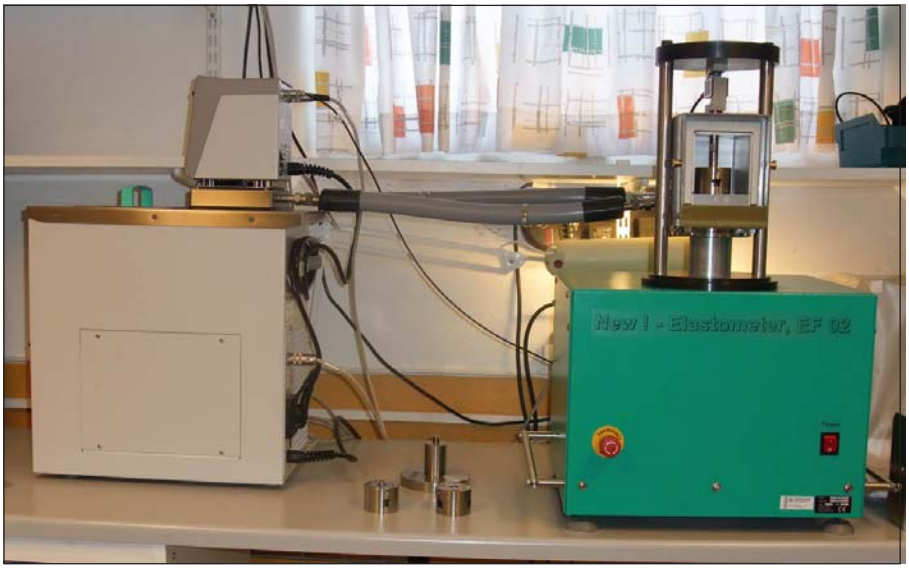
** see next page for information about the oven.*

Relaxation test jig

Please note the two threaded holes, one on the front side and one on the top for lifting or moving the jig with a lifting tool.

Temperature chamber, EF 02.03

Temperature chamber for EF 02 for testing at elevated and low temperature



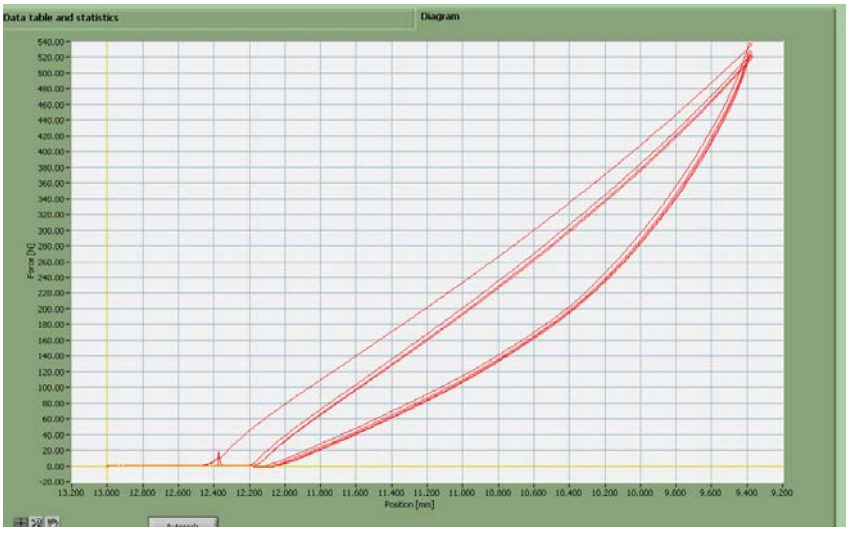
Oven for making discontinuous stress relaxation tests at elevated or low temperatures in Elastometer EF 02. The temperature range depends on the range of the liquid circulator used.

With this oven it is possible to make tests according to both method A and B of ISO 3384.

When making tests according to method A (measurements at test temperature), the test jig is transferred from the ageing oven to the Elastometer oven and when the test temperature has stabilised the measurement is done.

When making tests according to method B (measurements at standard laboratory temperature) the jigs are removed from the ageing oven and left to cool in the laboratory temperature. When the jig has reached about the correct temperature the jig is placed in the Elastometer Oven (+23 °C) and when the test temperature has stabilised the measurement is done.

If a circulator with compressor cooling is used it is possible to study the counterforce at subzero temperatures.



Modulus according to ISO 7743

Tests have shown that keeping the correct and the same temperature from one measurement to the other is of vital importance for getting accurate test results.

With this oven it is now possible for discontinuous stress relaxation tests.

Technical specification, Stress Relaxation Tester, EB 02

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
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 (HT=+300)

The Equipment works with continuous stress relaxation measurements in both compression and tension.
The basic version can do tests according to ISO 3384 and ASTM D6147.
The rig works together with the cell ovens EB 01, EB 07, EB 19, EB 20, EB 21, EB 22, EB 23 and the programmable temperature cell oven, EB 17.

EB 02 HT	Relaxation rig for high temperatures up to + 300 °C.
EB 02 TE	Relaxation rig for testing in tension (100 N).
EB 02.01	Container and pressure plate (with a hole in the centre) 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. See below for more info.
EB 02.02	Grips for testing relaxation in tension, according to ISO 6914. } for rebuilding EB 02 to EB 02 TE
EB 02.03	Load Cell 100 N for tests in tension, including adapters. } for rebuilding EB 02 to EB 02 TE
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 02.12	Container for testing in liquids in tension.
EB 02.14-1	Amplifier box with inputs for 1 load cell and 1 Pt 100 sensor (1 rig).
EB 02.14-2	Amplifier box with inputs for 2 load cells and 2 Pt100 sensors (2 rigs).
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 02.14-12	Amplifier box with inputs for 12 load cells and 12 Pt 100 sensors (12 rigs).
EB 17	Programmable Cell Oven, -40 °C to +200 °C, for six rigs.
EB 17HT	Programmable Cell Oven, -40 °C to +250 °C, for six rigs.
EB XX *	Cell Ovens with 3 to 6 cells, temperature between +40 °C up to +200 °C.
EB XX*HT	Cell Ovens with 4 to 6 cells, High Temperature up to +300 °C.
EC 05	This software evaluates results from relaxation tests according to ISO 3384 and ISO 6914.
ED 04	Computer.
ED 06	UPS 1000 VA double converting.

*** XX =** different article numbers, i.e.21. 22. 23.
NOTE: our stress relaxation rigs are also available in acid proof steel.

Technical specification, EB 02.01P

Airtight Containers for testing of stress relaxation in liquids (compression):

Temperature range, °C:	up to 150
Diameter, mm:	90
Height, mm:	96 + 32
Weight, kg:	1,12
Material:	Stainless steel
Seals:	Fluoro rubber or EPDM

Spare parts
Set of 6 O-rings, **EB 02.01P.1** FKM
Set of 6 O-rings, **EB 02.01P.2** EPDM

Technical specification, Cell Ageing Oven EB 01 LTP

Temperature range, °C:	+20 to +200
Temp. control, 40 - 100 °C, °C:	± 0,5
101 - 200 °C, °C:	± 1
Temp.variation in time and space,°C:	± 0,25
Temperature sensors:	Pt 100, 1/3 DIN
No. of temperatures:	1
No. of cells:	4
Air speed, m/s:	<0,001
Air changes, changes/hour:	3 - 20
Useful volume, l:	4 x 2,4
Dimensions, inner, dia x h, mm:	100 x 300
Dimensions, external, w x h x d, mm:	575 x 465 x 400
Weight, kg:	48
Voltage, V/phase/freq:	220-240/1/50 (110-120/1/60)
Power, W:	900
Water flow l/min:	0,1-1
Standards:	ISO 188, method A, IEC 811, ISO 3384 method B

Programmable temperature from a PC

Technical specification, Expansion sleeve, EB 02.04

Expansion sleeve for good heat transfer in cell oven EB 01.

Technical specification, Room Temperature Box, EB 02.08

Temperature range, °C:	+10 to +40 °C *
Nominal temperature, °C:	23
Temp. variation in time and space, °C:	± 0,25
Temperature reduction, below ambient, °C:	min 12
Temperature sensor:	NTC
Dimensions, external, w x d x h, mm:	620 x 610 x 630
No. of relaxation rigs:	8
Weight, kg:	33
Voltage, V/phase/freq:	200 - 240 / 1 / 50 - 60 or 100 - 120 / 1 / 50 - 60
Cooling power, W:	62
Total power, W:	200

* *Lowest temperature depending of ambient temperature*

- The casing consists of steel, painted with powder paint in bluegreen colour.
- Temperature controller with 0,1°C setpoint.

Technical specification, Draught Hood, EB 02.10

Cooling power, W:	50
Temperature Sensor:	TC type K
Temperature Range °C:	+10 to +50
Voltage in, V:	110-240 VAC 50/60
Voltage out, V:	= 24 - 27
Curent out, A:	3 - 3,5
Weight, kg:	8
Dimensions, w x d x h, mm:	660 x 425 x 350

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, the draught hood is included in the new generation of cell ovens for relaxation.

Technical specification, Amplifier Box EB 02.14

Pt 100 input

Connection type:	3 wire
Temperature range; °C:	- 200 to +850
Resolution, °C:	0,1
Conversion time, ms:	320
Measuring error (25 °C), %:	±0,2 of full range
Bit width, bits:	2 x 16

Load Cell input

Signal voltage, Ud, mV:	-16 to +16
Signal voltage Uref, V:	-10 to +10
Resolution, bits:	16
Conversion time, ms:	250
Measuring error, %:	0,1 of full range
Bit width, bits:	16

Communication

Transmission medium:	Twisted pair S-UTP 100 ¤ cat5
Buscoupler connection:	RJ45
Max length of fieldbus segment:	100 m between hubstation EB 02.14
Baud rate:	10 mbits/s
Protocols:	ModBus/ TCP, HTTP, bootp ModBus, UDP

Common specifications

Dimensions, external, w x h x d, mm:	400 x 150 x 310
Weight, kg:	6
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)

Technical data of FNCT, EB 15-II-10

Liquid bath and storage tanks.

Precise control and distribution of temperature within the fluid bath is achieved by:

- Circulating the liquid from the top of one end of the bath to the lower part of the other end. The heating element is extended over most of the base of the bath to create convection within the bath for uniform temperature control and distribution.
- The same pump is also used for filling the bath from a storage tank, thus eliminating manual liquid handling.
- Temperature controller (PID) with 0,1 °C indication and set point. The temperature is set from the computer software.
- Peltier element cooling enables measurements to be carried out down to 20 °C.
- Liquid level control and alarm indicator.
- Embedded computer with PLC tuch screen, colour.
- Specification includes Windows based Creep Software.
- Support agreement first year is included.
- Installation is included in the purchase.

The Test Stations

- The load is applied by a load cell – amplifier system with a PID control function.
- The elongation can be measured by the digital encoder in the motor.
- The load cell amplifier and the motor control are connected in a closed loop control which works even without the computer. The load is set from the computer software.

Technical specification,

Materials in the liquid containers:	Stainless steel
Materials in other places:	Anodized aluminum, or powder coated steel
Load range, N:	0 – 500 (other ranges optional)
Load accuracy, %:	< 0,5
Temperature range, °C:	20 - 80
Motor system:	AC-servo with stepping function

Storage tank volume:

Soap solution, l:	35
Distilled water, l:	35
Number of test stations:	10 as standard, or variable according to customer requirements

Standards:

According to: ISO 16770 (FNCT) and other technical equivalent standards, ISO 899.

Accessories:

EP 02.02 Notchpress for FNCT.

Technical specification, Cell Ovens, EB 17 and EB 17 HT

Temperature range, °C:	- 40 to +200 (HT 250)
-70 °C to +150 °C:	EB 17 + EB 17.02
-40 °C to +200 °C:	EB 17 + EB 17.01
-40 °C to +250 °C:	EB 17 HT + EB 17.01
Temp. control, -40 to +200 °C, °C:	± 0,5
+201 to +250 °C, °C:	± 1,0
Temp. variation in time and space,°C:	± 0,25
Temperature sensors:	Pt 100, 1/3 DIN
Air speed, m/s:	<0,001
Air changes, changes/hour:	3 - 20
Useful volume, l:	6 x 1,3
No. of cells:	6
Dimensions, internal, dia x h, mm:	100 x 160
external, w x h x d, mm:	960 x 715 x 520
No. of temperatures:	1
Weight, kg:	approx 74
Voltage, V:	220 -240/1/50 or 60
Power, W:	300
Standards:	ISO 3384-2, ISO 188 method A and ISO 3384 -1

Liquid circulator

	EB 17.01 -40 °C to +240 °C	**EB 17.02** -70 °C to +150 °C
Heating power, W:	1 800	1 800
Cooling power at +20 °C, W:	900	900
Cooling power at -40 °C, W:	700	700
Temperature range °C:	- 80 to + 250	- 80 to + 250
Temperature stability °C:	±0,05	±0,05
Dimensions, external, w x l x h, mm:	500 x 590 x 640	500 x 590 x 640
Weight, kg:	130	130
Volume, l:	5,2	5,2
Pump flow rate, l/min:	16-30	16-30
Cooling of compressor:	air/water	air/water

Note: The temperature range depends on the liquid used.

Technical specification, Cell Ovens EB 21- 22 - 23

Temperature range, °C:	+40 to +200 (HT 300 °C)
Temp. control, +40 to + 200 °C, °C:	± 0,5
+ 201 to + 300 °C, °C:	± 1,0
Temp. variation in time and space, °C:	± 0,25
Temperature sensors:	Pt 100, 1/3 DIN
No. of temperatures:	1 (EB 23) 4, (EB 21) or 6 (EB 22)
Air speed, m/s:	<0,001
Air changes, changes/hour:	3 - 20
Useful volume, l:	4 x 1,3 (EB 21, EB 23) or 6 x 1,3 (EB 22)
No. of cells:	4 (EB 21, EB 23) or 6 (EB 22)
Dimensions, inner, dia x h, mm:	100 x 160
Dimensions, external, w x h x d, mm:	760 x 715 x 520 (EB 21, EB 23) 960 x 715 x 520 (EB 22)
Weight, kg:	50 (EB 21, EB 23) 57 (EB 22)
Voltage, V:	220-240/1/50 (110-120/1/60)
Power, W:	900 (EB 21, EB 23) or 1 300 (EB 22)
Standards:	ISO 188 method A ISO 3384 -1

Options

EC 11 Monitor Software.
Network cable.
Ramp function for temperature settings in the PLC.

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

Technical specification, Automatic Relaxation and Creep Tester, EB 18-II (3 test stations)

Temperature range, °C:	+40 to +200 (HT=+300)
Temp. control, 40 - 200 °C, °C:	± 0,5
201 - 300 °C, °C:	± 1,0
Temp. variation in time and space, °C:	± 0,25
Temperature sensors:	Pt 100, 1/3 DIN
No. of temperatures:	3
No. of cells:	3
Air speed, m/s:	<0,001
Air changes, changes/hour:	3-20
Force range compression, N:	0 -1 000 (alternatively 100, 500 or 1 500)
Force resolution, N:	0,1 in compression and 0,01 in tension
Force accuracy, N:	0,2 (0,02, 0,1, 0,4)
Displacement resolution, mm:	0,0001
Displacement accuracy, mm:	0,003
Transport speed, mm/min:	0,1-200
Testing speed, mm/min:	0,1-200
Compression plate, mm dia:	50
Power, W:	900
Voltage, V/Hz:	220-240/1/50, or 110-120/1/60

Materials:

Compression plates:	Stainless steel
Compression rig:	Stainless steel and aluminium
Casing:	Powder painted steel
Size, w x d x h, mm:	1170 x 500 x 1220
Weight, kg:	151
Standards:	ISO 188 method A, ISO 3384-1, ISO 6914, ISO 899 with modification

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 19 " LCD monitor 900 x 1440
1 PS2 - US keyboard
1 USB mouse

OP system
Windows XP professional embedded version

Included
Installation and support agreement first year are included

Optional accessories
For rebuilding the rigs to tension

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.

For testing in liquids

EB 02.01 Container and pressure plate (with a hole in the centre) 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. (maximum 150 °C).
EB 02.12 Container for testing in liquids in tension.

Technical specification, Film Creep Tester, EB 24

Temperature range, °C:	+40 to +200
Temp. control, 40 - 100 °C, °C:	0,5
101 - 200 °C, °C:	± 1,0
Temp. variation in time and space, °C:	± 0,25
Temperature sensors:	Pt 100, 1/3 DIN
Air speed, m/s:	<0,001
Air changes, changes/hour:	14
Useful volume, l:	120
Dimensions, inner, w x h x d, mm:	550 x 550 x 400
Dimensions, external, w x h x d, mm:	920 x 820 x 780
Dimension, window, 4 glass, mm:	370 x 300
Illumination of the inner chamber:	2 x 10 W, 24 V halogen
Weight, kg:	103
Voltage, V:	220 - 240 / 1 / 50
Power, W:	2 100
Standards:	ISO 188, IEC 811 and other technical equivalent standards.

Common specifications:

- Special design with controlled air exchange rate and low air speed.
- The casing consists of steel, painted with epoxy powder paint in bluegreen colour.
- The inner chamber is made of stainless steel.
- Temperature controller with 0,1°C setpoint.
- Solid state relay for safe control.
- Temperature indicator with sensor in the inner chamber.
- Fixed over temperature fuse.
- Fixed set air exchange rate at 14 changes per hour.
- The air speed is low and is dependent on the air exchange rate only.
- Cooling channels in the casing for low surface temperature.
- Controlled cooling fan for the electronics cabinet.
- Run-time meter.
- Countdown timer.
- Door sensor to turn off heat and illumination when the door is opened.

Options

EC 11 Monitor software
Network cable
Ramp function for temperature settings in the PLC

Technical specification, Elastometer EF 02

Force range, N:	0 -1 000 (alternatively 200, 500 or 2 000)
Force resolution, N:	0,01
Force accuracy, N:	0,1 (0,01, 0,05, 0,2)
Displacement range, mm:	100
Displacement resolution, mm:	0,0001
Displacement accuracy, mm:	0,002
Transport speed, mm/min:	0,05 - 200
Testing speed, mm/min:	0,05 - 100
Compression plate, mm dia:	110
Power, W:	60
Voltage, V:	220 - 240/1/50 110 - 120/1/60
Standards:	ISO 3384, ISO 7743

Materials:

Compression plates:	Nickel plated steel
Compression rig:	Steel, stainless steel and aluminium
Casing:	Powder painted steel
Size, w x d x h, mm:	500 x 370 x 870
Weight, kg:	52
Computer:	included

Technical specification, Heating circulator

Option 1 Room temperature to +200 °C, EF 02.06

Working temperature range, °C:	+20 to +200
Temperature control:	P ID, cascade
Temperature stability, °C:	±0.01
Display resolution, °C:	0,1
Heater capacity, W:	2 000
Water cooling:	
Pump capacity, pressure, bar:	Pressure: 0,23 - 0,45
flow rate, l/min:	Flow rate: 11-16
Bath opening / bath depth (W X L/D), mm:	130 x 150 /150
Filling volume, l:	4,5
Dimensions (W x L x H), mm:	210 x 420 x 380
Weight, kg:	9,6
Ambient temperature, °C:	5 - 40

• Built in cooling coils

Option 2 Low temperature -28 °C to +200 °C, EF 02.07

Working temperature range, °C:	-28 to +200		
Temperature control:	PID, cascade		
Temperature stability, °C:	±0.01		
Display resolution, °C:	0,1		
Heater capacity, W:	2 000		
Cooling capacity at, °C:	20	0	-20
W:	260	200	60
Refrigerant:	R134a		
Pump capacity, pressure, bar:	Pressure: 0,23 - 0,45		
flow rate, l/min:	Flow rate: 11-16		
Bath opening / bath depth (W X L / D), mm:	120 x 140 / 140		
Filling volume, l:	4,5		
Dimensions (W x L x H), mm:	230 x 420 x 610		
Weight, kg:	31		
Ambient temperature, °C:	5 - 40		

• Rapid cool down time

Other temperature ranges with other circulator models are available on request.

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

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