ATTENTION

Read Operating Instructions carefully before commissioning.

Operating Instructions

Scratch Hardness Tester

LINEARTESTER 249

Seria-No.:

Erichsen-No.:

Year of construction: **2010**

Country of origin: **Germany**

Stand: VI/2010

Index **Page**

1. Fundamentals

1.1 Who should have access to the Manual

- It is a fundamental precondition for safe and trouble-free operation of the instrument that the safety instructions and safety guidelines are known by all concerned.

  This instruction manual contains the most important guidelines for the safe operation of the instrument.

- The contents of this instruction manual and especially the safety guidelines must be observed by all persons who work with the instrument.

- In addition all local safety regulations and instructions for accident and prevention must be observed.

1.2 Duties of the user's management

It is the user's management's duty:

a) only to permit persons to work on the machine who

- are familiar with the regulations for safety at work and accident prevention and who have been trained to operate the instrument, and
- who have read the Chapter on Safety and the warnings given in this instruction manual and have understood what they have read and have confirmed this by signing a statement to that effect, and

b) to check at regular intervals that personnel are aware of the essential need for a safe working

1.3 Duties of the user's operators

All persons whose duty it is to work with the instrument must before starting work:

- take note and follow the fundamental instructions for safe working and accident prevention
- read the Safety Instructions chapter and warnings given in this instruction manual and to confirm that they have done this and have understood what they have read with their signature.

1.4 Dangers arising from the use of the instrument

The instrument is built in accordance with the state of technology and the recognised safety regulations. In spite of this, dangers to life and limb can arise for the user or third parties. Damage on the instrument of other objects can arise in its use. The instrument must only be used:

- for the application for which it is intended.
- with all safety features in fault-free condition.

Faults that could influence safety must be corrected immediately.

1.5 Proper Use

The **Scratch Hardness Tester LINEARTESTER 249**, is intended for determining the scratch resistance of protective surface coatings, such as paint and lacquer finishes, plastic coatings etc.
Also for other tests:
Scribe/Scratch tests, to and fro-cycle abrasion tests, Crockmeter tests, MEK tests, tests determining the resistance against solvents in general or wipe test, respectively.

If the instrument is employed for any other purposes, this will be improper use. Erichsen GmbH & Co. KG will not be liable for any damage resulting from this.

Proper use also implies:

- observance of all guidelines contained in the instruction manual and
- full attention to laid down inspection and maintenance procedures.

1.6 Guarantee and Liability

Fundamentally our general Conditions of Sale and Supply apply. These will be available to the user at the latest at the time of completion of the contract. Claims under guarantee or liability in the event of injury to persons or damage to equipment cannot be accepted if these are the result of one or more of the following causes:

- Improper use of the instrument.
- Incorrect assembly, commissioning, operation and maintenance of the instrument.
- Operation of the instrument when safety equipment was faulty or incorrectly fitted.
- Failure to observe guidelines in the instruction manual in respect of transport, storage, assembly, commissioning, operation, maintenance, and setting up the instrument.
- Unauthorised modifications to the instrument
- Inadequate monitoring of parts of the instrument that are subject to wear, or incorrectly made repairs.
- Catastrophic damage caused by external effects or force majeur.

1.7 Copyright

1.8 Address of the Manufacturer

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2. Safety Instructions

2.1 Meaning of Symbols

The following symbols for dangers are used in this instruction manual.

Danger

This symbol means possible **immediate danger** to the life or health of personnel.
- If this guideline is not noted it can lead to severe danger to health, up to fatal injury.

Warning

This signal signifies a ***situation that could be dangerous***.
- Non observance of this guideline can lead to injury or to damage to equipment.

This symbol draws the attention to special tips for the user and information that is particularly useful.
- It refers to aspects which will enable you to use your Instrument to optimum effect.

2.2 Availability of Safety Information

- The instruction manuals must always be kept at the place of operation of the instrument.
- In addition to the information contained in the instruction manual, general and local regulations for accident prevention and environmental protection shall be kept available and observed.
- It is essential to ensure that all guidelines in respect of safety and dangers on the instrument are kept in readable condition.

2.3 Training of Personnel

- Only properly trained personnel may operate the instrument.
- Who is responsible for what must be clearly established in respect of installation, commissioning, operation, setting up maintenance and repair.
- Personnel in training must only be allowed to work on the instrument when supervised by an experienced person.

2.4 Dangers from Electrical Energy

- Work on the electrical supply may only be done by qualified electrician.
- The electrical equipment of the instrument must be checked regularly. Loose connections and cable damaged by heat must be corrected immediately.

2.5 Points of Special Danger

Danger

There is a special point of danger in the working area of the instrument:
Do not move hands into the radius of action of the working stylus.

2.6 Care, Maintenance, Correction of Faults

- Carry out maintenance and inspection at the correct intervals.
- Inform operating personnel before starting with maintenance or repair work.
- The instrument must be isolated from the elctrical supply whenever maintenance, inspection or repair work is done.

2.7 Modifications to the Equipment

- No modifications or additions or alterations to the instrument may be made without permission from the manufacturer.
- All measures involving modifications require written confirmation of approval from ERICHSEN GmbH & Co. KG
- Instruments not in fault-free condition must be switched off immediately.
- Use only replacement parts from the original supplier.
  - If parts from other sources are used there is no guarantee that they are designed to take the loading and meet the safety requirements.

2.8 Cleaning of the Instrument and Disposal of Materials

- Materials must always be used and disposed of correctly. This applies particularly when cleaning with solvents.

3. Transport and Storage

3.1 Packing

One of the factors on which the type of packing depends is the method of transport involved. Unless otherwise agreed in the Contract, the packing will be in accordance with the HPE guidelines laid down by the Federal Association for Timber, Pallet and Export Packing (German registered association) and from the German Association of Machine Builders.

Note must be taken of the pictorial symbols on the packing.

3.2 Checks on Receipt by the User

Check packing for damage
After unpacking check complete supply.

3.3 Reporting Transport Damage and Documentation

Reports of damage should be documented as accurately as possible (possibly photographed) and reported to the relevant insurers or, in the case of sales "delivered to customers works", to the supplier.

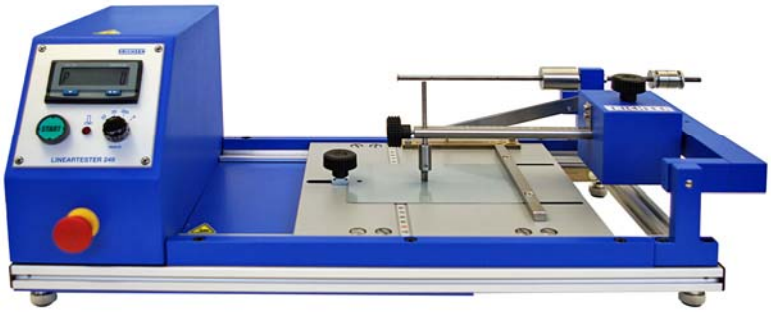
3.4 Storage

The instrument must be stored in a dry place at a temperature between 10 - 40°C (if possible in the original packing).

4. Instrument Data

4.1 Name / Type

Scratch Hardness Tester LINEARTESTER 249
Ord.-No. 0263.01.31



4.2 Scope of supply

1 Basic unit
1 Circular level
1 Power pack
1 Operating manual

4.3 Accessories and Spare Parts

Ord.-No.	Product Description
0839.01.32	Load weight (1 - 40) N
	Test Tip with long shaft
915030241	Test tip acc. to Clemen (R 1.0 mm)
0693.01.32	Test tip acc. to van Laar (Ø 0.5 mm)
0842.01.32	Test tip acc. to IHD (Ø 0.6 mm)
0208.02.32	Test tip acc. to ISO (Ø 1.0 mm)
915030441	Test tip acc. to VW (3 mm/60°)
0741.01.32	Test tip acc. to (0.5 mm/90°)
0740.01.32	Test tip acc. to (1.0 mm/90°)
	Equipment for MEK test
0840.01.32	MEK-Attachment
0841.01.32	Test plugs made of high dense special felt (per 100 pcs.)
0849.01.32	Test set for MEK test
0364.08.53	Crocking cloth (per 1000 pcs.)
	Universal adapter set and accessories
0690.01.32	Universal Adapter Set
	Spherical inserts for the clamping adapter (short shaft without clamping device)
0539.01.32	Test tip acc. to van Laar (Ø 0.5 mm)
0539.02.32	Test tip acc. to Bosch (Ø 0.75 mm)

Ord.-No.	Product Description
0539.03.32	Test tip acc. to ISO (Ø 1.0 mm)
0539.07.32	Test tip acc. to ISO (Ø 1.0 mm) – additionally covered with an extremly hard layer
0539.04.32	Test tip acc. to BMW (Ø 3.0 mm)
	Asymmetric inserts (short shaft with clamping device)
0218.02.32	Test tip acc. to Clemen (R 1.0 mm)
0564.01.32	Test Tip for cross hatch cutting (30°) – additionally covered with an extremly hard layer
	Inserts (Ø 16 mm/R 0.5 mm) for the disc adapter
0430.01.32	Test discs made of Duroplast (p. 10 pcs.)
0430.02.32	Test discs made of copper (p. 10 pcs.)
0430.03.32	Test discs made of stainless steel (p. 10 pcs.)
0539.05.32	Test discs made of stainless steel, additionally covered with an extremly hard layer (p. 10 pcs.)
	Adapter for abrasion tests
0844.01.32	Squarish adapter (egde length 25 mm)
0845.01.32	Cylindrical adapter (dia. 25 mm)

4.4 Technical Data

4.4.1 Dimensions

Width: approx. 280 mm
Length: approx. 580 mm
Height: approx. 210 mm

Net weight: approx. 13 kg

4.4.2 Technical Data

Power supply:		(100 - 240) VAC, (47 - 63) Hz
Power consumption:		25 VA
Scratch force:	- range:	(0,5 - 20) N *)
	- increment:	0,5 N *)
	- accuracy:	0,2 N *)
Test speed:		22/35/200 mm/s (fixed)
		(20 - 200) mm/s programmable
Test distance:		60 mm
Specimen dimensions		max. 150 x 210 mm (DIN A 5) **)
Length of cycles:		60/110 mm (with/without guide plate)

*) ***Using the 40 N load weight (optional) all force levels doubles up.***
) ***Only flat specimens can be tested.*

4.5 Noise Level

The continuous noise level from the instrument does not exceed <70 dB(A).

5. Assembly and Commissioning

5.1 Assembly of the Instrument

The **Scratch Hardness Tester LINEARTASTER 249** is a table model, which must be installed in a suitable place with normal ambient temperature. Special fixings are not required.

To align the instrument horizontally use the four adjustable leveling feet at the bottom of the device as well as the included spirit level.

5.2 Preparation of Energy and Supply Connections

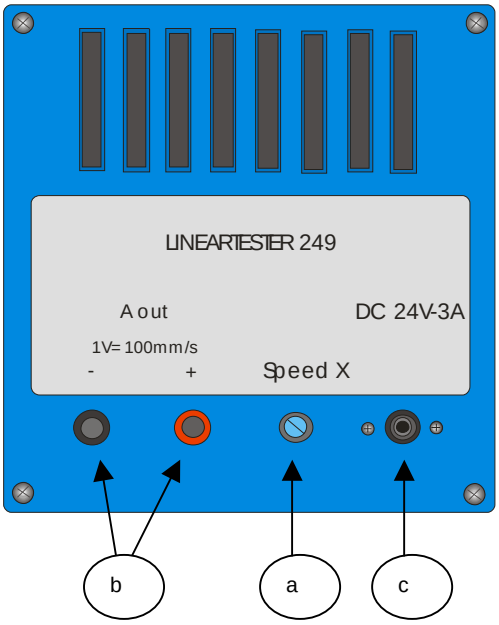
For the power supply please use the delivered power pack 24V 3A only.

Attention

Prior to connecting the instrument check whether the voltage indicated on the name plate corresponds to the local mains voltage.
If these ratings are not compatible, the instrument should under no circumstances be connected!
The input voltage range is 100 V AC – 240 V AC. Please make sure that this range is not exceeded.

- Connect the low tension jack (c) to the instrument.
- Connect mains plug to the AC mains supply.

Rear panel of the housing



a Potentiometer for speed setting
b Analogue output
c Low tension jack

The analogue output (b) consists of two telephone jacks (black = pole / red = +pole).
The analogue output is short-circuit proof and must be connected to a commercial digital voltmeter <2% and an input resistance > 1 MOhm. Adjust the measuring range to 2 V DC (direct current).

The test weight with the test tip must be lifted safely.

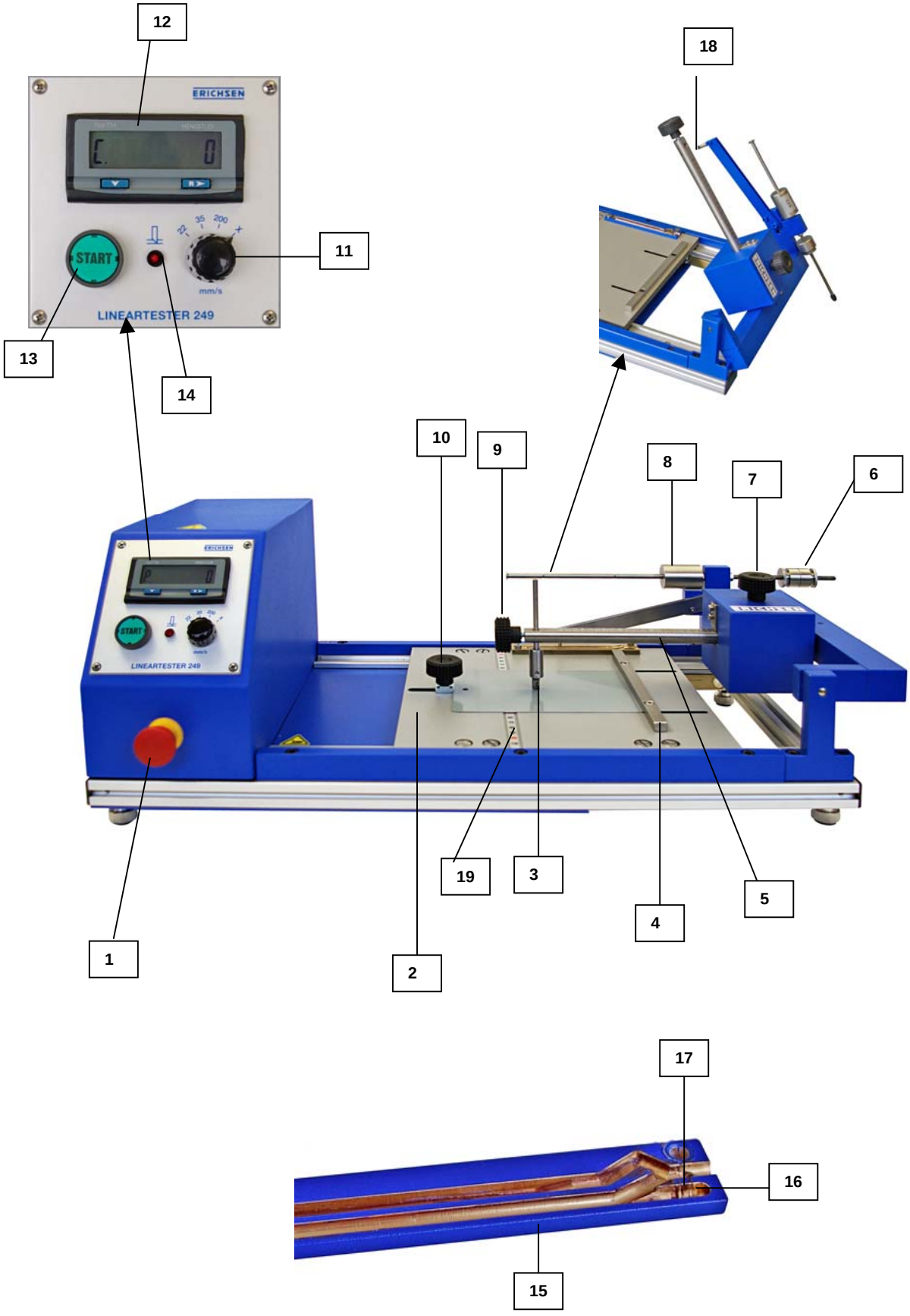
Set the preselection counter to a value of >50 strokes to have time enough available for the adjusting procedure.
Reasonable values for the speed are recommended in the range of 10 mm/s to 190 mm/s (resolution: 1 V – 100 mm/s; medium test speed with an accuracy of ±2.5 %.

The 15-gear potentiometer (a) serves for the setting of the speed.

With the help of a calibration screw driver and the reading of the proportional analogue output voltage it is possible to adjust the speed simply and precisely.

5.3 Control elements

1 Main switch EMERGENCY-OFF
2 Slide
3 Test tip
4 Limit stop / Movable clamping bar
5 Counterpoised lever with scale
6 Taring weight
7 Weight block with locking screw
8 Weight of 0.5 N
9 Fastening screw for test tip
10 Clamp screw for fixing the test panel
11 Setting test speed
12 LED display
13 Start key
14 Visual through-cutting signal
15 Scratch guide plate
16 Scratch depth adjusting groove
17 Rest position of sliding guide ball
18 Sliding guide ball
19 Ruler

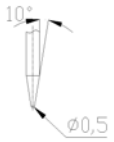
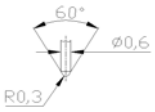
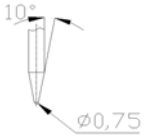
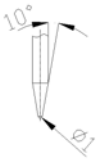
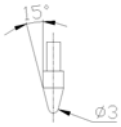

12
18
ERICHSEN
START
11
mm/s
LINEARTESTER 249
13
14
10
9
8
7
6
19
3
4
5
1
2
17
16
15

6. Performance of the Scratch Tests

6.1 Selection of Test Tools

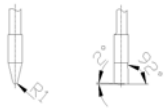
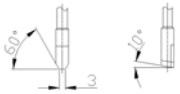
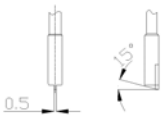
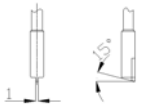
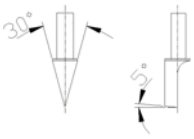
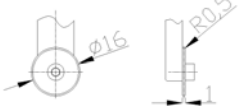
For the performance of scratch hardness tests with the LINEARTESTER 249 following test tools are available:

Spherical Inserts

Description	Test geometry	Material
test tip acc. to van Laar [1) 2)]		carbide insert
test tip acc. to IHD [1)]		
test tip acc. to Bosch [2)]		
test tip acc. to ISO [1) 2)]		carbide insert *)
test tip acc. to BMW [2)]		hardened steel

*) additionally covered with an extremly hard layer
1) long shaft, directly assembled
2) short shaft, only for using with the adapter set
3) only for using with the disc adapter of the universal adapter set

Asymmetric Inserts

Description	Test geometry	Material
test tip acc. to Clemen [1) 2)]		carbide insert
test tip acc. to VW [1)]		
test tip acc. to Sikkens [1)]		
test tip acc. to Sikkens [1)]		
test tip for cross hatch cutting [2)]		hardened steel [*)]
test disc acc. to Oesterle [3)]		duroplast copper stainless steel stainless steel [*)]

*) additionally covered with an extremly hard layer
1) long shaft, directly assembled
2) short shaft, only for using with the adapter set
3) only for using with the disc adapter of the universal adapter set

Fig. 1

6.2 Single Scratch Test

Loosen clamp screw (10) for fixing the specimen and draw it backwards.
Loosen movable clamping bar/ limit stop (4) and draw it backwards (if desired, tighten it in this position or in any other). ***(Fig. 1)***

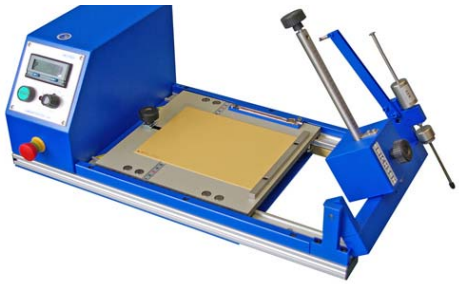


Fig. 2

Place test panel onto the slide (2) and push it against the clamping bar / limit stop (4). ***(Fig.2)***

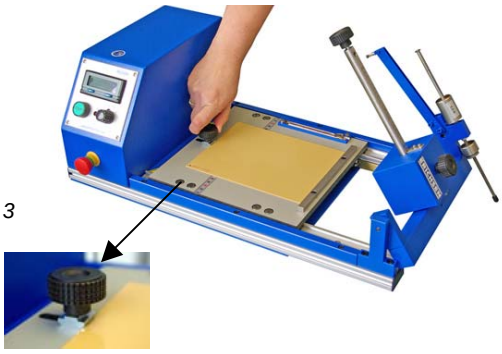


Fig. 3

Fix test panel with the clamp screw for fixing the specimen (10). ***(Fig.3)***

Fig. 4a

Place weight block (7) into zero position and fix it with the locking screw. ***(Fig. 4a/4b)***

Fig. 4b

Fig. 5

Move the weight of 0.5 N (8) to the right into the zero position (clicks into place behind). ***(Fig.5)***

Fig. 6

Insert test tip (3), according to the correct direction of effect, into the corresponding holder in the counterpoised beam (5) and fix it slightly with the fastening screw (9). ***(Fig.6)***

Fig. 7a

Then set the sliding guide ball (18) into the scratch depth adjusting groove (16) of the scratch guide plate (15).
At this the fastening screw (9) must be loosened again, so that the test tool rests on the test panel. ***(Fig. 7a)***
Now tighten the fastening screw (9) finally. ***(Fig.6)***
Then lift the counterpoised lever (5) for a moment using the fastening screw (9) and replace it immediately.
At this the sliding guide ball (18) automatically jumps from the scratch depths adjusting groove (16) into the rest position (17) of the guide plate (15). ***(Fig.7b)***

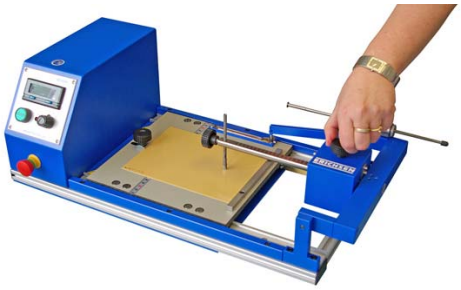
Fig. 7b

The tip of the test tool (3) is now located in a “pending / resting position” just over the test panel.

Fig. 8

Adjust the position of the taring weight by turning so that the weight of the test tip (3) is compensated and the counterpoised lever (5) shows already a corresponding upward trend when it is slightly touched. ***(Fig. 8)***

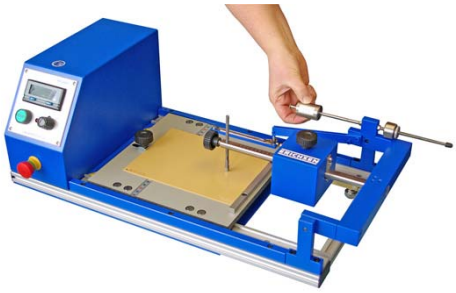
Fig. 9a



Now set the required test force by moving the weight block (7) along the scale on the counterpoised lever (5) (steps of 1 N).
(Fig. 9 a/9b)

Fig. 9b

Fig. 10



By moving the weight of 0.5 N (8) to the left into the first catching position the test force is increased by 0.5 N, when moving further into the next catching position by totally 1 N.
(Fig. 10)

Fig. 11a

Now push the left arrow key under the display (12) until “P” (programme/preset) appears on the left side of the display. ***(Fig. 11a)***

Fig. 11b

Then set the number „1“ (= 1 double stroke cycle) using the left and the right key. ***(Fig. 11b)***

Fig. 11c

Now push the left key again so that „C“(cycles completed) instead of „P“ appears on the left side of the display.***(Fig. 11c)***

(see page 25 – Operation of the preselection counter)

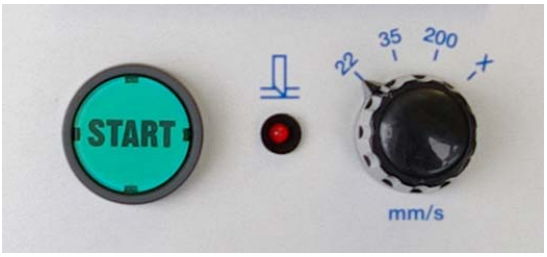


Fig. 12

Afterwards the test speed must be adjusted using the rotary knob (11).
In addition to the three preset test speeds that can be selected, it is possible to adjust under "X". Any other test speed up to 200 mm/s max., as required by the user. ***(Fig. 12)***

Now the **LINEARTESTER 249** is ready for a single scratch test.

By pushing the start key (13) the test procedure starts.

Only start the test procedure in the "C" mode, because otherwise the controller will not stop the instrument after completion of the preset cycles, and it will continue to run and to count

Fig. 13

The slide (2) moves to the right with the test tip (3) still lifted.
While the slide (2) returns to the left, the test tip (3) is then automatically placed onto the test panel by the guide plate (15), and then the scratching process starts immediately and will continue until the test tip (3) is lifted automatically by the guide plate.

When moving the test panel in a defined manner over the rule (19) embedded in the slide (2), several scratches with a defined distance to each other can be applied. ***(Fig. 13)***

Fig. 14

The different scratch forces can be obtained by corresponding, possibly combined, moving of the weight block (7) as well as of the weight of 0.5 N (8). ***(Fig. 14)***

6.3 Double stroke tests

- Crockmeter Test
- MEK Test
- Abrasion Test
- Wipe Test

Contrary to the single scratch test the guide plate (15) is not used in these tests, and it can be dismantled by loosening the two screws with the help of the enclosed Allen key.

In this way the corresponding test tip rests on the test panel during all to and fro double strokes.

The setting of the required cycles is carried out in the same manner (in the „P“ mode), but instead of "1" the number is, of course, higher.

In the “C” mode of the display (12) the double strokes already completed are shown.

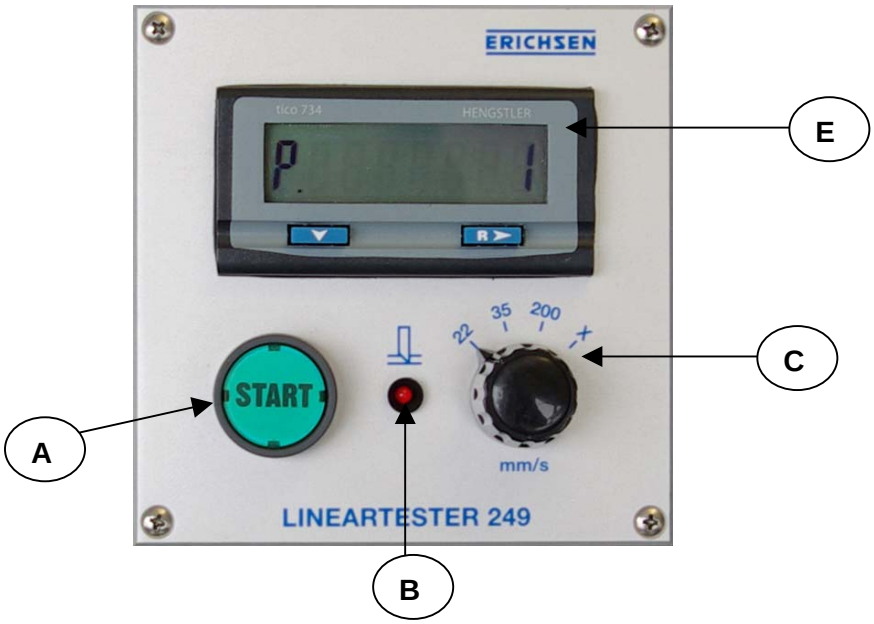
To interrupt the test procedure only push the main switch “EMERGENCY-OFF” (1).
Every new start is also a “Reset” signal for the cycle counter which is automatically reset to “0” , whereby in the “P” mode the preset number of cycles is retained.

Only start the test procedure in the „C“ mode, because otherwise the controller does not switch off the instrument after the completion of the preset number of cycles.

The minimum loading that is necessary to cause a close track on the specimen is used as a measure for the scratch hardness of the material under test, i.e. if at the first loading no scratch can be observed, the loading must be gradually increased. If at the first loading a deep track is already visible, the loading must be gradually reduced.
To avoid possible damage to the test tool it is advisable to lift the balance beam slightly whilst shifting the weight or levelling the beam.

7 Preselection Counter (Display)

7.1 Control Elements



A. Start: For starting the test press key for approx. 1 sec (single scratch test).

B. The contact indicator LED indicates the scratching through of the coating on conductive substrates (normally metal substrates) – with corresponding adaption.

C. Speed selector switch: Using this switch 3 preset speed can be selected. With position "**X**" another variable speed is available. The factory-provided variable speed is set to **50 mm/s**.

D. EMERGENCY OFF: The instrument stops immediately and the DC supply is interrupted (only in case of emergency).

Warning

After actuating the EMERGENCY-OFF key disconnect the power supply.
After troubleshooting (e.g. jammed specimen) restore the instrument to safe condition and connect it to the power supply.
Release the EMERGENCY OFF key by short actuating.
The instrument returns into the initial position or continues the preset test procedure.

E. The preselection counter enables up to 9.999.999 tests on one specimens.

7.2 Operation of the preselection counter

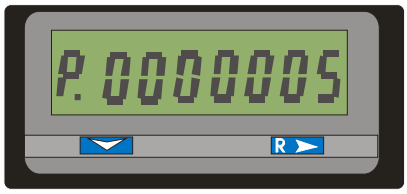
Counter reading

After each test the preselection counter C rises by one point.

By actuating the start key the counter reading is reset to zero.

Setting of the preset value

By means of the left key you get into menu "P" (programme).



By means of the key you get into the preselection menu.

With the help of the key the blinking digit is shifted one place to the right at each keystroke.

By means of the key it is now possible to scroll the numbers 0 to 9 into the blinking digit and to set the desired preselection value.

If all digits to the right side have been scrolled, the counter returns to the menu “P”.

By actuating key you get back to the test counter "C".
Here the preset tests (strokes) can now be started by actuating the start key (A).

If only single scratches have to be carried out via the start key (A), the preset value must be "1".

7.3 Battery change (Preselection counter)

For the storage of the preset values the preselection counter is equipped with two batteries. (**Typ CR ½ AA 3V Lithium**).
The batteries have an average life expectancy of approx. 5 years.

Warning

Prior to replacing the batteries, put the instrument into a **deenergized condition.**

- Loosen the fastening screws of the front panel (4 pcs).
- Pull the front panel carefully forward out of the housing.
- Open battery compartment.
- Replace the batteries **one after the other** with batteries of the same type (**CR ½ AA 3V Lithium**) (thereby the instrument will continue to operate without data loss)
- Close battery compartment.
- Push front panel carefully into the housing.
- Retighten the fastening screws in the front panel.

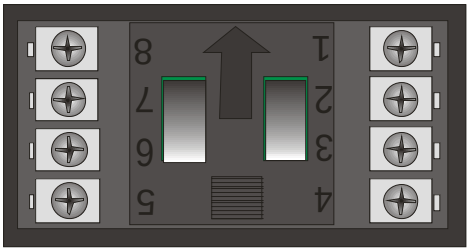


Fig. View on the battery compartment - (front panel opened)

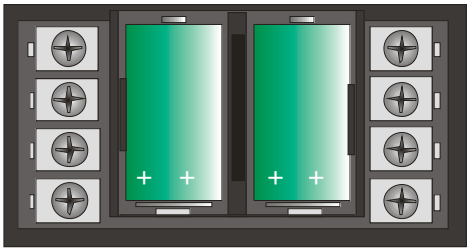


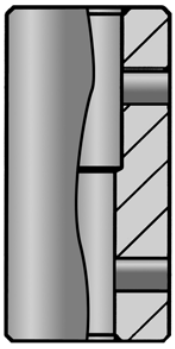
Fig. Opened battery compartment

8 Universal Adapter Set (Accessories)

The adapter set consists of the following components:

8.1 Universal shaft

Universal shaft: Round rod (5 mm diameter) made of stainless steel, with an axial bore with internal thread (M2.5) at one end and a clamping area over the total length. The universal shaft is mounted on the load arm vertically, the bore with the internal thread pointing downwards. There the adapter described hereafter can be fixed. However, the universal shaft can also be used without any additional adapter by screwing so-called gauge slides that are usually provided with a external thread M2.5, into the shaft. Gauge slides are available with a tip or a spherical touch area in a diameter range of 1 - 30 mm. They are made of different materials (hardened steel, tungsten carbide, sapphire, ruby). Therefore it may be recommendable to use these commercial, inexpensive inserts for purposes others than originally intended. To secure the gauge slides on the shaft a serrated lock washer should be used.



8.2 Clamping adapter

Clamping adapter: Cylindrical part made of stainless steel, with one axial bore each of 4 mm and 5 mm diameter as well as radial threaded bores with clamping screws. The clamping adapter is intended for tool inserts using a cylindrical shaft (4 mm dia.).

The following tools from the ERICHSEN line can be used:

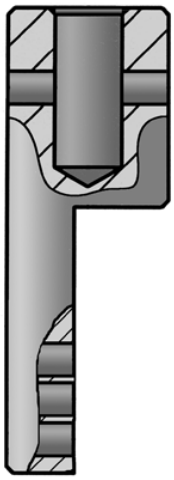
<u>spherical inserts, shaft without clamping device</u>

- *test tip in accordance with van Laar (0.5 mm dia.)*
- *test tip in accordance with Bosch (0.75 mm dia.)*
- *test tip in accordance to (EN) ISO 1518, DEF 1053 and GME 60280 (1 mm dia.)*
- *test tip (ball, 3 mm dia.)*

<u>asymmetric inserts, shaft with clamping device</u>

- *test tip in accordance with Clemen*
- *test tip for cross hatch cut tests*

The clamping adapter can be mounted - comparatively to the moving direction of the basic instrument - in two orientations turned by 180°.

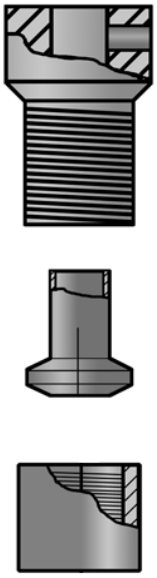


8.3 Disc adapter

Disc adapter: Cylindrical part made of stainless steel with axial bore (5 mm dia.) and radial threaded bores with clamping screws at one end; at the other end plane milling parallel to the axis with three radial threaded bores (M3). The disc adapter serves for fixing of plane tool inserts, especially such with circular disc geometry. The inserts must be provided with at least one bore for a screw M3. The min./max. admitted disc diameter is 8/25 mm.

From the ERICHSEN programme the "Oesterle disc" (disc dia. 16 mm, thickness 1 mm, radius 0.5 mm, centre bore 3 mm dia.). The following versions of the Oesterle insert are available:
- test disc made of Duroplast
- test disc made of copper
- test disc made of stainless steel

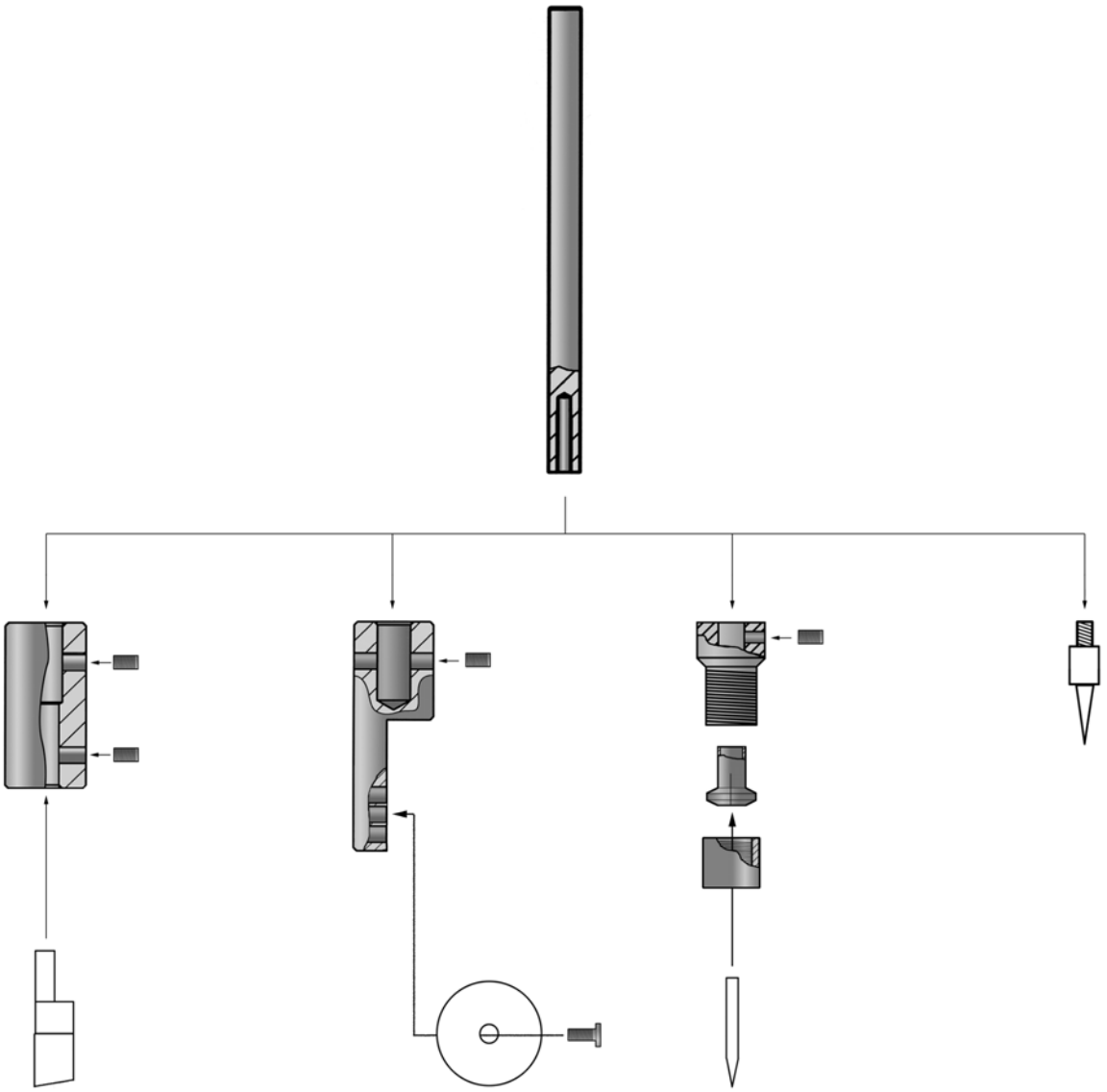
The disc adapter can be mounted - comparatively to the moving direction of the basic instrument - in four orientations turned by 90°.



8.4 Chucking adapter

Chucking adapter: Clamping huck made of gunmetal finish steel with three-piece collet chuck set for 1 / 2.35 / 3 mm dia. The chucking adapter serves as a support for a cylindrical tool insert with spherical or pointed tip (pins, needles etc.).

8.5 Mounting instructions for the universal adapter set



Clamping adapter
Tool insert with
4 mm-shaft
(e.g. Clemen-chisel)

Disc adapter
Two-dimensional tool
insert with bore M3-screw
(e.g. Oesterle disc)

Chucking adapter
Cylindrical tool insert with
∅ 1 / 2,35 / 3 mm
(e.g. needle)

Direct assembly
Gauge slide wih outside
thread M2.5
(e.g. probe tip)

9. Care and Maintenance

9.1 Inspection and Maintenance

9.1.1 Basic Unit

In principle the **Scratch Hardness Tester LINEARTESTER 249** does not require any maintenance.

9.1.2 Test Tools

However, from time to time the drive spindle should be greased and the strings checked and replaced, if necessary.

The geometry of the scratching tools should be checked in intervals of approx. 1 year - according to DIN EN ISO 9001.

9.2 Cleaning Material

Do not use abrasive cleaning materials or cleaning materials that dissolve plastics.

9.3 Disposal of Materials

Disposal of materials used in the operation of the instrument or for auxiliary functions and exchanged items should be dealt with safety and in a manner that will not harm the environment.

9.4 Customer Service

Customer service is provided on request by

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or outside Germany by local representatives.