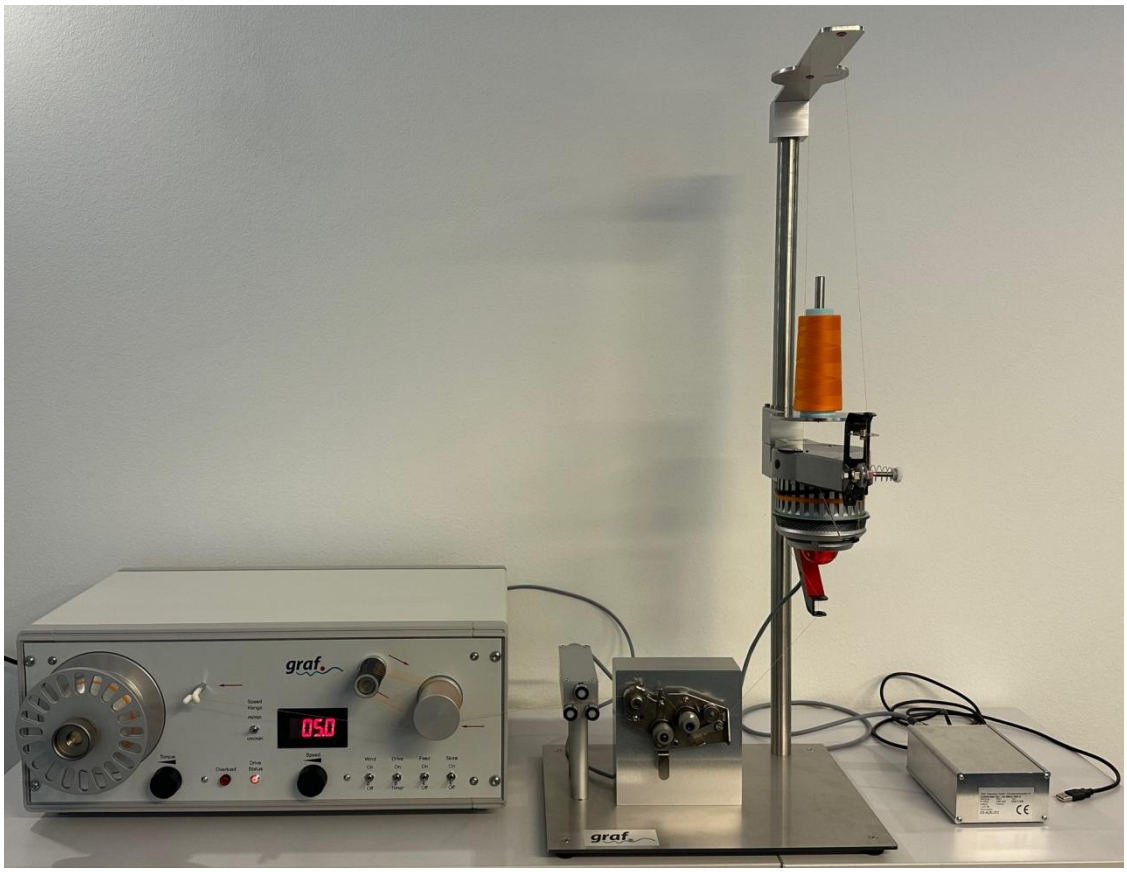
INSTRUCTION MANUAL



Friction Measuring System CPF / CTC

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1. Introduction

Friction measuring device CPF / CTC
Measuring Software Graf Friction Lab 2.9

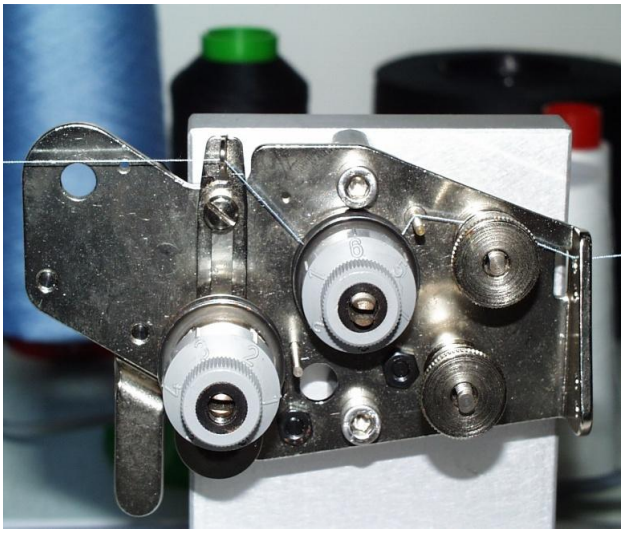
The friction of a sewing thread or embroidery yarn has a decisive influence on the machinability and productivity.

The more uniform the friction of the yarn, also from one batch to another, the more constant the yarn can be processed. A regular low friction avoids hooking and picking of the yarn in the thread guiding devices.

The speciality of the graf fricton measuring device CPF / CTC is the measuring of sewing thread and embroidery yarn. Our philosophy in this item is to imitate the tension device systems of a sewing machine, but to have reproducible conditions, of course, under same climatic conditions. Because of this we use a standard sewing thread tension device (see picture 1) for our CPF friction device. Our CPF-CTC friction device is equipped with a yarn roller tension break (see picture 2).

As a sewing machine makes no constant pull speed, we can measure at different speeds. We can measure, for example, friction at 5m/min and the characteristics of pulling the yarn from a standing position with 5cm/min. It is called “stick-slip”.

A yarn with a bad stick-slip really stops in the tension device and then, when tension is high enough it slips through. Then friction diagram looks like a saw-tooth.



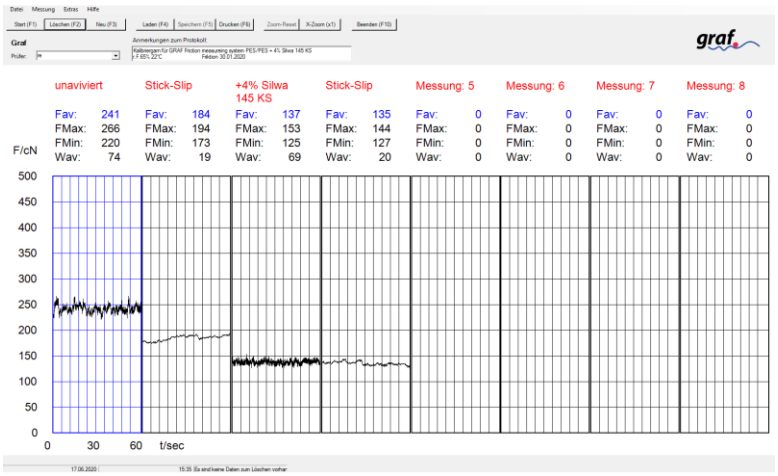
picture 1: Tension device

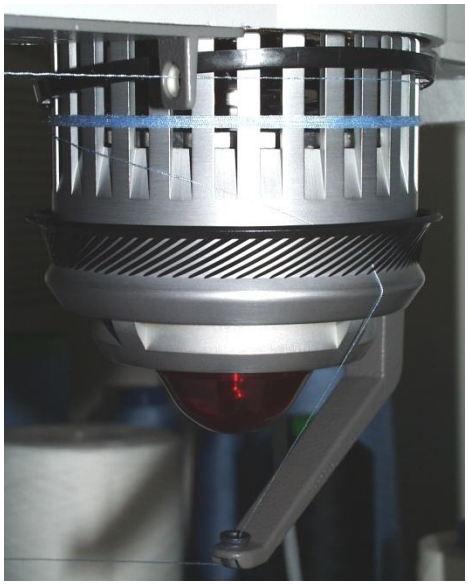
picture 2: Yarn roller tension break

To get same results, with one yarn at different locations, besides same climate, the same settings of the tension device system are necessary. For this, we produce calibration yarn. This specially cleaned and rinsed calibration yarn, which is from one dye lot and lubricated with our lubricant Silwa 145 KS at our SL2 lubrication system, gives a very constant friction, also at different humidity. A consistent level of quality of the calibration yarn is very important, especially if the friction devices are used at different locations.

It is important to set standards for production control.

The friction measuring file can be send easily by E-mail.



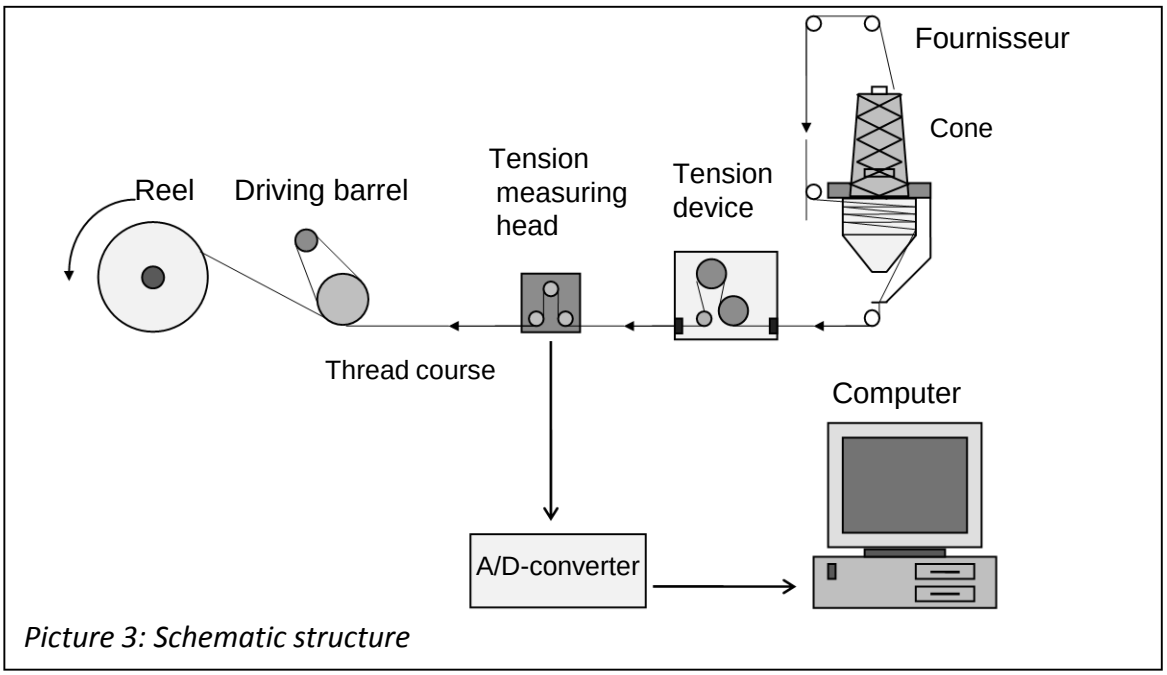


picture 3: Fournisseur

Our friction devices are equipped with a fournisseur (yarn feeder) (see picture 3) to have a constant, nearly free tension at the beginning of the tension device. So only the friction of the yarn and not the quality of the winding is measured. This is also one further point to get more reproducible results.

With this nearly zero tension we avoid using a second tension measuring head.

2. Function and structure of the Measuring device



Picture 3: Schematic structure

1. The thread will pulled off from the cone by the fournisseur. Turning the driving conus (half moon) of the fournisseur the thread stock can be adjusted. After that the thread on the fournisseur can be pulled off with nearly no tension.

2. A driving barrel, where the thread is turned around several times, move the yarn. The barrel is driven through a DC-motor, whose rotation speed can be regulated independent from the load. Because of this the thread can be pulled off with a constant, prescribed speed.

3. After the fournisseur the thread goes through the tension device. The friction, which arises on the thread going through the tension device, results in the necessary tensile force, which pulls the thread with prescribed speed through the yarn brake.

4. This tensile force of the thread is measured in the tension measuring head. The tension measuring head (consist of the DMS[1]-strength-sensor) converts the tensile force in electric voltage, which is directly proportional to the tensile force.

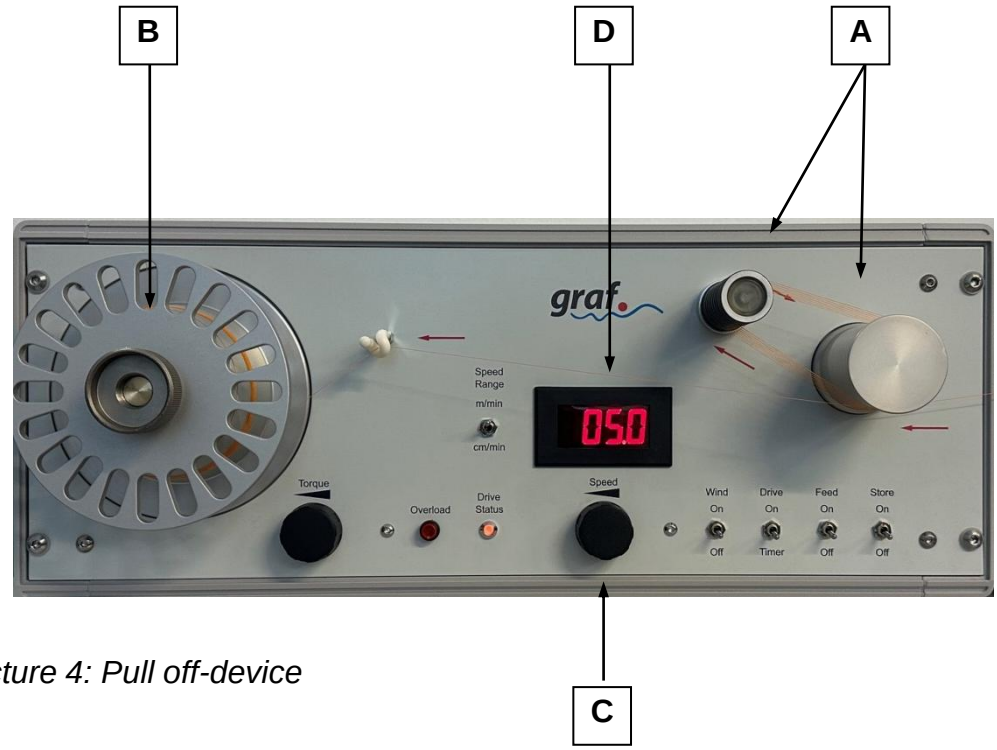
5. The voltage signals from the tension measuring head goes to the A/D-converter, which converts the signals in discreet digital values, which are received and processed from the computer.

6. The thread, which is coming from the driving barrel, is up winded on the reel.

[1] DMS =”Strain gauge“

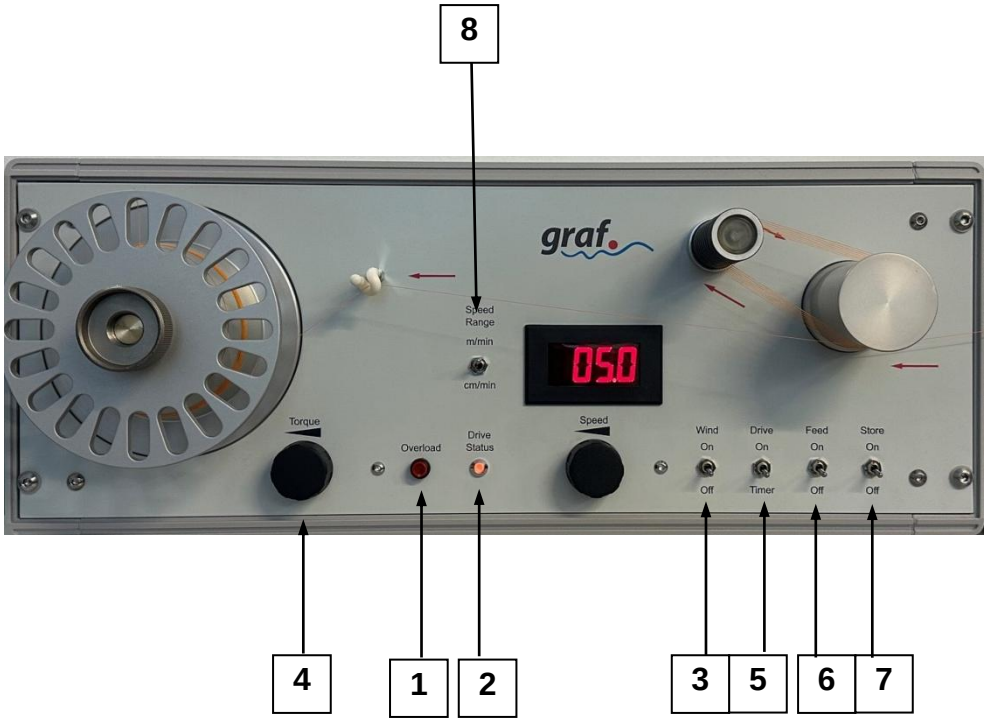
3. The Thread-pull off-device

To make the measuring set-up as flexible as possible, the speed control, the driving barrel and the reel are installed in a separate case, the pull off-device (See Picture 4).



Picture 4: Pull off-device

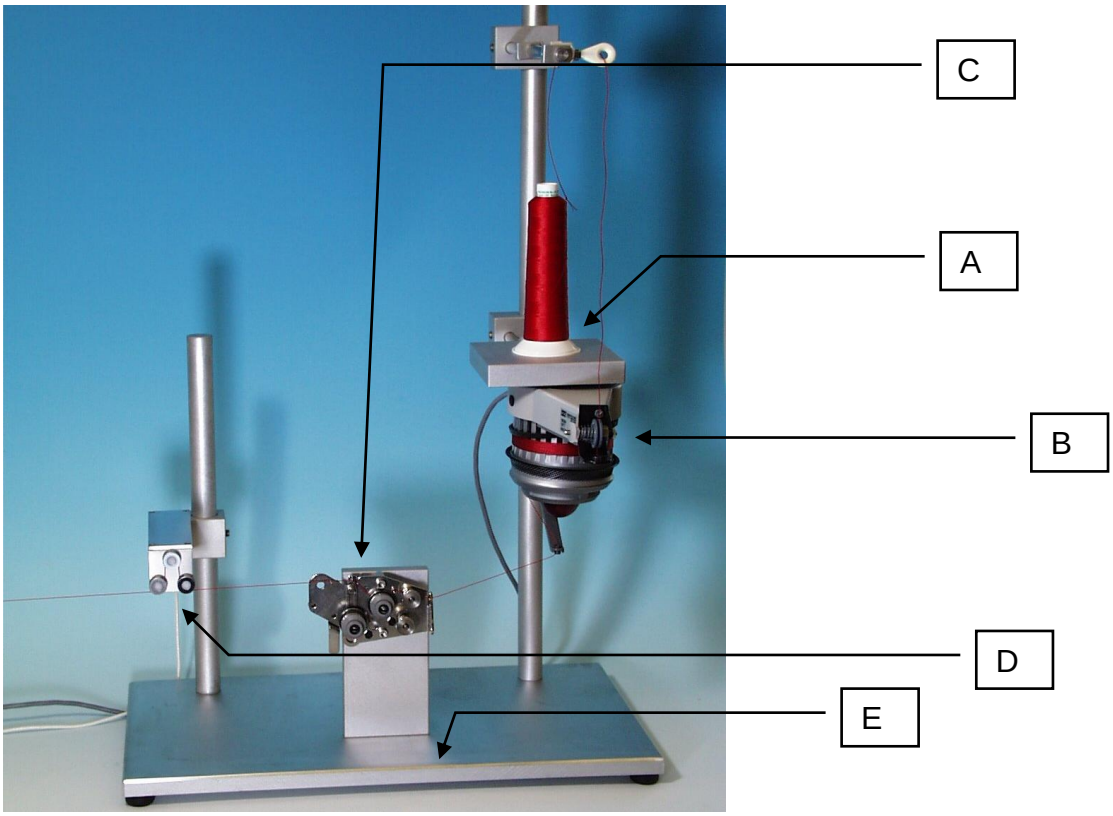
A	Speed controlled aluminium barrels for driving the thread To transmit a maximum of driving effect to the thread, the thread is wound around the barrels for several times.
B	Reel for winding up the measured thread The reel is torque-controlled, thus it can wind up fine thread as well as coarse thread without any influence on the measurement.
C	Rotary potentiometer for adjusting the pull off-speed (barrel speed) To guarantee an exact and long time constant adjustment, it was used a spiral potentiometer.
D	LED-digital display for the pull off-speed The actual pull off-speed is described at this display. A field adaptation of speed from 0,5 to 50 cm/min and from 0,5 to 50 m/min is also possible.



1	Overload	Overload protection for the motor Delete this protection: switch off the drive (button no. 5) and press the red button of the overload protection
2	Drive Status	Acceleration ramp red light: the drive stands still or accelerates green light: the drive works with constant speed
3	Wind	Reel-switch It switches on and off the reel
4	Torque	Reel-torque The power of the reel can be set from 0 % to 100 %
5	Drive	Drive switch: On - drive works continuous Off - drive is switched off
6	Feed	Fixed feed-speed setting: On - feed speed setting with 25 m/min Off - feed speed setting off
7	Store	Switch for the extern fournisseur
8	Speed Range	Change the speed from m/min to cm/min (stick-slip)

4. Other components of the measuring system

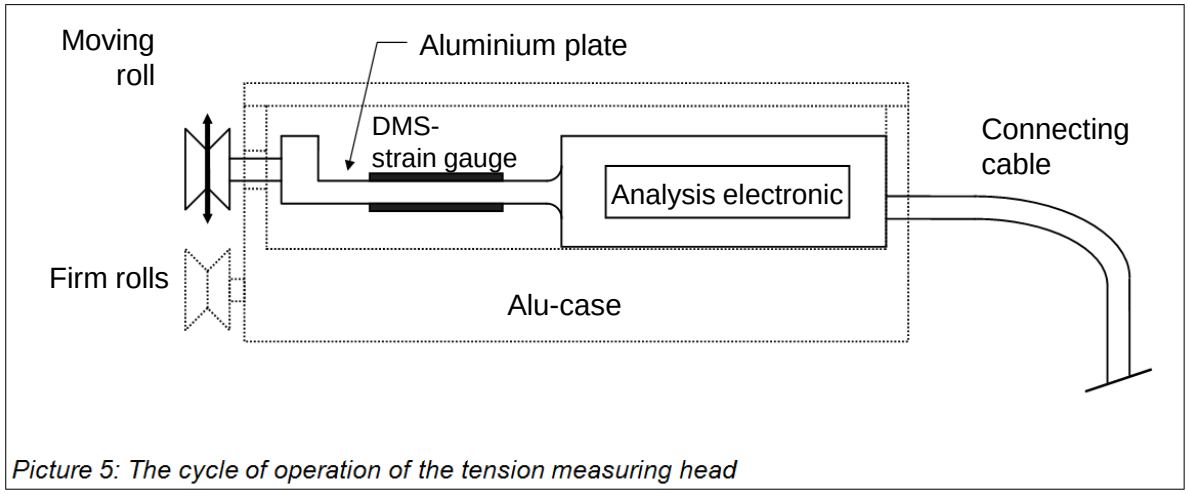
The other components like the serving bobbin coil holder, the fournisseur, the yarn brake and the tension measuring head are installed at a separate board.



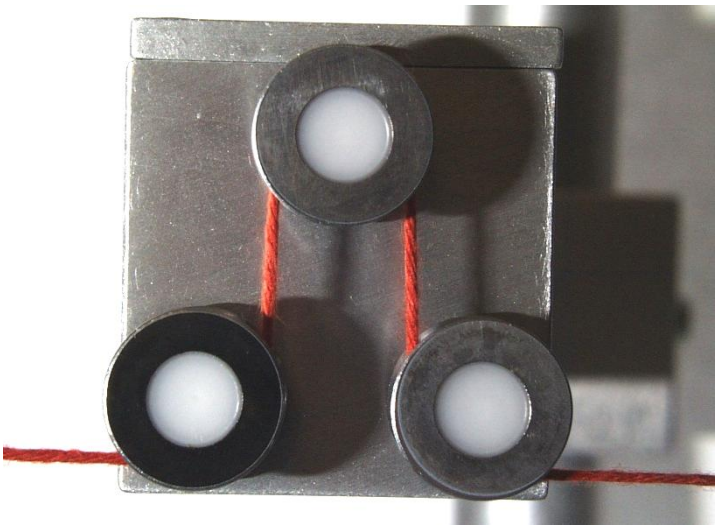
A	Bobbin holder
B	The fournisseur for tension-free thread-serve The fournisseur takes off a specific quantity of thread from the bobbin. This thread can nearly tensionfree unreeled. If the stock is exhausted, the fournisseur turns on itself for coiling and providing new thread.
C	The yarn brake The yarn brake, where the thread goes through, produces the real frictional force for measuring.
D	The tension measuring head The tension measuring head measures the tension of the thread, which is produced by the yarn brake. The A/D-converter changes the tension signals in digital values for the computer.
E	Board

5. The tension measuring head

It contain inside an aluminium plate with two bonded DMS-strain gauges. At this plate a yarn roll is mounted for measuring the thread. The yarn tension leads to a bend of the aluminium plate. This bend can be measured through the strain gauges (see Picture 5).



Picture 5: The cycle of operation of the tension measuring head



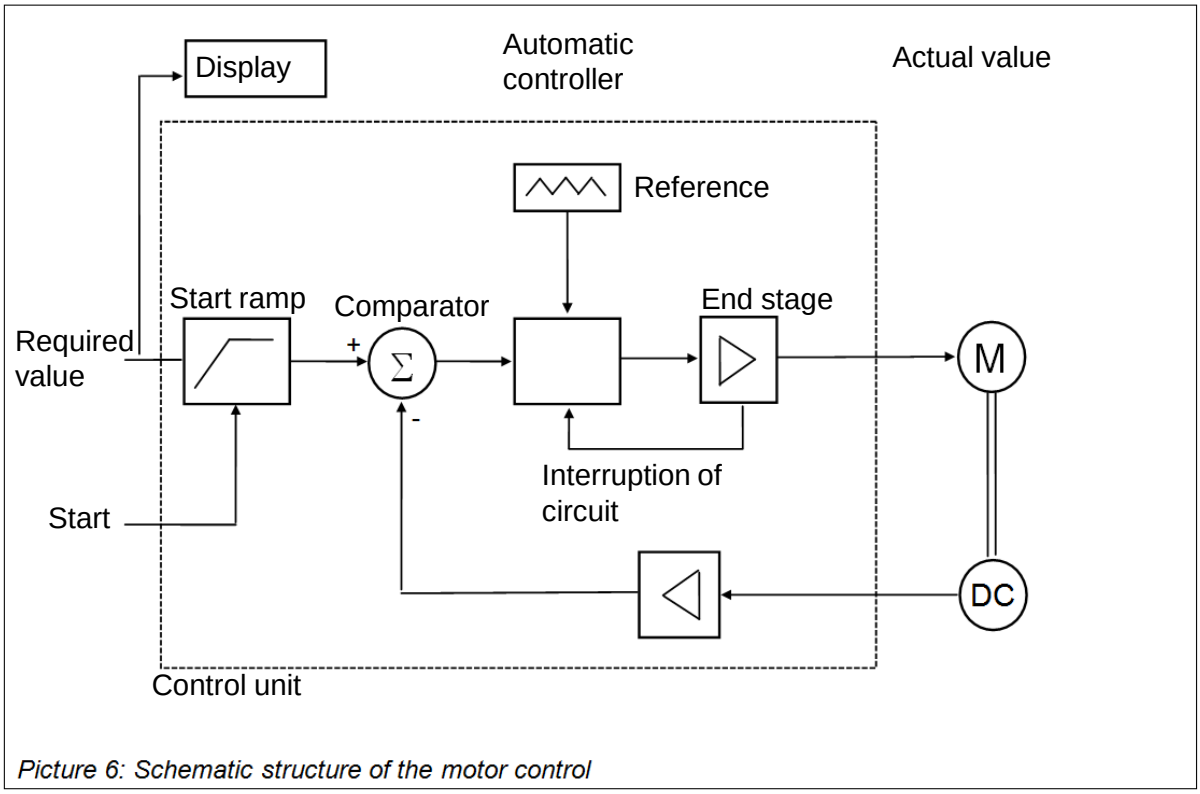
The thread is first guided upwards through the firm roll, then it goes around the moving roll, which is connected to the aluminium plate, and finally it is guided around the second firm roll.

The tension signals, which are produced from the tension measuring head, are sent to the A/D-converter-interface. The interface changes the signals in discreet digital values and send them to the computer.

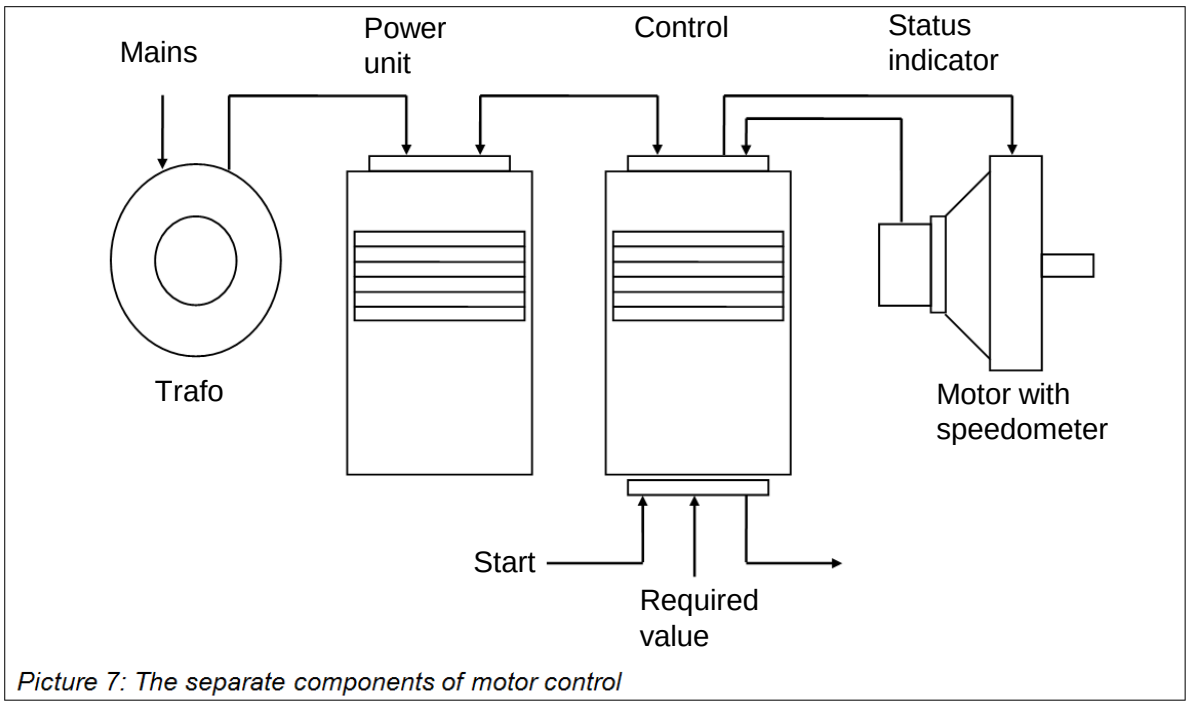
The interface makes equalise and zero adjustment of the tension measuring head possible to guarantee a very high precision.

Every interface is adjusted to the tension measuring head. If the tension measuring head is changed, the interface has to be adjusted again.

6. The Structure of the motor



Picture 6: Schematic structure of the motor control



Picture 7: The separate components of motor control

7. Installation Guide for the Graf Friction Lab 2.9 Software

General requirements:
OS Windows 7 or higher, USB 2.0 port, A/D-converter with USB cable (included in the delivery), Graf friction measuring system CPF or CPF-CTC (included in the delivery). The A/D-converter should be connected to the tension head of the Graf friction measuring system and to the computer.

Graf Friction Lab 2.9 (Friction Measurement System Software) is available for download at www.graf-chemicals.com/en/products/technological-products

Also you will get a license key (*LicenseFile.asc*), which allows you to install and use the software.

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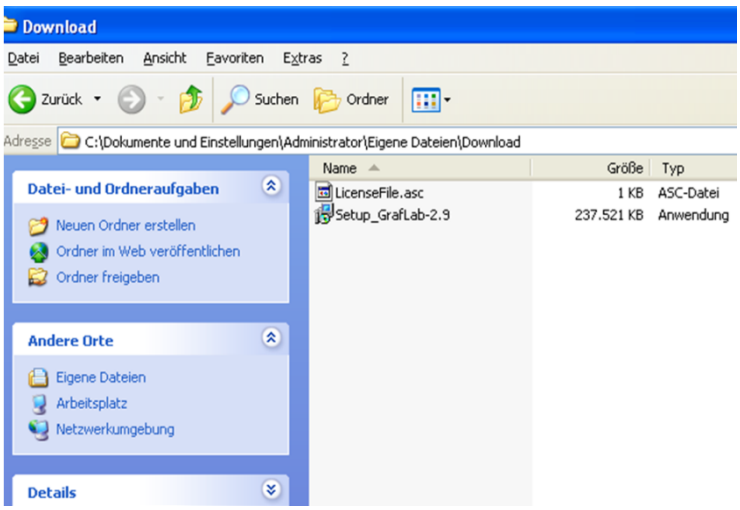
<td> 
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<td>7.1.
LicenseFile.asc and the Setup_GrafLab-2.9 should be in the same file

7.2.
Click “Setup_GrafLab-2.9“ to start the setup</td>
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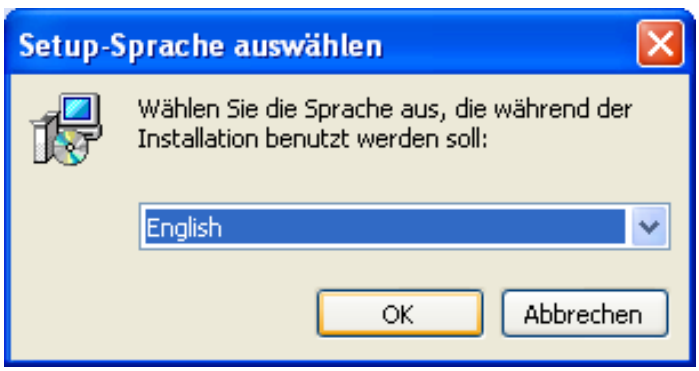
<td> 
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<td>7.3.
Choose the language and click “ok”</td>
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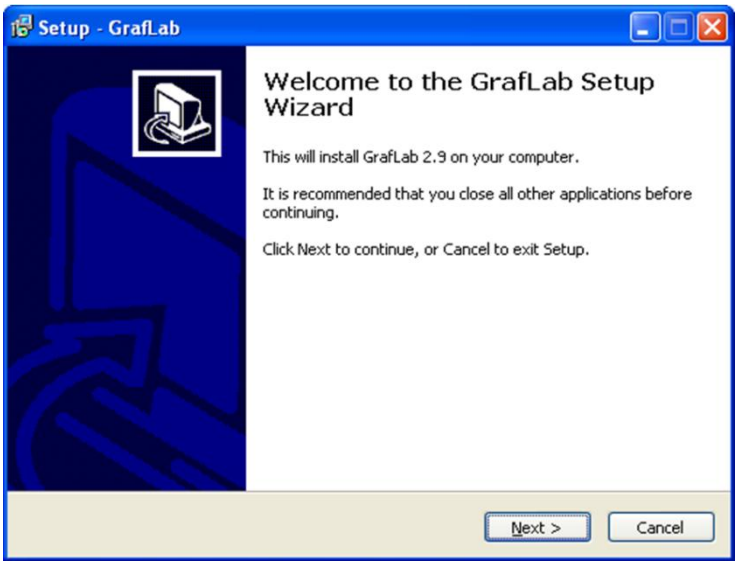
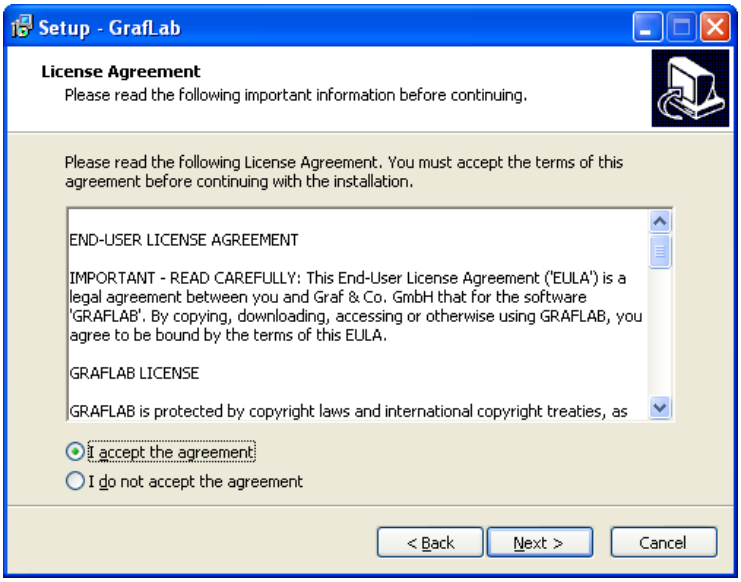
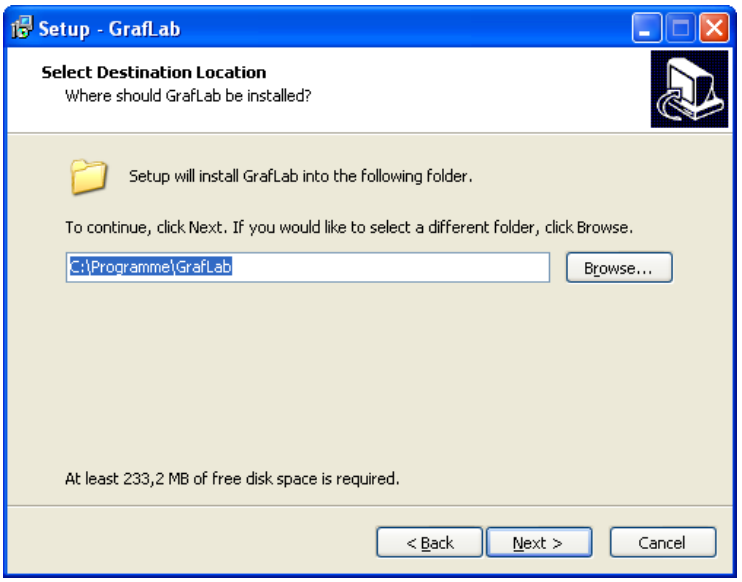


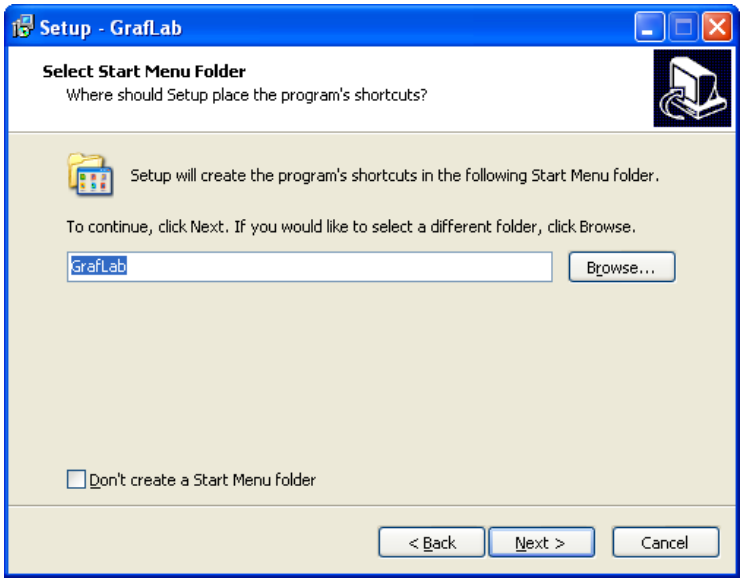
7.4.
Click “Next”



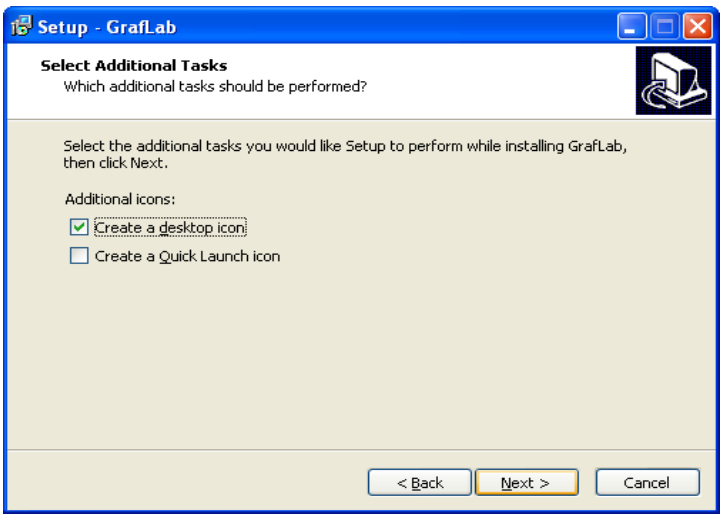
7.5.
Choose “I accept the agreement” and click “Next”



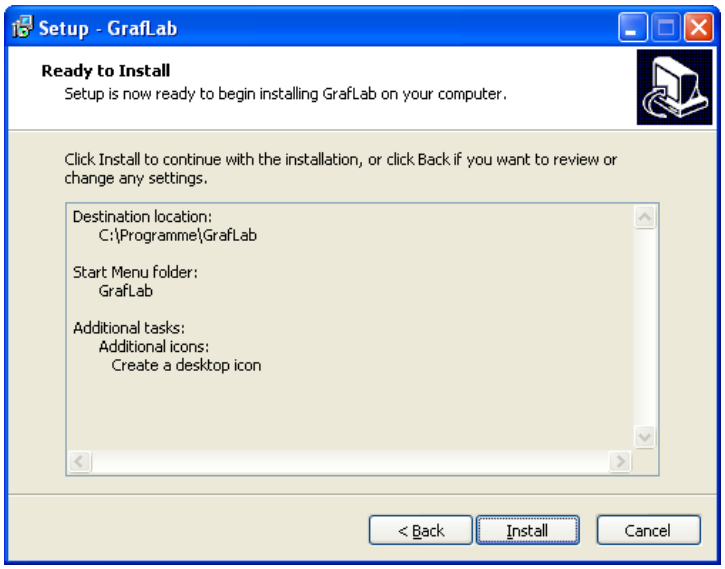
7.6.
Select destination location and click “Next”



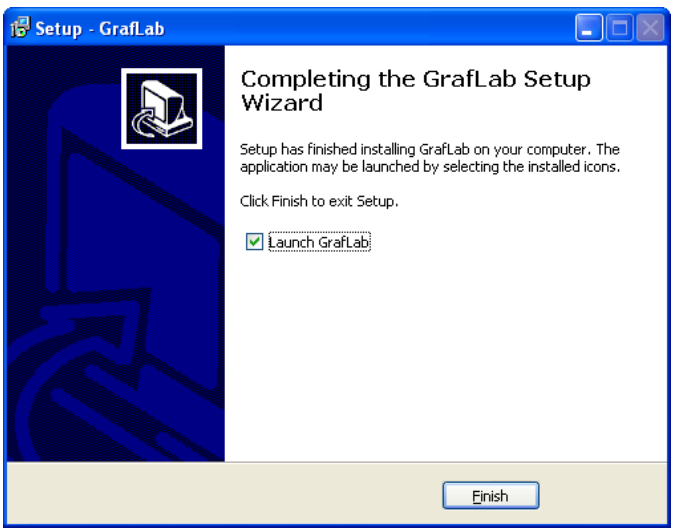
7.7.
Select start menu folder and click “Next”



7.8. Select additional tasks and click “Next”



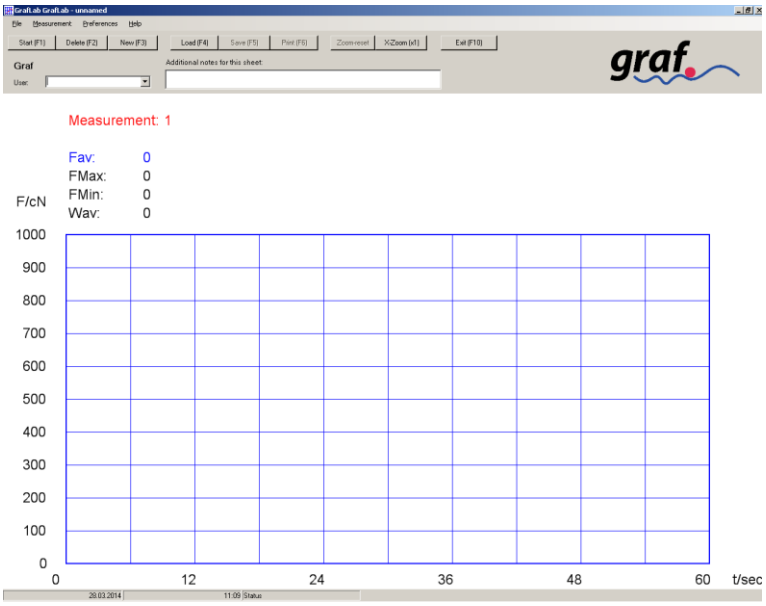
7.9.
Setup is now ready to begin installing of the GrafLab on your computer



7.10
The program is now installed. Click “Finish”

8. Start Graf Friction Lab 2.9

8.1.
Click “Start“ and choose the “Graf Lab“ to start it

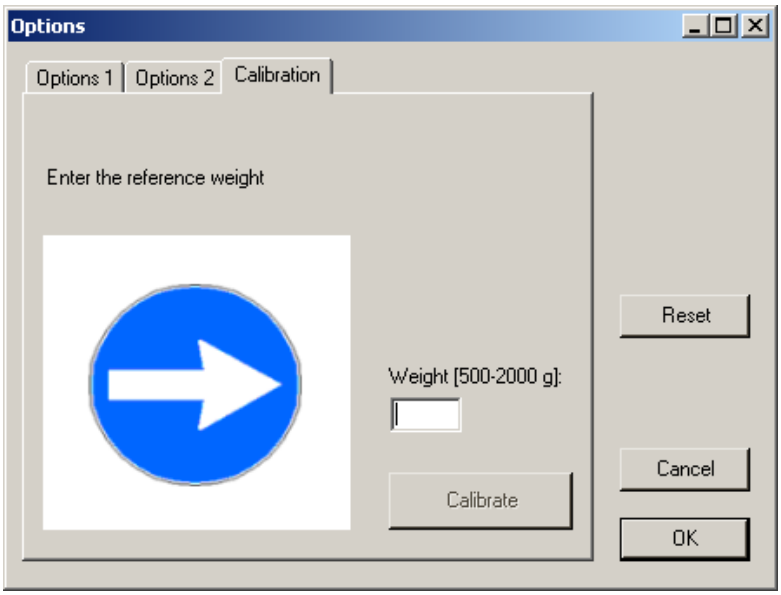


Before measuring process for the first time, proceed at first with the chapter 9 “Calibration of the Program”.
Then start with 8.2.

8.2.
Start a measuring with “F1” or load an old one with “F4”.

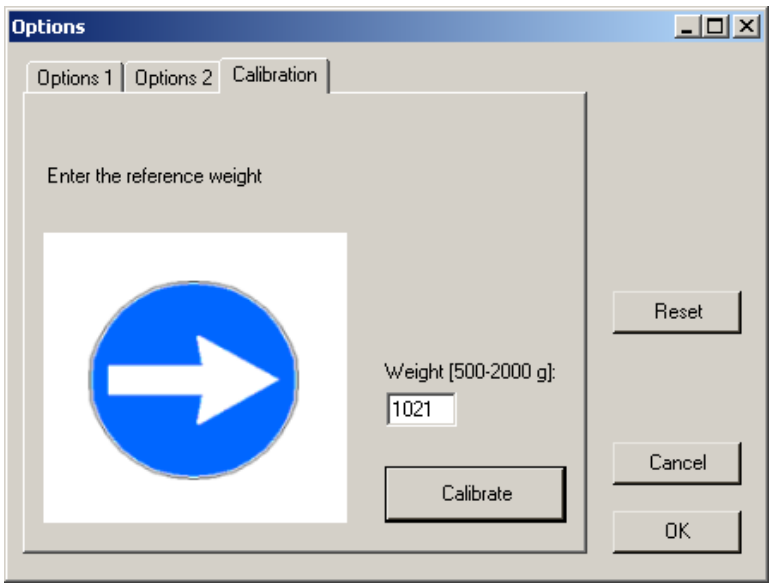
8.3.
Start Graf Friction Lab 2.9 for the first time: A window appears to enter your Company name and location

9. Calibration of the Program



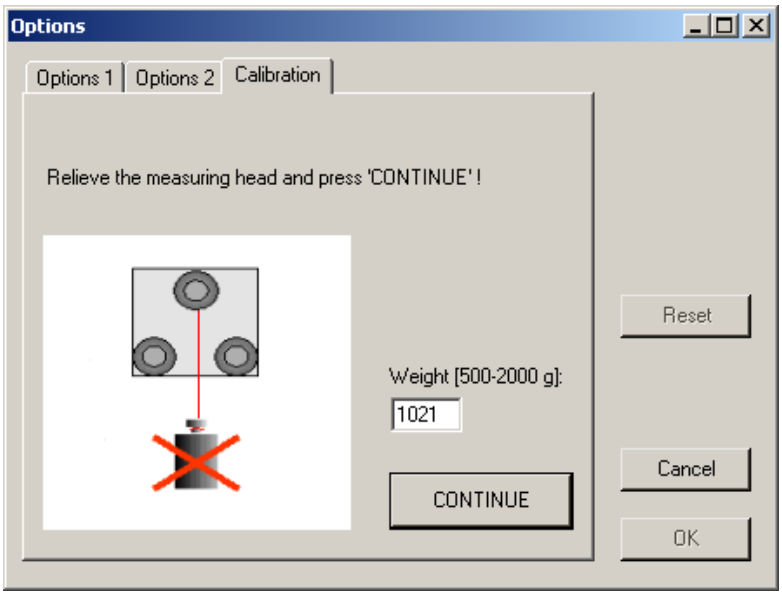
9.1.
Click in the top menu “Preferences” , then “Options” and choose “Calibration”

9.2.
Prepare supplied calibration weight (approx.1000 g)



9.3.
Check if the weight mentioned on the label is correct (while weighing it on some scale)

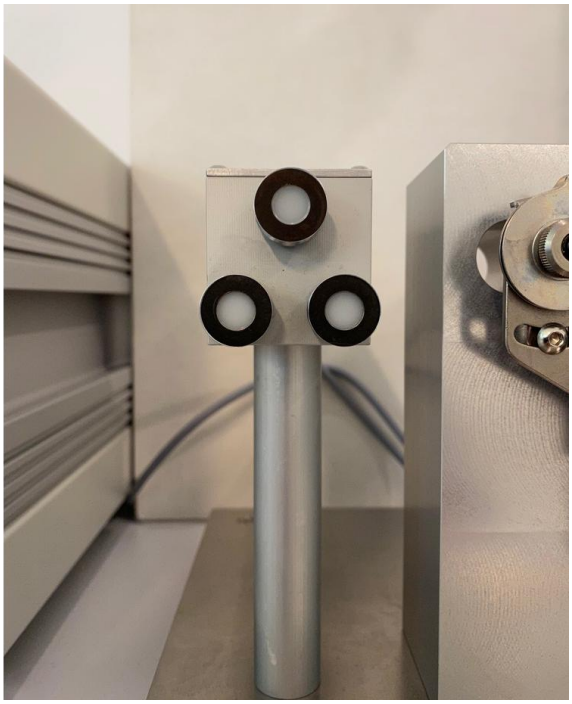
9.4.
Write the measured weight in the small field “Weight (500-2000g)” and click “Calibrate”



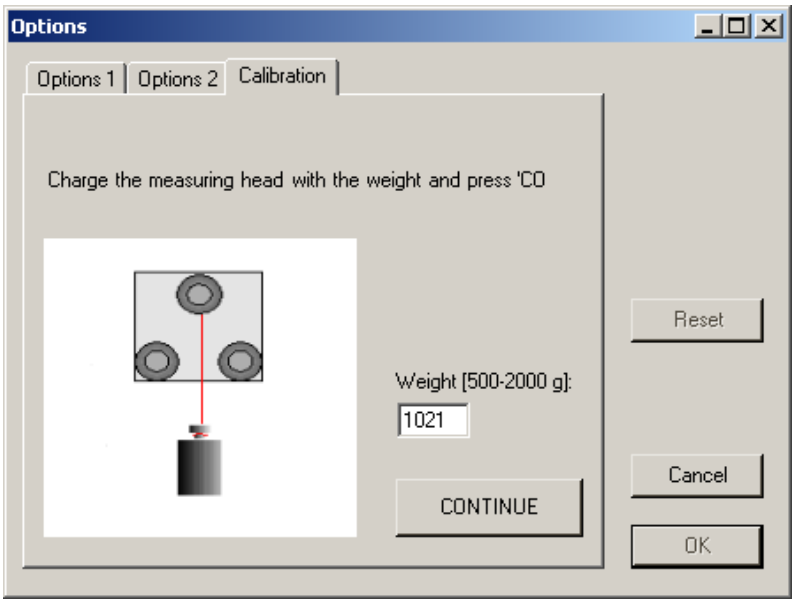
9.5.
Check if the measuring head is free of any weight (please see the picture below) and click "Continue"

9.6.
The calibration needs some seconds.

If required please repeat the procedure.

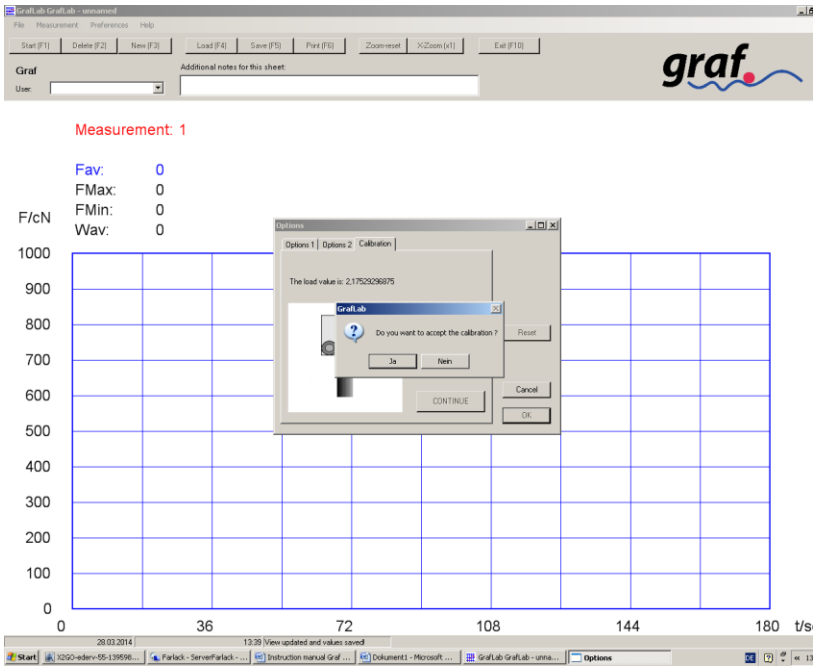


The picture on the left shows the measuring head in a completely unloaded state.



9.7.
Charge the measuring head with the weight and click “Continue”

The picture on the left shows the measuring head loaded with the weight referred to above. It must be fixed on the wheel at the top of the measuring head.



9.8.
Accept the calibration with "JA"

Calibration is now valid.

9.9.
Remove the weight from the measuring head

The Graf Friction Lab 2.9 software is now calibrated correctly.

You can check this by running a measuring test with the weight hanging on the Measuring head as you can see in the picture of **Step No. 9.7.**

With a weight mass of X gram, the measurement curve in the screen must have a constant value of X/2,04cN

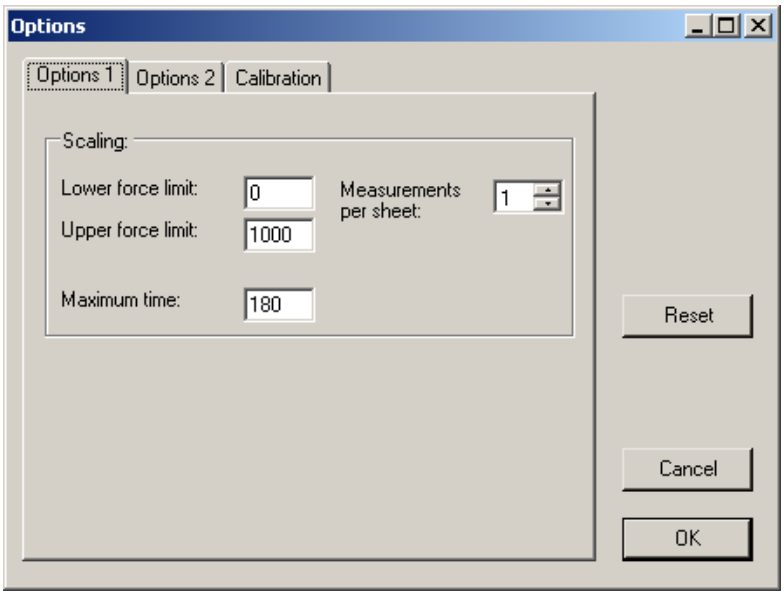
Example:
With a weight mass of 1145 gram, the measurement curve in the screen must have a constant value of 562cN +/- 5cN

Then, please run a measuring test with the measuring head completely unloaded, as you can see in the picture of step **No. 9.5.**

In this case, the measuring curve on the screen must stay at 0cN (zero line).

If you have any doubt that the calibration process has been incorrect, you can perform this process again without having to reinstall the software

10. Operating of the program



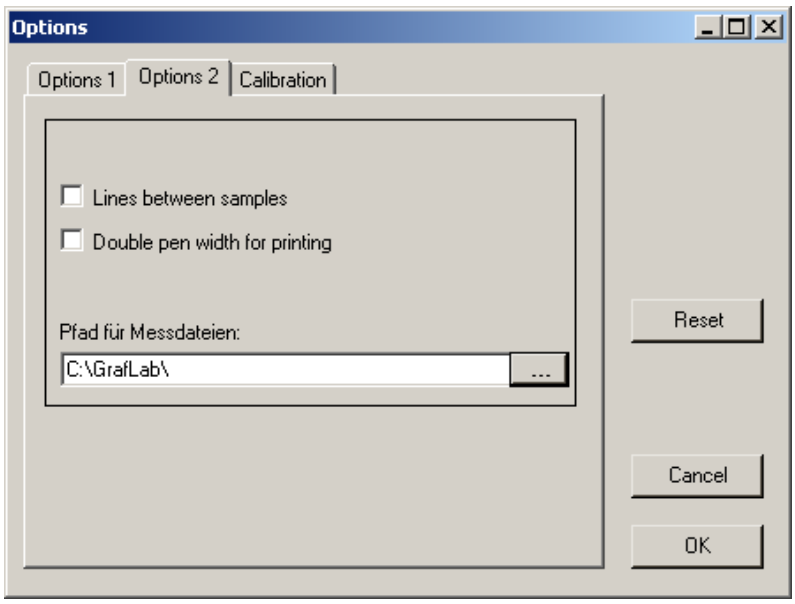
10.1.
Click in the top menu “Preferences”, then “Options” and choose “Options 1”

Make your settings.

“Maximal time” means the time after that the recording process stops automatically

“Measurement per sheet” means the number of measurements per page

10.2.
Click “Ok” after the setting

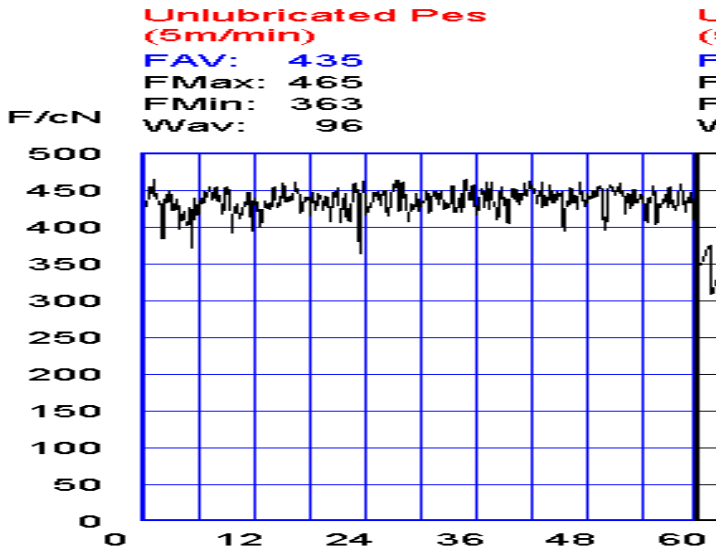
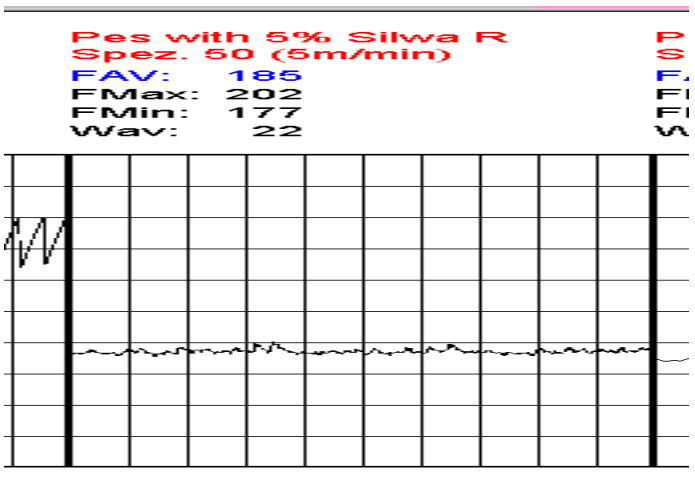


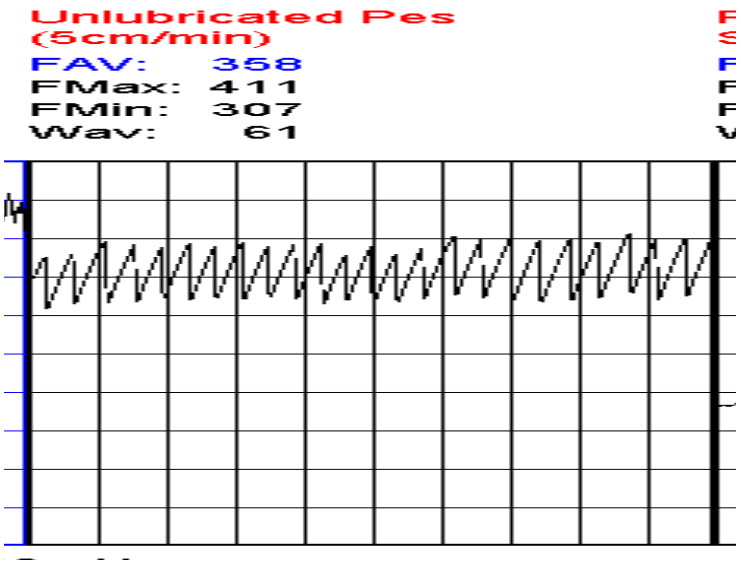
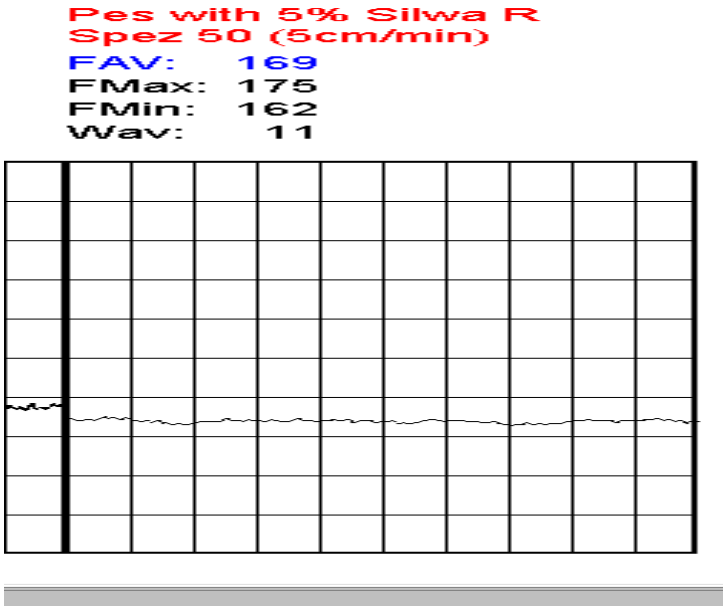
10.3.
Click in the top menu “Preferences”, then “Options” and choose “Options 2” to make other settings

10.4.
Click “Ok” to confirm your settings.

11. Typical diagrams

FAV	Average calculation of the tension in cN (1cN ≈ 1g) The lower, the better
F max	Maximum tension peak in cN The more close to FAV, the better
F min	Minimum tension peak in cN The more close to FAV, the better
Wav	Dimensionless number for the roughness of the friction diagram The lower, the better

	Bad friction
	Good friction

	Bad stick-slip
	Good stick-slip

12. Technical data of the Friction measuring system

Thread pull off-device

Mains voltage	230 V~ +/- 5%
Current	1,5 A
Power consumption	250 W
Dimensions	500 x 300 x 320 mm
Weight	15 kg
Take-off speed	1 cm/min ... 50 m/min
Take-off force	50 N max
Power consumption of the fournisseur	15 W

Tension measuring head with A/D-conventer

Mains voltage	230 V +/- 5 %
Current	30 mA
Power	8 W
Supply voltage for tension measuring head	+/- 15 V
Dimension of tension measuring head	40 x 45 x 150 mm
Weight of tension measuring head	650 g
Dimension A/D-converter	130 x 185 x 70 mm
Weight A/D-converter	1,1 kg
Strength measuring range	0 ... 2.000 cN
Point of destruction	6.250 cN
Measuring solution GRAF-ADC	12 Bit
Measuring solution UM4	8 Bit
Sampling frequency	2 Hz ... 100 Hz
Measurement error about full scale	Max +/- 1 %
Linearity deviation	0,5 % max
Hysteresis	0,35 % max
Temperature coefficient about full scale	0,3 % max