Programmable

Logic Control (PLC)

SCRATCH HARDNESS TESTER 430 P-Smart

Optionally with manually actuated/motor-driven loading force and manually actuated/automatic test panel turn

Operation, documentation and data management via ERICHSEN-App

testing equipment for quality management

ERICHSEN since 1910

Technical Description

DIN EN ISO 2409
ASTM D 3359
JIS K 5600-5-6
SNV 37 111

VDA 621-411
ECCA T6
GME 60 280

- **Scratch Hardness**
- **Cross Hatch Cut**
- **Scratch Resistance**
- **Writing Effect**

Purpose and Application

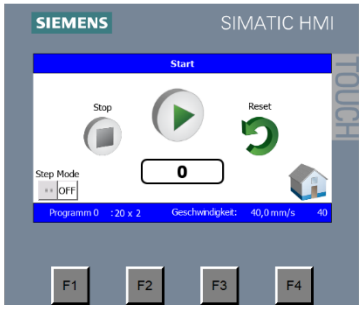
The motor-driven **SCRATCH HARDNESS TESTER 430 P-Smart** is a universal testing instrument designed for carrying out a wide range of tests on varnished and plastic surfaces to determine their resistance to scratches and cuts. Single cuts, parallel cuts and - by turning the specimen by 90° - cross-cuts can be applied to test panels of various thicknesses.

The **SCRATCH HARDNESS TESTER 430 P-Smart** is particularly provided for adhesion tests using the cross hatch cut method (in accordance with all mostly required standards) and for specific plastics tests according with Opel (scratch resistance and writing effect). For these as well as for further tests numerous setting possibilites on the basic instrument and a large variety of test tools are available.

Using the **SCRATCH HARDNESS TESTER 430 P-Smart**, series testing can be conducted with much greater ease. The results of testing are reproducible and well-defined.

Design and Function

The **SCRATCH HARDNESS TESTER 430 P-Smart** is a benchtop instrument of sound mechanical construction which provides reliable, well-defined cuts, even under extreme test conditions. By default, the machine is equipped with a protective cover. The device is operated via touch panel (automatic menu navigation).The test procedure is carried out automatically and all parameters (cutting speed, cutting stroke, cross-cut pattern) can be set using the keyboard. Each motion sequence (transport of test panel, cut positioning and any required pressure adjustment) is driven by a separate step motor.



During the test the specimen is conveyed linearly and at a constant speed under the test tip which has been set at the required pressure load (max. 40 N). A transmission guide ensures that the test tip is lowered onto the test panel as defined. The scope of supply includes two control plates for different cross-cut patterns which can be easily interchanged.

With Model 430 P-Smart parallel cross hatch cuts with graduated test forces are possible. After carrying out the first cross hatch cut the instrument can be stopped and the test force (up to 50 N) can be ad-justed individually before starting the next test track.Theoretically, 80 test tracks with a distance of 0.5 mm of different test forces are possible within the pre-selected cross hatch cut programme.

The **SCRATCH HARDNESS TESTER 430 P-Smart** is power-driven and obtainable in four versions - with manual or with motor-driven force regulation and with manual or motor-driven test panel turn. On the manual version it is a simple matter to adjust the test force to the exact pressure. The instrument with motor-driven force regulation provides the additional benefit of conducting a trial run with gradually increasing force. In this way, the force required to achieve a through cut can be automatically ascertained in the course of a "trial cut".
A 6-piece weight set is available as an optional accessory for conducting special tests in the lower pressure range and enables cuts with test forces in the range (1 - 15) N - graduated in 1-N steps.

Special Features

- 2 cutting speeds and 2 cutting lengths which can be combined as required
- 9 preset cross-cuts in compliance with the most commonly used standards
- 1 freely programmable cross-cut pattern for special applications
- Setting for cut distance with step motor precision
- "Stop"-option within the cross hatch cutting mode, for individually changing the test force for the next scratch track of the concerning current cross-cut pattern
- Visual display upon cutting through insulating layers to metal substrate
- Rapid clamping device for test panels, with wide clamping range.

Cross Hatch Testing

The **SCRATCH HARDNESS TESTER 430 P-Smart** enables cross hatch tests to be conducted in accordance with all the usual standards, summarized in the following table, and carried out immediately without additional programming. The following cross-cuts can be selected by pressing a key (number of cuts x distance in mm between cuts) 2 x 5, 6 x 1, 6 x 2, 6 x 3, 8 x 1, 8 x 2, 11 x 1.

The cuts are carried out automatically in succession using the test tip for cross hatch at a cutting speed of 40 mm/s. After turning the test panel manually by 90°, the procedure is repeated to complete the cross-cut pattern. The load required to ensure that the layer of varnish will be cut through to the substrate must be ascertained in trial runs. With **Model 430 P-II-Smart or Model 430 P-IV-Smart** (motor-driven force adjustment) this can be carried out very simply by performing a "trial cut".

For the examination of cross hatch cuts a magnifiying glass with 2.5 magnification is included in the scope of supply. To evaluate the cross hatch pattern achieved, it is visually related to a comparison pattern within a scheme indicated in the relevant standard (cross cut classification).
In ECCA T6 it is mentioned that the cross hatch cut test may be intensified by a subsequent cupping test according to DIN EN ISO 1520. For this purpose we recommend the ERICHSEN Lacquer and Paint Testing Machines, models 200 and 202 EM.

Although the results of adhesion tests in accordance with the cross hatch method are comparable with each other, they are - due to their respective procedures - not transferable to results of alternative test methods (e. g. perpendicular pull-off test according to DIN EN ISO 4624).
The ERICHSEN production programme offers the following model for adhesion testing to the pull-off method:

- Adhesion Test Apparatus, Model 525 (manual / inexpensive)

Standard	Layer thickness	No. of cuts x distance (mm)
DIN EN ISO 2409	up to 60 µm	6 x 1 (for soft substrates) 6 x 2 (for hard substrates)
JIS K 5600-5-6	over 60 µm to 120 µm over 120 µm to 250 µm	6 x 2 6 x 3
ASTM D 3359	up to 50 µm over 50 µm to 125 µm	11 x 1 6 x 2
SNV 37111	up to 60 µm over 60 µm	8 x 1 8 x 2
VDA 621-411	up to 60 µm over 60 µm to 120 µm over 120 µm	6 x 1 6 x 2 6 x 3
ECCA T6	up to 50 µm over 50 µm	6 x 1 2 x 5

Scratch Resistance Testing

For testing scratch resistance in accordance with Opel (GME 60280 / GMW14688) the test tip with a 1 mm ∅ is selected together with the preset grid "20 cuts at a distance of 2 mm" (20 x 2). The stress pattern in this case is applied with a test load of 5 N (set of weights) by the same procedure as for the cross hatch test (cutting speed 1m/min).

To analyse the scratch resistance test the brightness variance (ΔL) is determined in comparison with the plastic surface which is not subjected to strain. The colour measuring device to be used for this purpose must fulfil the following requirements: illuminant D65, measuring geometry d/8 with gloss exclusion, measuring aperture ∅ 27 mm.

Writing Effect Testing

For testing the writing effect in accordance with Opel the test inset offered as optional accessory, is required. This inset has to be mounted on the load arm instead of the tool holder. The stress pattern is applied with the preset grid "80 cuts at a distance of 0.5 mm" (80 x 0.5) and a test load of 7 N (set of weights) analogue to the cross hatch test (cutting speed 1 m/min).
To evaluate the result of the writing effect test the gloss difference is determinded in comparison with the plastic surface not subjected to strain. The gloss meter used should be provided with a 60° geometry; the measuring area must be small enough to allow carrying out reproducible gloss measurements on the surface subjected to strain.

For this test purpose all the ERICHSEN glossmeters of the PICOGLOSS family are highly recommended.

Special Tests

Deviating from the determinations of the above mentioned tests (cross hatch test, scratch resistance, writing effect) further scratch tests can be carried out varying the following parameters:

- Test tip
  - ball test tool ∅ 0.5 / 0.75 / 1 / 3 mm
  - asymmetric test tools: cross cut / Clemen
- Test load
  - rough range 50 N with 2 N graduation (standard)
  - fine range 15 N in 1 N steps (optional)
- Cutting grid
  - preset, selectable by depression of key: 2 x 5, 6 x 1, 6 x 2, 6 x 3, 8 x 1, 8 x 2, 11 x 1, 20 x 2, 80 x 0.5 (number of cuts x distance in mm)
  - freely programmable: all grids max. width 40 mm and a multiple of 0.5 mm as cutting distance.
- Cutting pattern
  - parallel cuts or cross cuts
- Cutting path
  - 25 mm or 40 mm (exchangeable guide plates)
- Cutting speed
  - 16.7 mm/s (1 m/min) or 40 mm/s

In order to minimize testing time, the smallest possible length of cut is always selected, together with the relevant connecting member.

Operation via App
The innovative optimized control concept of the Models 430 P-Smart allows the operation per smartphone or tablet via App (free download at: Google Play Store / Apple Store), as well as a different form of settings, documentation and data management.

Technical Data

Dimensions (WxHxD)	approx. 725 x 560 x 425 mm
Net weight	approx. 50 kg
Power supply [1)]	230 VAC / 50 Hz
Consumption	ca. 100 W - 150 W
Test panel format, min.	80 x 50 mm
Test panel format, max.	165 mm wide, any length
Thickness of specimen	0.5 - 20 mm
Standard load range	2 - 50 N (2-N grading)
Special load range [2)]	1 - 15 N (1-N grading)
Cutting path	25 or 40 mm
Cutting speed	1 m/min or 40 mm/s

[1)] alternatively 115 VAC / 60 Hz - *surcharge* (please specify mains supply when ordering)

[2)] Optional set of weights for bottom load range

Reference Class:
Both versions of the SCRATCH HARDNESS TESTER 430 P-Smart are supplied with a Calibration Certificate in accordance with DIN 55 350-18 that includes among others the following information:

Actual and setting values of loading force, scratching speed and cutting distance, test equipments used with calibration status, product indentification, date, name of inspector.

Comparisons of the setting/actual values for the following parameters are made:
- Loading force (5 setting values evenly distributed over the load range
- Cutting speed (both desired values in combination with both cutting paths)
- Cutting distance (exemplary for setting value 0.5 mm).

Order Information

Order No..	Product Description
03240131	**SCRATCH HARDNESS TESTER 430 P-I-Smart** motor-driven turntable and cutting position and with **manual** adjustment of loading force, **manual** turning of test panels and control plate for cutting path of 25 mm and 40 mm Load pressure max. 50 N
03240231	**SCRATCH HARDNESS TESTER 430 P-II-Smart** as for Order No. 03240131, but with **motor-driven** adjustment of loading force and **manual** turning of test panels
03240331	**SCRATCH HARDNESS TESTER 430 P-III-Smart** as for Order No. 03240131, but with **manual** adjustment of loading force and **automatic** turning of test panels
03240431	**SCRATCH HARDNESS TESTER 430 P-IV-Smart** as for Order No. 03240131, but with **motor-driven** adjustment of loading force and **automatic** turning of test panels

Included in scope of supply:
Transport case with
- 3 Allen keys (SW 2 / 2.5 / 3)
- Connecting member for cutting path of 25 mm
- Folding magnifier (2.5 fold magnification)
- Recesses for set of weights, test inset (writing effect) and for max. 8 test tips

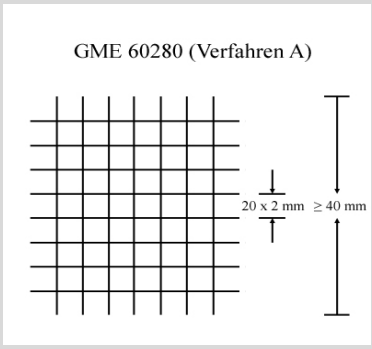
Mains connection cable
Operating instructions

Caution:
- Test tips are not included in the scope of supply
- Please specify mains supply when ordering

Accessories / Spare parts		
Order No.	**Product-Description**	**Figures**
05640132	Test tip for cross hatch cutting (30°)[1)] additionally covered with an extremly hard layer (short shaft with flat clamping area)	
05390132	Test tip acc. to van Laar (Ø 0.5 mm) (short shaft without flat clamping area)	
05390232	Test tip acc. to Bosch (∅ 0.75 mm) [2)] (short shaft without flat clamping area)	
05390332	Test tip acc. to ISO 1518-1 (∅ 1.0 mm) [2)] (short shaft without flat clamping area)	
05390732	Test tip technically equivalent to ISO 1518-1 (Ø 1.0 mm) additionally covered with an extremly hard layer (short shaft without flat clamping area).	
05390432	Test tip acc. to BMW (∅ 3.0 mm) [1)] (short shaft without flat clamping area)	
02180232	Test tip acc. to Clemen [2)] (short shaft with flat clamping area)	
05391432	Test tip acc. to PV 3962 (VW/Audi) [1)] without clearance angle (for scraping use), for testing of cylinder head gaskets	
30770132	Sapphire test tip acc. to SES N 3241, Meth. A (Suzuki), (Ø 0.6 mm, 0.3 mm R, 60°)	
05391332	Sapphire test tip acc. to SES N 3241, Meth. B (Suzuki), (Ø 1.0 mm, 0.5 mm R, 60°)	

Accessories / Spare parts		
Order No.	**Product-Description**	**Figures**
05390532	Testing device for writing effect acc. to Opel (acc. to GME 60280, Meth. B; GMW 14688, Meth. B) with mounted test disc (steel) and assembly tool (allen key SW 1.5 and SW 2.5)	
04300332	Test disc made of stainless steel for writing effect acc. to Opel (GME 60280, Meth. B; GMW 14688, Meth. B) (spare part) (Ø 16 mm, R 0.5 mm	
05391132	Testing device for writing effect acc. to PV 3974 (VW/Audi) with mounted test disc (hard metal) and assembly tool (allen keys SW 1.5 and SW 2.5)	
04300532	Test disc (hard metal) for writing effect acc. to PV 3974 VW/Audi (spare part)	
05390932	Testing device for tests according to DBL 9202 holder for longitudinal guiding of the test disc, incl. test disc acc. to DBL 9202 made of steel, hard-coated, laser-engraved with 12 marked and numbered test areas, with calibration certificate	
5390832	Test disc according to DBL 9202 made of steel, hard-coated, laser-engraved with 12 marked and numbered test areas, with calibration certificate	
05391232	Testing device for writing effect acc. to TPJLR.52.010 (Jaguar/Land Rover) consisting of holder with mounted PMMA test disc (incl. the necessary centering assembly screw) and assembly tool (allen keys SW 1.5 and SW 2.5), incl. calibration certificate	
08040232	PMMA test disc (acryl/plexiglass) acc. to GS 97034-2 (BMW) as well as TPJLR.52.010 (Jaguar/ Land Rover – (spare part) with 8 marked and numbered test areas	
30240132	Centering assembly screw (spare part) required for assembling the test disc made of PMMA)	
05670132	Set of weights for low load range (6 pcs.) consisting of holder and 5 weights (1 N, 2 N, 3 N, 4 N, 5 N), incl. Manufacturer's Test Certificate.	

[1] hardened steel **[2] equipped with hard metal**

Standardised Setups (minimum equipment = **Bold** marked)				
Standard	**OEM**	**Scratch figure acc. to standard**	**Order No.**	**Product Description**
GME 60280 Method A	General Motors / Opel		**03240131**	**SCRATCH HARDNESS TESTER 430 P-I-Smart**
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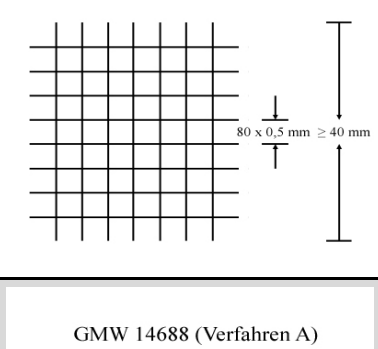
			03240231	SCRATCH HARDNESS TESTER 430 P-II-Smart
				alternatively
			03240331	SCRATCH HARDNESS TESTER 430 P-III-Smart
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05390332	**Test tip acc. to ISO 1518-1 (Ø 1 mm)**
			05670132	**Set of weights for low load range (6 pcs.)**
GME 60280 Method B	General Motors / Opel		**03240131**	**SCRATCH HARDNESS TESTER 430 P-I-Smart**
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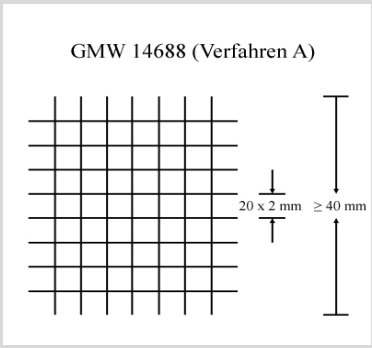
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05390532	**Testing device for writing effect acc. to Opel**
			05670132	**Set of weights for low load range (6 pcs.)**
GMW 14688 Method A	General Motors / Opel		**03240131**	**SCRATCH HARDNESS TESTER 430 P-I-Smart**
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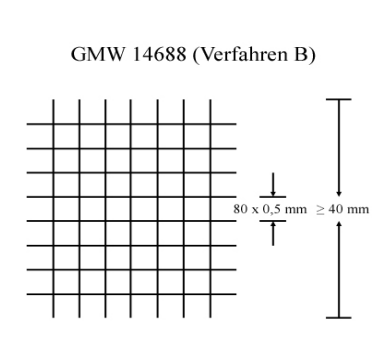
			05390332	**Test tip acc. to ISO 1518-1 (Ø 1 mm)**
			05670132	**Set of weights for low load range (6 pcs.)**
GMW 14688 Method B	General Motors / Opel		**03240131**	**SCRATCH HARDNESS TESTER 430 P-I-Smart**
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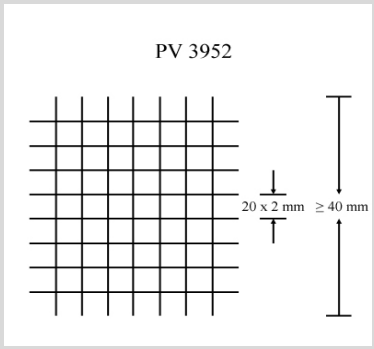
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05390532	**Testing device for writing effect acc. to Opel**
			05670132	**Set of weights for low load range (6 pcs.)**

Standardised Setups (minimum equipment = **Bold** marked)				
Standard	**OEM**	**Scratch figure acc. to standard**	**Order No.**	**Product Description**
PV 3952	Volkswagen / Audi		**03240131**	**SCRATCH HARDNESS TESTER 430 P-I-Smart**
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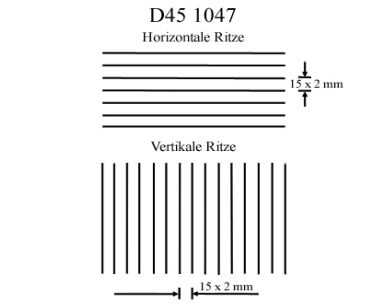
			03240331	SCRATCH HARDNESS TESTER 430 P-III-Smart
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05390332	**Test tip acc. to ISO 1518-1 (Ø 1 mm)**
			05670132	**Set of weights for low load range (6 pcs.)**
D45 1047	Renault		**03240131**	**SCRATCH HARDNESS TESTER 430 P-I-Smart**
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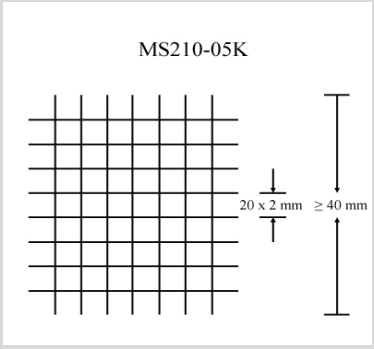
			03240331	SCRATCH HARDNESS TESTER 430 P-III-Smart
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05390332	**Test tip acc. to ISO 1518-1 (Ø 1 mm)**
			05670132	**Set of weights for low load range (6 pcs.)**
MS210-05K /4.9.1	Hyundai / Kia		**03240131**	**SCRATCH HARDNESS TESTER 430 P-I-Smart**
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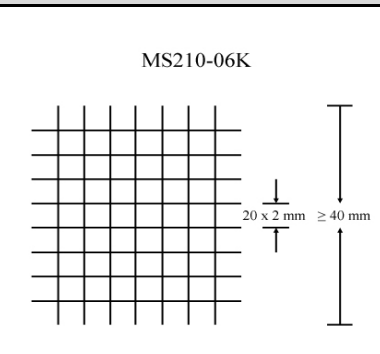
			05390332	**Test tip acc. to ISO 1518-1 (Ø 1 mm)**
			05670132	**Set of weights for low load range (6 pcs.)**
MS210-06K	Hyundai / Kia		**03240131**	**SCRATCH HARDNESS TESTER 430 P-I-Smart**
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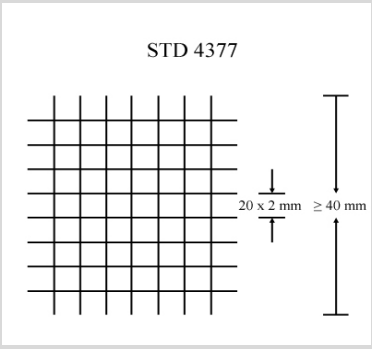
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05390332	**Test tip acc. to ISO 1518-1 (Ø 1 mm)**
			05670132	**Set of weights for low load range (6 pcs.)**

Standardised Setups (minimum equipment = **Bold** marked)				
Standard	**OEM**	**Scratch figure acc. to standard**	**Order No.**	**Product Description**
STD 4377	Volvo			
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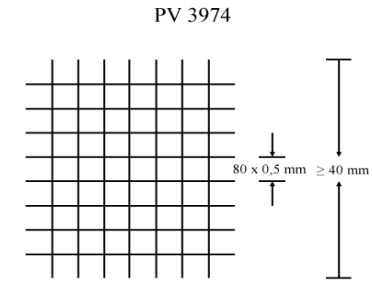
			03240331	SCRATCH HARDNESS TESTER 430 P-III-Smart
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05390332	**Test tip acc. to ISO 1518-1 (Ø 1 mm)**
			05670132	**Set of weights for low load range (6 pcs.)**
PV 3974	Volkswagen / Audi			
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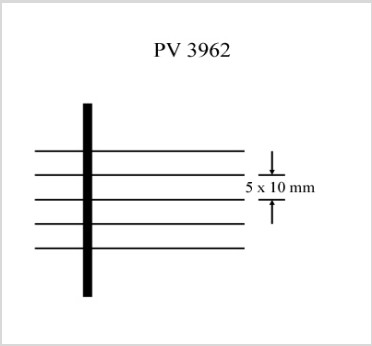
			03240331	SCRATCH HARDNESS TESTER 430 P-III-Smart
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05391132	**Testing device for writing effect acc. to VW/Audi**
			05670132	**Set of weights for low load range (6 pcs.)**
PV 3962	Volkswagen / Audi			
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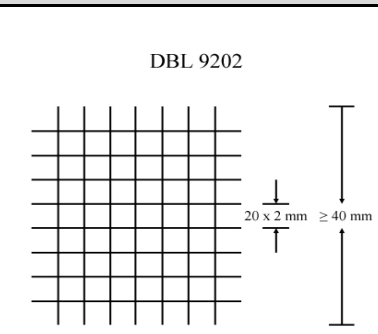
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05391432	**Test tip acc. to PV 3962 (VW/Audi)**
			05670132	**Set of weights for low load range (6 pcs.)**
DBL 9202	Daimler			
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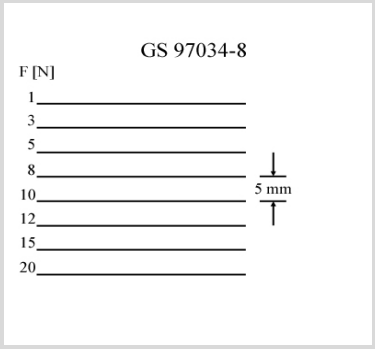
			03240331	SCRATCH HARDNESS TESTER 430 P-III-Smart
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05390932	**Testing device for test acc. to DBL 9202**
			05670132	**Set of weights for low load range (6 pcs.)**

Standardised Setups (minimum equipment = **Bold** marked)				
Standard	**OEM**	**Scratch figure acc. to standard**	**Order No.**	**Product Description**
GS 97034-8	BMW			
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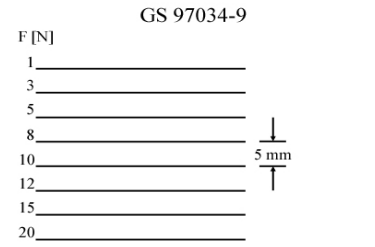
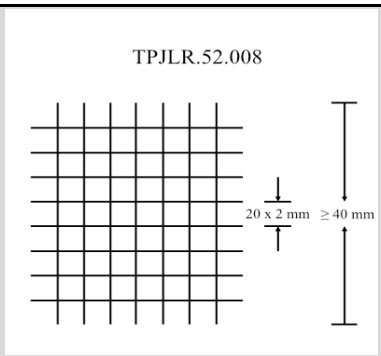
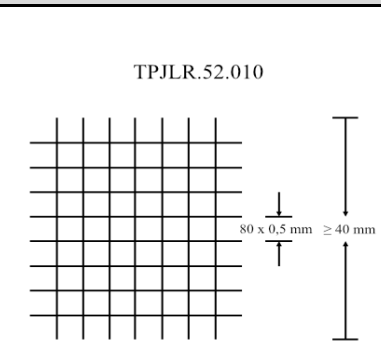
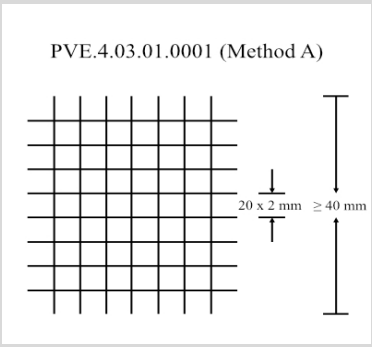
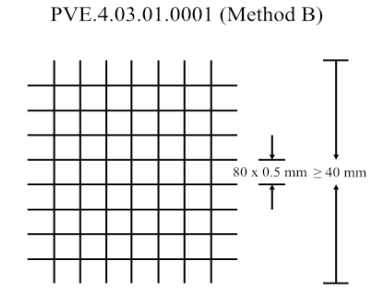
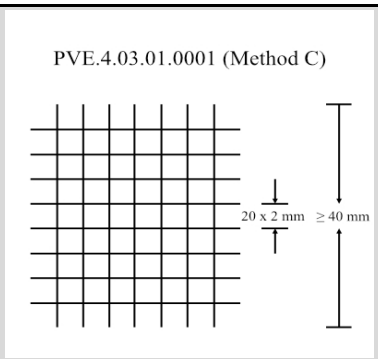
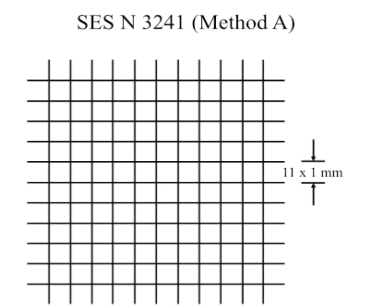
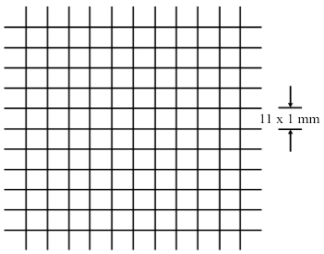
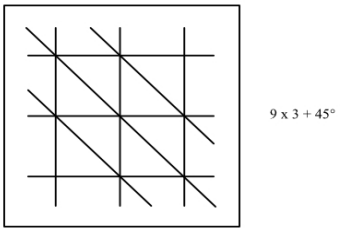
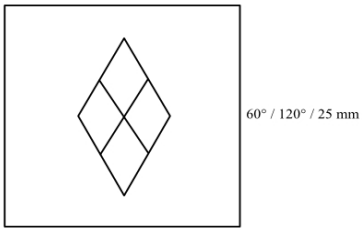
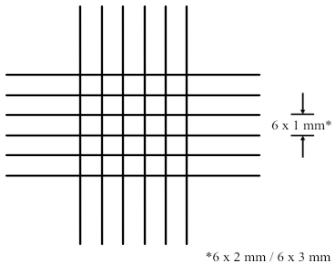
			03240331	SCRATCH HARDNESS TESTER 430 P-III-Smart
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05390432	**Test tip acc. to BMW (Ø 3.0 mm)**
			05670132	**Set of weights for low load range (6 pcs.)**
GS 97034-9	BMW			
			03240131	**SCRATCH HARDNESS TESTER 430 P-I-Smart**
				alternatively
			03240231	SCRATCH HARDNESS TESTER 430 P-II-Smart
				alternatively
			03240331	SCRATCH HARDNESS TESTER 430 P-III-Smart
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05390232	**Test tip acc. to Bosch (Ø 0.75 mm)**
			05670132	**Set of weights for low load range (6 pcs.)**
TPJLR.52.008	Jaguar/ Landrover			
			03240131	**SCRATCH HARDNESS TESTER 430 P-I-Smart**
				alternatively
			03240231	SCRATCH HARDNESS TESTER 430 P-II-Smart
				alternatively
			03240331	SCRATCH HARDNESS TESTER 430 P-III-Smart
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05390132	**Test tip acc. to van Laar (Ø 0.5 mm)**
			05670132	**Set of weights for low load range (6 pcs.)**
TPJLR.52.010	Jaguar/ Landrover			
			03240131	**SCRATCH HARDNESS TESTER 430 P-I-Smart**
				alternatively
			03240231	SCRATCH HARDNESS TESTER 430 P-II-Smart
				alternatively
			03240331	SCRATCH HARDNESS TESTER 430 P-III-Smart
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05391232	**Testing device for writing effect acc. to Jaguar/Landrover**
			05670132	**Set of weights for low load range (6 pcs.)**

Standardised Setups (minimum equipment = **Bold** marked)				
Standard	**OEM**	**Scratch figure acc. to standard**	**Order No.**	**Product Description**
PVE.4.03.01.0001 Method A	TOGG		**03240131**	**SCRATCH HARDNESS TESTER 430 P-I-Smart**
				alternatively
			03240231	SCRATCH HARDNESS TESTER 430 P-II-Smart
				alternatively
			03240331	SCRATCH HARDNESS TESTER 430 P-III-Smart
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05390332	**Test tip acc. to ISO 1518-1 (Ø 1 mm)**
			05670132	**Set of weights for low load range (6 pcs.)**
PVE.4.03.01.0001 Method B	TOGG		**03240131**	**SCRATCH HARDNESS TESTER 430 P-I-Smart**
				alternatively
			03240231	SCRATCH HARDNESS TESTER 430 P-II-Smart
				alternatively
			03240331	SCRATCH HARDNESS TESTER 430 P-III-Smart
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05390532	**Testing device for writing effect**
			05670132	**Set of weights for low load range (6 pcs.)**
PVE.4.03.01.0001 Method C	TOGG		**03240131**	**SCRATCH HARDNESS TESTER 430 P-I-Smart**
				alternatively
			03240231	SCRATCH HARDNESS TESTER 430 P-II-Smart
				alternatively
			03240331	SCRATCH HARDNESS TESTER 430 P-III-Smart
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			05390332	**Test tip acc. to ISO 1518-1 (Ø 1 mm)**
			05670132	**Set of weights for low load range (6 pcs.)**
SES N 3241 Method A	Suzuki		**03240131**	**SCRATCH HARDNESS TESTER 430 P-I-Smart**
				alternatively
			03240231	SCRATCH HARDNESS TESTER 430 P-II-Smart
				alternatively
			03240331	SCRATCH HARDNESS TESTER 430 P-III-Smart
				alternatively
			03240431	SCRATCH HARDNESS TESTER 430 P-IV-Smart
			30770132	**Sapphire test tip (R 0.3 mm)**
			05670132	**Set of weights for low load range (6 pcs.)**

Standardised Setups (minimum equipment = **Bold** marked)				
Standard	**OEM**	**Scratch figure acc. to standard**	**Order No.**	**Product Description**
SES N 3241 Method B	Suzuki	SES N 3241 (Method B)  	**03240131** alternatively 03240231 alternatively 03240331 alternatively 03240431 **05391332** **05670132**	**SCRATCH HARDNESS TESTER 430 P-I-Smart** alternatively SCRATCH HARDNESS TESTER 430 P-II-Smart alternatively SCRATCH HARDNESS TESTER 430 P-III-Smart alternatively SCRATCH HARDNESS TESTER 430 P-IV-Smart **Sapphire test tip (R 0.5 mm)** **Set of weights for low load range (6 pcs.)**
BI 106-01 Method B	Ford	BI 106-01 (Method B)  	**03240331** alternatively 03240431 **05640132**	**SCRATCH HARDNESS TESTER 430 P-III-Smart** alternatively SCRATCH HARDNESS TESTER 430 P-IV-Smart **Test tip for cross hatch cutting (30°)**
BI 106-01 Method D	Ford	BI 106-01 (Method D)  	**03240331** alternatively 03240431 **05640132**	**SCRATCH HARDNESS TESTER 430 P-III-Smart** alternatively SCRATCH HARDNESS TESTER 430 P-IV-Smart **Test tip for cross hatch cutting (30°)**
DIN EN ISO 2409	Potentially All	DIN EN ISO 2409  *6 x 2 mm / 6 x 3 mm	**03240131** alternatively 03240231 alternatively 03240331 alternatively 03240431 **05640132**	**SCRATCH HARDNESS TESTER 430 P-I-Smart** alternatively SCRATCH HARDNESS TESTER 430 P-II-Smart alternatively SCRATCH HARDNESS TESTER 430 P-III-Smart alternatively SCRATCH HARDNESS TESTER 430 P-IV-Smart **Test tip for cross hatch cutting (30°)**