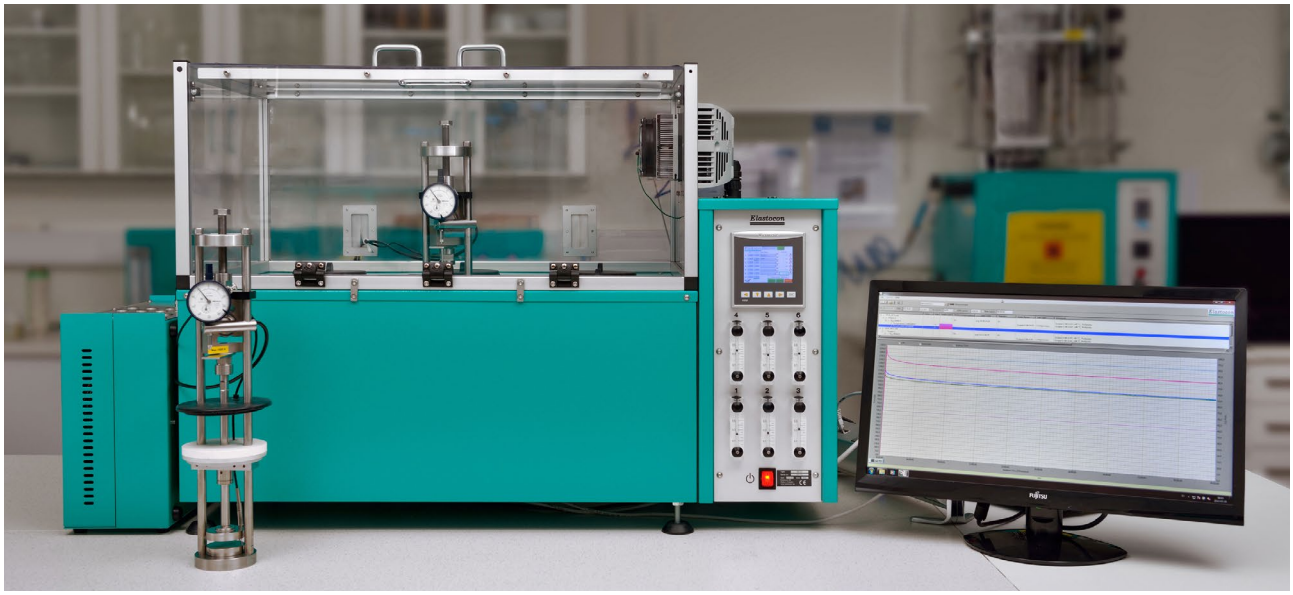
Elastocon®

Elastocon AB • Tvinnargatan 25 • SE-507 30 Brämhult • Sweden
Phone: +46 33 323 39 00 • info@elastocon.se • www.elastocon.com

Manual
Relaxation System for continuous testing



Contents

1. Setting up the relaxation system *p. 2*
2. Relaxation rigs *p. 3*
3. Calibration *p. 6*
4. Service and maintenance *p. 6*
5. Troubleshooting *p. 6*
6. Safety *p. 6*
7. Technical specification *p. 7*
8. Accessories to the rigs *p. 8*
9. Relaxation Software EC 05 *p. 11*
10. Step by step instructions *p. 36*

Technical documentation supplied on USB flash drive

ma-relaxation-system_07_2104

1. Setting up the Relaxation System

Please read through the whole manual until you are familiar with it before you start working with the equipment.

1.1 Unpacking

Unpack everything (oven, amplifier box, computer, rigs and eventually other accessories) carefully and set it up on your bench/table. A suggestable set-up is found on the picture on the front page of this manual.

If the optional extension cords was not included in the purchase, place the amplifier box right behind the oven instead of at the side of the oven.

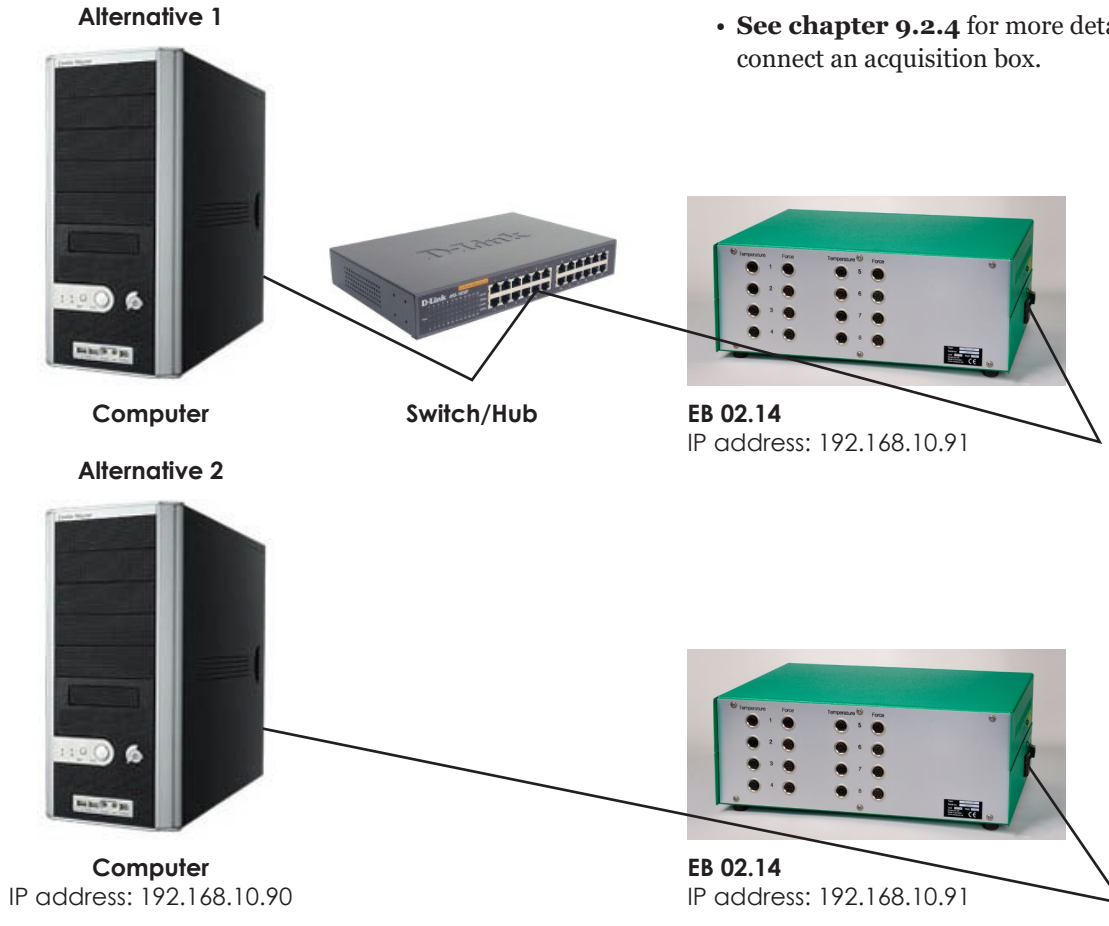
1.2 Setting up the cell oven

Place the cell oven on a stable and horizontal bench.

Connect the oven to a grounded mains outlet of 220–240 VAC having a 10 A fuse (alternatively 110–120 VAC 20 A fuse).

1.3 Setting up the computer

Connect the computer and its accessories to each other and the power source (preferably to an UPS).



1.4 Setting up the amplifier box, EB 02.14

Connect the amplifier box to the computer and the power source (preferably to an UPS).

The amplifier box for data connection consists of WAGO-modules for load cells and temperature sensors.

The box has a network output and can be connected directly to the network connection on your PC or to your local network.

The box is assigned to the IP-address 192.168.10.91 at delivery. If you are already using this IP-address in your network, the address must be changed. To change the IP-address, use the WAGO Setup software from the USB drive in the folder Install/WAGO. Be sure to mark up the box with the new IP-address since the only way to connect to it is by knowing the exact IP-address.

If troubleshooting connection issues, it may be helpful to know this:

- The amplifier box does not have a power indicator, but it is possible to peek inside the box and see if any lights (LEDs) are lit.
- Newer amplifier boxes have a web server which can be accessed by entering the IP-address in a web-browser.
- **See chapter 9.2.4** for more details of how to connect an acquisition box.

2. Rigs for continuous measurement of stress relaxation

2.1 Rig for compression testing (in air), EB 02

The EB 02 rig for temperatures up to 200 °C complies to ISO 3384 and other equivalent standards.

2.1.1 Temperature sensor

The temperature sensors are PT 100 elements. When testing compression in air the temperature sensor is placed in the bottom of the compression platens to get a temperature reading as close to the sample as possible.

2.1.2 Load cell

The load cells are Z-type load cells of steel with an accuracy class of 0,1 %. Default load cell will have 600 N as force range (if not anything else is specified on the order).

2.1.3 Compensation for the spring effect in the load cell

When doing very accurate measurements it may be necessary to compensate for the spring effect in the load cell. The spring effect is caused by the load cell slightly returning as the rubber sample relaxes, thus actually increasing the compression of the test specimen. All load cells are deformed when a force is applied. It is this deformation which is measured to read the force.

When doing comparative tests it may not be necessary to do any compensation.

2.1.4 Mounting and adjustment of the dial gauge

Loosen the small hexagon locking screw that holds the gauge holder to the rig and adjust it so that the gauge will be placed right over the support plate. Loosen the small hexagon locking screw in front of the gauge holder and place the gauge in place and tighten the screw again, be careful so you won't tighten it too hard. If necessary adjust the height of the gauge holder.

The dial gauge has a span of 10 mm. If you are using specimens below 10 mm in height, adjust the gauge to read 0 mm when the compression platens are together. When using specimens with a height of 5 to 15 mm, adjust the gauge to read 0 mm with a 5 mm gauge block between the platens, and add 5 mm to the readings.

The dial gauge is moved by loosening the hexagon locking screw in the holder.

Note: When tightening any hexagon locking screw in the rigs, do not tighten too much, just very light, to avoid marks in the rods.

Rig for testing in compression.

2.2 Rigs for tension testing (in air), EB 02TE

The EB 02TE rig for temperatures up to 200 °C complies to ISO 6914 and other equivalent standards.

If relaxation testing is done in tension the rig is equipped with a pair of grips allowing the test strip to have a maximum width of 30 mm. No dial gauge is used when testing in tension. Instead the elongation is measured by the number of revolutions with the rigs top screw. One full revolution equals to 1 mm movement.

2.2.1 Temperature sensor

The temperature sensors are PT 100 elements. When testing in tension the temperature sensor is placed close to the sample to get a temperature reading as close as possible to the sample.

2.2.2 Load cell

The load cells are Z-type load cells of steel with an accuracy class of 0,1 %. The load cell for tension testing has by default a lower force range (100 N) than the compression load cell.

2.2.3 Compensation for the spring effect in the load cell

When doing very accurate measurements it may be necessary to compensate for the spring effect in the load cell. The spring effect is caused by the load cell slightly returning as the rubber sample relaxes, thus actually increasing the stress of the test specimen. All load cells are deformed when a force is applied. It is this deformation which is measured to read the force.

The software will automatically compensate for this in the logview. In the log file Viewer strain compensation can be turned on or off, **see 9.4.19 Turn strain compensation off**.

When doing comparative tests it may not be necessary to do any compensation.

> **Note:** When tightening any hexagon locking screw in the rigs, do not tighten too much, just very light, to avoid marks in the rods.

Rig for testing in tension.

2.3 Special rigs

There are different kind of special rigs available as well.

2.3.1 Rig for compression testing in high temperatures (+300 °C), EB 02HT

The EB 02HT rig for temperatures up to +300 °C complies to ISO 3384.

This rig can be equipped with a liquid container, EB 02.01.

It can also be equipped with an air tight container, EB 02.01P, together with a pressure gauge (EB 02.01P6) for measurements in liquid for pressure up to 3 Bar and temperatures up to +200 °C.

2.3.2 Rig for tension testing in high temperatures (+300 °C), EB 02TEHT

The EB 02TEHT rig for temperatures up to 300 °C complies to ISO 6914.

Note: This rig cannot be equipped with a liquid container.

2.3.3 Acid proof rig for compression testing in liquids, EB 02AP

The EB 02AP rig for temperatures up to 150 °C complies to ISO 3384 and is delivered by default with an acid proof air tight container. Default load cell will have 600 N as force range (if not anything else is specified on the order).

2.3.4 Super acid proof rig for compression testing in liquids, EB 02SA

The EB 02SA rig for temperatures up to 200 °C complies to ISO 3384. It is delivered by default with a container in super acid proof material and a compression plate. Default load cell will have 600 N as force range (if not anything else is specified on the order).

2.3.5 Rig for high force compression testing up to 45 kN, EB 02HF

The EB 02HF rig for temperatures up to 300 °C complies to ISO 3384.

Note: This rig is not included in this manual.

2.3.5 Rig for compression testing with automatic liquid exchange, aeration and stirrer function, EB 02ALE

The EB 02ALE rig is for temperatures up to 200 °C.

Note: This rig is not included in this manual.

Rig for testing in liquids.

3. Calibration

The rig temperature sensors and the load cells are at the delivery calibrated together with the data connection box according to the attached calibration certificate. The dial gauges are also included in the calibration certificate.

Calibration should be done annually.

4. Service and maintenance

The relaxation rigs shall be cleaned at regular intervals.

A service of the relaxation rigs should be done annually with lubrication of the screw and the rotating coupling.

5. Troubleshooting

If no data is coming to the computer, open the amplifier box and check that the LEDs on the data modules are showing green lights, if this is not the case, check the cable connections, **see chapter 1.4**.

If some module is showing a red light, something is wrong with that module.

If this does not help, check the fuses. The fuses are located in the power adaptor inlet, the value is 2 A (slow).

Before changing a defective fuse, check for any possible short circuit, causing the fuse to burn.

6. Safety

Note: Use gloves when lifting the rig from a cell oven, as the rig may be hot.

Important! For the best performance of the instrument, we recommend the following working environment:

- Standard laboratory temperature of either 23 °C ± 2° or 27 °C ± 2 °.
- Humidity not more than 90 % RH – non condensing.
- For long term logging instruments secure the power to the computer with a double converting UPS, for reducing electrical disturbances and power failure. (Ask Elastocon for recommendations or quotation.)
- Other environmental aspects: Pollution degree 2 – Laboratory environment.

7. Technical specification

The EB 02 is a rig for continuous stress relaxation measurements in both compression and tension. The rig works together with the cell ovens EB 21, EB 22, the programmable temperature cell ovens EB 17 and EB 21 LTHTP.

Stress Relaxation Rig	**EB 02**	**EB 02HT**	**EB 02TE**	**EB 02TEHT**
Maximum temperature, °C:	+200	+300	+200	+300
Default range in compression/tension, N:	600	600	100	100
Resolution, compression/tension, N:	0,05	0,05	0,01	0,01
Optional range in compression, N *(must be specified in order):*	1 200/2 000	1 200/2 000	–	–
Resolution, compression, N:	0,1/0,2	0,1/0,2	–	–
Accuracy, %:	± 0,1 of full range	± 0,1 of full range	± 0,1 of full range	± 0,1 of full range
Dimensions, dia × h, mm:	120 × 450	120 × 450	120 × 450	120 × 450
Weight, kg:	4,5	4,5	4,5	4,5
Material:	Stainless steel	Stainless steel	Stainless steel	Stainless steel
Temperature sensor:	Pt 100, 1/3 DIN	Pt 100, 1/3 DIN	Pt 100, 1/3 DIN	Pt 100, 1/3 DIN
Standards:	ISO 3384	ISO 3384	ISO 6914	ISO 6914
Suitable accessories				
Liquid container:	EB 02.01	EB 02.01	EB 02.12	–
Air tight container:	EB 02.01P	EB 02.01P	–	–
Pressure gauge for air tight container:	EB 02.01P6	EB 02.01P6	–	–
Extension cords for load cell:	EB 02.05.1	EB 02.05.1	EB 02.05.1	EB 02.05.1
Extension cords for temperature:	EB 02.05.2	EB 02.05.2	EB 02.05.2	EB 02.05.2
Load cell 1 200 N:	EB 02.18	EB 02.18	–	–
Load cell 2 000 N:	EB 02.19	EB 02.19	–	–
Test piece holder:	EB 02.26	EB 02.26	EB 02.26	EB 02.26
Bending fixture with 3-point loading:	EB 02.29	EB 02.29	–	–

Stress Relaxation Rig	**EB 02AP**	**EB 02SA**	**EB 02ALE**	**EB 02HF**
Maximum temperature, °C:	+150	+200	+200	+200
Default range in compression, N:	600	600	600	45 000
Resolution, compression, N:	0,05	0,05	0,05	–
Optional range in compression, N *(must be specified in order):*	1 200/2 000	1 200/2 000	1 200/2 000	–
Resolution, compression, N:	0,1/0,2	0,1/0,2	0,1/0,2	–
Accuracy, %:	± 0,1 of full range	± 0,1 of full range	± 0,1 of full range	± 0,1 of full range
Dimensions, dia × h, mm:	120 × 450	120 × 450	120 × 450	120 × 450
Weight, kg:	4,5	4,5	4,5	4,5
Material:	EN 1.4404 (acid proof)	EN 1.4547 (super acid proof)	Stainless steel	Stainless steel
Temperature sensor:	Pt 100, 1/3 DIN	Pt 100, 1/3 DIN	Pt 100, 1/3 DIN	Pt 100, 1/3 DIN
Standards:	ISO 3384	ISO 3384	–	ISO 3384
Suitable accessories				
Liquid container:	–	included	included	–
Air tight container:	included	–	–	–
Pressure gauge for air tight container:	EB 02.01P6	–	–	–
Test piece holder:	–	–	included	–
Extension cords for load cell:	EB 02.05.1	EB 02.05.1	EB 02.05.1	EB 02.05.1
Extension cords for temperature:	EB 02.05.2	EB 02.05.2	EB 02.05.2	EB 02.05.2
Load cell 1 200 N:	EB 02.18	EB 02.18	EB 02.18	–
Load cell 2 000 N:	EB 02.19	EB 02.19	EB 02.19	–
			NOTE! *Must be connected to special control box, EB 02.24-x*	

8. Accessories to the rigs

8.1 Container for compression testing of Stress Relaxation in liquids, EB 02.01

8.1.1 Use

This container can be used with the Stress Relaxation Rig EB 02 for compression. This makes it possible to test samples in liquids such as coolants, oil, water etc.

The container is not air tight. Maximum temperature is 200 °C.

8.1.2 Running a test

When testing in liquid the bottom compression plate should be removed from the rig by loosen the screw in the bottom of the rig. The upper compression platen should be replaced with the upper compression plate with a hole for the liquid to circulate through. Remember to remove the “whitish” isolation washer between the rod and the platen, the washer shall only be used when testing in air.

8.1.3 Technical data, EB 02.01

Maximum temperature, °C:	+200
Diameter, mm:	90
Height, mm	95
Weight, kg	1
Material:	Stainless steel

8.2 Container for tension testing of Stress Relaxation in liquids, EB 02.12

8.2.1 Use

This container can be used with the Stress Relaxation Rig, EB 02TE. This makes it possible to test samples in liquids such as coolants, oil, water etc.

The container is not air tight. Maximum temperature is 200 °C.

8.2.2 Technical data, EB 02.12

Maximum temperature, °C:	+200
Diameter, mm:	90
Height, mm	150
Weight, kg	1,4
Material:	Stainless steel

8.3 Air tight container for compression testing of Stress Relaxation in liquids, EB 02.01P

8.3.1 Use

This air tight container can be used up to a pressure of 3 Bar together with the Stress Relaxation Rig, EB 02. This makes it possible to test samples in coolants under pressure.

When testing in volatile fuels evaporation can be eliminated, which reduces explosion and environmental risks.

The container is equipped with a safety valve set to about 3 Bar.

Maximum temperature 150 °C.

8.3.2 Running a test

Keep the O-ring for the central rod lubricated with silicone oil to reduce the influence on the force reading from the O-ring.

When testing under over-pressure, the pressure in the container will influence the force on the load cell. How much it will influence is depending of the size of the test piece and the free surfaces on the top and bottom of the upper compression platen. Even if the absolute force can be different the change in force is correct.

When testing in liquid the bottom compression plate should be removed from the rig by loosen the screw in the bottom of the rig. The upper compression platen should be replaced with the upper compression plate with a hole for the liquid to circulate through. Remember to remove the “whitish” isolation washer between the rod and the platen, the washer shall only be used when testing in air.

8.3.3 How to replace the O-ring seals

1. Remove the lids from the relaxation rig according to the drawing in this manual.
2. Remove the old O-rings.
3. Mount the new O-rings. To make it easier to mount the lid in the rig lubricate the O-rings with silicone oil.

8.3.4 Technical data

Temperature range, °C:	+5 to 150
Diameter, mm	90
Height, mm	95 + 25
Weight, kg	1.1
Material:	Stainless steel
Seals:	Fluoru rubber or EPDM

Consumables

EB 02.01P1	Set of 6 O-rings, FPM for EB 02.01P
EB 02.01P2	Set of 6 O-rings, EPDM Peroxide cured for EB 02.01P

Optional pressure gauge, EB 02.01P6

Together with a pressure gauge (EB 02.01P6) the air tight container, EB 02.01P, can be used for measurements in liquid for pressure up to 3 Bar and temperatures up to +200 °C.

8.4 Fixture for bending test, EB 02.29

8.4.1 Use

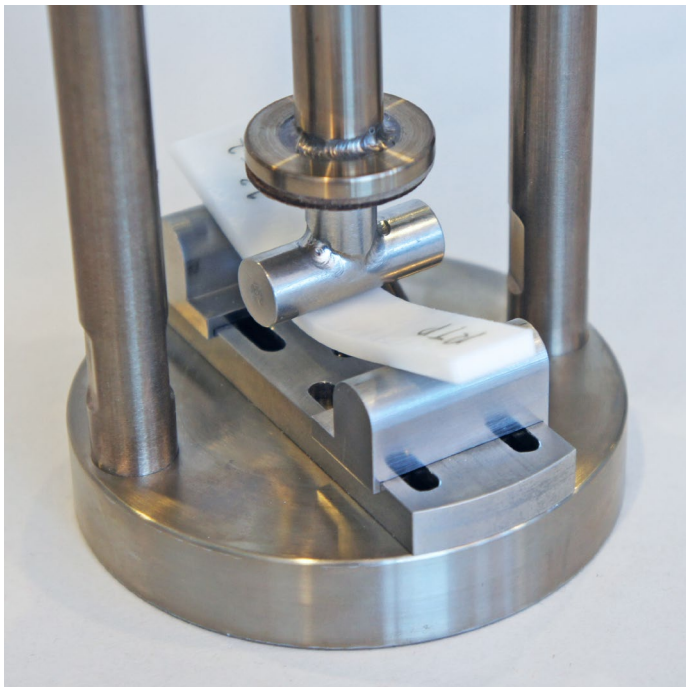
With this fixture it is possible to measure the force change over time with a 3-point loading. The test fixture is developed from ISO 899-2 but the actual test is a type of stress relaxation test for plastic material.

The deformation is calculated with help from the standard, the chosen deformation in percentage could be up to 10 %, if it is to much the material may break. During the actual test is the force decrease measured automatically and continuously.

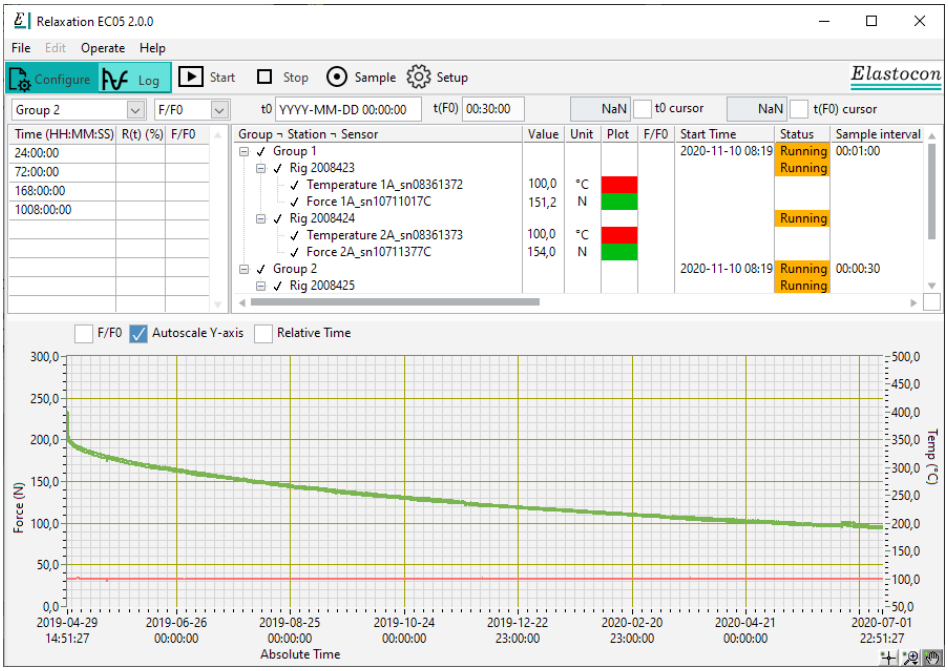
If the big decrease of the force that occurs in the beginning of the test should be displayed, please set F0 to 1 minute instead of the default 30 minutes in the software. The reason for recommending 1 minute instead of 0 is that the maximum force is dependent of the speed of deformation of the sample. If 1 minute is used as general value, the results will be more comparable between different tests.

Be observant of the force needed, and if necessary order an additional load cell to ensure the best accuracy.

For further instructions, please read standard ISO 899-2 and the rest of this manual in how to perform a test.



9. Relaxation Software EC 05



This manual is applicable on the EC 05 *Relaxation* software version 2.0 or newer and *Relaxation Viewer* version 2.0 or newer.

Important computer settings

The following settings must be set to guarantee a stable function of the EC 05 Relaxation software.

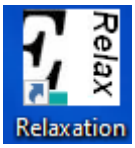
When the system is shipped, the computer will already have appropriate settings applied, but if Windows is updated or reinstalled, these settings may be affected. If so, the following settings must be reviewed and applied to ensure a stable function of the Relaxation application. The name, availability, location of and configuration for these settings may vary with Windows versions.

1. Never turn off hard drives.
2. Never put the computer to sleep.
3. Inactivate hibernation usage.
4. Do not allow hybrid sleep.
5. Do not enable wake up on LAN.
6. Never allow suspension of a USB port.
7. Do not let Windows automatically restart the PC after updates are installed.
8. Disable automatic update for the operating system. Download of updates are allowed, but no automatic installations. The reason for this is that the system may re-boot the computer after installing updates when the EC 05 Relaxation application is running.
9. Disable Windows Fast Startup.
10. Disable automatic scanning of EC 05 Relaxation test files by any anti-virus software.
11. If using a firewall – permanently allow the IP number of the data box to act as client and server.

Backup Considerations

It is highly recommended that the test files folder be backed up regularly since it contains your valuable data. The test files are normally stored at C:\Elastocon data.

9.1 Start application



Double click on the icon for relaxation to launch the application.

9.2 Configuration view

The application will start up in the configuration view. A hardware configuration profile that matches the delivered hardware is supplied by the manufacturer. This profile was added with the software installation and will now be loaded every time the relaxation application is launched.

The hardware profile can be managed by using a separate configuration tool (*HW ConfigUtility*). See separate manual for this software.

The configuration view enables the user to pick items from the hardware profile and configure a user configuration for a test setup. Changes in the configuration view should only be made while no measurement is running as it may affect ongoing measurements. The configuration window is split into a hardware field (upper) and user configuration field (lower).

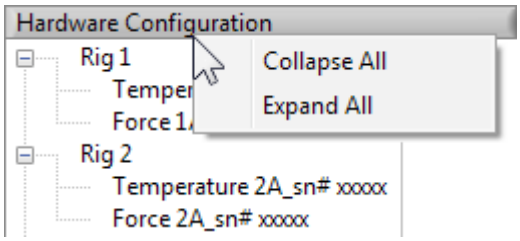
9.2.1 Hardware Configuration

The upper field in the configuration view shows a list of all hardware added by the manufacturer.

The structure of this list cannot be modified. Modifications can only be made by the supplier of this system.

The user can change hardware address, re-connect hardware and view sensor properties.

The hardware setup is as a tree structure with rigs as top level items with one or more included sensors.



A click on the +/– glyphs to the left will show or hide sensors for the rig.

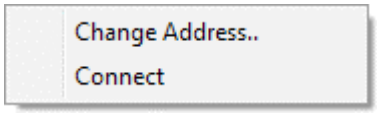
The entire tree structure can be shown as a collapsed or expanded view. Right-click on the header of the *Hardware Configuration* column, to access this feature.

Rig items

Rig items in the example picture are Rig 1 and Rig 2 and are shown as an expanded view.

Right click on any rig items in the list. A drop list menu will show all commands available.

Available commands are:



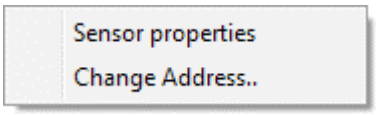
Change address. – will change rig address so it corresponds with the hardware listed. All underlying sensors for this rig will be re-directed to the new address. **See chapter 9.2.4.**

Connect – will re-establish connection with hardware that was disconnected or turned off at the time the application was started or had a log running.
See chapter 9.2.4.

Rig sensors

Right-click on any of the underlying rig sensors, *Temperature...* or *Force...*

A drop list menu will show all commands available.



Available commands are:

Sensor properties – will view the sensor properties for a sensor. Properties are offset, gain, sensor name, physical quantity and unit adjustment table.

A new sensor can also be imported here as an alternative sensor for an existing sensor. This is useful when the same hardware input uses more than one different physical sensors or if a sensor breaks and requires a replacement sensor. **See chapter 9.2.3.**

Change address – Change sensor address so it matches the connected hardware. ONLY THIS SENSOR will be re-directed to the new address and no other sensors.
See chapter 9.2.4.

Application features regarding sensors:

- The application will try and establish connection with all sensors in the *Hardware configuration* list at application launch.
- The application will automatically disconnect sensors that have been switched off or lost communication with the application. Conditions for a disconnection are setup in a system file. The conditions for this can be modified, but this is not described here. Contact the supplier of this system to change these conditions if necessary.

  To restore a disconnection status, the user must at that point manually re-connect the instrument.
  See chapter 9.2.4.
- Failure in communication will change the sensor status to *Disconnected* for any sensor that fails to connect.

  Sensors with the *Disconnected* status will still be available in the list, but this sensor will not be scanned for readings.

  The connection can be re-established at any time, even with a log running, as long as the hardware is connected properly.

  To resolve the disconnected status, go to **chapter 9.2.5.**

9.2.2 User Configuration

The lower field in the configuration view shows a list of rigs with sensors, copied from the upper field and bundled into groups, as the user specified.

This field will remain blank if no user configuration was loaded at program launch.

Use a prepared file

The application will automatically open the currently used user configuration file at application launch and the application is ready to start a test. Go to chapter 3. *Log view*, to prepare a test for logging.

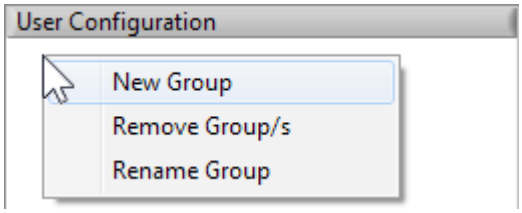
It is also possible to load a stored user configuration file or create a new group setup.

Load a stored user configuration

1. Go to the *File* menu and select *Open*.
2. Choose a file and click on the *OK*.
3. Go to the *File* menu and select *Load to log*.
4. Go to chapter 9.3. *Log view*, to prepare a test for logging.

Create a new group set-up

1. Go to the *File* menu and select *New*. The user configuration field will be initiated with a blank white field.
2. Right-click on the blank white field in the *User Configuration* column and select *New Group*.



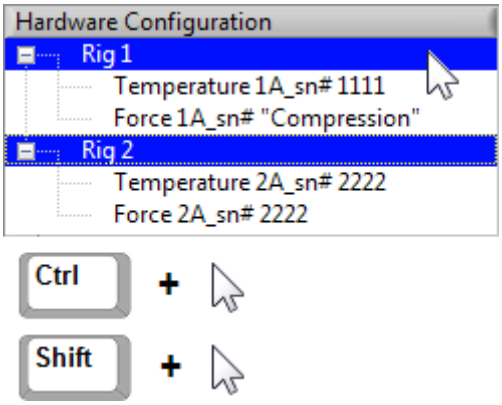
3. Enter a suitable name for the group. e.g. ”Group 1” or a name that refers to the type of test, location etc. *Group 1* is set as default.

   The idea with the group set-up is to bundle rigs that must be stored in the same log file. Rigs in the same group will all be managed and started at the same time when logging.

4. Highlight hardware from the *Hardware Configuration* list with a click on the rigs.

   More than one rig can be highlighted at the same time. Use *Shift*+click to select a range or *CTRL*+click to add any rig to the selection.

   Drag and drop the selected hardware on to the group name that was created in the *User Configuration* field.



5. Go to the *File* menu and select *Save* or *Save As*. Type in a suitable file name for the configuration made. MyConfig.tvc is set as default.
6. Go to the *File* menu and select *Load to log*. The user configuration will now be loaded to the log view and ready to be used for test.

   Continue with chapter 9.3. *Log view* to prepare a test for logging.

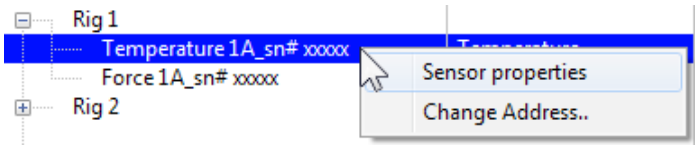
IMPORTANT!

- The configuration made and saved must remain the same as long as the same log is recording in the *Log view*. Any test interrupted by the user, power failure etc. cannot be resumed, if the configuration is lost or has been changed.

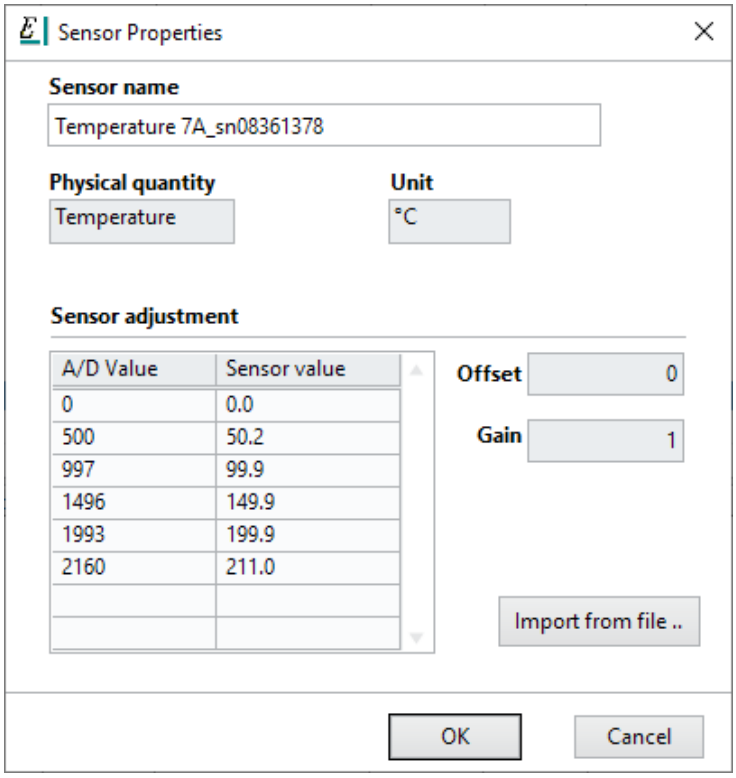
  It is recommended not making any change to the *User Configuration* file once it has been used for logging.
- It is not possible to make any changes to a *User Configuration* file when it is loaded to *Log*. If changes are necessary, the user must first open or create a new *User Configuration* file, load this to log and after that open the file that needs to be changed. The file opened now can be changed.
- A rig copied to a group from the *Hardware Configuration* field cannot be copied to another group.
- Once the bundled group(s) has been saved to file, this file can be re-used for other tests.
- A hint is to give the file a suitable name of its content. When the user configuration has been saved and loaded to *Log view* with *Load to Log*, it can be used for logging.
- A maximum of three rigs can be loaded to a report using the *Table & Graph* report setup. Statistic calculations will be done when more than one rig is in the report. **See chapter 9.4.31 for more details.**

9.2.3 Sensor properties

Right-click on the sensor in the upper field and select *Sensor properties*.



This window allows the user to view sensor properties and import a new sensor. It can be useful if a sensor must be replaced for any reason.



The new sensor from the manufacturer is normally delivered with a new sensor property file (*.tvs file). By importing the new profile on top of the existing sensor, it is possible to continue the logging without losing valuable test time.

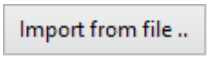
Import a new sensor

To import a sensor, make sure no measurements are running, since a sensor cannot be imported when a log is running. If measurements are running and you need to import a sensor, simply close the application without stopping the measurements, by opening the file menu and clicking Exit or by pressing *CTRL+Q*. **DO NOT** stop the running measurements unless the test is finished. Stopping a log is definite and the log cannot be restored to be in an unstopped state.

After import of a sensor, go to chapter 9.3.4.3, to resume the ongoing measurements.

Import of a sensor will create an alternative sensor.

1. In the *Hardware Configuration* view, right-click on the sensor in the upper field and select Sensor properties.
2. In the sensor properties windows, click *Import from file..*



3. Browse to the folder where the new sensor file is located and select it and click *OK*.
4. Click *OK*.

   A new sensor will appear in the Sensor Name list box.

   The new sensor can be identified by a matching serial number on the sensor and application sensor name.

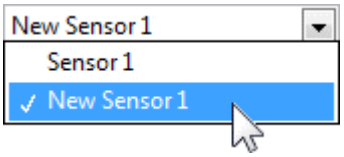
   After import, the new sensor will be set as default for this input and is ready to be used.

Remove a sensor

It is not possible to remove a sensor item with its properties in the *Relaxation* application because it is involved with a risk to remove a sensor by accident.

Removing a sensor can only be done in the *HW ConfigUtillity* application. See separate manual for the *HW ConfigUtillity* application.

Removing a sensor with its properties can be useful when information for a broken or replaced sensor is no longer needed.

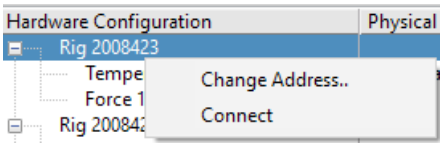


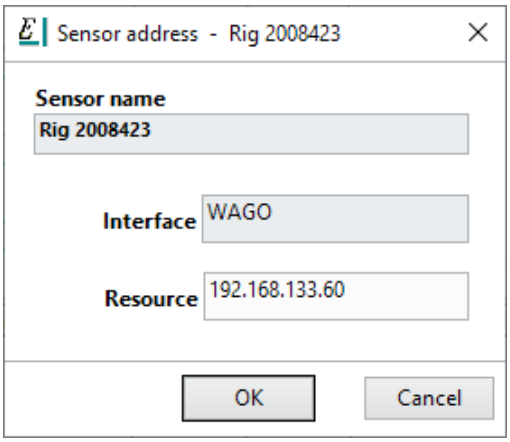
9.2.4 Change address

Sometimes the rig address must be changed due to address conflicts, especially when the rig data box is connected to a computer network (LAN).

The address must first be changed in the instrument EB 02.14-X, the amplifier box. Instructions on how to do this can be found in **chapter 1.4**. As a second step, the new instrument address must then be set in the application.

In the *Hardware Configuration* view, right-click on the desired rig item and select *Change Address* to open the Change Address window. Enter the new rig address and click *OK*.





9.2.5 Connect *(Re-connect a rig)*

If the rig data acquisition box gets powered down or loses network connection, the application will disconnect the rigs from this data box or device.

To re-establish connection, the user must initiate the connect sequence for each rig. This can be done in the *Configuration* view (upper field).

First, make sure the data acquisition box is powered and the data communication is working.

Protocols supported by the EC 05 Relaxation are:

TCP/IP-/WAGO/Vision350 – Make sure the data cable is plugged in correctly. If the data box/PLC is connected to a LAN, make sure the LAN is not blocking the IP number for this data box/PLC.

RS232-/SERAD/Mitutoyo/Shinko – Make sure the data cable is plugged in correctly.

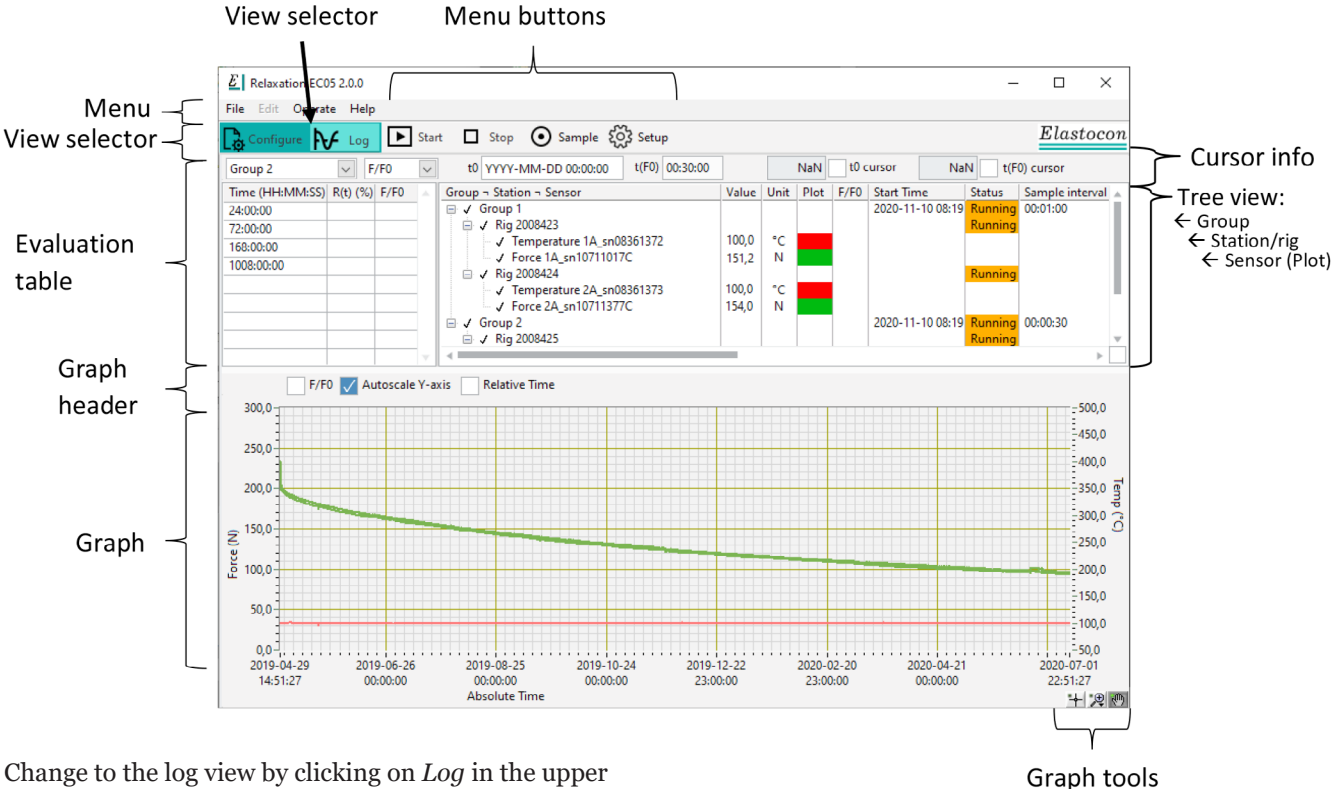
If the data acquisition box/device uses this RS232 interface protocol, make sure the RS232 port is not used by another service, device or application on the computer with the EC 05 *Relaxation* application.

If the data box/device uses ethernet, the IP-address on the PC must be on the same subnet as the data box (i.e. differing only on the last group in the IP-address, e.g. 192.168.10.xx). If the PC is connected directly to the data box, the IP-address of the network card in the PC shall have a fixed IP-address set.

If the IP-address is ever changed on the Wago data box, be sure to mark up the data box with the new IP-address on the box itself, since the Wago configuration software using Ethernet will only work when the exact IP-address is known.

In the *Configuration* view, right-click on any rig item in the *Hardware Configuration* field and select *Connect*. The application will search for hardware changes on the selected rig. If the rig data acquisition box is powered and has communication, it will respond by changing the status to *Connected*.

9.3 *Log* View



Change to the log view by clicking on *Log* in the upper left corner of the Relaxation application window.

The *Log* view is where you will configure and monitor the measurement logging.

When the application is launched, the previous user configuration will be loaded and is ready to be used, but if a user configuration has not been created it needs to be created (**see chapter 9.2.2**).

Before starting a test, the group or groups that you want to perform a measurement on needs to be set up for the measurement (**see chapter 9.3.2**).

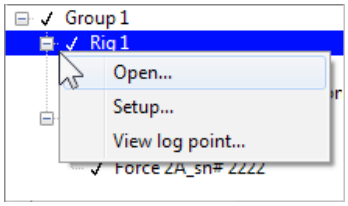
9.3.1 Adjusting zero

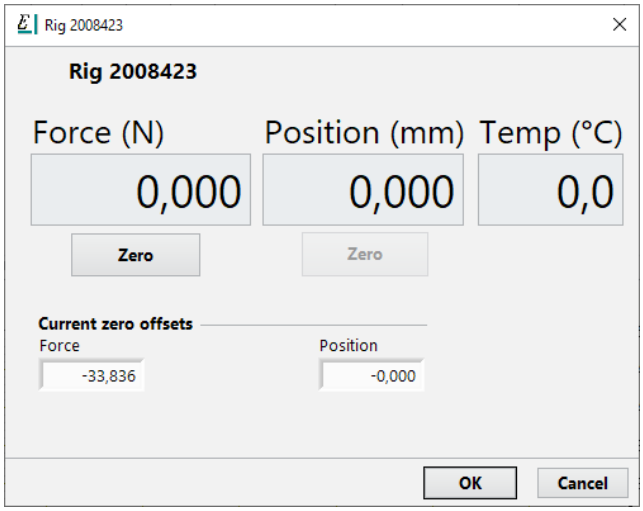
The force sensors are possible to tare. The tare function will set the sensor to zero.

Apply the zero function

1. Right-click on each rig and choose *Open*.
2. If the sensor is a load cell, make sure that the sensor is physically unloaded.
3. In the *Station View*, click *Zero* under the indicator for *Force (N)*. The value should switch to 0,0.

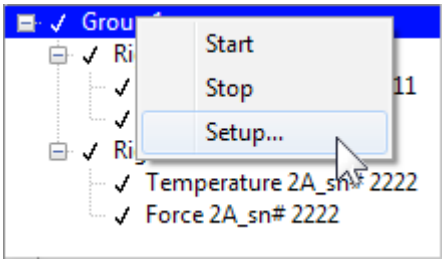
   If a digital position indicator is attached to the user configuration, the *Zero* button for this will be enabled. It is now possible to adjust the zero position.
4. Click on the *OK* button to apply the changes.





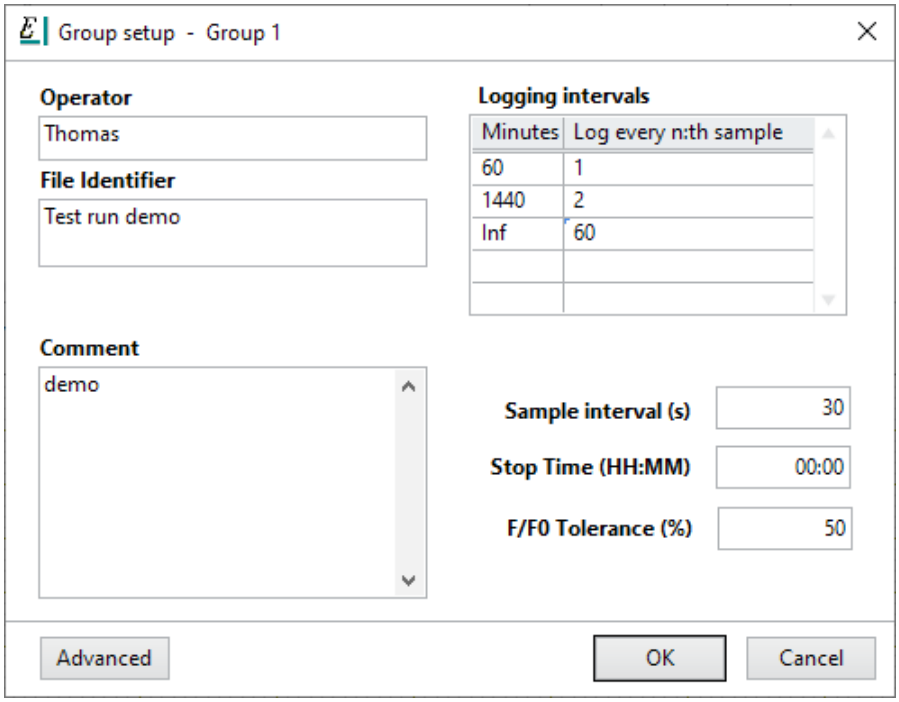
9.3.2 Setup

Each group and the group's included rigs need to be set up before a measurement can be started.



Setup Group

Right-click on the *Group* and select *Setup*... A window for the *Group Setup* will appear.



Group setup window displaying recommended logging intervals and sample interval.

Group setup

1. Enter an *Operator* name.
2. Enter a *File Identifier*. The file identifier will be used as file name for the result file.

   The application will automatically add the log start date and time to the given file name at log start.
3. Optionally enter comments in the *Comment* field.

4. Specify *Logging interval(s)*

a. Enter a sample interval. The recommended value is 30 seconds. This value will set the base frequency on how often the logger can record the data.

b. In the *Logging intervals* table, type in the first value in minutes.

This is the time from log start.

c. In the next column *Log every n:th sample*, type in how frequently the log should record data based on the *Sample Interval*.

That is, with a value of 1, from start and 60 minutes ahead, the logger will record data every Log interval (30 seconds)

d. Continue to add rows with *Minutes* and *Log every n:th sample*.

e. The last row in this table must be set as Inf (infinite).

Minutes	Log every n:th sample
60	

Minutes	Log every n:th sample
60	1

Minutes	Log every n:th sample
60	1
1440	2
Inf	60

The example table is the recommended settings and will:

- Record data every 30 seconds from log start and 60 minutes ahead.
- After 60 minutes record data every minute (*Log every n:th sample* 2 x *Sample interval* 30 = 60 seconds/60 = 1 minute for the next 24 hours (1440 minutes)).
- After 24 hours record data every 30 minutes (*Log every n:th sample* 60 x *Sample interval* 30 = 1800 seconds/60 = 30 minutes).
  The logger will record with this last interval for as long as the log is running.

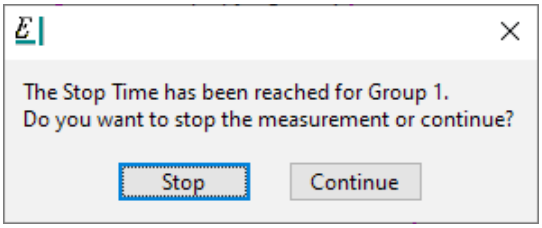
Important!

Setting up the table correctly will allow for more frequent log points when it is needed.

The beginning of a test is where the test changes the most. With this setup the user will keep the file at a reasonable size. Logging very often on many rigs for a long time can produce very large files which also will take longer to process during calculations.

5. Enter a stop time in hours and minutes. When the stop condition is met during the test time, a dialog will pop up with information that this time has been reached. However, the log will continue to record data until the user stops the test. The value 00:00 in this input box will disable the stop function.

   If a stop time is specified, the user will be notified when the stop time is reached.



6. Type in an *F/F0 tolerance (%)*. The value is specified as change from *F0*. E.g. a value of 10 means a change of 10 % since F0.

   If the value is set to 50, a dialog will pop-up with information that the F/F0 is reduced by 50 %, when F/F0 is equal or higher than 50 %.

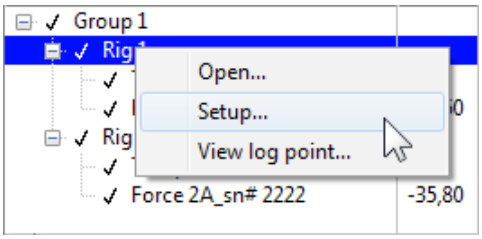
   Set to 100 will trigger the dialog when the F/F0 is reduced by 100 % (No counter force left in the material). It is recommended to set this value to 50.

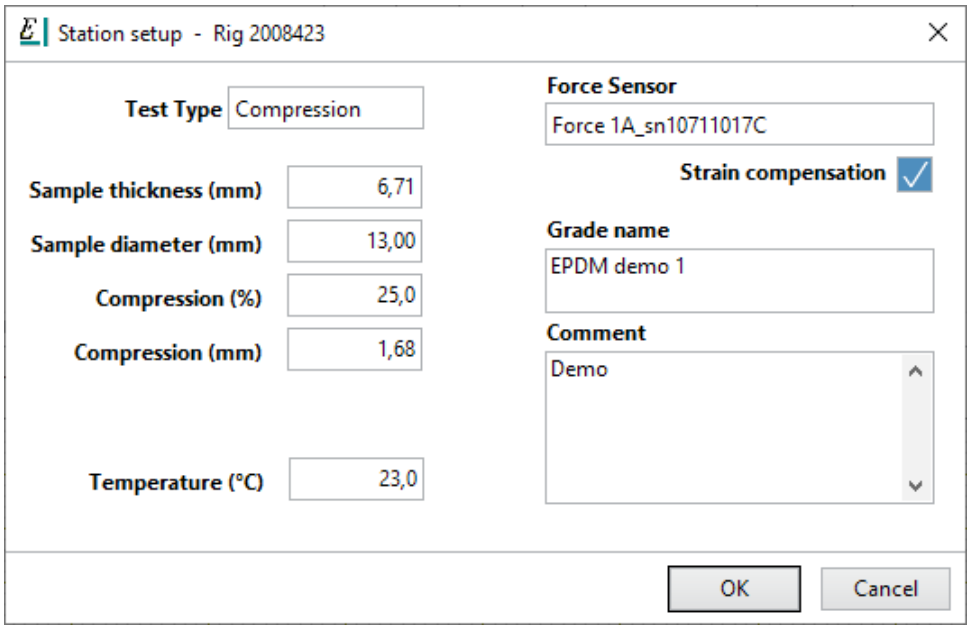
7. Tick the box *Strain Compensation* to use a calculated force compensation for the load cell deflection.

Setup Rigs

1. Right-click on the first rig in a group and choose *Setup…*

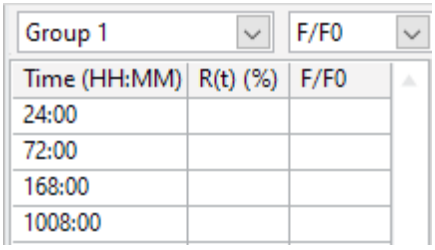
   The *Station Setup* window will appear for the selected rig





2. Select *Test Type* tension or compression.
3. Enter the sample dimension.
   a. The measured thickness in mm before the mechanical conditioning.
   b. Sample diameter (mm) is information and is not used.
4. Enter the % compression needed for the test.
5. Compression (mm). The value calculated by the application is information about how much the sample should be compressed.
6. Force Sensor, please double check that the correct load cell is chosen.
7. Enter a grade name, e.g. material name/number, batch number etc. This information will be visible on the report.
8. Optionally, add a comment in the *Comment* field.
10. Go back to point 2 and repeat 2 to 7 for every rig in the group.

9.3.3 Evaluation points



The table for evaluation points can be found in the upper left field of the *Log* view.

Each group has its own list of evaluation points. To view evaluation points for a group, select the group in the drop-down list above the evaluation point table, or select the group in the tree view to the right of the evaluation points table.

The table's calculated values R(t) and F/F0 will be updated with values in real-time as the log continues to record.

The table is be stored in the test file together with the group and will be read in the Relaxation Viewer application.

Recorded points for this table are the relaxation in percent (R(t)) and F/F0. These evaluation points are median values from all rigs in this group.

The evaluation point times will be used as default values for that group the next time the application is started, if the group has started.

It is possible to add, modify and remove evaluation points after the test has started. Whenever a change is made to this table, the evaluation point values will be recalculated. To delete a point, select the time field data and press Delete. Add points by writing a time-value (HH:MM) in a new row in the *Time* column. To only specify hours, the format *HH::* is also possible.

9.3.4 Start

Conditioning prior to test start

According to the ISO test standard the samples shall be conditioned before the test. This is described in the standards. A summary of this text for ISO 6914 test in tension should be to condition the samples for a minimum of 3 hours at standard laboratory temperature before testing, kept out of light and without contact with other test materials with different compositions.

A summary of the conditioning text for ISO 3384 test in compression is that the test pieces should undergo both a thermal and mechanical conditioning prior to test start. The thermal conditioning consists of heating the test pieces to 70 °C for 3 hours with possibility to rest not less than 16 hours and not more than 48 hours at standard laboratory temperature prior to mechanical conditioning.

Remember to measure the thickness of the samples before the mechanical conditioning.

The mechanical conditioning shall be at standard laboratory temperature and consists of compressing the test pieces to the same compression that will be used during the test (often 25 %) immediately release them to zero stress, this repeated for a total of 5 cycles of deformation and immediately return. Let the test pieces rest at standard laboratory temperature no less than 16 hours and no more than 48 hours prior to test start.

The mechanical conditioning improves the test reproducibility, especially for compounds with a considerable amount of filler, it is not always suitable for finished products.

When testing according to other standards, check the valid standard for the correct procedure.

Test start

You will find a simplified step by step instruction, named as User Guide, in the last pages of this manual.

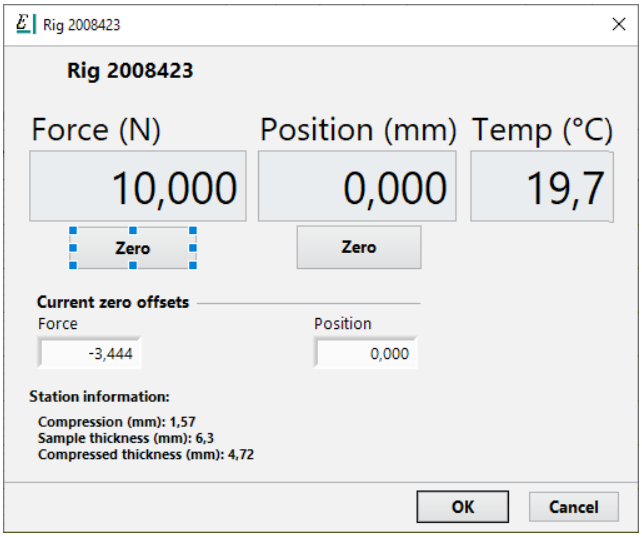
1. Place the rigs in the oven to preheat them. This minimizes the temperature drop when inserting the rig with the sample mounted and will shorten the time needed to stabilize the temperature before test start.

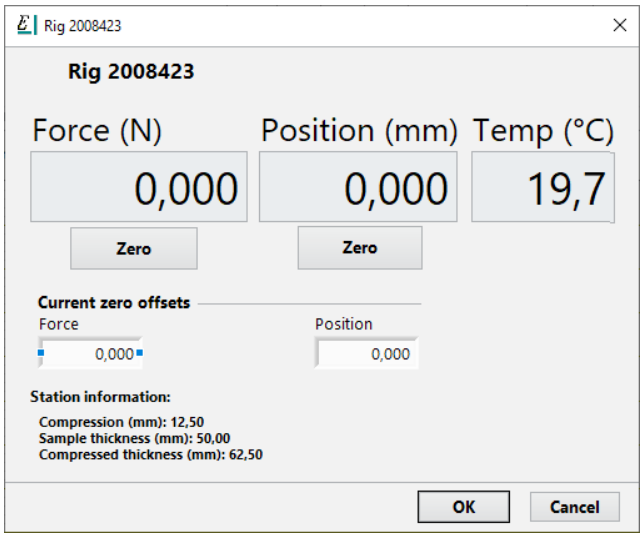
   Note: When working with the rigs here after they might be hot so use protection gloves.

2. Zero the rigs.

   a. Choose a rig in the Log view, right click on it and choose *Open*. Look at the window that opens and make sure that you have the correct rig opened. Also note that some station information is available in the lower left of the station window.

   b. For **compression**: Check that the dial gauge is zero when the platens are together (with approximately 10 N force applied) and zero the position. Then raise the upper platen a couple of mm and go back down 0,5–1 mm approximately, then you zero the force. Make sure that the platens are NOT closed when you zero the force.





c. For **tension**: Set the free distance between the clamps to 50 mm, make sure you turn the clamp first up and are in a down motion when you reach the 50 mm, use a 50 mm gauge block to set the distance, zero the position and the force.

3. Mounting the samples

a. For **compression**, lubricate the sample contact surface on the upper and lower compression platens with suitable lubricant according to ISO 3384, alternatively lubricate the sample itself. Load the test pieces in centre of the platens in the rig, add a small pre-load of approximately 10 N to make sure it stays in place. Put the rig back into the cell oven again to stabilize the temperature.

b. For **tension**, we recommend a test piece that is 22 mm longer than the test length entered in the test set-up, which is total test piece length of 72 mm for a 50 mm free distance length as above.

Turn the rig clockwise until the distance between the tension clamps is about 49 mm. One full turn on the screw corresponds to 1 mm of displacement.

The reason why it is recommended to reduce the distance with 1 mm is that a 1 mm thick test piece will expand a bit when it's clamped.

In tension, change F0 to 5 min.

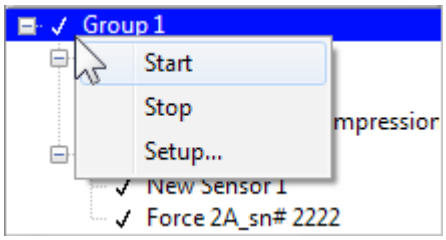
Mount the test piece in the clamps. Insert the test strip in both clamps until the test piece reached the bottom of the clamps. That is 11 mm in each end of the test piece should be inserted in each clamp.

When the test piece is clamped, turn the rig screw one turn anti-clockwise to go back to the 50 mm free distance between the clamps.

Put the rig inside the cell oven again to allow the temperature to stabilize.

4. Starting the test

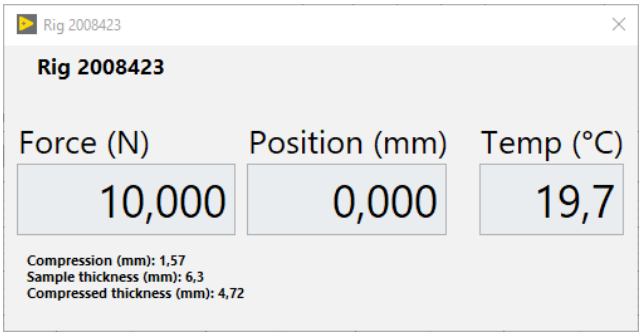
a. To start the test in **compression**:



i. Right click on the group and select *Start*.

ii. Right click on the rig and open the window again by choosing *Open*. In this station view window you find information about the compression and the total compressed thickness.

These values are good to have when compressing the sample, you can see on the gauge on the rig that you compressed until the right value (for info about the gauge, please look at **chapter 2.1.4**). Compress your sample according to your standard.



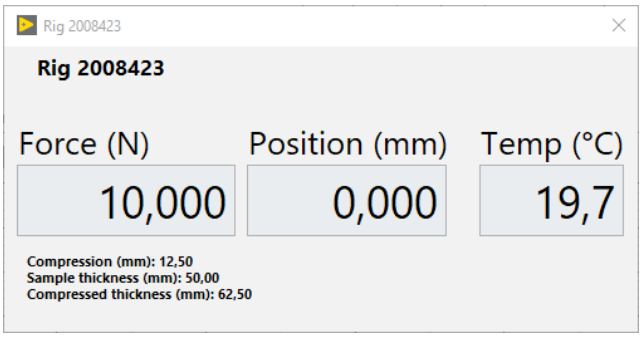
b. To start the test in **tension**:

   i. Right click on the group and select *Start*.

   ii. Right click on the rig and open the window again by choosing *Open*. In this station view window you find information about the tension in mm.

   You elongate the test piece by turning the rig screw anti-clockwise until the distance between the tension clamps has stretched out the test piece to the given elongation in the window for each rig.

   One full turn on the screw corresponds to 1 mm of displacement.

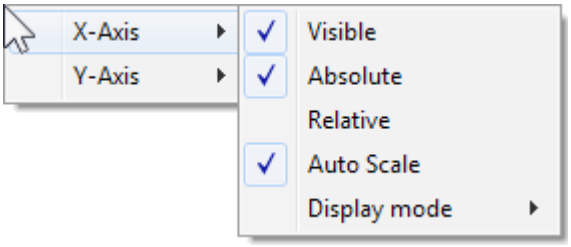


The test is now running and recorded data points will be plotted on the graph. The graphs setting can be changed and the size can be adjusted by dragging the split bar between configuration and graph windows.

Change graph settings

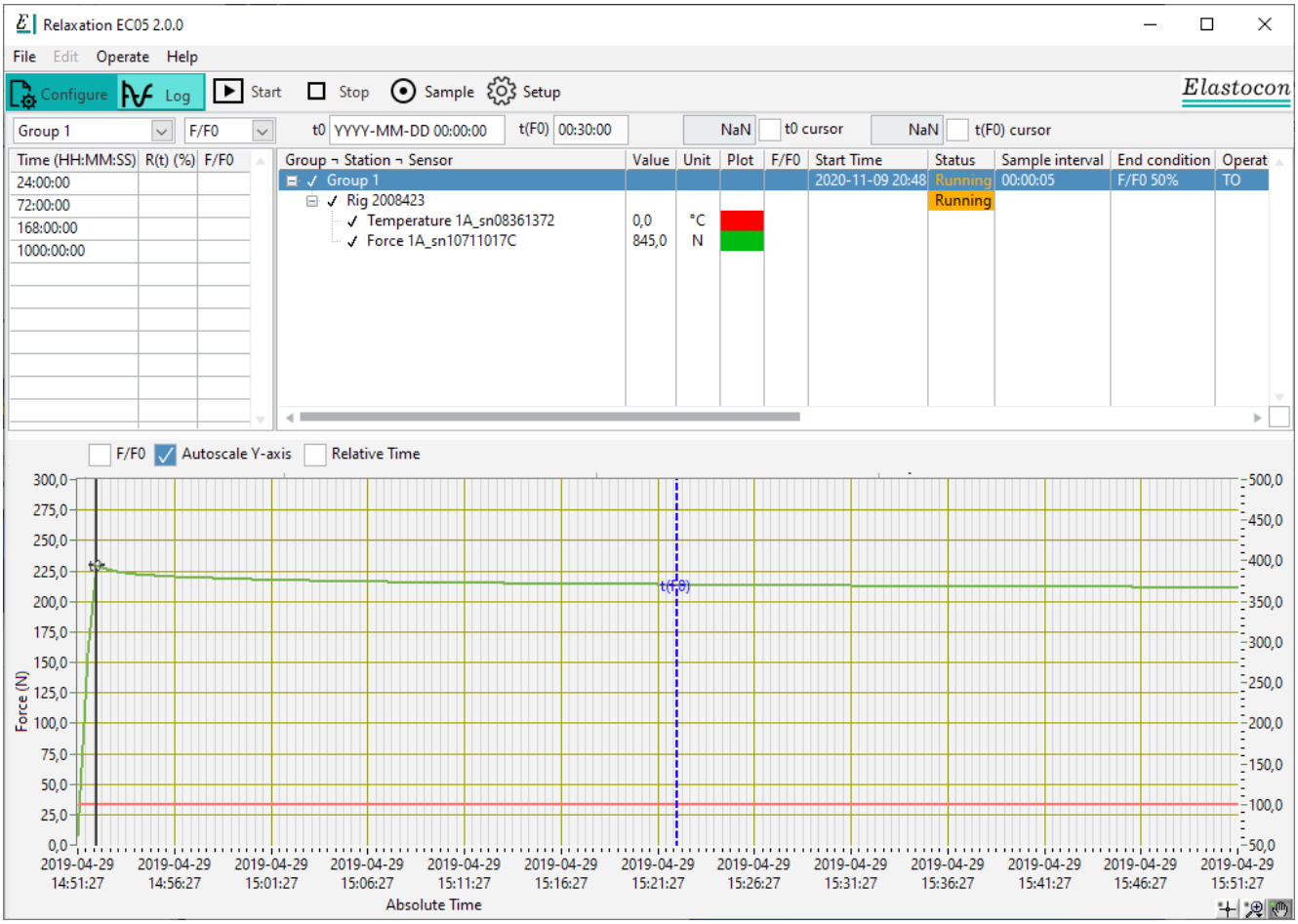
To change plot colour, left-click the coloured cell for the sensor in the *Plot* column to show the colour selector. To change the line width, right-click the coloured cell for the sensor in the *Plot* column to show the line properties menu.

Right-click in the graph, to access all visual settings for the X and Y-axis.



9.3.4.1 Calculate F/F0

The t0 and the t(F0) must be set before the application can automatically calculate F/F0 (relative force).



1. Click on a rig item
2. Untick the *Relative Time* tick box to set the graph time to absolute time.

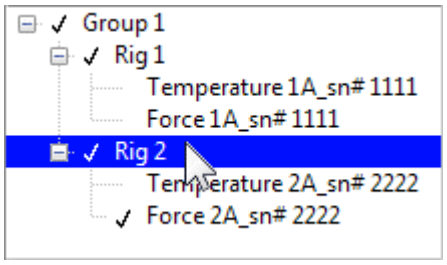
   

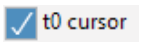
3. Tick *t0 cursor* to enable the t0 cursor for this rig. The t0 is the time for the maximum compression or tension force reached at start. The value can be set either by entering a time in the t0 indicator or by dragging and releasing the black t0 cursor to the wanted time.

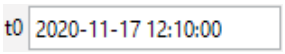
   Make sure to set the t0 cursor to the point of the maximum force at start.

   The black t0 cursor is found on the y-axis to the left in the graph.

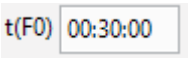
   Make sure to highlight the corresponding rig and not any other rig or group.







4. T(F0) is the time for the initial force and is according to standard. 30 minutes is set as default, which correlates to compression test. For tension test, change this time to 5 min.



5. Tick the box *F/F0* in the graph to show the relaxation curves as F/F0. The relative force F/F0 will now be calculated automatically and shown in the graph.

9.3.4.2 Add an extra log point

When the log is running, it is possible to add an extra log point at any time.

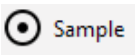
The extra log point can be useful when the user wants to take control of an extra precise log point at time critical situation.

An example of this could be to record a special treatment during the test at a specific time.

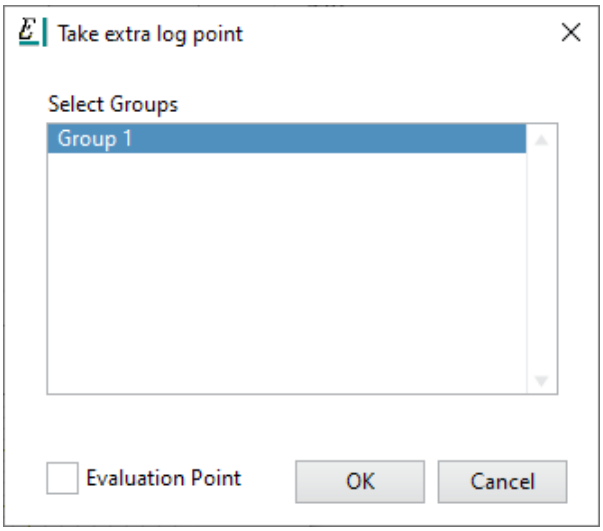
The user can choose to add extra log point as just an extra log point or as an evaluation point. An evaluation point will be shown on the report printout.

Add an extra log point

1. When the log is running, click *Sample* (main menu button).



2. Choose one group to add the extra log point to.
3. Tick the box *Evaluation Point*, if the extra log point shall be added as an evaluation point.
4. Click *OK*



9.3.4.3 Re-start after log interruption *(power failure etc.)*

If the software has been re-started after a power failure or system re-boot, the application will wait for the user to act, before the log can be resumed.

> **Note:** If the user decided to stop an ongoing log, it cannot be resumed. The stop log command will stop the ongoing logger with test file permanently.

After such an interruption the application will connect to all listed instruments but will not continue to log.

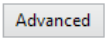
A shortcut to the application can be placed in the Windows start-up folder for selected users or all users.

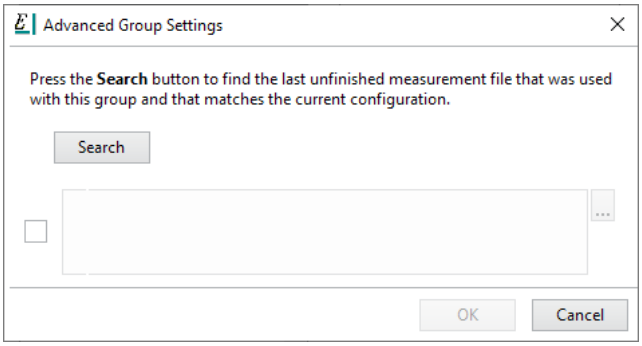
Re-start a log

1. Double click on the icon for relaxation to launch the application. The application will start up in the configuration view.
2. Go to the *Log* view and right-click on any group that needs to be re-started and select *Setup...*
3. Click on *Advanced*.
4. In the advanced group settings, click *Search*.
5. Highlight the file to resume and click *OK*.

   A green light indicator *File OK to continue on* will display to indicate if the file can be resumed.
6. Check the group settings in the group setup window and click *OK*.

   Right-click on the group and select *Start*.





9.3.4.4 Stop logging

To stop logging of a group, select the group and click on *Stop*, or right click on the group and select *Stop*. Stopping a log is definite and the log cannot be restored to be in an unstopped state, so only stop the test once you are certain that the measurement is finished.

If the logging has been stopped due to an end condition (F/F0 or stop time), the force value presented in the tree view will have red background and will stop updating until a new measurement has been started on a group again.

9.4. Log File Viewer

The log file viewer is installed as a separate application. Double-click the *Relaxation Viewer* shortcut on the desktop to run the application.

The Relaxation Viewer is used to view, analyse, print and export log data from both ongoing and finished log files. When a log file is opened, the current data in it will be presented.

9.4.1 Getting help

A brief tip will be displayed for things you hover over in the application. To display the context help window, which will display more information, press *CTRL+H* or go to the *Help* menu and click on *Show Context help*. This window will display more information on things you hover over in the application. To close the context help window, click on the X in the upper right corner of the window.

9.4.2 Access log files

By default, the log files are stored on the local computer at *C:\Elastocon data\Relaxation data*. These files must be backed up regularly in case of e.g. a drive failure or accidental deletion. A suggested way of backing up is to copy it to a network storage, from where users only wanting to view the log data can access and open the files.

Another possibility to reach the files from another PC would be to make the test result data folder shared. However, this is not recommended since there is a risk that currently logging files are interfered with (accidental deletion, locking of files etc.).

If the log files are copied manually from the result file folder to e.g. a USB, make sure you copy them and do not move or cut the selection of files.

9.4.3 View log file data

To open a file, click *Open*, or press *CTRL+O* or open the *File* menu and select *Open*. The default log file folder will be pre-selected in the open-file dialog. Select one or more files to open and click OK. The file(s) will open and display its properties in the upper part of the application window, the tree view, and display the data in the graph in the lower part of the window. The application looks much like the log view in the Relaxation application but has some differences.

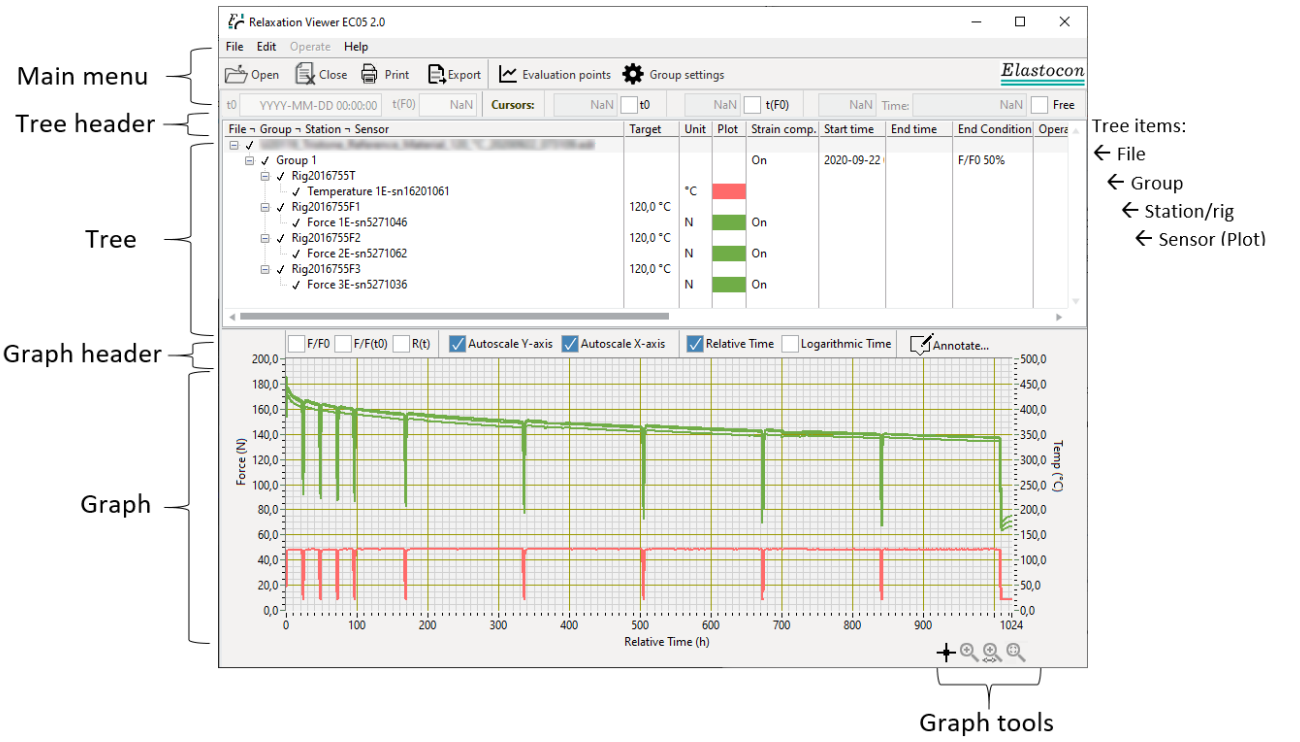
Actively logging files will not update data in the viewer application on already opened files. Just close and open the file again to update the data.

To close a file, select the file, or any item within a file, and click *Close* or press *CTRL+W*, or open the *File* menu and click *Close*. Multiple files can be selected and closed at once. If only one file is opened that file will be closed regardless of what is selected when closing.

9.4.5 Compare log file data

Open more files. Every opened file will be displayed in the graph. Force plots will be coloured differently for each opened file. Temperature plots will all be opened with different shades of red.

Close files you are not interested or choose not to display them by clicking on the tick to the left of the file name in the tree.



9.4.6 Select visible plots

When multiple files are opened, choose not to view anything but the plots you want to compare, to make it easier to read the graph. Do this by clicking the tick to the left of anything in the tree that is not of interest. Items (files, groups, stations, sensors/plots) that are not ticked will not be displayed in the graph. When the selection is changed, the graph will autoscale once to adapt to the visible data.

9.4.7 View information

The tree header displays information for the selected item in the tree.

- If a **file** or **group** is selected, t0 and t(F0) are available and will display values if all stations in that group have the same value. If values are different, *NaN* will be displayed.
- If a **station** (rig) is selected, t0 and t(F0) for that station is displayed, and its cursor values.
- If a **sensor** is selected, its cursor values will be displayed and the containing station's t0 and t(F0).

The tree displays information about the measurement file, group, station (rig) and sensor.

- The ***Target*** column displays the target temperature as specified in the station settings.
- The ***Unit*** column displays the unit for the sensor.
- The ***End time*** column displays the last measurement time for the test. If this field is empty for a group, it means the measurement is not finished.
- The ***End Condition*** column displays the condition to when the measurement shall stop, if there is a condition set. And end condition can be a specified stop time or F/F0 level, or both.
- The following columns ***Operator***, ***Grade name***, ***Test type*** and ***Comment*** displays the information as specified in the group settings for the group.

9.4.8 View cursors

There are three different cursors that can be activated. Tick the box for the cursor that shall be visible. The value of the cursor is displayed next to the cursor tick box. The unit of the values are the same as the unit of the corresponding graph axis.

t0 displays the location of t0 for the item selected in the tree. The cursor can be moved by dragging it to the desired location (see section *Change t0*). If the selected item is a group or file, the value will only be displayed if t0 is the same for all stations in that group.

t(F0) displays the location of t(F0). The location of t(F0) is determined by t0 and t(F0). To change t(F0), see section *Change t(F0)*.

Free cursor displays the value of the currently selected sensor (Force, Temperature). The cursor can be moved by dragging it. When another sensor is selected, the cursor will move to the nearest log point. The value will have the same unit as the graph displays. E.g., if a force plot is selected and F/F0 is active, the F/F0 value is displayed in the cursor indicator. The time value is also in the same unit as the graph time scale.

9.4.9 Move cursors

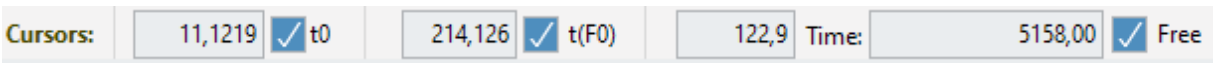
To move cursors, the cursor tool needs to be active. It is active by default, but if you have used a zoom tool, you need to activate the cursor tool again by clicking on it in the graph tools below the graph.

Cursor tool

9.4.10 Set graph time mode

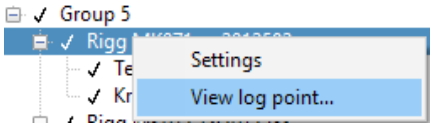
The graph time will by default be set to relative time. t0 is then time=0 on the graph. Untick *Relative time* to switch to absolute time mode.

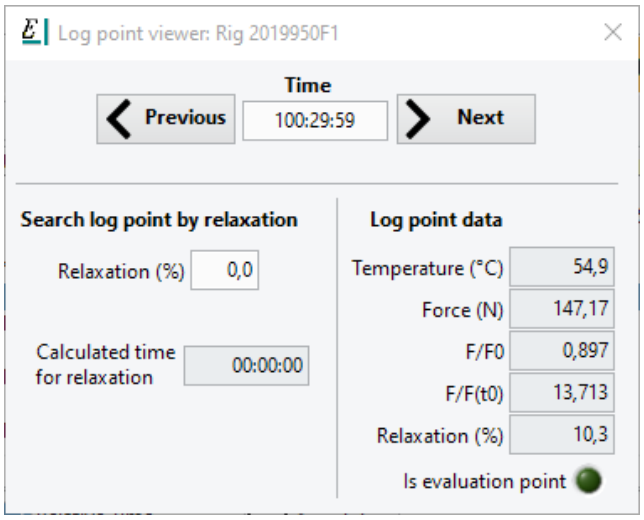
When switching between relative and absolute time, the x-scale will autoscale once, since it is not known for which t0 to relate to when switching.



9.4.11 View log data details

The details of a log point can be examined. Right-click a station and select *View log point*. To view a specific log point, either enter a time or click the left or right arrow to step through log points. If a time is selected, the nearest log point will be displayed, and the time will be adjusted to the time for that log point.





To quickly scroll through log points, select either the seconds part of *Time* (e.g. by clicking on the seconds part) or select all figures in Time (e.g. by double-clicking on the time data) and scroll using the mouse wheel, which will step through log points.

9.4.12 Find Relaxation

The time for a specified level of relaxation can be found using the log point viewer. Open it by right-clicking a station and select *View log point*. Enter the desired relaxation level and press enter to display the calculated relaxation time and the nearest log point details.

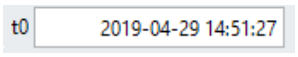
9.4.13 Lifetime estimation

Use the log point viewer to find relaxation (see section *Find Relaxation*) to search for the desired levels of relaxation and use those values and the corresponding time to plot an Arrhenius plot. Elastocon provides a separate application, *Arrhenius Plot*, for plotting and evaluating Arrhenius plots.

9.4.14 Change t0

When opening a file, t0 is automatically calculated (new feature in Viewer 2.0). But it is possible to manually change t0.

To change t0 for all stations in a group, click on a group or file to select it and change the time in the t0 indicator. The time must be in the same format as displayed in the indicator, so the easiest way to get that right is to only select and change the part you need to change. Press *Enter* to apply the change or click outside of the time control.

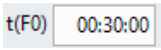


To change t0 for one station, select that station in the tree and change the time in the same way as for a group, or enable the t0 cursor by ticking the box t0 above the tree and drag the t0 cursor in the graph to the desired location.

The effect of the changed t0 will be visible as soon as t0 is changed. The change will affect all displayed data using t0, such as the graph, report, export and evaluation points table. The updated t0 will not be saved to the log file.

9.4.15 Change t(F0)

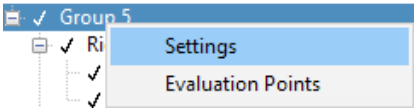
To change t(F0) for all stations in a group, click on a group to select it and change the time in the t(F0) control. Press *Enter* to apply the change or click outside of the t(F0) control. The updated t(F0) will not be saved to the log file.



To change t(F0) for one station, select that station in the tree and change the time in the same way as for a group. Press *Enter* to apply the change or click outside of the t(F0) control.

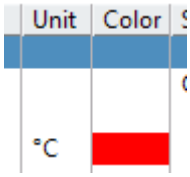
9.4.16 Edit information

Some group and station information can be edited. This can be convenient e.g. if the log file was run with incorrect information. The changed information will appear in the printed report. The updated information will not be saved to the log file. Right-click a group or station and click *Settings* to open the settings window for that item. Editable fields have white background. Non editable fields have grey background and will not accept data you enter. Click *OK* to accept the changes and close the settings window. The updated settings will immediately be displayed in the tree.



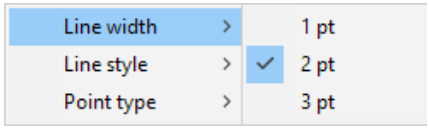
9.4.17 Change plot colour

To change colour on a plot, click on the coloured field in the *Colour* column for a sensor/plot to bring up the colour selector menu. Click on a colour in the selector to set that colour for the plot you clicked on.



9.4.18 Change plot thickness and style

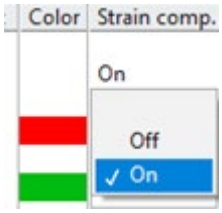
To change thickness or style on a plot, right-click on the coloured field in the *Colour* column for a sensor/plot to bring up the plot style menu. Click on a setting to enable it.



9.4.19 Turn strain compensation off

Strain compensation is by default included in the displayed data, if the sensor that acquired the data supports it and strain compensation was active when logging was performed. Strain compensation is supported by all sensors that have a strain compensation value in the calibration data for the sensor, which has been the default for years when delivering rigs from Elastocon. Contact Elastocon if you have an old calibration and wish to compensate for strain.

To display data without strain compensation, click the *On* value in the *Strain comp.* column for the group or station you want to turn off strain compensation for, and change to *Off*. The effects will immediately show in the graph. Strain compensation can sometimes have little impact so to see the difference you may need to zoom in when you toggle strain compensation. When stations in a group have different settings for strain compensation, the field for strain compensation for the group will display empty, but the selector for the group is still accessible and can be used to set all to on or off.



9.4.20 View calculated force values

Force can be displayed as F/F0, F/F(t0) or R(t) by ticking the respective box above the graph.

F/F0 will display all force plot values divided by the force at F0.

F/F(t0***)*** will display all force plot values divided by the force at t0. When F/F(t0) is active, only the data between t0 and F0 will be displayed.

R(t) will display all force plot values as relaxation values ((1-(F/F0))*100).

When F/F0 or F/F(t0) is enabled, Autoscale for the Y-axis will be turned off and the force scale will be set to be from 0 to 1. To see values above 1, just tick Autoscale Y-axis to autoscale and see the data.

When R(t) is enabled, Autoscale for the Y-axis will be turned off and the force scale will be set to be from 0 to 100 %.

When F/F0, R(t) or F/F(t0) is disabled, autoscaling will be enabled and performed on both X- and Y-axis to adapt to the complete data set.

When F/F(t0) is enabled, cursors for t0 and F0 are not displayed.

9.4.21 Zoom

There are several ways of selecting what timeframe or value range to view. The easiest is to use the zoom functions, which are accessible from the graph tools below the graph. Select from the following images to zoom in or out.


Zooms in an area of the graph. Click and drag a selection in the graph to zoom.


Zooms in an area of the graph on the x-axis. Click and drag a selection in the graph to zoom.


Zooms in or out to autoscale the graph.


Selects the cursor tool to enable moving cursors by dragging them. Selects the cursor tool to enable moving cursors by dragging them.

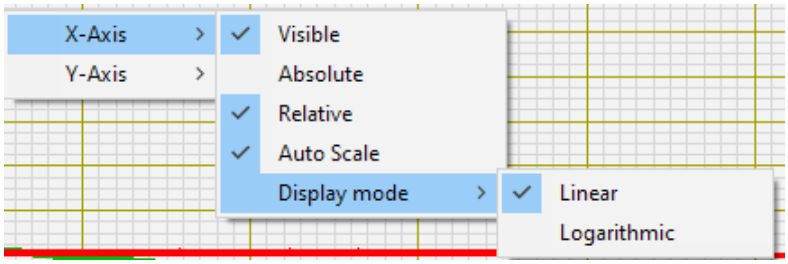
9.4.22 Set scale range

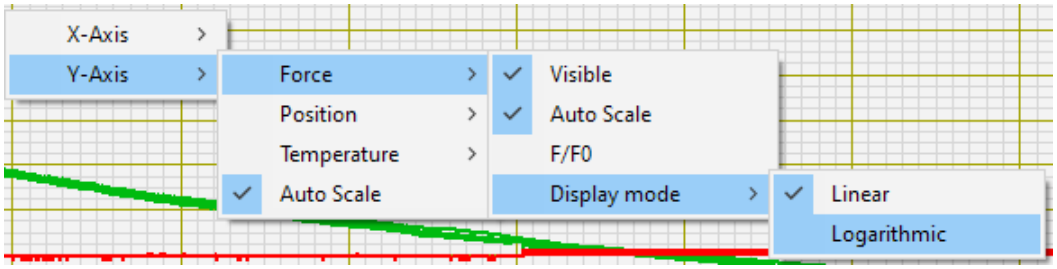
The scale range can be manually set by clicking on either of the scale's maximum or minimum value and changing that value to the desired maximum/minimum for that scale. For scales other than absolute time, it is also possible to enter the max/min scale value as SI-prefixes, e.g. *1M*, or scientific notation, e.g. *1e6*. When editing absolute time min/max range, the easiest is to just change the part you need to change by selecting it, since the format of the time needs to be correct to be accepted.

9.4.23 Setup graph axis

The X-axis can be set to logarithmic scale by ticking *Logarithmic time* above the graph. The default time scale minimum is 0,1 h to accommodate most common t(F0) values, but you may want to change the scale minimum value to match what is displayed (see *Set Scale Range*).

By right-clicking the graph area, you will access a number of graph axis settings, e.g. auto scaling and logarithmic scale.





If you disable (untick) a Y-scale, the scale will not be displayed, and no values for that scale will be displayed.

9.4.24 View evaluation points

The evaluation points for a selected item can be viewed by clicking on *Evaluation points* or by right-clicking on a group and selecting *Evaluation points*, which will open a window with a table and graph of the evaluation points for that group. If no item is selected and only one file is opened, that group's evaluation points will open. If nothing is selected and multiple files are opened, the evaluation point window will not open.

9.4.25 Editing evaluation points

To add an evaluation point, open the evaluation point viewer (see *View evaluation points*), scroll to the end of the table and add a new time entry in an empty field. The time value needs to include the colon separating hours and minutes for the value to be accepted and both hours and minutes needs to be specified.

If the visible part of the table is filled with data, instead click the plus sign ⊞ to the left of the lower left corner of the table to add a new point. A new point with the same time as the one last in the table will be added.

To remove an evaluation point, click the minus sign ⊟ to the left of the selected entry.

To modify the time for an evaluation point, select that time entry and modify the time by entering a new time, or by selecting either the hours or minutes and changing that part of the time entry.

The evaluation point table will be recalculated when any information in the table is changed.

The evaluation times will be sorted as soon as any change affects that data. Duplicate evaluation points are not automatically removed since you may want to change the values and may have entered a duplicate value that would then disappear. Values can be changed by selecting a value and using the keyboard arrows or mouse scroll wheel. If you change a value, the value will be unselected if the change causes a resort of the evaluation times, so you do not accidentally continue to change another value.

9.4.26 Evaluate by R(t) or F/F0

To calculate a time for a specific R(t) or F/F0, open the evaluation point viewer (see *View evaluation points*) and modify the specific entry of either a R(t)- or F/F0-value. The time-value will be updated from it. The time that matches the specified value will be used for time and R(t) and F/F0 will be calculated from it. The resulting calculated F/F0- or R(t) value can differ slightly to what was specified since the time is calculated from a mean time for the relaxation for each station in the group (and the median relaxation for the group is then calculated for that mean time).

9.4.27 Evaluate according to ISO 3384 Method B

To use temperature as evaluation point, open the evaluation point viewer (see *View evaluation points*) and tick *ISO 3384 Method B*. The default temperature and tolerance for ISO 3384 are already specified but can be changed by modifying the temperature at which the evaluation points shall be calculated from in *Target*, and the maximum difference from the specified temperature at which to evaluate in *Tolerance*. An evaluation point will be set at every time the temperature criteria is fulfilled, at the last point before the temperature changes. If the test data ends at the target temperature, an evaluation point will be set at the median offset time used for all other temperature evaluation points.

9.4.28 Save and recall evaluation settings

To save the evaluation settings to an evaluation point specification file, open the evaluation point viewer (see *View evaluation points*), click *Save* and choose a file name and location to save the file to. Click *Open* to open a previously saved file and populate the settings from that file into the evaluation point viewer. The evaluation points will immediately be recalculated based on the loaded file's evaluation settings. Use this feature to reuse common evaluation points and to be able to compare files that do not have the same evaluation points specified in its log data file. Just load the evaluation specification file for each Relaxation log data file you wish to compare. When printing, the evaluation points will then be the same and the median value for those files will be calculated. The edited evaluation points will not be saved to the log file.

9.4.29 Add annotations

Annotations can be used e.g. to label a group of plots or to highlight an occurrence of interest in the graph. Annotations will be visible in the printed report but will not be saved to the log file. To create annotations in the graph, click *Annotate* above the graph. Click *Add* in the window that opens, type in your annotation, click *OK*, optionally choose the size of the annotation (small, medium or large) and click *OK*. In the graph you can click and drag your annotation to place it. Keep the annotation short since all text in the same annotation will be on one line. Annotations can also be moved around in the print preview window. Open the annotation window to edit, delete, change size on or add more annotations. To edit an annotation, click *Annotations…* and double-click on its name in the Annotations window.

9.4.30 Autoscale

The application will by default autoscale both time and value (X and Y). To disable autoscale, untick either *Autoscale Y-axis* or *Autoscale X-axis*. These tick-boxes are available above the graph. Autoscale is turned off if scale is set manually by zooming or setting a scale range manually (See section *Set scale range*).

9.4.31 Print report

Press *CTRL+P* or go to the file menu and select Print to open the print preview window.

There are two types of reports, and a dialog will ask which type you want: *Table & Graph* or *Graph only*.

1. ***Table & Graph:*** Prints a table of evaluation points, a graph, and details about the tests for the items you have selected in the tree. A total of three stations can be printed. If more stations are selected to be printed, the three first selected stations will be used. Add to the selection by holding *CTRL* pressed while clicking.
2. ***Graph Only:*** Prints a graph as displayed on the graph, regardless of what is selected.

For both report types, only enabled/ticked stations' plots will be visible. So, if you untick a station but tick a sensor plot in that station, that plot will not be visible in the report.

The graph in the report will be set up in the same way as the main window's graph is set up. So, if you want to display the report using log scale, F/F0 or use a specific plot point style, just set it up on the main window's graph and then open the print preview.

In the print preview window, the report header can be changed by simply clicking on and editing the header text.

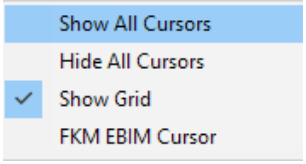
Click *Print* to print the report. Windows' default printer dialog will open. If you need to print to a PDF, newer version of Windows usually has that pre-installed as a printer, or a PDF printer can be installed. If you need to print to an image file, PDF viewers often have the ability to print the PDF as an image. It is also possible to install a virtual picture printer to print to an image file.

Click *Save as image* to save the report as an image file.

The name of the plots will be displayed on the graph with cursors attached to the plot. The plots are named with grade name and rig name, and filename if multiple files are in the report. These cursors can be moved freely, and the names can also be moved independently of the cursors. The cursors and names can also be hidden by right-clicking on the graph and untick the plot you don't want to display the cursor and name for, or by clicking *Hide all cursors*. A cursor name can be changed by double-clicking on the name.

The name(s) of the file(s) can be edited.

To hide the graph scale grid, right-click on the graph and click on *Show grid* to untick it.



Report header details

- **File(s):** Displays the file(s) name(s) the report data originates from. A maximum of three files will be listed. If more than three files are used, the first selected three will be listed.
- **RP(F0):** Physical relaxation between t0 and F0.
- **Stop time:** Time since start until end condition, if a specified end condition has been met. If the end condition has not been met, the total test time is reported.

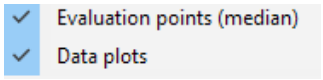
The evaluation point table in *Table & Graph* will include up to 10 evaluation points. If there are more points, the 10 points will be picked evenly distributed from the evaluation points list by index (not by time).

9.4.32 Display evaluation plot in report

Enable *F/F0 or R(t)* in the main window's graph and select to print as explained in the section *Print report*. *Table & Graph* will now display a plot for the evaluation points. Hide the evaluation plot by unticking *Plot evaluation points* or by unticking *Evaluation points (median)* in the graph's right-click menu.

To hide all plots but the evaluation data, right-click on the graph and untick *Data plots*.

To hide the evaluation data, right-click on the graph and untick *Evaluation points (median)*.



The *Graph only* report can also display a plot for evaluation data. Enable it by ticking *Plot evaluation points* or by ticking *Evaluation points (median)* in the graph's right-click menu. The evaluation data is a median per evaluation point of all displayed plots, and all evaluation points for all plots will be used in the evaluation plot. The plots do not even have to be of the same length (time), but evaluation data will only be plotted for points where all plots have data.

9.4.33 Export data

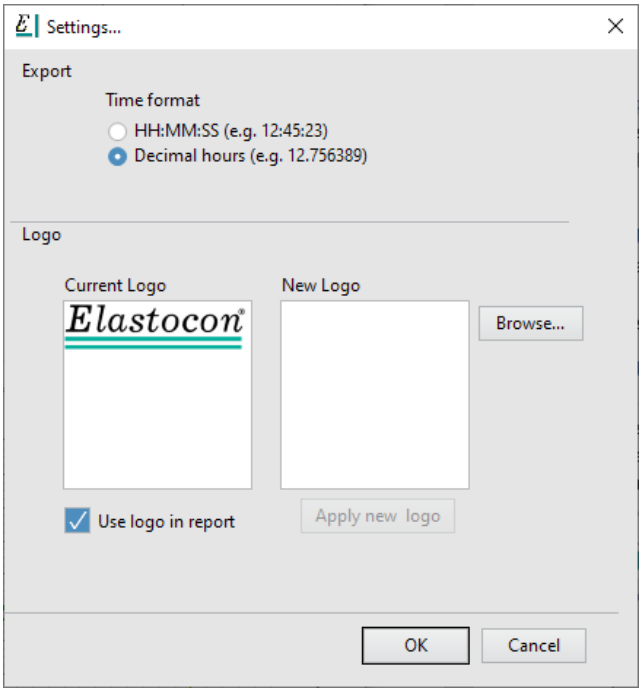
Click *Export* or press *CTRL+E* or go to the file menu and select *Export* to export the currently selected item(s)' file(s). If no item is selected and only one file is open, that file will be used for the export. If nothing is selected and multiple files are opened, nothing will be exported. A text file will be created for each log file with all the log file data and calculated F/F0, and you will be prompted where to save the file(s) and to name them. The file name is already suggested using the logfile's file name. The exported file can easily be imported into e.g. Excel or database systems.

9.4.34 Set export time format

The time format of the export can be either in HH:MM:SS (e.g. 12:45:30), or in decimal hours (e.g. 12.4567). To change this setting, press *CTRL+I* or go to the *Edit* menu and select *Settings*.... Click on the desired time format and click *OK* to apply.

9.4.35 Set report logo

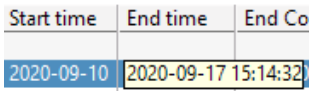
To set a logo to be printed in the upper right corner of the report, open the settings window by pressing *CTRL+I* or go to the *Edit* menu and select *Settings*.... Click *Browse* and select a picture file to use as logo. The picture size must be at most 125×125 pixels. The logo will display in the *New logo* frame so you can preview it and compare it to the current logo. Click *Apply new logo* to use the new logo.



To have the logo show in the report, make sure that *Use logo in report* is ticked. Click *OK* to apply the settings.

9.4.36 Tips

- To see more or less of the tree or graph, drag the splitter between the tree and graph.
- The application supports standard Windows inputs like e.g. *Shift/CTRL* and click to select multiple items, arrow keys to move cursor or selection, and combining *Shift/CTRL* with arrow-keys to select word(s) or parts of data.
- The mouse scroll wheel can be used to increment or decrement selected values.
  - When a numeric value is selected, the digit to the left of the location of the cursor will change when scrolling.
  - When a time value is selected, the selected part will increment/decrement.
  - Some controls have a minimum step size, so positioning the cursor to a less significant digit will still increment by the minimum step size.
- Press Escape to close a dialog or window, cancelling any change.
- An exported file can simply be dragged from Window's file explorer into Excel to be imported correctly.
- If a text is longer than the column width in the tree view, hover over an item to display the complete text in a tip strip:



9.4.37 Troubleshooting

Symptom

Temperature data displays 850 °C and force displays 4,3 N.

Probable cause

A file that contains a station that has been run but was not connected during the measurement will display values at the end of the range for the sensor. For a standard temperature sensor, the temperature will then display 850 °C and force will display about 4 N.

Solution

Either create a user configuration in which that station is not included or to have the station connected even if it is not used.

Symptom

Too many evaluation points for ISO Method B.

Probable cause

The specified temperature is not at the actual temperature used in the measurement, or the temperature was not stable during measurement.

Solution

Change the target temperature to the correct temperature or adjust the tolerance.

Symptom

The F/F0 values are off by a lot compared to expected values when evaluation using ISO Method B is used.

Probable cause

The measurement was not started at the target temperature (default 23 °C) or t(F0) is set at a time where the temperature is not at the target temperature.

Solution

Make sure t(F0) is at a time where the temperature has not changed since t0. Start the measurement at target temperature.

9.5 Calibration procedure

The procedure is the same regardless if no measurements are running, if another rig than that of the logging groups shall be calibrated, or if an actively logging rig is to be calibrated. There are more advanced ways of performing the calibration, but this describes a basic procedure which Elastocon recommends for most users.

1. Exit the application without stopping the ongoing measurements, by either closing the application window, pressing *CTRL+Q* or going to the file menu and selecting *Exit*. (Advanced users may want to keep the application opened, but it is not described here how that would affect the procedure.)
2. From the HWConfig application, open C:\ProgramData\Elastocon\Relaxation EC05\Stations\StationsConfig.tvc.

   NB! Do not open the file using "Load as template...". If you have, do not save it. This is an advanced feature that normal users shall not use, and which will make it impossible to continue any running measurements.

3. Perform the calibrations for temperature and force:

   In the main view of the HW Config application, in the tree view containing the configuration, select the line with the sensor you want to calibrate. Click on *Live adjustment* to display the A/D and output value of the sensor. Read the sensor output value for your selected calibration points, and if needed change the value in the adjustment table. It is possible to change either the A/D value or the corresponding sensor value until the A/D and sensor values are what you want. Typical acceptable deviation limits are normally 1 °C for temperature and 1 % relative error for force.

   The adjustment table values should always span the range for which you shall use the sensors. There is no built-in warning if the sensor is used outside of its calibrated range, and the resulting values will be extrapolated from the calibrated values, so the accuracy cannot be determined if used outside the adjustment table range.

   There are more advanced calibrations and settings that can be made from the HW Config application, but these should only be performed by a calibration technician trained by Elastocon.

4. Save the file. Replace the same file. Do not save as a new file.

5. Run the Relaxation application. The new calibration data is now loaded, and the newly calibrated rigs can be used.

6. Continue any running measurements (see section 9.3.4.3).

   NB! If there are ongoing measurements, do not change the user configuration for those groups during this procedure, since the ongoing measurements requires the user configuration for that group to be the same as when it was started. If there are ongoing measurements, do not load another user configuration file using *Load to Log*, since that may also make it so that measurement cannot be resumed.

10. Step by step instructions for running a stress relaxation test

Note: Always follow the standard applicable, these instructions are only guidance.

1. If applicable, perform the thermal conditioning, measure the thickness of the test pieces, and perform the mechanical conditioning according to the applicable test standard.
2. Start the oven and adjust the temperature, both for the cells and the hood.
3. Start the Relaxation application. If you already have a user configuration for the rig setup, click on the *Log* tab in the upper left corner of the application window. If you do not have a user configuration, create and save the configuration you want to use, and click *Load to Log*. Remember, the calculations will be performed as a median value for the whole group. You can have a maximum of 3 rigs/group, and the report prints maximum 3 rigs in the same report.
4. Put the clean rig in the cell for pre-heating and connect it to the amplifier box.
5. Choose Log view, right click on the rig and select *Setup*.
   a. Make sure the correct test method is chosen, compression or tension.
   b. Fill in the data about the sample.
   c. Fill in the grade name and if you like to, also a comment.
6. Right click on the group and choose set up.
   a. Enter the operator name or ID if you want to keep track of who performed the test.
   b. File identifier – this will be a part of the file name together with the date.
   c. Comments: optional, could be e.g. temperature, environment, batch number etc.
   d. Logging intervals: the default means, that for the first 30 (or recommended) 60 minutes the logging will take place every (1) time unit that is chosen in sample interval (s) e.g. 30 seconds. This means that logging will take place twice every minute. After 30 (or 60) minutes and until 1440 minutes from start (24 hours) the logging will take place every 2nd this time unit takes place (that is, one time each minute) and for Infinitive every 60th time unit, that is once every 30 minutes. If you log too often the file will be very big.
   e. Stop time: If you want to set a stop time for the test. E.g. one week is 168 hours. 0 = never stop.
   f. Set a value for F/F0 tolerance if you want to display a dialog box when the F/F0 value is reached for all stations in this group, allowing the user to stop or continue. A value of 100 means that there is no counterforce.
7. Click *OK*. In the log view, fill in evaluation points.
8. When the rig is preheated, adjust the temperature of the **hood**, and choose a temperature 2 degrees lower than it shows without the cooling activated.
9. Right click on the rig and select *Open*.
10. Zero the rigs:
    a. For **compression**: Check that the dial gauge is zero when the platens are together (with approximately 10 N force applied) and zero the position. Then raise the upper platen a couple of mm and go back down 0,5–1 mm approximately, then you zero the force.
    b. For **tension**: Set the free distance between the clamps to 50 mm, make sure you turn the clamp first up and are in a down motion when you reach the 50 mm, zero the position and the force.
11. Remove the rig from the cell in the oven. (**Hint:** Try to keep the rig inside the oven as much as possible to remain most of the heat. You save a lot of time this way.)
12. Mounting the sample:
    a. For **compression**: Lubricate the sample. Place the sample in middle of the platen, add a small preload of approximately 10 N to the sample. Place the rig back in the cell oven.
    b. For **tension**: Turn the screw 1 revolution downwards to make the free distance 49 mm while mounting your samples. Clamp the sample securely in both the upper and lower clamp, make sure you place the sample against the bottom of each clamp. Raise the upper rig 1 mm/1 full turn/resolution with the screw. Now your sample should be straight and not dented. Place the rig back in the cell oven.

13. When the temperature is correct/stabilized, right click on the group and choose start or use the button at the top of the window to start the test.
14. Open the rig by right clicking on it and choose *Open*, here you can find the values for your compression and elongation. Either compress or stretch the sample, remember that one revolution on the screw is equal to 1 mm in position.
15. Make sure you have marked the correct rig (not group) and click the box for the t0, and drag the line to the right point (or you could write in the exact time in the box).
16. t(F0) is the time for the initial force and according to standard is 30 minutes for compression and 5 minutes for tension. This is set to minimize the physical relaxation on the result.

    The measurement will start after this to ensure you measure the true ageing effect (for tests at room temperature the effects of the physical relaxation can go on for weeks).
17. When the test is finalized, mark the correct group and stop the test in the Log view (either use the stop button or right click on the group and choose stop).

    NB! Only stop groups that for certain shall not run any longer. Stopping a group finalizes the log file and such a file cannot be continued on.

Presentation/Report Presentation view

18. Open *Relaxation Viewer* software, choose *File* and Open those files you like to compare/look at.
19. Check the box for relative time if you like to compare different files.
20. You can change the scales on the axis if you like to, unmark the box automatic scale and just type in new values at the end point of the axis.
21. You can print this, or you can export the data to a text file which can be opened in a spreadsheet software such as Excel or Open Office, if required.

For more information about these steps, please read the corresponding chapter in the manual.

Appendix – What is the load cell strain compensation?

Shortly described, the strain compensation in the load cell is a calculated factor you will get when you measure how much the load cell is compressed (deformation) in µm at maximum force. This is the load cells normal working area and without this the load cell would not be able to function. The factor you receive is then recalculated to mm/Newton.

A typical deformation of the load cells for Elastocons relaxation rigs is 0,00055 mm/N. This may sound like a very small deviation, but during an actual measurement this can cause differences in tens of N, depending on start force and how big/quick the decreasing of the force is during the test. The load cell's strain compensation value will not change for a load cell during normal usage. Only if the load cell is overloaded or dropped (e.g. on the floor) and have a permanent deformation (plastic deformation) but still works, it may be relevant to make a new measurement for the strain compensation.

What happens during a measurement is that the load cell length is extended when your material is relaxing (chemical and mechanical/physical). You can say that the load cell to some extent is compensating for the relaxation in your material and you will get a better result for your material compared to the reality.

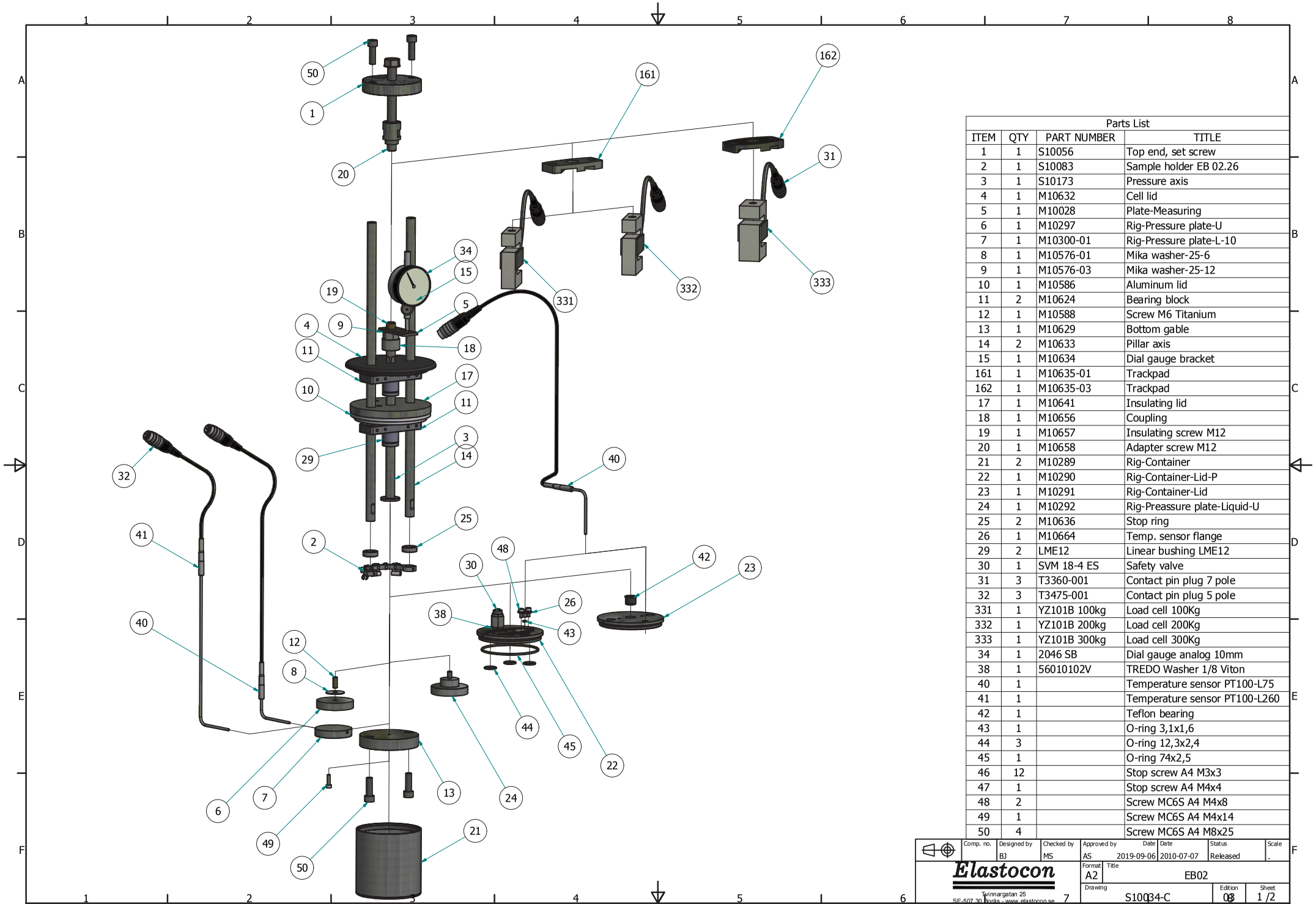
To avoid the influence from the load cell on your test result, choose to use the load cell strain compensation when the software asks you.

In the software, both for an opened measuring file and for export or print outs the current status about strain compensation will show, that is, if it is used or not.

The strain compensation is always on in the logging view in the software. But in the presentation view it is possible to choose a view with or without the strain compensation.

Appendix – Drawings EB02 and EB 02TE

Following pages.



Parts List			
ITEM	QTY	PART NUMBER	TITLE
1	1	S10056	Top end, set screw
2	1	S10083	Sample holder EB 02.26
3	1	S10173	Pressure axis
4	1	M10632	Cell lid
5	1	M10028	Plate-Measuring
6	1	M10297	Rig-Pressure plate-U
7	1	M10300-01	Rig-Pressure plate-L-10
8	1	M10576-01	Mika washer-25-6
9	1	M10576-03	Mika washer-25-12
10	1	M10586	Aluminum lid
11	2	M10624	Bearing block
12	1	M10588	Screw M6 Titanium
13	1	M10629	Bottom gable
14	2	M10633	Pillar axis
15	1	M10634	Dial gauge bracket
161	1	M10635-01	Trackpad
162	1	M10635-03	Trackpad
17	1	M10641	Insulating lid
18	1	M10656	Coupling
19	1	M10657	Insulating screw M12
20	1	M10658	Adapter screw M12
21	2	M10289	Rig-Container
22	1	M10290	Rig-Container-Lid-P
23	1	M10291	Rig-Container-Lid
24	1	M10292	Rig-Preassure plate-Liquid-U
25	2	M10636	Stop ring
26	1	M10664	Temp. sensor flange
29	2	LME12	Linear bushing LME12
30	1	SVM 18-4 ES	Safety valve
31	3	T3360-001	Contact pin plug 7 pole
32	3	T3475-001	Contact pin plug 5 pole
331	1	YZ101B 100kg	Load cell 100Kg
332	1	YZ101B 200kg	Load cell 200Kg
333	1	YZ101B 300kg	Load cell 300Kg
34	1	2046 SB	Dial gauge analog 10mm
38	1	56010102V	TREDO Washer 1/8 Viton
40	1		Temperature sensor PT100-L75
41	1		Temperature sensor PT100-L260
42	1		Teflon bearing
43	1		O-ring 3,1x1,6
44	3		O-ring 12,3x2,4
45	1		O-ring 74x2,5
46	12		Stop screw A4 M3x3
47	1		Stop screw A4 M4x4
48	2		Screw MC6S A4 M4x8
49	1		Screw MC6S A4 M4x14
50	4		Screw MC6S A4 M8x25

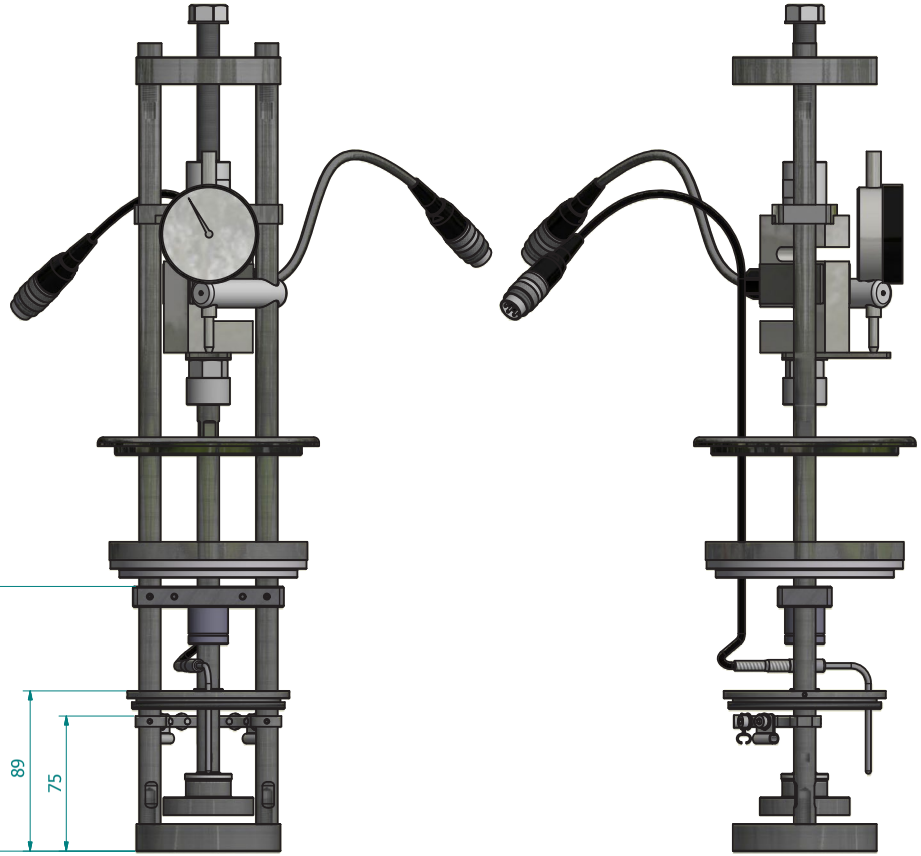
Comp. no.	Designed by	Checked by	Approved by	Date	Date	Status	Scale
	BJ	MS	AS	2019-09-06	2010-07-07	Released	-

Elastocon
Tvinnargatan 25
SE-507 30 Borås - www.elastocon.se

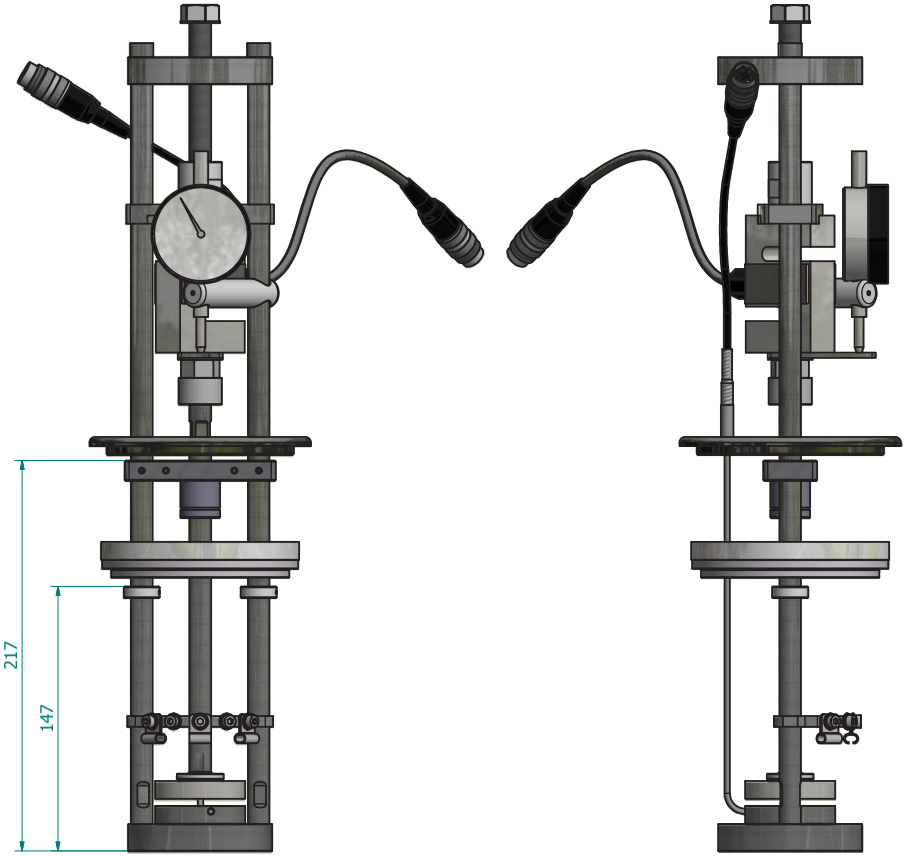
Format: A2 | Title: EB02

Drawing: S10034-C | Edition: 08 | Sheet: 1 /2

EB 02 (1 : 2)



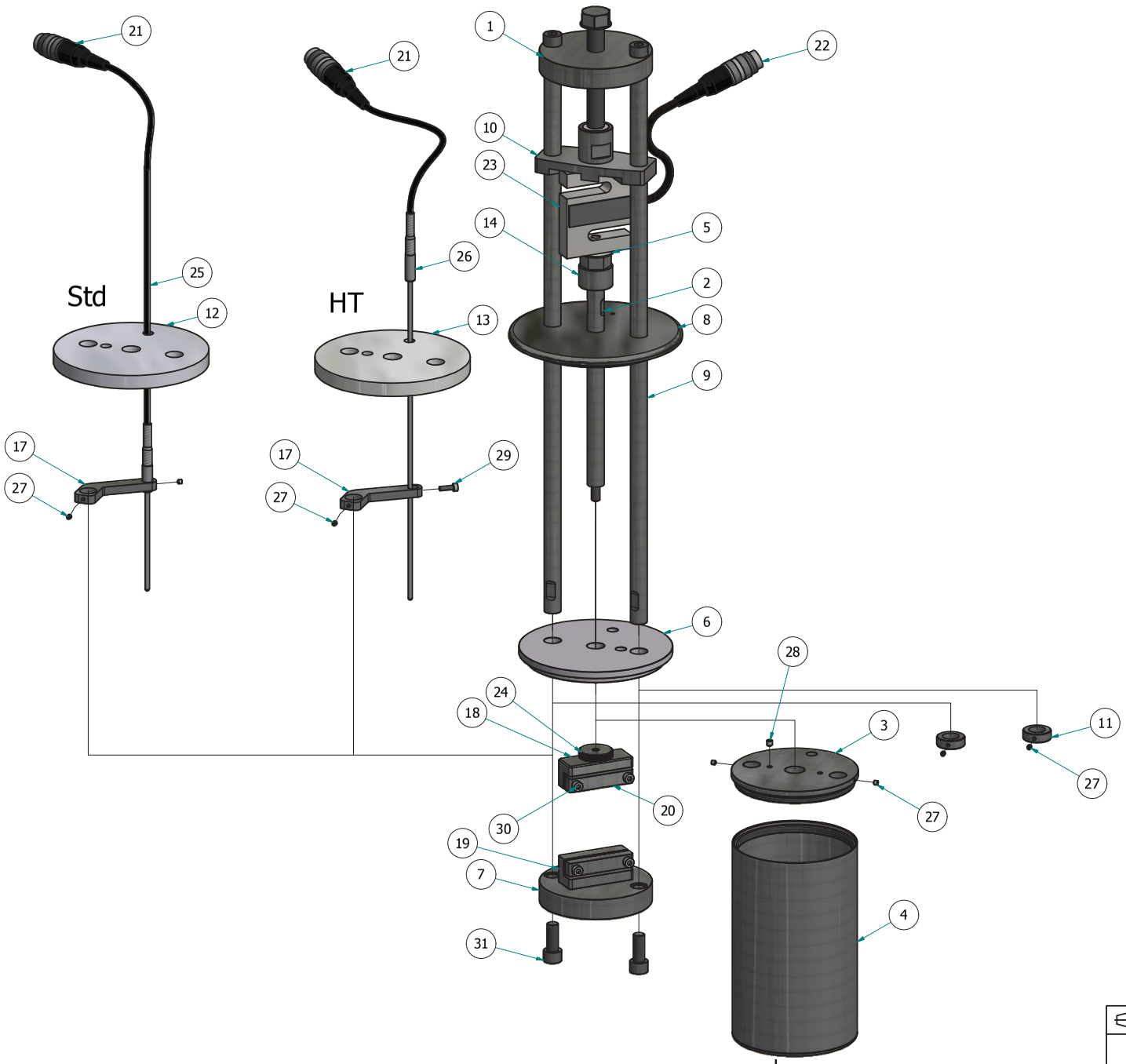
EB 02 HT (1 : 2)



Comp. no.	Designed by	Checked by	Approved by	Date	Date	Status	Scale
	BJ	MS	AS	2019-09-06	2010-07-07	Released	-

Elastocon
Tvinnargatan 25
SE-507 30 Borås - www.elastocon.se

Format	Title		
A2	EB02		
Drawing		Edition	Sheet
S10034-C		03	2 /2



Parts List			
ITEM	QTY	PART NUMBER	Title
1	1	S10056-01	Top end, set screw
2	1	M10082-02	Tension rod
3	1	M10291	Rig-Container-Lid
4	1	M10299	Rig-Container-TE
5	1	M10576-03	Mika washer-25-12
6	1	M10586-01	Aluminum lid
7	1	M10629-01	Bottom gable
8	1	M10632	Cell lid
9	2	M10633	Pillar axis
10	1	M10635-01	Trackpad
11	2	M10636	Stop ring
12	1	M10641-01	Insulating lid
13	1	M10641-02	Insulating lid
14	1	M10656	Coupling
15	1	M10662-01	Adapter screw M8-M12
16	1	M10662-02	Adapter screw M8-M12
17	2	M10663	Temperature sensor bracket
18	1	M10665	Upper tension grip
19	1	M10666	Lower tension grip
20	2	M10667	Tension grip plate
21	2	T3360-001	Contact pin plug 7 pole
22	1	T3475-001	Contact pin plug 5 pole
23	1		Load cell PT4000
24	1		Adjustment nut M6
25	1		Temperature sensor PT100-L75
26	1		Temperature sensor PT100-L260
27	7		Stop screw A4 M3x3
28	2		Stop screw A4 M4x4
29	1		Screw MC6S A4 M3x10
30	5		Screw MC6S A4 M4x16
31	4		Screw MC6S A4 M8x20

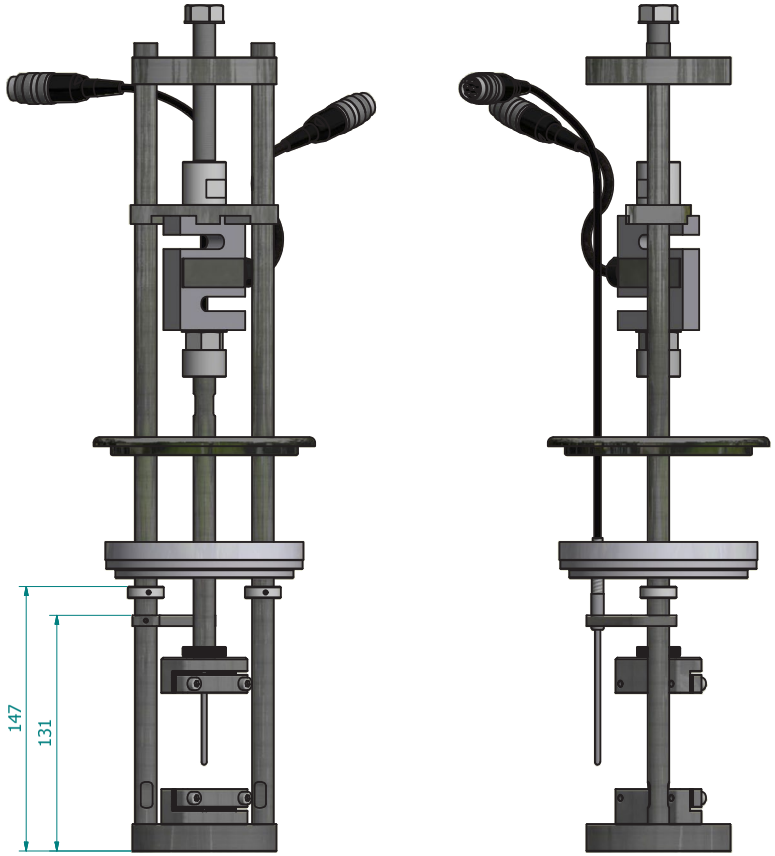
Comp. no.	Designed by	Checked by	Approved by	Date	Date	Status	Scale
	BJ	MS	AS	2019-09-06	2010-07-06	Released	1:2

Elastocon
Tvinnargatan 25
SE-507 30 Borås - www.elastocon.se

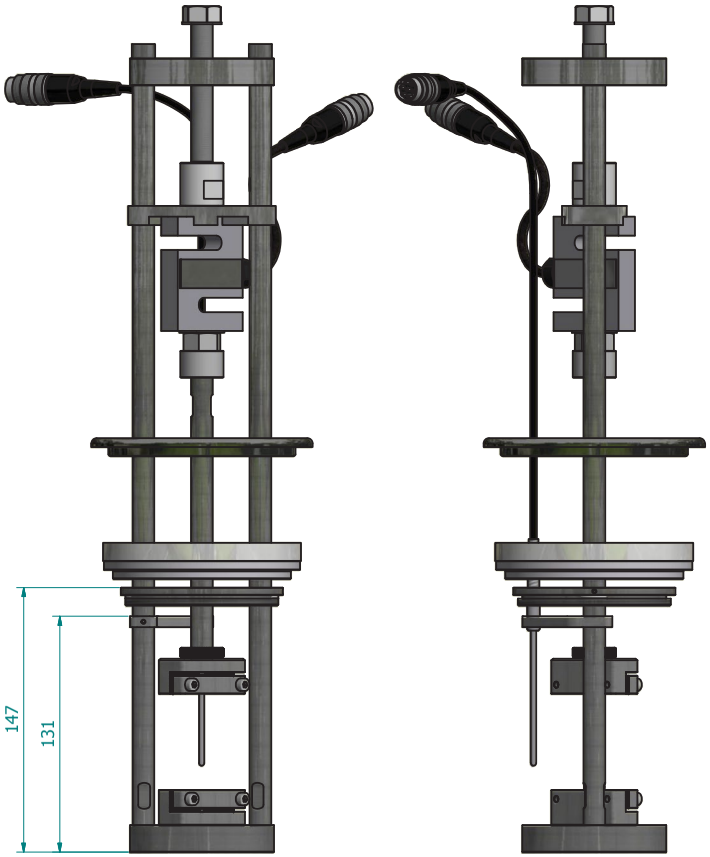
Format	Title
A2	EB 02TE

Drawing	Edition	Sheet
S10012-C	05	1 /2

EB 02TE



EB 02.01 TE



Comp. no.	Designed by	Checked by	Approved by	Date	Date	Status	Scale
	BJ	MS	AS	2019-09-06	2010-07-06	Released	1:2

Elastocon
Tvinnargatan 25
SE-507 30 Borås - www.elastocon.se

Format	Title		
A2	EB 02TE		
Drawing		Edition	Sheet
S10012		05	2 /2

Support

support@elastocon.se
+46 33 323 39 34

Elastocon®

Elastocon AB
Tvinnargatan 25 • SE-507 30 Brämhult • Sweden
Phone: +46 33 323 39 00 • E-mail: info@elastocon.se
www.elastocon.com