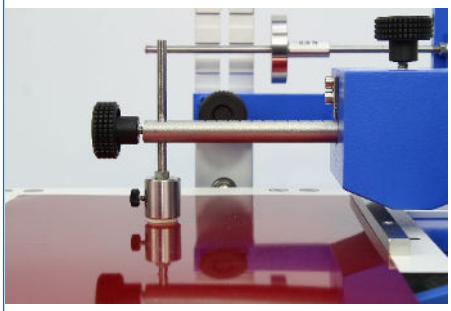


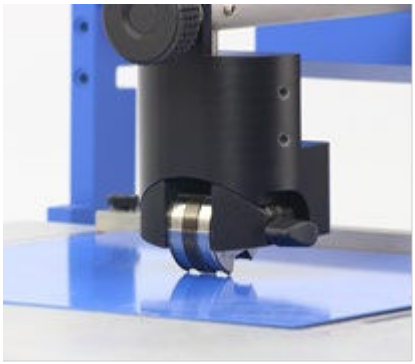
Scratch Hardness Tester

LINEARTESTER

249 Smart

249 Smart XL





Multi-Cut-Adapter Set (cross-cut)



Fig. Mod. 249 Smart

testing equipment for quality management

ERICHSEN
since 1910

Technical Description

van Laar
IHD
Bosch
ISO
BMW

Clemen
VW
Sikkens
Gitterschnitt
Oesterle

Purpose and Application

The optimised scratch hardness tester **LINEARTESTER 249 Smart** is intended, in addition to its original purpose of application, i. e. to establish the ability of a surfaces to resist damage by scratching, also for several 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; cross-cut tests.

Principle of the Test

The test panel is fixed onto a mobile slide by means of clamping rails. Above this slide and held on two metal pillars is a reciprocating beam bedded in a free-moving manner and carrying the adequate test tool as well as a weight.
The required scratching force in the range of (0.5 to 20)N is set by moving the weight along the reciprocating beam, making use of a setting scale (an additional load weight of (1 to 40)N is optionally available). The testing machine is equipped with a 4-position height adjustable load arm device with standard height of about 10 mm (+20/+40/+60 mm). For clamping thicker specimens, a set of sample clamping pieces are also required (Order No. 21010332).



Operation (settings) is via a capacitive LCD display.

To start a scratch/scribe test, the test tool is lowered onto the specimen when moving forward initiating the scratching process immediately. The test panel can be moved sideways so that a series of scratches can be carried out side by side with different force settings. Due to a ruler integrated in the slide plate, an uniform distance between the scratches can be achieved very easily.

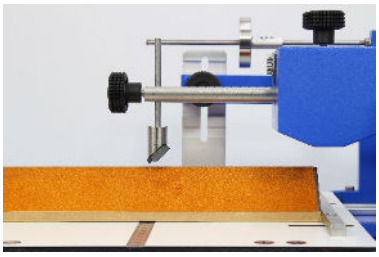
When testing insulating coatings on conducting substrates, an electric recognition of the through-scratching offers an additional security for setting the scratching force.

For abrasion tests, crockmeter tests, MEK or wipe tests the test movement is carried out with the tool lowered onto the specimen, in preset cycles to and fro. For this, the guide plate has to be removed from the slide plate. The test speeds are freely adjustable. The **LINEARTESTER Smart** is equipped with variable stroke lengths.

With the Multi-Cut Adapter and multi-blade cutter with 6 cutting edges at choice, defined, right-angled and accordingly intersecting cuts are applied in such manner, until the substrate recognisable throughout.

Version

The **LINEARTESTER 249 Smart** is a tabletop device that is operated via a capacitive LCD display.
The electromotive drive ensures a uniform forward motion of the slide. The test tool is lowered and lifted automatically when scratch/scribe tests are carried out.



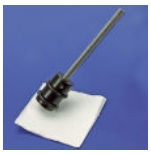
A multitude of different test tools are available (see table on the next page). The tools marked with (*) are made of Tungsten Carbide Steel, additionally covered with an extremely hard layer. Due to this layer's "golden" appearance, any worn parts are visually very easy recognizable because the Tungsten Carbide Material under the "golden" layer has a distincly different color. With the optional available universal adapter set (see last page) even also several user-specifc tool inserts can be used.

Technical Data

Dimensions (L x W x H); Weight	249 Smart: approx. 550 x 380 x 325 mm; 23 kg (incl. load weight 20 N) 249 Smart XL: approx. 680 x 380 x 325 mm; 26 kg (incl. load weight 20 N)
Specimen dimensions	max. 210 x 210 mm (Smart) bzw. 210 x 260 mm (Smart XL)
Power supply	(100 - 240) VAC, (47 - 63) Hz
Scratch force	(0,5 - 20) N in 0,5 N steps
Test speed	Single stroke: (10 - 100)mm/s; double stroke: (10 - 400)mm/s infinitely adjustable
Test length	Single stroke: (50 - 110)mm (Smart) or (50 - 220)mm (Smart XL)
Stroke length	Double stroke: (35 - 150)mm (Smart) or (35 – 260)mm (Smart XL); variably adjustable

Order Information		
Art.-No.		**Product Description**
30800131		Scratch Hardness Tester **LINEARTESTER 249Smart** with an electromotive drive; scratch length single stroke 50 - 110 mm; double stroke 35 - 150 mm (without test tools)
30810131		Scratch Hardness Tester **LINEARTESTER 249 Smart XL** with an electromotive drive; scratch length single stroke 50 - 220 mm; double stroke 35 - 260 mm (without test tools)

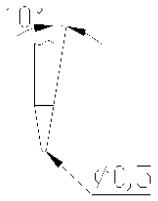
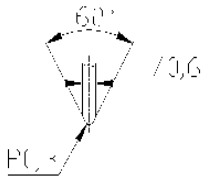
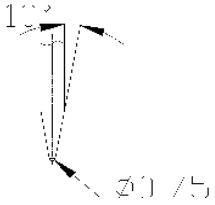
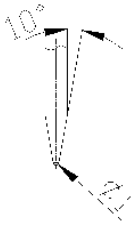
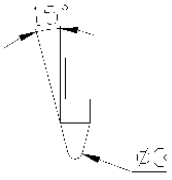
	Necessary A c c e s s o r i e s (at option):	
Art.No.		**Product Description**
19610232		Load weight (1 - 40) N
21010332		Sample clamping pieces (3-part-set)
		Test tips with long shaft
915030241		Test tip acc. to Clemen (R 1,0 mm)
06930132		Test tip acc. to van Laar (Ø 0,5 mm)
0842.01.32		Test tip acc. to IHD (Ø 0,6 mm)
02080232		Test tip acc. to ISO (Ø 1,0 mm)
915030441		Test tip acc. to VW (3 mm/60°)
07400132		Test tip acc. to Sikkens (1,0 mm/90°)
07410132		Test tip acc. to Sikkens (0,5 mm/90°)

		Accessories
Art.-No.		**Product Description**
31390132		Adapter for pencil hardness (holder for pencil, hold-down template, sandpaper, special pencil sharpener, set of standard pencils, tool for mounting the adapter, additional weight)
32990232		Multi-Cut-Adapter-Set **(can only be used with model 249 Smart from serial no. 23047/001)** consisting of multi-cut adapter, knurled fastening screw (20 mmlong), large washer, spacer, 3 tare weights, adjustment screw for tare weight (120 mm long) and a cutter with 6 cutting edges of choice (6x1 mm, 6x2 mm or 6x3 mm cutting distance; without Manufacturer's Test Certificate).
04330132		Cutter (6x1 mm)
04330232		Cutter (6x2 mm)
04330732		Cutter (6x3 mm)
		Ausrüstung für MEK-Test
08400132		MEK attachment
08410132		Test plugs made of high dense special felt
		Equipment for Crockmeter Test
08490132		Crockmeter attachment
19100132		Crockmeter test head according to BMW AA-0134 (conforms to *Rub Head C acc. to DIN 55654*)
03640853		Crocking cloth
03644752		Crocking cloth acc. to ISO 105-F09 (per 500 pcs.)

		Accessories
Art.-No.		**Product Description**
		Universal adapter and Accessories
06900132		Universal adapter set
		Spherical inserts *(short shaft without flat clamping area)*
05390132		Test tip acc. to van Laar (Ø 0.5 mm)
05390232		Test tip acc. to Bosch (Ø 0.75 mm)
05390332		Test tip acc. to ISO (Ø 1.0 mm)
05390732		Test tip technically equivalent to ISO 1518-1 (Ø 1.0 mm) covered with an extremly hard
05391332		Test tip Sapphire (R 0.5 mm, ~60°) acc. to MS210-05 (Hyundai/KIA)
05390432		Test tip acc. to BMW (Ø 3.0 mm)
		Asymmetric inserts (short shaft with clamping device)
02180232		Test tip acc. to Clemen
05640132		Test tip for cross hatch cutting (30°)
		Inserts (Ø 16 mm/R 0,5 mm) for the disc adapter
0430132		Test disc made of Duroplast
04300232		Test disc made of copper
04300332		Test disc made of stainless steel
04300432		Test disc made of stainless steel, covered with an extremly hard layer

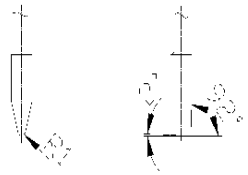
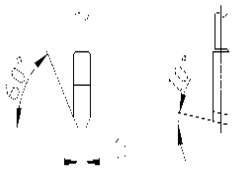
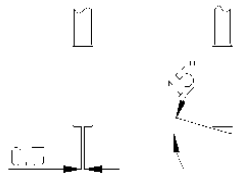
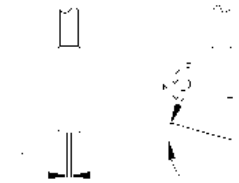
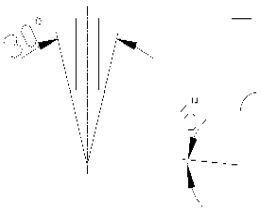
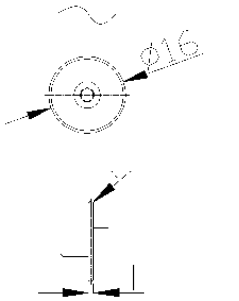
		Accessories
Art.-No.		**Product Description**
		Adapter for abrasion tests
08440132		Squarish adapter (edge length 25 mm)
08450132		Cylindrical adapter (Ø 25 mm)

Spherical Inserts

Description	Test geometry	Figure	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 extremely 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

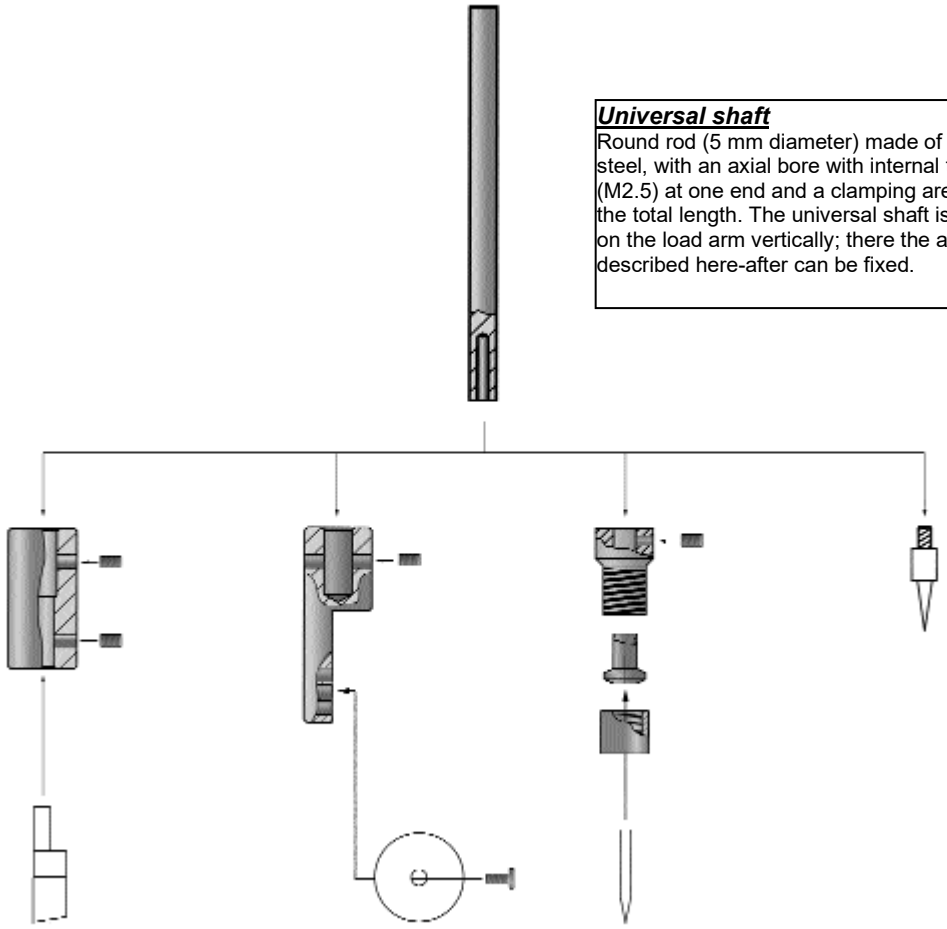
Asymmetric Inserts

Description	Test geometry	Figure	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 extremely 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

Universal Adapter Set

In addition to the standard range of test tools the Universal Adapter Set allows the use of a variety of additions tool inserts. In this way individual test problems with specific tool geometries deviating from established determinations can be solved in an easy manner. The adapter set consists of the following components:



Universal shaft
Round rod (5 mm diameter) made of stain-less 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; there the adapter described here-after can be fixed.

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

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 letter disc geometry.

Chucking adapter
Clamping chuck made of gunmetal finish steel with three-piece collet chuck se 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.).

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

Subject to technical modifications.
Group 14 - TBE 249 Smart – VI/2026