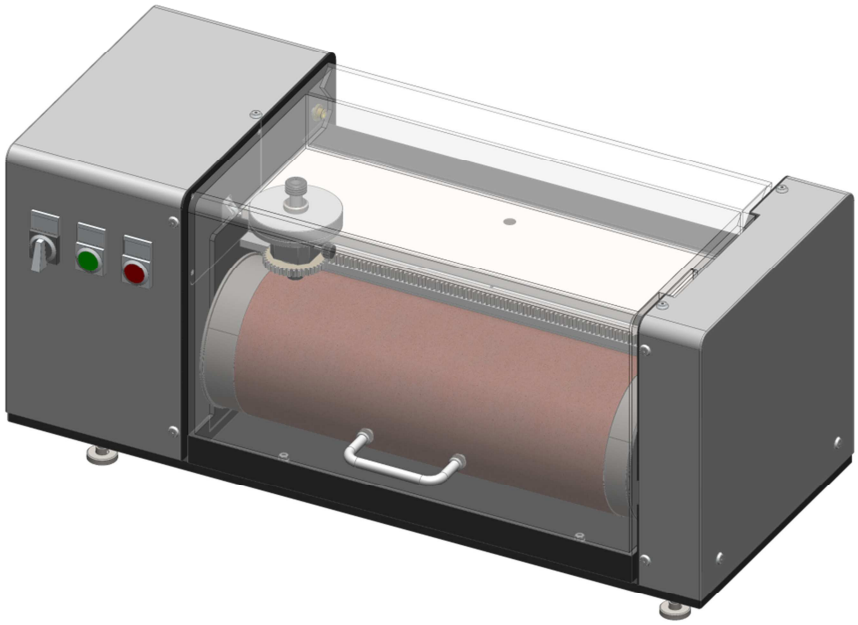
testing solutions since 1954

Original operating instructions



Abrasion tester

Translation of original operating instructions

Devices

Order number	Device	Version / Option
fe05000	Abrasion tester	Standard
fe05000-01	Abrasion tester	Automatic vacuum cleaner connection
fe05000-02	Abrasion tester	Heating module

Table of contents

1. Using these operating instructions

Different symbols are used in these operating instructions, in order to highlight the various contexts and relationships. Brief information of a detailed description is also shown in this way.

Symbol	***Description***
	Attention / Warning / Caution It is about: - topics related to safety - how injuries to persons can be avoided - how damages to devices can be avoided - how damages to test pieces can be avoided
	Important instruction It is about: - the operator must always follow these points for the correct operation of the device.

Table 1: Symbols used:

2. Safety instructions

Devices are developed - for accurate material testing - according to the requirements of existing standards and different new tasks. The practical handling of the device and the view of the user are always taken into account.

The manufacturer is committed to produce a high quality and reliable device. This commitment also concerns the adherence to the latest safety guidelines. The manufacturer places a high demand on the safety of a device, which can extend beyond the requirements of the safety guidelines.

Each device is tested diligently and professionally for its function and safety before it leaves the factory. Dangers can still arise for the users, the test pieces or for the device itself because of the tasks or through damages. The operators and the users must follow the following instructions.

Instructions in these operating instructions must be read and followed before commissioning.

Improper or unprofessional use, manipulations or improper commissioning of the device is prohibited.

Abrasive dust that arises can be harmful to health.
A dust mask or something similar can become necessary.

No materials may be used in the abrasion tester that can get ignited during the abrasion process or through the emery sheet.

2.1. Electrical, mechanical

Defective electrical components can be live and hence be life-threatening.

Work on electrical components and assemblies may only be done by electrically qualified persons according to electro-technical rules.

Work on mechanical components and assemblies may only be done by experts.

Defects detected in electrical or mechanical parts must be removed immediately and the device may not be used any further.

Work, in which it is necessary to use tools, may be carried out only at the abrasion tester disconnected from the mains.

Before opening the abrasion tester, pull out the mains plug and secure it against unintentional switch on.

Only the original spare parts may be used.

The instructions of these operating instructions and the technical documentation (e.g. circuit diagrams, lubrication plan) must be followed.

After conducting the work, the complete device is to be inspected for damages.

2.2. Cleaning

For cleaning the device, it is necessary to switch off the device and to secure it against unintentional switch on.

Please pay attention to the cleaning instructions.

The abrasion tester may not be wet cleaned.

The abrasion tester must be cleaned after every abrasion, to do this the collection pan is to be removed.

Always the complete abrasion tester must be cleaned - it does not suffice to clean only the collection pan.

The instructions of these operating instructions and the technical documentation (e.g. permitted cleaning agents) must be followed.

After conducting the cleaning, the complete device is to be inspected for damages.

2.3. Proper use

The abrasion tester acts as the auxiliary equipment for standard-compliant determination of the resistance of elastomers against abrasion.
It is intended to clamp the standardised test piece in a sample holder and to abrade it destructively automatically and in compliance with the standards.

2.3.1. Essential components of the abrasion tester

The abrasion tester essentially consists of:
a.) a sample holder (possibly rotating) with different loading weights
b.) a rotating, cylindrical roller
c.) an emery sheet placed on the roller
d.) an electrical control
e.) Optional: an automatic vacuum cleaner connection
f.) Optional: a heating module

2.3.2. Operation as per standard (list of standards)

The abrasion tester is suitable for operation according to the standards:
a.) DIN ISO 4649 (DIN 53516)
b.) ASTM D5963
c.) NF KSO 4649

The exact use and the intended area of application can be taken from the respective standards.

2.3.3. The standard abrasion process

The standard abrasion process can be done in two different methods:
a.) with a standing (not rotating) test piece
b.) with a rotating test piece

For a standardised testing, the standard abrasion process can also be retrofitted, in order to do the abrasion of the test piece according to the requirement
a.) above 20 metres
b.) above 40 metres

The standard abrasion process can be carried out with different loading weights:
a.) 2.5 Newton
b.) 5.0 Newton
c.) 7.5 Newton
d.) 10.0 Newton
e.) Optional: 12.5 Newton
f.) Optional: 15.0 Newton
g.) Optional: 17.5 Newton
h.) Optional: 20.0 Newton

2.4. Options of the abrasion tester

The named options - automatic vacuum cleaner connection and heating module - extend only the test method described in the standards by additional possibilities, the process itself remains the same.
a.) The automatic vacuum cleaner connection is an option, in which a commercially available vacuum cleaner can be connected via an automatically switched Schuko socket. This Schuko socket is activated during the standard abrasion process and enables to suck away the dust arising during the process.
b.) The heating module enables to carry out the standard abrasion process at high temperatures. In doing so, the abrasion area is ventilated with a hot blower before the abrasion process.

2.4.1. Optional design with automatic vacuum cleaner connection

The warnings mentioned below are applicable in addition to the general ones.

At the switched Schuko socket only a commercially available vacuum cleaner may be connected for sucking the abrasive dust.

The option of automatic vacuum cleaner connection is deactivated in the option of heating module.

2.4.2. Optional design with heating module

The warnings mentioned below are applicable in addition to the general ones.

The use of the heating module in the corresponding temperature range is not permitted for inflammable materials or when an inflammable abrasive dust is produced.

Hot particles may not be sucked directly: the material must cool for at least 2 hours in the abrasion tester, before a cleaning or drainage may be done.

Hot particles can cause (secondary) smouldering fires in the waste.

In the given case, the abrasion tester is warmer than the surroundings. Do not put anything in the device that is sensitive to temperature or inflammable.

The heating is not done during the abrasion process.

2.5. Incorrect use

The abrasion tester may not be used for purposes other than the ones described. Further, the following also applies:

The abrasion tester may be used only for the abrasion of elastomer test pieces with the aim of determining the resistance against abrasion.

The abrasion tester may be fitted only with the standardised emery sheet.

The incorrect use with respect to the optional designs of the device is described below separately.

If non-standardised emery sheets, loading weights and test pieces are used, the abrasion process cannot be carried out for determining the resistance against abrasion.

2.6. Safety devices

The abrasion tester has safety devices, such as safety switches and other electrical locks. These serve the purpose of protecting persons, the abrasion tester and the test pieces.

The safety devices of the abrasion tester may not be manipulated or bridged.

2.7. Protective measures for users

The use of any kind of gloves is not permitted during the operation of the abrasion tester.

In case of a constant use of the abrasion tester or cleaning, the use of a dust mask can become necessary - the manufacturer of the material of the test piece is to be consulted for this.

2.8. Operating/work instructions

The abrasion tester is to be used very intuitively, still the following instructions must be followed.

Every user must follow the operating instructions and technical documentation.

Only trained and instructed users may operate the abrasion tester.

The selection of a suitable abrasion stretch is up to the user and depends on the test piece.

The selection of a suitable loading weight is up to the user and depends on the test piece.

The user must ensure that owing to a too strong abrasion the sample holder does not come in contact with the emery sheet.

2.9. Duties of the operator

In the scope of due diligence the use and the condition of the abrasion tester as well as following these operating instructions must be checked regularly and necessary steps must be taken.

The regulations of the law maker are to be followed.

It must be ensured that the users, for whom the operation of the abrasion tester is defined, get the necessary protective equipment, are instructed accordingly, are trained regularly and have understood the contents of the operating instructions.

It is to be ensured that no test pieces are used that cause dust harmful to health.

It is to be ensured that the abrasion tester is operated at a stable and clean place free of vibrations.

It is to be ensured that the operating instructions are easily accessible to all users - immediately near the abrasion tester.

It is to be ensured that the abrasion tester is protected against air containing dust, oil, grease and metal, sources of heat (direct solar irradiation, heaters), moisture, wetness, vibration as well as crash.

2.10. Residual risk

Despite safety measures, there is a residual risk depending upon functions and tasks.

Abrasion processes are to be done exclusively under supervision, for instance, if the test piece is subject to a too strong abrasion because of misuse or else becomes loose.

The dimensions of the test pieces and the loading weights are always to be selected such that the sample holder can in no case run on the emery sheet.

There is a risk of crushing and shearing in the initial setup operation between the cog wheel and the toothed rod or while swivelling the sample holder.

Residual risk remains, even when the speed is suitably reduced with the protective hood opened and as a result the tip operation becomes active.

3. Delivery, transportation, mounting, set up and commissioning

3.1. Delivery

Immediately after receiving, the completeness and the intactness of the delivery is to be checked by doing a comparison with the delivery note or the order confirmation.

Missing transport boxes must be claimed immediately from the delivering forwarding agency.

Missing parts are to be claimed immediately from the manufacturer.

In case of transportation damages, the forwarding agency must be notified immediately and photos of the damaged parts are to be sent to Bareiss.

Damages of the packing can indicate damages to the abrasion tester.

3.1.1. Instructions for disposing of the packaging material

Preserve the accompanying packaging materials and boxes and use these for sending - they simplify the workflow during returns.

Preserve the wooden box of the abrasion tester for eventual returns.
The wooden box is free of worms and insects, free of bark and is heat-treated according to the IPCC standard ISPM No. 15.

The packaging tape made of plastic, the holding clip, the film, the foam and the cable tie made of plastic can be recycled.

3.2. Transportation

It can become necessary to transport the abrasion tester for maintenance, in case of shifting or for dispatching. The following points must always be kept in mind in order to avoid damages during transportation.

The abrasion tester is always to be transported in the original packing. Please place the original transport locks again.
Please follow the transportation instructions given on the packing.

Transportation work may be done only by persons qualified for this - carry out the transportation carefully.

An installer is available upon request, in order to set up the abrasion tester at the intended place and to commission it.

3.3. Mounting, set up and commissioning

3.3.1. General

You need the following tools and accessories for mounting and setting up the abrasion tester:

a.) Cross recess - screwdriver - for dismantling the transportation boxes
b.) Allen key size 10 - for unscrewing the transport screws
c.) Allen key size 3 - for aligning the adjusting screws
d.) Two squared timbers (approx. 50x50 mm) or similar - in order to place down temporarily the partly mounted abrasion tester
e.) Safeguard against a crashing down of the transportation box - for instance, tension belt
f.) Lifting aid - for instance, ground conveyor
g.) Spirit level - for aligning

Damaged abrasion tester may not be commissioned.

3.3.2. Unpacking

Do not lift the abrasion tester or the transportation box alone or without safeguard - weight approx. 50 kg.

It is recommended to use a ground conveyor so as to reach the lower side of the transport packing.

The process during the setup is described below.

a.) Make available adequate space immediately near the planned set up area for keeping the transportation box and for working.
b.) Make sure that you can move freely around the transportation box. Remove stumbling points and obstacles from the way.
c.) Loosen the lateral screw connections (cross recess) of the lid and dismantle the lid of the transportation box.
d.) Remove at first all separately packed parts from the opened transportation box.
e.) Lift the transportation box by a few centimetres, in order to reach the transport screws at the lower side of the transportation box.

Secure the transportation box against crashing down.

f.) Loosen and remove the four fixing screws at the lower side of the transportation box (Allen key size 10) - this separates the abrasion tester from the transportation box.
g.) Place the squared timber at a separation of approx. 460 mm from each other near the planned set up location - for a pre-assembly of machine mounts.
h.) Carefully lift the abrasion tester from the transportation box.
i.) Place the abrasion tester on the squared timbers.
j.) Clear up the used area again and close the transportation box.

Preserve the accompanying packaging materials and boxes.

3.3.3. Mechanical mounting

a.) Remove the four adjusting screws from the delivery and mount them in the threaded holes at the lower side of the abrasion tester.
b.) Place the foot plates aligned below the foot screws.
c.) Carefully lift one side of the abrasion tester and remove the correspondingly unburdened squared timber.
d.) Lower the abrasion tester carefully on the corresponding foot plate.

While lowering, there is a crushing hazard between the abrasion tester and the contact surface at the set up area!

e.) Proceed in a similar way with the other side of the abrasion tester too.
f.) Align the abrasion tester (spirit level and Allen key size 3) in longitudinal and transverse direction.

You can compensate any possible unevenness of the ground by adjusting the adjusting screws.

g.) Align the abrasion tester with the adjusting screws.

3.3.4. Electrical mounting

Please follow the operating instructions given in the chapter on Safety instructions

The electrical connection values of the abrasion tester as well as the options are given in the Annexure.

The abrasion tester is suitable for operation at the normal lighting circuit (230 V AC / 50 Hz). Make sure that a suitable safety socket is available near the abrasion tester.

Use only the original electrical lines delivered along with the abrasion tester, like the power cable with inlet connector for non-heating apparatus.

Do the connection as well as the safety measures according to DIN VDE 0100 and the conditions of the lower power supply company.

The abrasion tester has a separate electrical safety fuse and a spare fuse immediately near the mains connection.

3.4. Prerequisites for operation

For operating the abrasion tester, it is necessary that the statements of operating instructions are kept in mind and are followed.
Instructions for dismantling
In case it becomes necessary to dismantle the abrasion tester, please proceed in the reverse sequence of the instructions for mounting, setting up and commissioning.

The abrasion tester is always to be transported in the original packing. Please place the original transport locks again.

3.5. Storage

Before storing, do a complete maintenance of the abrasion tester according to operating instructions, in order to protect the parts suitably against corrosion.

Always store the abrasion tester in the original packing. Please place the original transport locks again.

Storage conditions -

a.) Do not store in the open
b.) Store in a dry and dust-free place
c.) Do not expose to any aggressive media
d.) Protect against solar irradiation
e.) Avoid mechanical shocks
f.) Storage temperature: 0 to +70 °C
g.) Relative air humidity: max. 60%
h.) In case of storage for more than three months, regularly check the general condition of all parts and packing material.

3.6. Disposal

Old devices contain valuable recyclable materials –please dispose them environment-friendly-.

Old devices can be disposed on suitable collection points for recycling which are offered In cities and villages. It should be noted that electrical / electronical parts (like e.g. motors, cables, circuit boards) have to be disposed separately.
If you don't do the recycling yourself, the manufacturer of the devices will do this for you. Send us your device with the hint: "Recycle this device".

4. Instructions for liability

The manufacturer does not take any responsibility and is not liable for events that result from not following or not adhering to the operating instructions.

Considerable transportation damages can be caused if the original packing materials and boxes are not used for transportation.

5. Description of the machine

The different designs and the functioning of the abrasion tester are described in detail below. The detailed handling and operation of the abrasion tester are described in a separate chapter.

5.1. Functional description

The abrasion tester is available in several different designs, these are described below.

5.1.1. Standard

The abrasion process can start after the abrasion tester has been commissioned properly and is fitted with a suitable test piece.

The abrasion process is done in the way described in the standard and only with the protective hood closed.

Depending upon the test piece and the requirements for the abrasion process, the abrasion tester can be configured with different clamping forces and abrasion paths.

The clamping forces can be adjusted by means of the different weights on the sample holder.

The abrasion path can be adjusted by adjusting the positioning screw.

The emery sheet placed on the roller is subject to wear because of the abrasion process and must be replaced, if needed. The emery sheet is only pasted and can be replaced. The abrasion tester supports this through an inching mode, with which the roller can be driven.

When the hood is open, the roller can be driven in inching mode with lower peripheral speed. Always use the abrasion tester alone.

For fitting the abrasion tester with a new emery sheet, it is possible to drive the roller in inching mode with a lower peripheral speed.

5.1.2. Vacuum cleaner

The abrasion tester can be retrofitted with a cleaning brush, which travels with the sample holder on the back side of the roller and cleans the emery sheet. A vacuum cleaner can be connected to this cleaning brush, in order to remove the abrasive dust that occurs in a suitable way.

Optional accessories are available for the vacuum cleaner.

5.1.3. Automatic vacuum cleaner connection

The abrasion tester has a cleaning brush, which travels with the sample holder on the back side of the roller and cleans the emery sheet. A vacuum cleaner can be connected to this cleaning brush, in order to remove the abrasive dust that occurs in a suitable way.
In addition to the functions described in the standard, the control of the properly connected vacuum cleaner is done automatically as soon as the abrasion process is started.

The vacuum cleaner is activated and deactivated simultaneously with the abrasion process.

5.1.4. Heating module

In addition to the functions described in the standard, the heating module is suitable for heating up the area of the abrasion process. It is possible to set a reference temperature by means of a temperature regulator. In doing so, it must be kept in mind that it may take a while till the desired temperature has reached the core of the test piece.

The heating module enables a regulated heating up of the area to maximum 60 °C.

It is possible to keep further test pieces in the collection pan, in order to heat them up or pre-condition them.

6. Overview of the abrasion tester

6.1. Standard

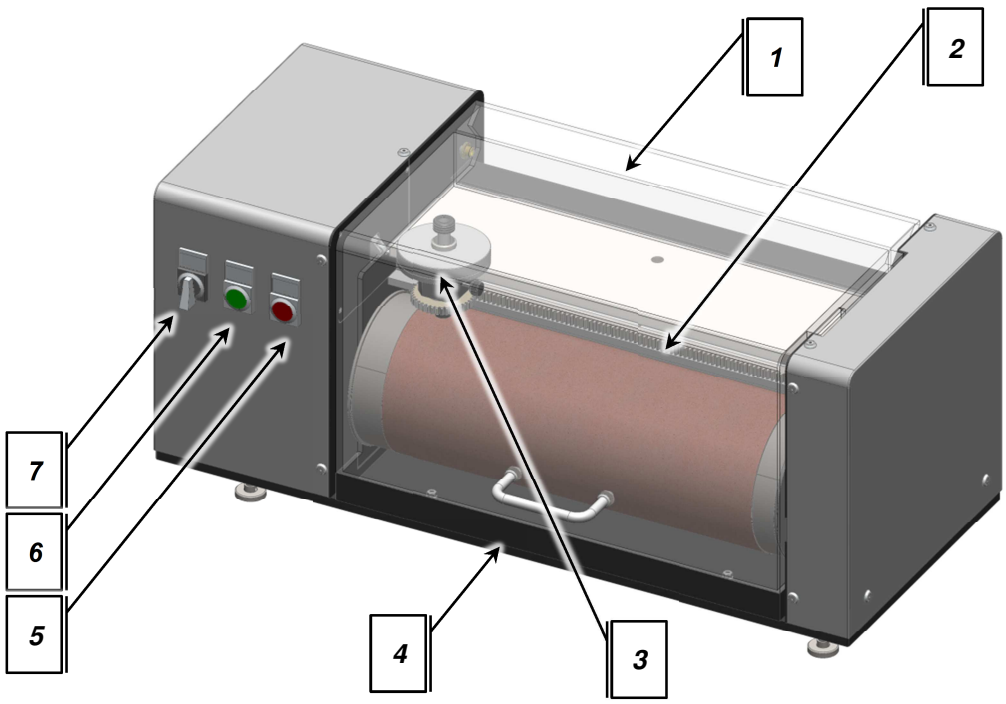


Figure 1: Overview of standard abrasion tester

No.	*Description*
1	Protective hood
2	Toothed rod
3	Sample and weight holder (clamping force)
4	Collection pan
5	STOP
6	START
7	POWER O I (Off On)

Table 2: Legend for standard abrasion tester

6.2. Automatic vacuum cleaner connection

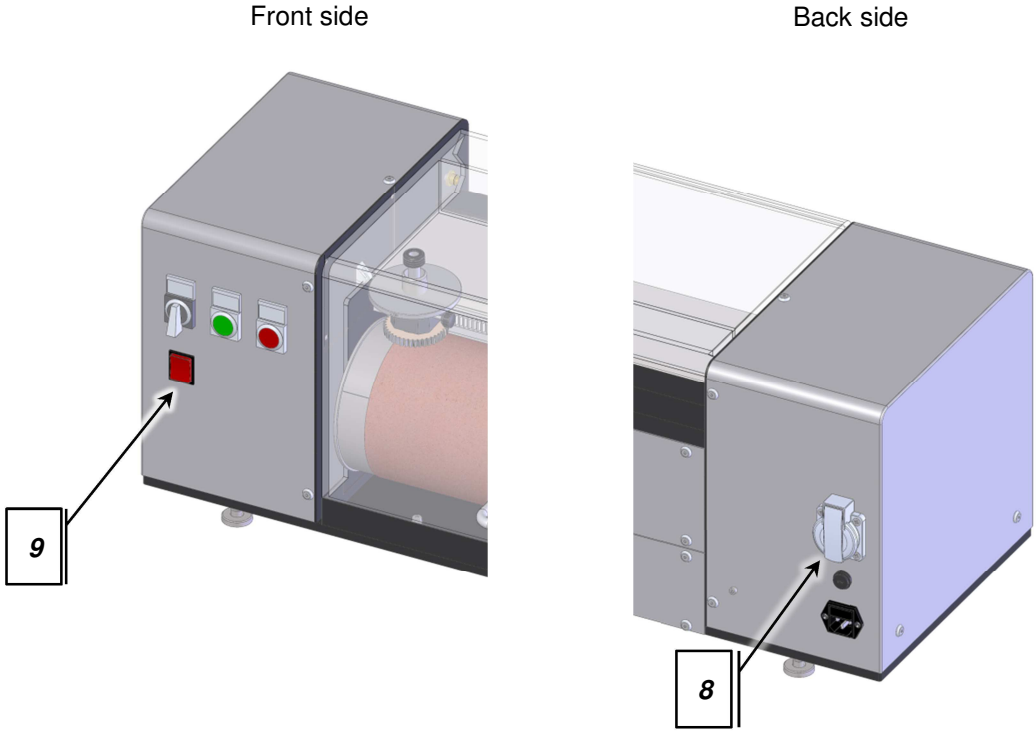


Figure 2: Legend for abrasion tester with automatic vacuum cleaner connection

In addition to standard -

No.	*Description*
8	Automatically switched Schuko socket for vacuum cleaner (back side)
9	Switch for automatically switched Schuko socket (front side)

Table 3: Overview of abrasion tester with automatic vacuum cleaner connection

6.3. Heating module

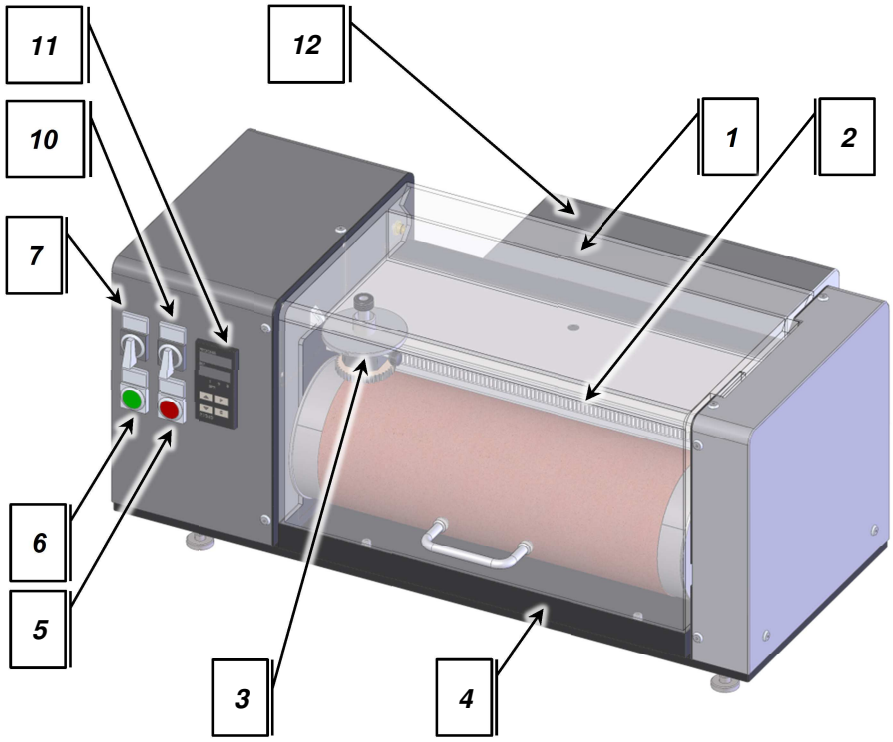


Figure 3: Legend for abrasion tester heating module

No.	*Description*
1	Protective hood
2	Toothed rod
3	Sample and weight holder (clamping force)
4	Collection pan
5	STOP
6	START
7	POWER O I (Off On)
10	Heating O I (Off On)
11	Heating temperature regulator
12	Heating module

Table 4: Overview of abrasion tester with temperature module

6.4. Functions of control elements

Start the work only when the contents of the operating instructions have been understood.

Brief explanation of the control elements of the abrasion tester -

a.) Abrasion tester standard and automatic vacuum cleaner connection:

Control element	***Explanation***
POWER - switch O I	The abrasion tester is switched on and off via the rotary switch (main switch). This is illuminated and thus shows the state of the abrasion tester (off / on).
STOP - button	Each action of the automatic abrasion process can be stopped immediately with the STOP button.
START - button	Different workflows with respect to the roller drive are started with the START - button, depending upon the mode of operation.
Automatically switched socket for vacuum cleaner	This socket is activated automatically, when the abrasion process is active and when this function is switched on.
Switch automatically switched socket	This function switches on and off the function of the automatic vacuum cleaner.

Table 5: Control elements of abrasion tester standard and automatic vacuum cleaner connection:

b.) Abrasion tester heating module

Additional control elements, supplementary to the standard, are available in this option.

Control element	***Explanation***
Heating O I	The heating module of the abrasion tester is switched on and off via the rotary switch.
Heating temperature regulator	The current temperature of the test area is shown at the temperature regulator and the desired reference temperature is set.

Table 6: Control elements for abrasion tester with heating module

7. Operating modes

The abrasion tester is put in various operating modes depending upon the position of the protective hood.

a.) Hood open: Set up
b.) Hood closed: Automatic

The operating modes basically differ from one another - they are necessary for different tasks, such as equipping or the automatic abrasion process.

Operating mode	***Explanation***
Set up	Only an inching operation of the roller with reduced speed is possible. The sample holder can be swivelled here by hand - for instance, for fitting with a test piece.
Automatic	The start of the automatic abrasion process with the settings made, such as the abrasion path, is possible.

Table 7: Operating modes

7.1. Operation according to standard abrasion process

The proper operation of the abrasion tester is shown below step by step.

Do not operate the abrasion tester, if you have not understood the statements and explanations of the operating instructions.

The automatic abrasion process can be interrupted at any time by pressing the STOP button.

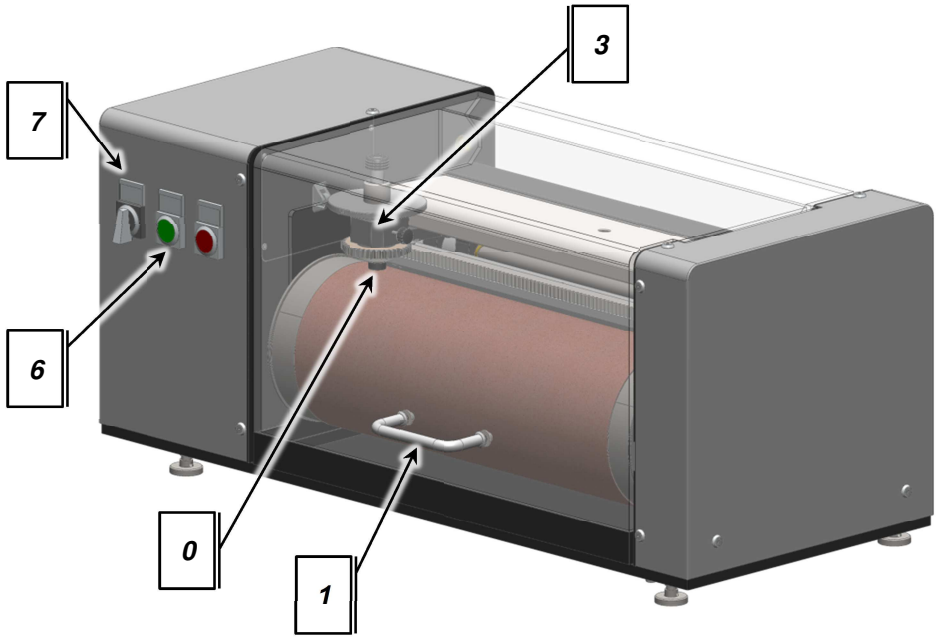


Figure 4: Standard abrasion process

a.) Switch on the abrasion tester with the POWER rotary switch [7].
b.) Open the protective hood [1].
c.) Fit the sample holder [3] with a test piece.
d.) Place the sample holder [3] on its base position [0] and swivel the sample holder.
e.) Close the protective hood [1].
f.) The automatic standard abrasion process can be interrupted, after a start, at any time by pressing the STOP button.
g.) Start the abrasion process with the START button [6].
h.) After the set abrasion path is traversed, the abrasion tester is switched off automatically.
i.) Open the protective hood [1].
j.) Take out the sample from the sample holder [3].
k.) Bring the sample holder [3] back to its base position.
l.) Close the protective hood [1].
m.) Switch off the abrasion tester with the POWER rotary switch [7].

7.2. Operation with automatic vacuum cleaner connection

Please follow the instructions for the standard abrasion process.

Make sure that the vacuum cleaner is connected and is ready to use.

A vacuum cleaner connected at the provided Schuko socket is fed with electrical power automatically after the standard abrasion process starts. Upon ending the standard abrasion process, the supply of electricity to the vacuum cleaner is automatically cut off.

Switch on the automatic vacuum cleaner connection.

The operation is identical to the operation of standard abrasion process.

a.) Fit the abrasion tester accordingly with the vacuum cleaner.
b.) Activate the automatic vacuum cleaner connection with the switch [9].

7.3. Operating mode with heating module

Note that only the air temperature is regulated - the heating up of the abrasion tester or of the test piece can take longer time.

Either only heating or an abrasion process can be done. Both are not possible at the same time.

For this operating mode, remove the cleaning brushes of the abrasion tester, in order to prevent large deposits of abrasive dust on the emery sheet.

Operating modes of the heating module:

a.) O - Switched off
  a.a.) The heating module is switched off and the device is working like a standard abrasion tester.
  a.b.) If applicable, with the previously heated temperature.

b.) I - Switched on
b.a.) The heating regulation is active immediately.
b.b.) It is not possible to start the abrasion process.

The proper operation of the temperature module is shown below step by step. As an example, the air temperature is to be set to 45 °C.

The cooling can take longer than heating - the temperature module does not possess any active cooling.

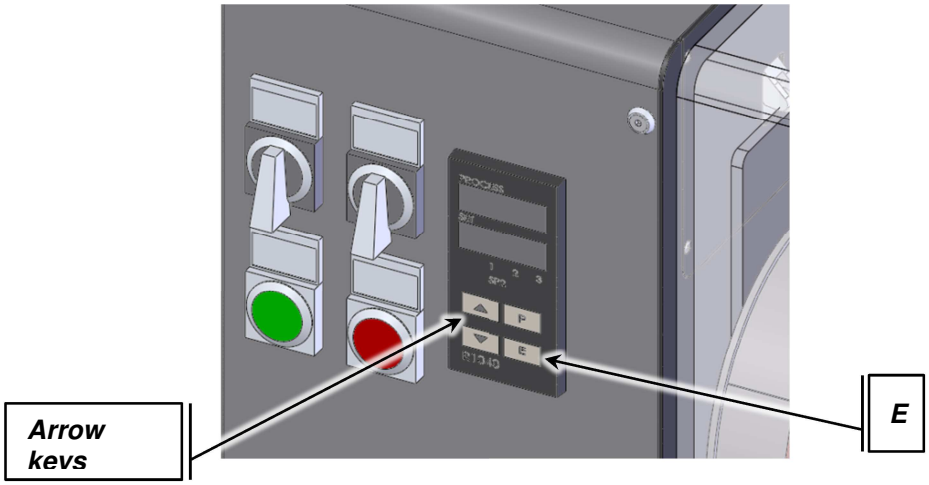


Figure 5: Standard abrasion process

a.) Switch on the abrasion tester by the POWER rotary switch [7].
b.) Open the protective hood [1].
c.) Fit the sample holder [3] with a test piece.
d.) Place the sample holder [3] on its base position and swivel the sample holder.
e.) Close the protective hood [1].
f.) Switch on the temperature module by the rotary switch [10].
g.) Using the arrow keys, enter a reference temperature value at the temperature regulator [11] - for instance, 45 °C and confirm this with the button "E".

The set temperature reference value is regulated immediately. The actual value of temperature shows the operator the current air temperature at the measurement point.

Gather experience, for how long the achieved actual temperature value is to be maintained after reaching the reference temperature value - in order to ensure the heating or cooling of all parts and the test piece.

Do not confuse the actual temperature value with the temperature of the test piece.

h.) Wait till the desired temperature is reached and heating and cooling is done adequately long.
i.) Switch off the temperature module by the rotary switch [10].
j.) Start the abrasion process immediately with the START button [6].
k.) After the set abrasion path is traversed, the abrasion tester is switched off automatically.
l.) Open the protective hood [1].
m.) Take out the sample from the sample holder [3].
n.) Bring the sample holder [3] back to its base position.
o.) Close the protective hood [1].
p.) Switch off the abrasion tester, if needed, with the POWER rotary switch [7].

The operation is identical to the operation of standard abrasion process.

8. Preparations and equipping at the abrasion tester

Before using a possibly placed emery sheet, check its quality - possibly the abrasive power is too high.

8.1. Circle cutter and preparing the test pieces

Before the abrasion test, the test pieces must mostly be prepared suitably according to the technical specifications and standards.

Test pieces are to be prepared in such a way that their diameter lies ø16 mm within the tolerance of ±0.2 mm.

Test pieces are to be prepared in such a way that their material strength (thickness) is at least 6 mm so that they can be fixed in the sample holder.

If test pieces having suitable material strength are not available, an equivalent replacement with a test piece having a thickness of at least 2 mm can be prepared.
To do this, the thin test piece is stuck on a base body that has a hardness of at least 80 IRHD or, for instance, also made of steel.

The available circle cutters help in preparing test pieces conforming to the standards.

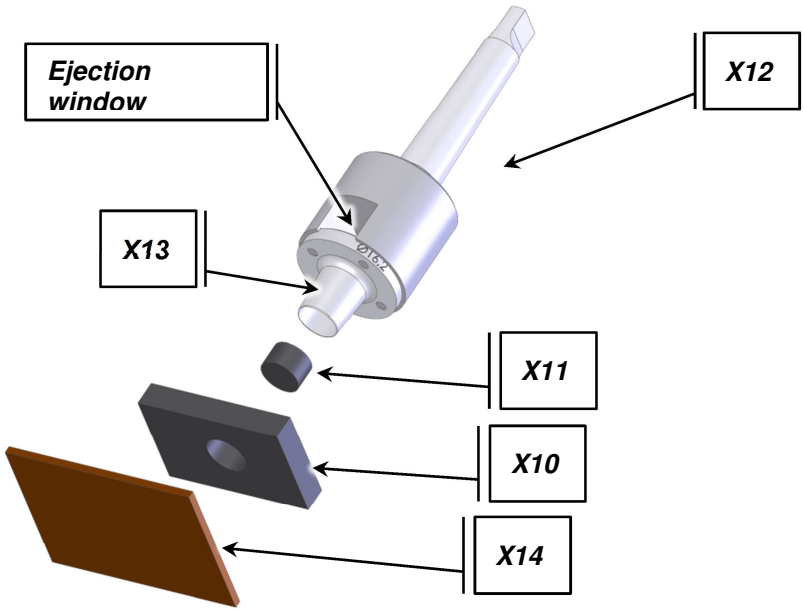


Figure 6: Circle cutter and preparation of test piece

No.	Description
X10	Plate material
X11	Test piece
X12	Circle cutter
X13	Circular cutting knife
X14	Cutting base

Table 8: Legend for circle cutter

Circle cutters [X12] can be used for preparing test pieces [X11] from plate material [X10]. Circle cutters [X12] are used in conventional box column drills.

Do not exceed a speed of 400 RPM. This can damage the circular cutting knife.

Use an elastomer plate as the cutting base*. Wooden plates or similar objects are not suitable here.*

It is best to operate the circle cutters at a speed of 200 - 300 RPM.

It is recommended to use here a coolant and lubricant (glycerine/water mix) and to place a cutting base below the plate material to protect the circular cutting knife.

a.) Clamp the circle cutter [X12] properly in a box column drill.
b.) Place the cutting base [X14] on the table of the box column drill.
c.) Place the plate material [X10] on the cutting base [X14].

Secure the arrangement of cutting base and plate material on the table of the box column drill properly against slipping.

d.) Properly secure the arrangement of cutting base [X14] and plate material [X10].
e.) Set a speed of 200 - 300 RPM at the box column drill.
f.) Cut out a test piece [X11] from the plate material by drilling only to the extent in the plate material [X10] so that the circular cutting knife [X13] penetrates only slightly (maximum 1 mm) in the cutting base.

Do not cut through the cutting base.

g.) Switch off the box column drill.

In no case try to remove the test piece with fingers - the circular cutting knife is very sharp.

h.) Eject the test piece through the ejection window, for instance, with the help of an Allen key.

Spare circular cutting knives are available, more about this in the ordering instructions for spare parts.

8.2. Fitting and removing the test piece

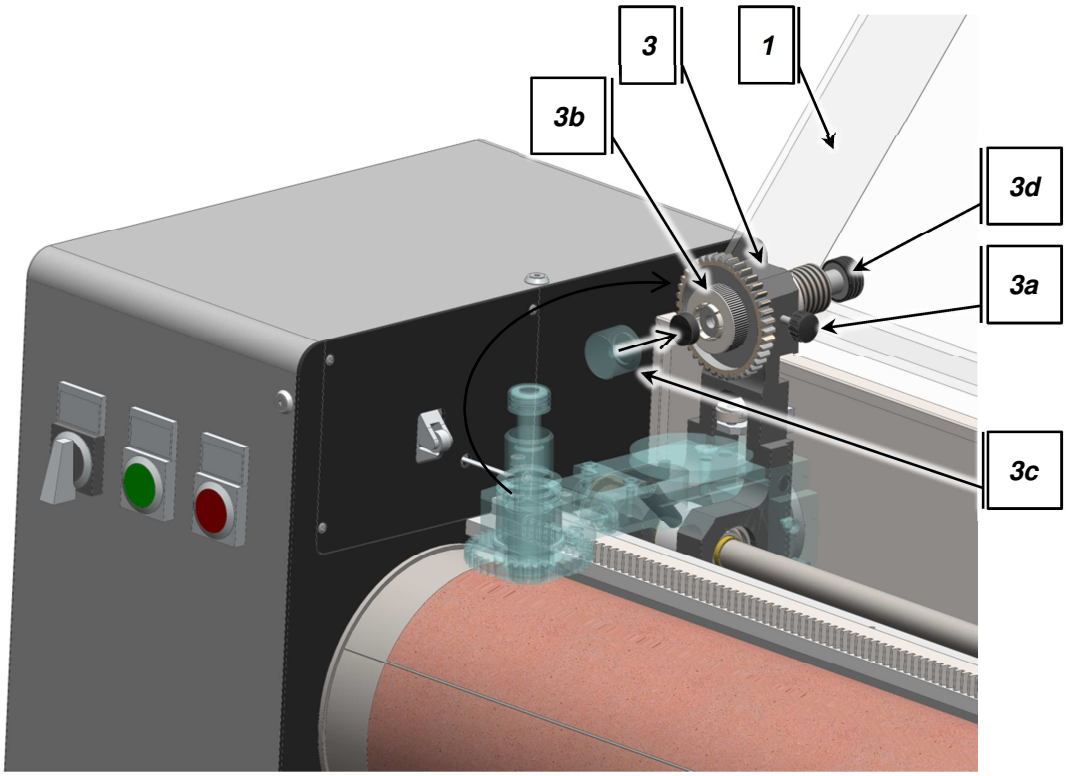


Figure 7: Fitting and removing the test piece

No.	*Description*
1	Protective hood
3	Sample holder
3a	Clamping screw
3b	Test piece clamping ring
3c	Alignment gauge
3d	End stop

Table 9: Legend Fitting and removing the test pieces

A test piece from the previous abrasion process could still be present in the sample holder. Always remove this before you place a new one.

In case the test piece does not fall out by itself, use the accompanying cross recess screwdriver for this. It can be pushed straight through the sample holder.

a.) Open the protective hood [1].
b.) Swivel the sample holder [3] backward and place it down.
c.) Fix the clamping screw [3a], in case it is not already clamped.
d.) Loosen the test piece clamping ring [3b] and remove the previous test piece, if still there.

e.) Place the new test piece in the sample holder [3].
f.) Hold the alignment gauge [3c] at the test piece and fasten it at the test piece clamping ring [3b].
g.) Adjust the end stop [3d], in order to suitably set and secure the protruding of the test piece according to the alignment gauge [3c].

Before the abrasion test, the test piece - as can be checked by the alignment gauge - should protrude from the collet chuck.

A new setting is necessary only for abrasion test with test pieces having different dimensions.

The alignment gauge is magnetic and can be stored suitably in the immediate vicinity at the sheet metal housing of the abrasion tester.

h.) Fix the test piece in this position with the test piece clamping ring [3c].
i.) Place the sample holder [3] on its base position and swivel the sample holder.
j.) Loosen the clamping screw [3a] again, if needed.
k.) Close the protective hood [1].

The alignment gauge is magnetic and can be fixed at the housing.

8.2.1. Option of heating module

If the abrasion tester is still warm, do not carry out any work without the necessary protective equipment.

8.3. Setting the clamping force

According to the standard, the clamping force must be kept constant during the testing.

Depending upon the test sample, it can become necessary to vary the clamping force. Possible combinations are given in the table below.

Sample holder 2.5 N	***Additional weight 2.5 N***	***Additional weight 5 N***	***Additional weight 10 N (optional)***	***Clamping weight [N]***
X	-	-	-	2.5
X	X	-	-	5
X	-	X	-	7.5
X	X	X	-	10
X	-	-	X	12.5
X	X	-	X	15
X	-	X	X	17.5
X	X	X	X	20

Table 10: Clamping weight combinations

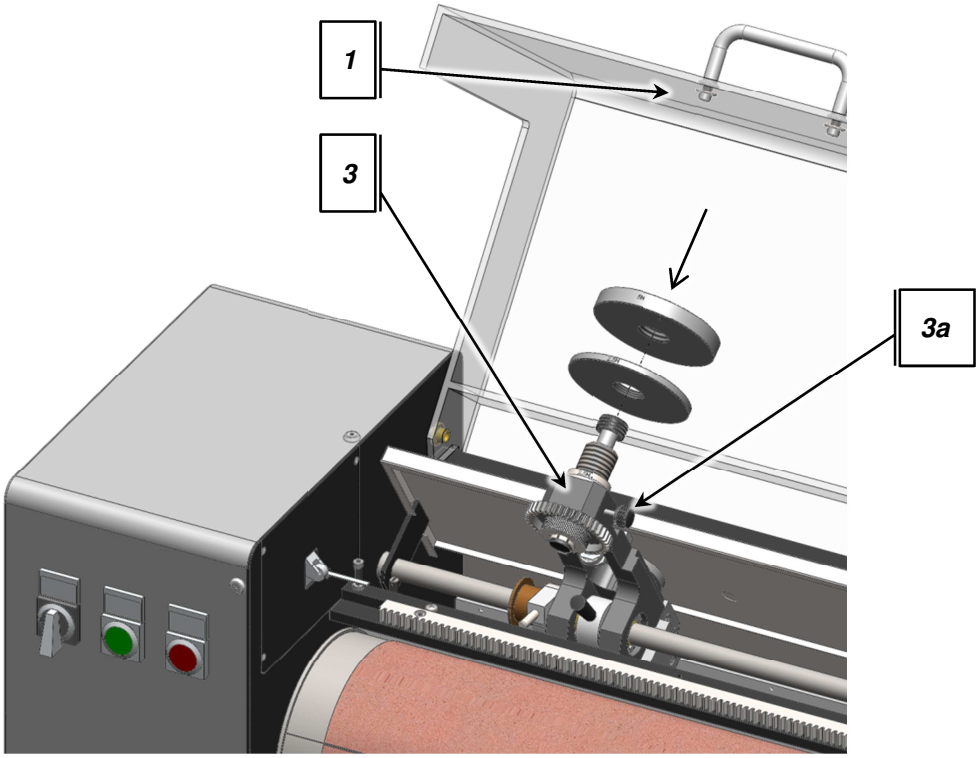


Figure 8: Setting the clamping force

a.) Open the protective hood [1].
b.) Fix the clamping screw [3a].
c.) Screw the desired additional weights till the end stop on the sample holder [3].
d.) Close the protective hood [1].

8.4. Retrofitting fixed or rotating test pieces

Retrofitting the abrasion process from a fixed test piece to a rotating one is done by shifting the toothed rod.

In case the test sample is to be abraded according to the rotating method, the cog wheel of the sample holder must engage with the toothed rod.

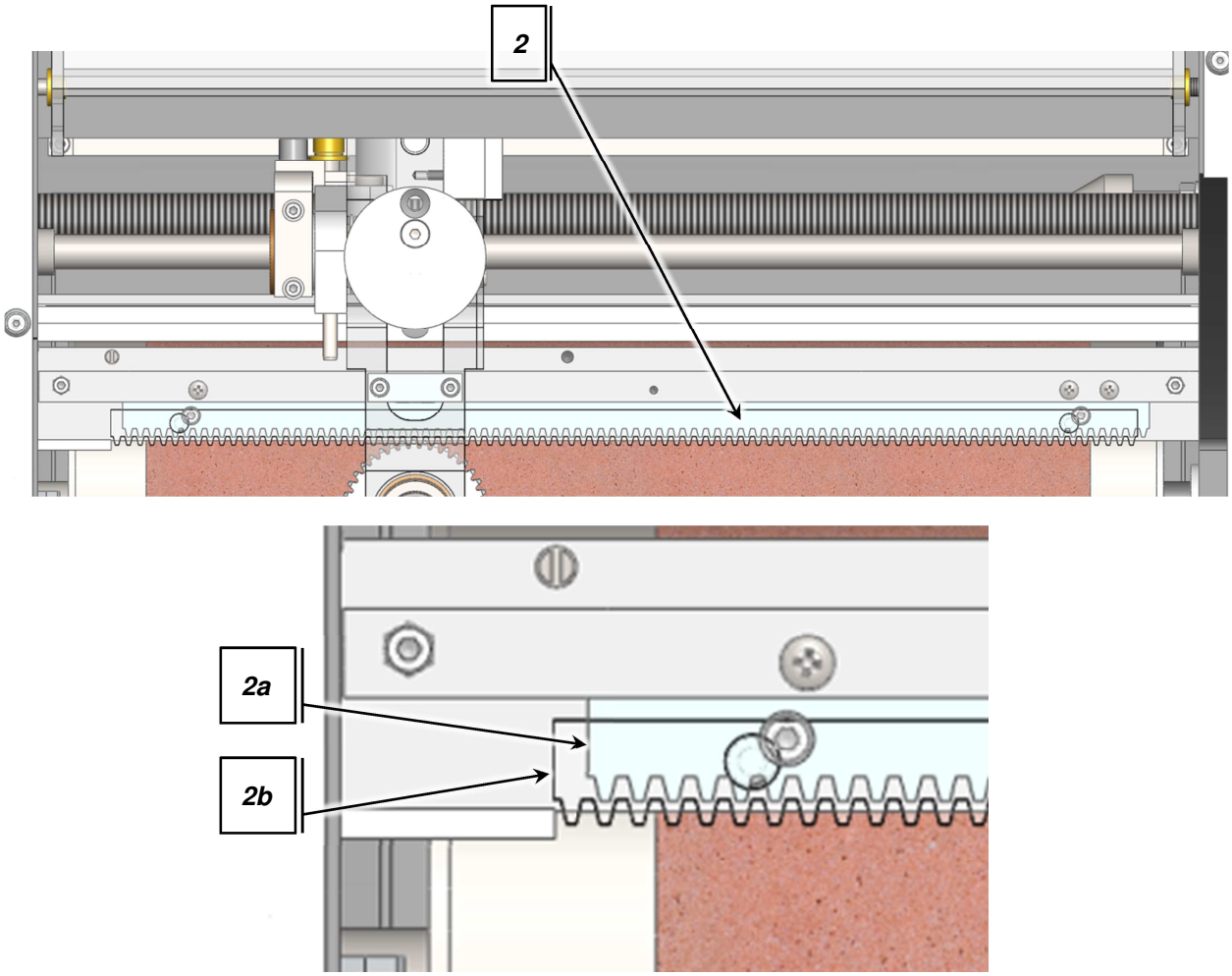


Figure 9: Retrofitting fixed or rotating test piece

No.	***Description***
2	Toothed rod
2a	Fixing position for fixed test pieces
2b	Fixing position for rotating test pieces

Table 11: Legend Retrofitting fixed and rotating test pieces

It is described below, how the toothed rod [2] can be changed between the fixing positions [2a] and [2b].

8.4.1. Retrofitting process for rotating test pieces

a.) Open the protective hood [1].
b.) Swivel the sample holder backward [3].
c.) Loosen all the three screws of the toothed rod [2] at the position [2a].
d.) Displace the toothed rod via the threaded holes of position [2b].
e.) Fix the toothed rod [2] with the screws at the position [2b] - tighten the screws properly.

In the operating mode with rotating test piece, the clamping screw may not be tightened.

f.) Loosen the clamping screw [3a] so that the test piece can rotate.
g.) Move the sample holder to the start position and swivel out the sample holder [3].
h.) Close the protective hood [1].

8.4.2. Retrofitting process for fixed test pieces

a.) Open the protective hood [1].
b.) Swivel the sample holder backward [3].
c.) Loosen all the three screws of the toothed rod [2] at the position [2b].
d.) Displace the toothed rod via the threaded holes of position [2a] and strike at the edge.
e.) Fix the toothed rod [2] with the screws at the position [2a] - tighten the screws properly.

In the operating mode with fixed test piece, the clamping screw must tightened.

f.) Tighten the clamping screw [3a] so that the test piece cannot rotate.
g.) Move the sample holder to the start position and swivel out the sample holder [3].
h.) Close the protective hood [1].

8.5. Preparing the emery sheet

According to the standards, the abrasive power of the emery sheet must be checked with a reference elastomer before and after every test series.

For determining the weight of the reference elastomer - test piece, a scale with a high measurement accuracy is suitable - available as accessory.

The mass difference of the reference elastomer test piece before and after the abrasion process is a measure of the abrasive power of the emery sheet.

8.5.1. Checking the abrasive power

a.) Fit the abrasion tester - according to the standard - for instance, with the weight of 10 N, at an abrasion path of 40 m and with standing (not rotating) test piece.

The abrasion test is to be carried out with standing (not rotating) *test piece for checking the abrasive power of the emery sheet.*

b.) Determine the weight of the reference elastomer test piece (accuracy at least ±1 mg) - e.g. type A.
c.) Start the standard abrasion process, but fit the abrasion tester with the test piece of reference elastomer measured beforehand.

For abrasion processes, only the emery sheets are to be used whose abrasive power lies within the tolerance given in the standard - for instance, between 180 and 220 mg abrasion at 40 m abrasion path.

Carry out at least three test runs - the mean value of the weight measurements is taken for evaluating the abrasive power of the emery sheet.

d.) Evaluate the determined abrasion of the reference elastomer:
d.a.) Abrasion too low: Replace the emery sheet and calibrate.
d.b.) Abrasion too high: Calibrate the emery sheet.

Do not conduct any tests with a worn out or too sharp emery sheet for relevant measurements - otherwise the measured values are incorrect.

8.5.2. Calibrating the emery sheet

a.) Fit the abrasion tester - according to the standard - for instance, with the weight of 10 N, at an abrasion path of 40 m and with standing (not rotating) test piece.
b.) Start the standard abrasion process, but fit the abrasion tester with the abrasion - steel test piece.

By using the abrasion - steel test piece the emery sheet gets blunted.

Use the abrasion - steel test piece only once for each calibration with the high loading weight of 10 N. Reduce the loading weight, in order not to blunt the emery sheet too much.

c.) If needed, repeat the standard abrasion process with the abrasion - steel test piece, but with reduced loading weight.

Experience values show that a successful calibration is normally achieved with an abrasion process below 10 N and one more abrasion process without loading weight.

d.) Clean the emery sheet thoroughly.
e.) Check the abrasive power of the emery sheet.

8.5.3. Replacing and fitting the emery sheet

Under all circumstances, pay attention to the safety instructions and the technical documentation.

The emery sheet is placed in the switched on state in inching mode.

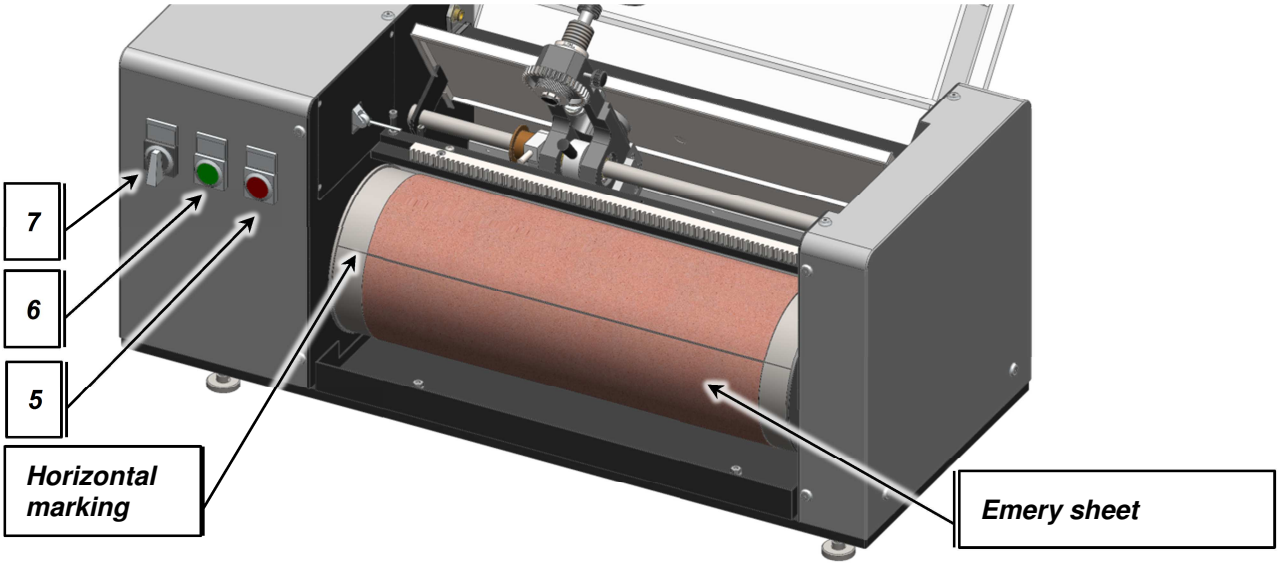


Figure 10: Replacing and fitting the emery sheet

No.	*Description*
5	STOP
6	START
7	POWER O I (Off On)

Table 12: Legend Replacing emery sheet

a.) Switch off the abrasion tester [7].
b.) Open the protective hood [1].
c.) Swivel back the sample holder [3].
d.) If applicable, remove impurities, residues or the worn out emery sheet from the roller.
e.) Switch on the abrasion tester [7].

The roller is driven at low speed by pressing the START button - do not put your hand in the running abrasion tester.

f.) Press the START button [6], till you see one of the thee horizontal marks (gradation 120°) on the roller and can access it well for sticking.
g.) Place an adhesive strip in the middle along the marking on the entire width of the roller.
h.) Drive the roller further in inching mode and place, as described above, adhesive strips on each of the remaining two markings.
i.) Position the emery sheet along the horizontal and vertical marking and place it on the adhesive strip present with a slight tension.

See to it that you do not get injured by the emery sheet (risk of scraping).

See to it that the emery sheet lies at the entire periphery.

See to it that the emery sheet neither overlaps nor exceeds a gap of 2 mm at the joint.

j.) Swivel the sample holder [3] in working position.
k.) Close the protective hood [1].

Probably the abrasive power of the emery sheet is still too high.

l.) Switch off the abrasion tester.

8.6. Setting up the abrasion path 20 or 40 metres

According to the requirements of the standards or owing to the texture of the test piece, it can become necessary to adjust the abrasion path suitably.

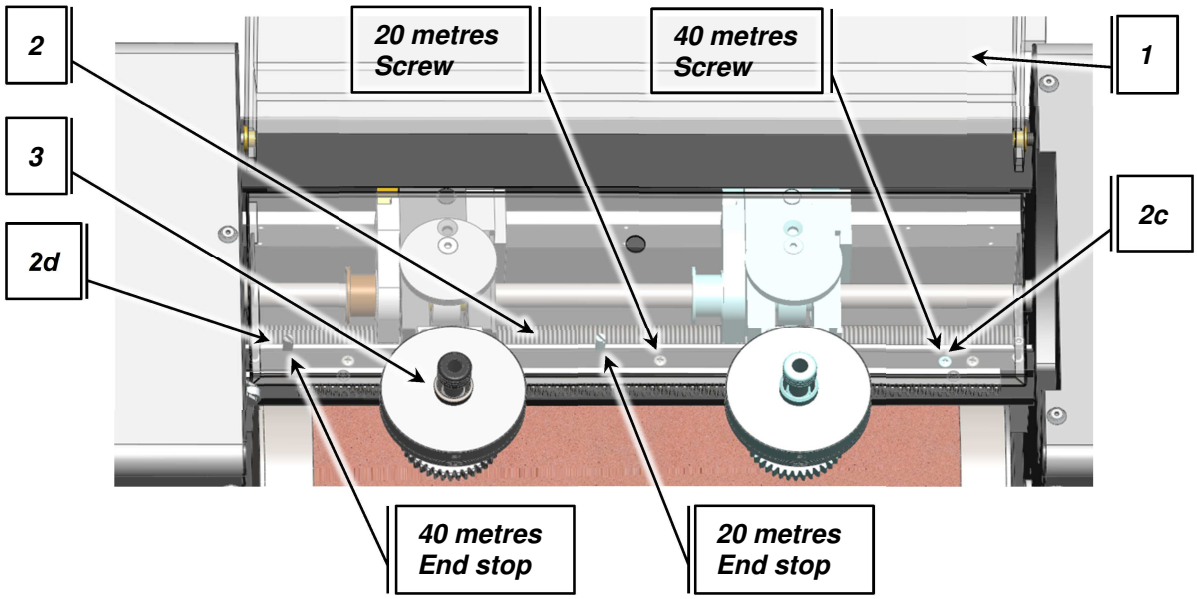


Figure 11: Setting up 20 m and 40 m

No.	*Description*
1	Protective hood
2	Toothed rod
2c	Screw abrasion path
2d	Stop pin
3	Sample holder

Table 13: Legend Setting up abrasion path 20 m and 40 m

The abrasion process is carried out depending upon the abrasion path screw [2a]:

a.) 20 m
b.) 40 m

If the abrasion tester is operated with an abrasion path of 20 m, the emery sheet is not fully used. Accordingly, there is only a one sided wear of the emery sheet in the left area.
In order to still be able to use the remaining area of the emery sheet, it is possible to displace the stop pin [2b] further - as such, the start position of the abrasion process can be pushed approximately in the middle of the width of emery sheet.

Use only the original screw for setting the abrasion path, otherwise the abrasion path can change unexpectedly.

The setting of the abrasion path depends on the position of the abrasion path screw and the stop pin, it acts as end switching cam and starting point of the abrasion path.

Proceed as follows to adjust the path:

a.) Open the protective hood [1].
b.) Swivel the sample holder [3] backward and place it down.

Use the accompanying cross-recess screwdriver to change the position of the abrasion path screw.

c.) Loosen the abrasion path screw [2c] and place it on the position 20 m or 40 m depending upon the requirement.
d.) Loosen, if needed, the stop pin [2c] and place it on the position 20 m or 40 m depending upon the requirement.

The stop pin helps in adjusting the start position according to requirement.

e.) Properly tighten the abrasion path screw [2c].

Make sure that the stop pin does not hinder the movement of the sample holder.

Make sure that the sample holder is still present to the right of the stop pin.

f.) Place the stop pin [2d] and tighten it too properly.
g.) Close the protective hood [1].

8.7. Changing the cleaning brush

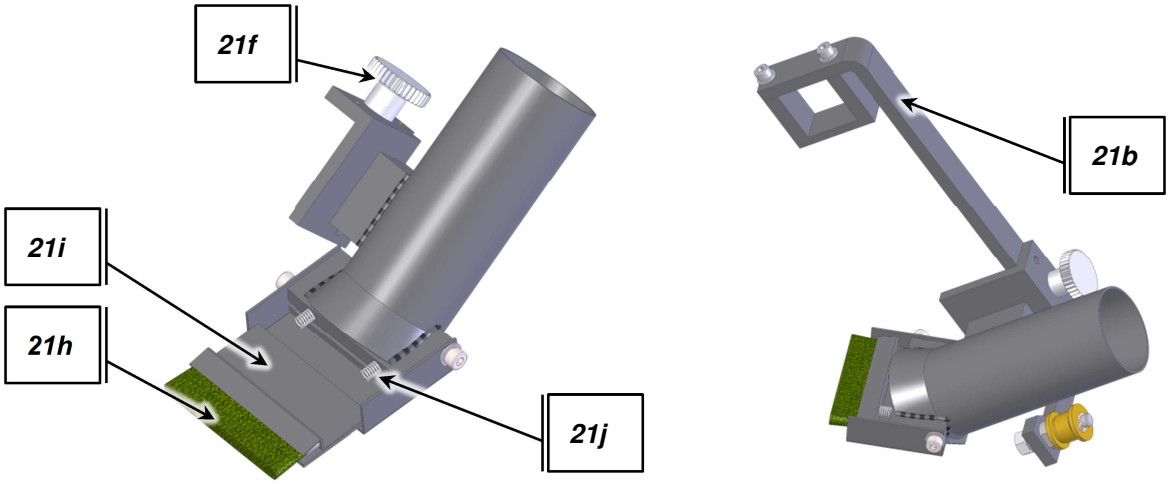


Figure 12: Changing the cleaning brush

No.	*Description*
21b	Bracket unit
21f	Knurled screw
21h	Cleaning brush
21i	Brush holder
21j	Pressure spring

Table 14: Legend Changing cleaning brush

a.) If applicable, loosen the screws of the cover plate [20] and dismantle it.
b.) Preserve the screws and the cover plate [20] at a suitable place.
c.) Dismantle, if applicable, the connected vacuum cleaner [23].
d.) Loosen the knurled screw [21f] and remove the connecting piece [21].

The pressure springs can fall out during the dismantling.

e.) Pull out the cleaning brush [21h] together with the brush holder [21i] from the connecting piece [21]. Pay attention to the pressure springs [21j].
f.) Push the worn out cleaning brush [21h] sideways from the brush holder [21i] and thereafter insert a new one.
g.) Mount the new cleaning brush [21h] together with the brush holder [21i] again in the connecting piece. Pay attention to the pressure springs [21j].
h.) Mount the connecting piece [21] again in the abrasion tester.
i.) Fix the connecting piece [21] with the knurled screw [21f] at a distance of 0.5 mm - 1 mm to the emery sheet.
j.) Mount the cover plate [20], if applicable, at its original place.
k.) Mount, if applicable, the vacuum cleaner [23].

8.8. Option vacuum cleaner

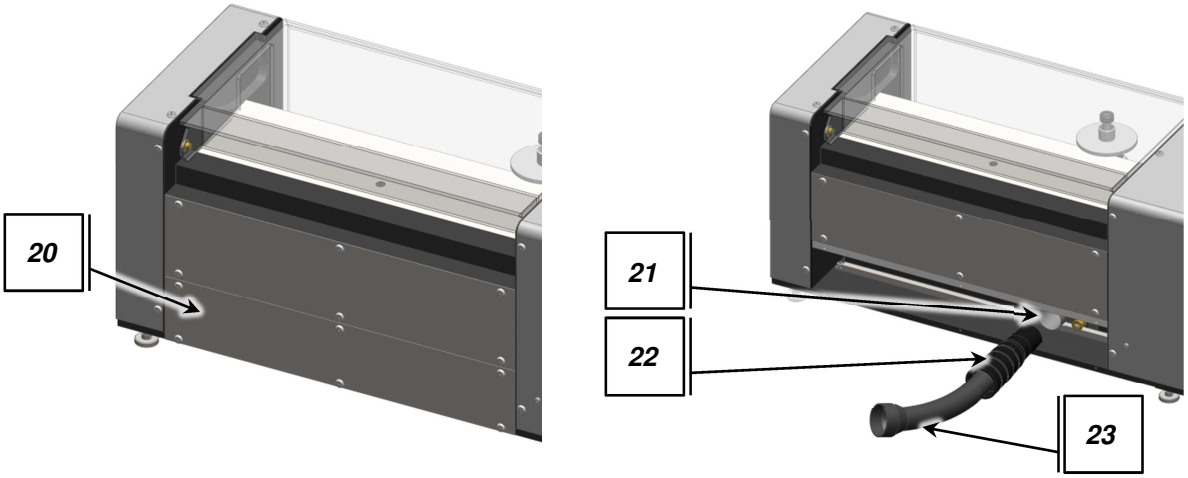


Figure 13: Legend Connect vacuum cleaner

No.	*Description*
20	Cover plate vacuum cleaner connection
21	Connecting piece
22	Adapter
23	Vacuum cleaner hose

Table 15: Legend Option vacuum cleaner

The cover plate on the back side must be dismantled for using the vacuum cleaner.

Preserve the screws and the cover plate of the vacuum cleaner connection properly for a later use.

8.9. Connection of vacuum cleaner

Without the option of automatic vacuum cleaner connection, the operator must suitably switch on and off the vacuum cleaner for abrasion process.

a.) Loosen the screws of the cover plate [20] and dismantle it.
b.) Preserve the screws and the cover plate [20] at a suitable place.
c.) Fix the adapter [22] on the connecting piece [21].
d.) Connect the vacuum cleaner hose [23] with the adapter [22].

8.10. Automatic vacuum cleaner connection

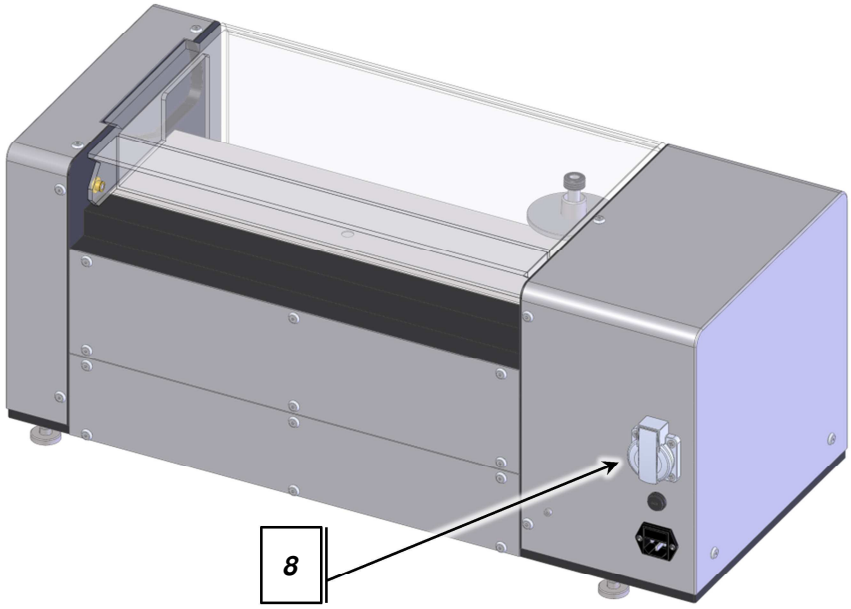


Figure 14: Automatic vacuum cleaner connection

Follow at first the description of connecting the vacuum cleaner.

The electrical control of a connected vacuum cleaner is done automatically by the abrasion tester and the vacuum cleaner is activated automatically during the abrasion process.

Insert the electrical plug of the connected vacuum cleaner in the socket [8] provided for it at the abrasion tester.

8.11. Equipping for using the heating module

The vacuum cleaner must be removed and the cover plate must be placed on the back side for using the heating module.

9. Maintenance

It is recommended to prepare and maintain a maintenance plan, which suffices the instructions given here.

9.1. Cleaning

The abrasion process normally leads to a strong contamination of the interior of the abrasion tester. It is recommended to use the optional vacuum cleaner connection, in order to efficiently suck away the dust that arises. Still, it remains necessary to clean the abrasion tester regularly.

Under all circumstances, pay attention to the safety instructions and the technical documentation.

Recommendations are given for suitably cleaning the abrasion tester.

For cleaning the abrasion tester only mild cleaning agents should be used, in order to avoid surface damages.

Use a soft plastic brush or a paint brush for cleaning the emery sheet.

Use a soft and lint-free cleaning cloth, if possible.

Alcohol, petrol or other easily inflammable substances may not be used for cleaning.

Also clean the periphery around the abrasion tester.

To easily remove large quantities of abrasive dust, the collection pan can be removed with the hood open.

9.2. Lubrication plan

A complete cleaning of the components beforehand is part of the proper lubrication of the abrasion tester.

The recommendation for the lubricant used (type) must be followed for a proper lubrication of the components.

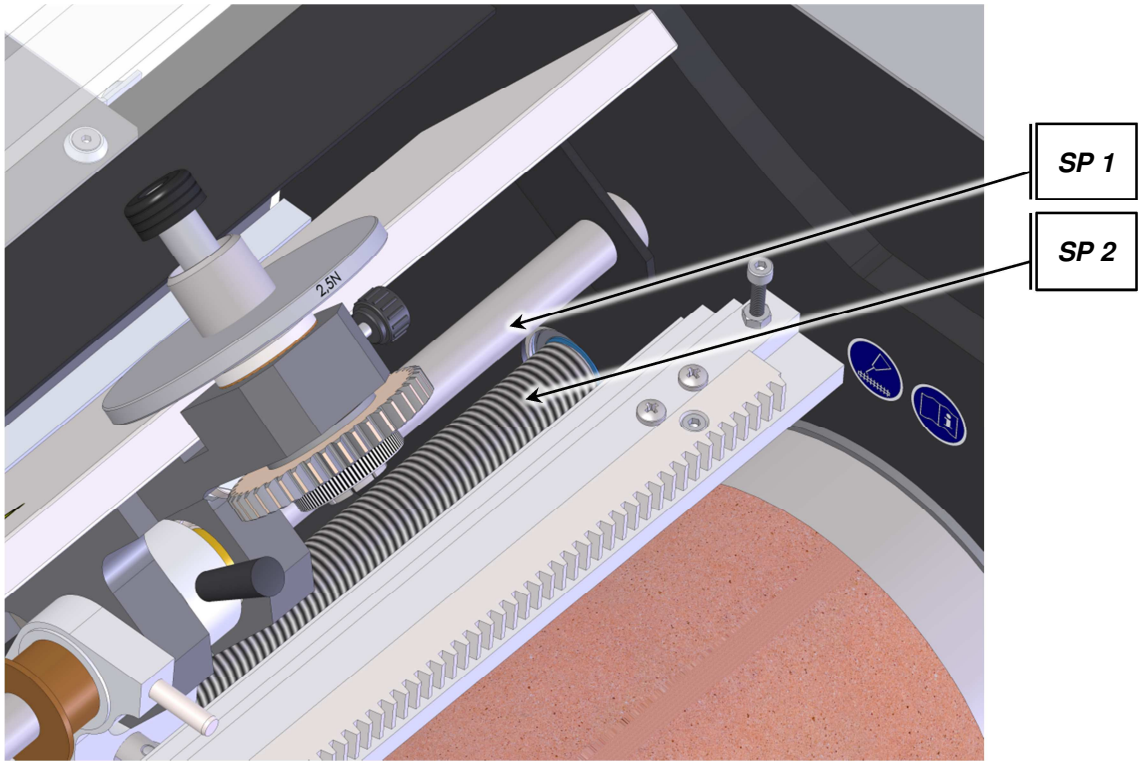


Figure 15: Lubrication plan lubrication points

No.	*Description*	*Lubricant (type)*	*Interval*
SP 1	Guide shaft	AVIA slipway oil RSU	1 week or as and when needed
SP 2	Spindle	AVIA slipway oil RSU	1 week or as and when needed

Table 16: Lubrication plan

Immediately remove the excess lubricant and the dripping quantity and clean the abrasion tester.

9.3. Spare parts ordering instructions

Following components are available as spare parts - please contact us for more information.

Name	***Article number***
Emery sheet set untested and special adhesive tape 5 brackets à 474 x 402 mm one roll 50 x 0.1 mm for placing the emery sheet	fm05002
Emery sheet set untested 5 brackets à 474 x 402 mm	fm05015
Special adhesive tape one roll 50 x 0.1 mm for placing the emery sheet	k28-00050
Cleaning brushes 1 set à 10 pieces	k29-00001
Melt fuse abrasion tester T 3.15 A; 6.3 x 32 mm	k11-04179
Melt fuse heater heating module T 10 A; 5 x 20 mm	k11-00792
Melt fuse control of heater T 32 mA; 5 x 20 mm	k11-00912
Additional weight 2.5 N	11018146
Additional weight 5 N	11018147
Circle cutting knife Ø 16.2 mm	k68-05000

Table 17: Ordering instructions spare parts

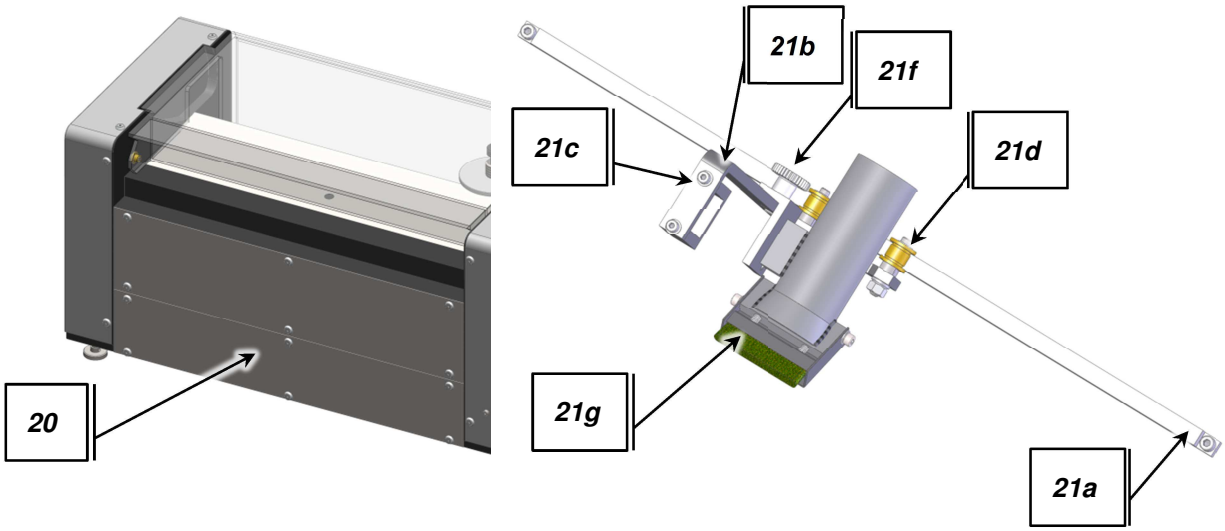
10. Accessories and options

Following components are available as accessories - please contact us for more information.

Name	***Article number***
Reference elastomer No. 1 (method A) ISO 4649, ASTM D 5963 (DIN 53516); 181 x 181 x 8 mm, 365 g	k57-00001
Reference elastomer No. 2 (method B) ISO 4649, ASTM D 5963 (DIN 53516); 181 x 181 x 8 mm, 333 g	k57-00002
Circle cutter - Morse taper shank - Circle cutting knife Ø 16.2 mm	fm05004
Circle cutter - Clamping shaft Ø10 mm - Circle cutting knife Ø 16.2 mm	fm05004-1
Abrasion steel test piece	fm00514
Alignment gauge	12002070
Additional weight 10 N	fm05006
Vacuum cleaner with adapter for vacuum cleaner connection (cleaning device)	fe05005
Vacuum cleaner connection - mechanical (cleaning device) with cleaning brushes 1 set à 10 pieces	fm05007
electronic precision scale	upon request
Dust hood for abrasion tester	k52-00105

Table 18: Ordering instructions for accessories

10.1. Installation of option vacuum cleaner connection - mechanical fm05007



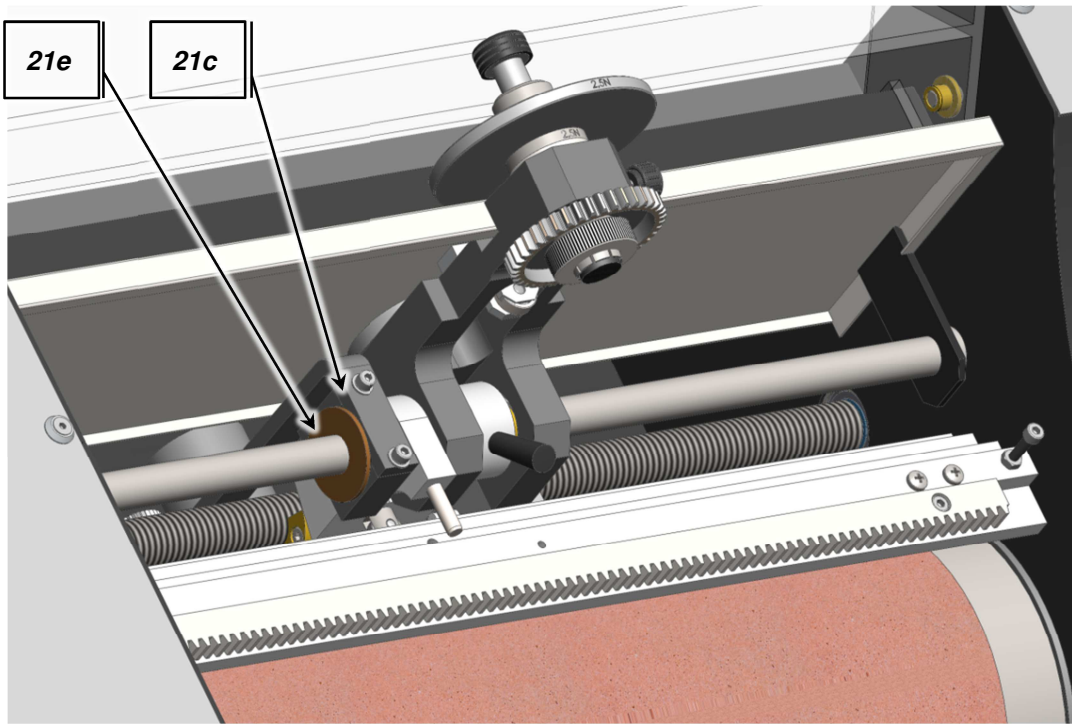


Figure 16: Automatic vacuum cleaner connection

No.	*Description*
20	Cover plate vacuum cleaner connection
21a	Guide bar
21b	Bracket unit
21c	Clamping for carrier of bracket unit
21d	Guide rollers
21e	Guide ring
21f	Knurled screw
21g	Brush and deflector

Table 19: Legend Installation of vacuum cleaner connection - mechanical fm05007

a.) Loosen the screws of the cover plate [20] and dismantle it.
b.) Preserve the screws and the cover plate [20] at a suitable place.
c.) Open the protective hood, position the sample holder somewhere in the middle and swivel it back.
d.) Loosen the screws and dismantle the clamping [21c] of the bracket unit [21b].
e.) Place the bracket unit [21b] in such a way in the abrasion tester that the carrier of the bracket unit lies on the guide ring [21e].
f.) Place the guide rollers [21d] on the guide bar [21a] and align the guide rollers [21d] parallel in the fixing elongated holes.
g.) Mount the clamping [21c] at the original place and thus establish a secure connection to the sample holder.

If strong friction noises can be heard, the alignment of the rollers to the guide bar is to be checked and aligned in parallel, if needed.

h.) Fix the brush and the deflector [21g] with the knurled screw [21f] at a distance of 0.5 mm - 1 mm to the emery sheet.
i.) Mount the cover plate [20] at its original place.

11. Guarantee and warranty

Please read the guarantee and warranty provisions from the general terms and conditions of business (AGB) at www.bareiss.de.

Claims of damages and defects can become null and void because of the points given in the following listing:

a.) Improper handling, such as transportation, operation, connection and commissioning.
b.) Improper use
c.) Negligence
d.) Non-adherence to operating instructions and maintenance instructions
e.) Changes made in the device by a person not authorised by Bareiss.
f.) Removing the name plate.

12. Conduct in case of faults

Under all circumstances, pay attention to the safety instructions and the technical documentation.

Faults can occur while operating the abrasion tester - for instance, during the abrasion process - which do not indicate a defect of the device. A suitably skilled person is capable of removing these faults.

Please contact our service, if the suggested procedure does not successfully remove the fault or in case you need any further help.

12.1. Procedure for fault removal

Fault	Cause	Procedure
The abrasion tester does not show any reaction when switched on	no power supply	- Check the power supply - Check the fuse - Check the power cable
The abrasion is higher than desired	The abrasive power of the emery sheet is too high	Reduce the abrasive power with steel test piece
	The clamping force is too high (weights applied)	Reduce the weights appropriately
The abrasion is lower than desired	The abrasive power of the emery sheet is too low	Replace the emery sheet
	The clamping force is too low (weights applied)	Increase the weights appropriately
The abrasion is non-uniform	The emery sheet is contaminated	Remove the residues from the emery sheet
	The cleaning brush is worn out	Replace the cleaning brush
The abrasion takes longer time than desired	Positioning screw is not placed at 20 m	Check the positioning screw and place it at 20 m
The abrasion takes less time than desired	Positioning screw is placed at 20 m	Check the positioning screw and place it only at 40 m
The test piece is rotating	Toothed rod not positioned correctly	Reposition the toothed rod (direction "back")
The test piece is not rotating	Toothed rod not positioned correctly	Reposition the toothed rod (direction "front")
Strong frictional noises can be heard	The test piece is not clamped	- Stop the abrasion process - Clamp the test piece
	The rollers of the vacuum cleaner connection are not running correctly on the guide bar.	Check the alignment of the rollers of vacuum cleaner connection vis-à-vis the guide bar and align it in parallel, if needed.
	Maintenance has not been done.	Follow the maintenance instructions

Table 20: Fault removal

12.2. Service

Bareiss is ready to provide you help with its qualified service via phone, e-mail or fax. A joint fault removal is also possible as the case may be.

To conduct the service process smoothly, please keep ready the serial number and a possibly exact description of the cause of fault and the condition of the abrasion tester.

Before sending the abrasion tester, make sure that this is necessary for removing the fault.

Please follow the instructions with respect to transportation of the abrasion tester.

In each case, please attach a description of the fault with the delivered abrasion tester.

Returning the complete abrasion tester is necessary for repair / calibration.

12.3. Contact data

BAREISS PRÜFGERÄTEBAU GmbH
DAkkS / DKD - Calibration Laboratory
Breiteweg 1
D - 89610 Oberdischingen
Germany

Phone: +49-7305/9642-0
Fax: +49-7305/964222
info@bareiss.de
www.bareiss.de
www.bareiss-germany.com

13. Annexure

13.1. EU compliance

EU – Declaration of Conformity

Manufacturer: Bareiss Prüfgerätebau GmbH
DAkkS/DKD-Kalibrierlaboratorium
Breiteweg 1
DE-89610 Oberdischingen

We hereby declare that the product

Tester, Type **Abrasion tester,** serial no.: see rating plate

complies with the following directives:

- Machines directive 2006/42/EU
- Low voltage directive 2014/35/EU
- EMC directive 2014/30/EU

The following standards have been applied:

- DIN EN ISO 12100:2011 Safety of machinery - General principles for design – Risk assessment and risk reduction

- DIN EN 61010-1:2011 Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements

- DIN EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements – Part 1: General requirements

Documentation officer: Mr Harald Glöggler
Address: see manufacturer's address

Oberdischingen, 02 May 2016

Place/ date

Manfred Maier
Head of sales

Figure 17: EC Declaration of Conformity

13.2. Technical data

13.2.1. General technical data

Dimensions of test piece	Ø16 mm x 6 mm to Ø16 mm x 15 mm
Span length of test piece	Maximum 13 mm
Clamping force of test piece (standard)	2.5 N; 5.0 N; 7.5 N; 10.0 N
Abrasion path / rotations of the roller	- 20 m / 42 R (rotations) - 40 m / 84 R
Speed of rotating test piece	0.9 RPM
Speed of roller	40 RPM
Feed	4.2 mm/R
Peripheral speed	0.32 m/s
Angle of inclination of sample holder	3°
Roller diameter	150 mm
Roller width	460 mm

Table 21: General technical data

13.2.2. Emery sheet

Dimensions	472.5 (-0/+2) x 400.0 mm
Grain size	60

Table 22: General technical data of accessories

13.2.3. Additional weight 10 N

Clamping force of test piece	12.5 N; 15.0 N; 17.5 N; 20.0 N

Table 23: Technical data accessories additional weight 10 N

13.2.4. Abrasion tester standard fe05000

Dimensions when packed (WxDxH)	750 x 650 x 500 mm
Weight when packed	approx. 85 kg
Dimensions when unpacked (WxDxH)	780 x 400 x 350 / 750 mm (closed / open)
Weight when unpacked	approx. 50 kg
Electrical connection data (operation)	100 - 240 V 50 / 60 Hz 50 VA

Table 24: Standard technical data

13.2.5. Abrasion tester automatic vacuum cleaner connection fe05000-01

Dimensions when packed (WxDxH)	750 x 650 x 500 mm
Weight when packed	approx. 85 kg
Dimensions when unpacked (WxDxH)	780 x 400 x 350 / 750 mm (closed / open)
Weight when unpacked	approx. 50 kg
Electrical connection data (operation)	100 - 240 V 50 / 60 Hz 50 VA + vacuum cleaner power
Electrical data for connection of vacuum cleaner	100 - 240 V 50 / 60 Hz max. 10 A

Table 25: Technical data vacuum cleaner connection

13.2.6. Abrasion tester heating module fe05000-02

Dimensions when packed (WxDxH)	750 x 650 x 500 mm
	2100 VA heating operation
Weight when packed	approx. 90 kg
Dimensions when unpacked (WxDxH)	780 x 600 x 350 / 750 mm (closed / open)
Weight when unpacked	approx. 55 kg
Electrical connection data (operation)	100 - 240 V 50 / 60 Hz 2100 VA

Table 26: Technical data heating module

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