

MECHANISED SCRATCH TESTER (705)

SH0530 - Operating Manual



Contents

Contents	2
Features of the Scratch Tester	2
1 Safety Instructions	3
2 Getting started	4
Packing list	4
Operating environment	4
3 Description of instruments	5
4 Operation	8
Checking the level of the balance arm	8
Checking the stylus position	8
Testing the meter	9
Performing a sample test	9
Metal Marking Test	10
5 Instrument Specifications and standards	10
705	10
6 Care and Routine Maintenance	11
7 Instrument Limitations	12
8 Accessories	12

The Mechanised Scratch Tester (705) is dedicated to coatings hardness evaluation based on the scratching resistance method. A test panel is clamped on the test bed and slowly moved whilst a stylus or alternative tool scratches its surface. Depending on test procedures, specified or variable loads can be applied to obtain different degrees of failure, from trace to destruction. A voltmeter mounted in the front panel indicates contact of the tool tip with the metallic sample substrate. Maximum panel size: 100 x 150 x 1.6 mm (0.3 mm coating).

Features of the Scratch Tester

- Robust construction
- Reliable and reproducible results
- Simple maintenance, easy to replace tools
- 230 VAC 50 Hz
- Ease of operation

1 Safety Instructions

1. Read this operating manual carefully before using the machine.
2. Keep this operating manual for future reference.
3. Observe all safety and warning markings on the machine.
4. Always position the unit on a solid, level surface.
5. This machine must only be used in areas electrically classified as **NON-HAZARDOUS**.
6. Ensure the voltage setting matches your local power supply.
7. The power supply to the instruments IEC inlet socket must be connected to an earthed supply, using the IEC power cord supplied.
8. Safety critical components:
 - a. This machine must be fitted with fuses as specified in this manual and as appropriate to the supplied voltage.
 - b. Any replacement Mains Lead must have an equivalent specification to the one supplied.
 - c. When operating the machine, remove any loose clothing or jewellery that could become entangled and beware of moving parts.
9. Use normal handling methods taking care when unpacking and lifting the instrument.
10. In order to avoid a fire hazard do not use flammable solvents when cleaning the instrument unless absolutely necessary and in any case do not use on front panel or labels.
11. Avoid solvent fumes when cleaning or using the instrument.
12. Do **NOT** attempt to lift the instrument by the balance arm or casting.
13. This instrument must **NOT** be used in potentially explosive atmospheres.
14. Keep both hands away from the test panel area during operation.



Do not dispose of this product with household, commercial or industrial waste. Please refer to local disposal methods or contact us regarding the proper handling of end-of-life electrical and electronic equipment.



Protection is impaired if used in a manner not specified by the manufacturer.

2 Getting started

Packing list

The instrument will come with the following items:

INSTRUMENT	SH0530
WEIGHT SET	0.5 N x 2 1 N x 1 2 N x 2 4 N x 1 10 N x 1 SPINDLE x 1
STYLUS, 1 FITTED, 1 SPARE	NEEDLE TYPE
ELECTRICAL POWER CABLE	Yes
CERTIFICATE OF CONFORMITY AND/OR CALIBRATION (WHERE REQUESTED)	Yes
PRODUCT MANUAL	Yes

Operating environment

The instrument must not be exposed to the following conditions:

- Excessive heat exceeding the operating specification
- Excessive humidity exceeding the operating specifications
- Flammable substances
- Excessive vibration
- Dust and dirt

Temperature: 18°C to 35°C (non-operating temperature: -18°C to 66°C)

Humidity: 5-85% non-condensing

3 Description of instruments



The instrument consists of a painted metal case containing a motor driven Test SAMPLE HOLDER and an instrument control panel.

A Balance Arm is set directly above the Test SAMPLE HOLDER; a stylus tool (needle or marring stylus) is located in a small chuck on the underside of the Balance Arm.

A set of weights are supplied for placing on a mounting rod located directly above the cutting tool.

The controls for the instrument are described as follows;

Power ON/OFF Switch: At instrument rear, switches power through the fused IEC mains inlet.

Front Panel RUN Switch: A momentary switch which connects the electrical supply to the instrument. Used in conjunction with the **TEST** or **SCRATCH/RETURN SWITCH** to ensure 'hands clear'.

Indicator Lamp: lights up when the Mains Inlet Power ON/OFF switch is in the ON position and power is supplied.

TEST switch: a momentary switch for checking the electrical continuity between the needle point and an uncoated metal test panel.

When the **TEST** switch and the **Front Panel RUN Switch** are pressed the METER needle will swing to the right, indicating that the meter & circuit are functional.

SCRATCH/RETURN SWITCH: A center off momentary switch which controls the direction of travel of the test table for the scratch operation. Used with the **Front Panel RUN Switch** to ensure 'hands clear'.

NOTE: the test sample holder must always be in the RETURN position before commencement of the scratch operation

BALANCE ARM: consists of a counter-balanced arm fitted with holder containing a NEEDLE/MAR tool and a small housing containing a roller.

BALANCE ARM LIFTING MECHANISM: Directly behind the roller on the underside of the BALANCE ARM is a LIFTING MECHANISM consisting of a housing containing a CAM (the CAM comprises a cylinder with a flat face) and a lifting arm to the rear of the Instrument.

The MECHANISM provides a means of raising and lowering the BALANCE ARM when the SAMPLE HOLDER is activated.

The purpose of the MECHANISM is to prevent possible impact damage to the stylus and sample. When the SAMPLE HOLDER is at the rest position the BALANCE ARM rests on the round part of the CAM.

When the SAMPLE HOLDER is activated (travelling to the left) the CAM turns to the flat part of its profile, whilst doing so lowers the balance arm and STYLUS onto the sample test panel without causing impact between the STYLUS and the test sample surface.

Directly behind the roller on the underside of the BALANCE ARM is a LIFTING MECHANISM consisting of a housing containing a CAM (comprising of a cylinder with a flat face) and a lifting arm to the rear of the instrument.

When the instrument is switched off (or the SCRATCH/RETURN switch is set in the RETURN position) the round part of the cylinder is in contact with the BALANCE ARM.

WEIGHT SET: a series of weights and a mounting rod for location into the BALANCE ARM directly above the needle holder. The weights are used to establish the amount of mass required to determine a surface coating resistance failure.

SAMPLE HOLDER: for securing the test sample panels. Moves when activated by the SCRATCH/RETURN switch.

POWER INPUT MODULE: located on the rear panel of the instrument, consists of a switched IEC type connector and a fuse holder (plus a spare fuse)

IEC MAINS POWER CABLE: for connection with the Power Input.

4 Operation

Before first use:

Check suitability of the electrical supply requirements (see the label located above the IEC socket)

(230 VAC 50)

Fit the IEC Mains POWER LEAD into the IEC socket on the rear panel of the instrument and connect the other end to a suitable electrical supply.

Switch the electrical power switch at the rear of the instrument on the IEC inlet to the ON position.

Checking the level of the balance arm

- Hold the RUN button, move the SCRATCH/RETURN switch to the SCRATCH position, the SAMPLE HOLDER will move to the left (ensure there is no obstruction in its path) release the SCARTCH/RETURN switch at approximately half way along the SAMPLE HOLDER travel.
- The BALANCE ARM should be parallel with the SAMPLE HOLDER, where adjustment is required the weight at the end of the ARM maybe moved.
- To move the weight (use a 1.5 mm a/f key) release the grub screw (turn the screw anti-clockwise) located on the circumference of the BALANCE WEIGHT.
- Slide the weight to the left; this will cause the BALANCE ARM to lower at the STYLUS end.
- Slide the weight to the right the stylus will raise, adjust the weight sufficient to maintain the BALANCE ARM horizontal to the SAMPLE HOLDER surface.

Checking the stylus position

The stylus (needle or marring tool) is positioned on the underside of the BALANCE ARM, located in a holder. The setting of the stylus tip should be a minimum of 0.1 mm above the SAMPLE HOLDER surface when the instrument is in operation.

- To check that the height of the stylus is correct, connect the electrical supply and hold the RUN button, and set the SCRATCH/RETURN switch to the SCRATCH position, the SAMPLE HOLDER will travel to the left.
- Whilst the HOLDER is in motion and after the guide wheel has rolled down the ramp, release the RUN button when the HOLDER is midway along its travel.
- Use a shim of 0.15 mm thickness to pass beneath the tip of the stylus and the SAMPLE HOLDER surface, where the gap is smaller or larger, adjust the stylus position in the holder to obtain the correct height.

- Upon completion of setting the height, tighten the holder sleeve and re-check the gap size.
- Reset the SCRATCH/RETURN by holding down the **RUN** button and setting the SCRATCH/RETURN switch to the RETURN position.

Testing the meter

- Place an uncoated metal panel (size 100 X 150 X 0.8 mm thick) onto the SAMPLE HOLDER, locate the panel under the CLAMPING DEVICE and lightly tighten the two fixing screws to the panel.
- With the NEEDLE in contact with the uncoated metal panel hold down the RUN & TEST buttons, the contact between the NEEDLE and the TEST PANEL forms an electrical circuit that will cause the METER needle to move to the right.

Performing a sample test

In order to achieve meaningful results it is strongly recommend that sample testing be conducted in association with the respective national standard test methods.

- Prepare the sample test panels (100 X 150 X 0.8) in accordance with associated product test documents, eg. Conditioning panels before test.
- Before each test examine the stylus (needle using a high power magnifying glass to check that the tip is smooth hemispherical and free from contamination. Clean and or replace the stylus accordingly. Ensure the stylus is held firmly in the holder.
- Place the Spindle into the Balance Arm (hole located above the needle holder) connect the instrument to the electrical supply.
- Carefully lift the BALANCE ARM away from the SAMPLE HOLDER then operate the SCRATCH/RETURN by holding the RUN button whilst moving the SCRATCH/RETURN switch to the SCRATCH position.
- Carefully lower the BALANCE ARM and allow it to settle, the arm should sit parallel with the SAMPLE HOLDER. (adjust the BALANCE WEIGHT, use - A/F hexagon wrench to loosen the fixing screw)
- After checking the BALANCE ARM to be level hold the RUN button and set the SCRATCH/RETURN switch to the RETURN position.
- Place a prepared sample test panel on to the SAMPLE HOLDER, by sliding the panel under the scratching/marring tool with any damaging the panel surface. Locate the panel under the PANEL CLAMP till the edge of the panel touches the back of the CLAMP. Tighten the two screws to hold the panel in position.
- Place the initial 1 N weight onto the SPINDLE
- Hold the RUN button and move the SCRATCH/RETURN switch to the SCRATCH position and traverse the SAMPLE HOLDER away from the needle. This allows easy removal of the panel from the SAMPLE HOLDER.
- Visually inspect the area of the test panel subjected to the scratch, look for signs of penetration of the coating surface. (use a magnifying glass if needed)

- Where no damage occurs, repeat the test on an unmarked area of the test panel, increasing the weights in increments of 0.5 N until the coating fails, maximum applied mass 20 N.
- A complete coating failure will be indicated when the needle on the METER swings over to the right hand side (for metallic test panels only)

Metal Marking Test

This variant to the Scratch Test consists of removing the Tungsten Carbide Stylus (used for the Scratch Test) and replacing with the Rub Stylus Marking Tool.

Wrap a piece of 15 micron thick annealed aluminium (approximately 30 mm square) around the tool, ensure the foil has its glossy side out and is smooth and even over the curve of the tool, secure in place using the rubber O-ring.

- Prepare the test panels in accordance with ECCA T11 specification.
- Place the recommended 1kg weight on the Balance Arm Spindle.
- Operate the instrument same as for the SH705.
- Review results against the ECCA specification.

5 Instrument Specifications and standards

705

Physical dimensions	420mm x 330mm x 320mm
Weight	14kg
SAMPLE HOLDER	Metallic test panel size 100mm x 150mm x 0.2mm Travel speed 30mm/s to 40mm/s Travel distance 75mm
Scratching tool:	1mm tungsten carbide hemispherical tip

This instrument has been manufactured to comply with the following standards:
BS3900:E2, ISO 1518, ECCA T11

The following test methods are recommended when preparing for test panel sampling:
ISO 1513, ISO 1514, ISO 2808, ISO 3270

6 Care and Routine Maintenance

The instrument has been designed for the minimum of maintenance, restricted to cleaning and function checking only.

Checking:

- Ensure the instrument is switched off and disconnected from the electrical supply.
- Clean the instrument after use, removing any fragments of surface coatings from the working surfaces, pay particular attention to the SAMPLE HOLDER slides.
- Check the needle for wear using a suitable magnifying glass and remove any deposits of surface coatings.
- If the needle shows evidence of wear for example; scratches, chips or any Irregularities in the surface they must be replaced.

Cleaning:

- Use a damp soft cloth to wipe the external surfaces only.
- A mild detergent or soap free from any dyes (colour) product may be used.
- Do not use abrasive detergents or scouring powers as they will permanently scratch painted or anodized surfaces

Fuse Replacement:

- Switch the instrument off and remove the electrical cable from the rear of the instrument.
- The fuse carrier is located in the electrical connector plug directly below the terminal pins.
- Carefully release the holder (use a small screwdriver) and lightly pull the fuse housing outwards.
- Inside the housing are fitted two fuses, the nearest fuse is the spare, to remove the fuse nearest the housing enter the blade of a small screw driver through the holes provided under the housing and lift the fuse out, discard the failed fuse.
- Remove the spare fuse in the same manner and fit into the position nearest the housing, replace the spare fuse accordingly.
- Gently push the fuse holder into the housing, reconnect the electrical cable and test the instrument accordingly.

7 Instrument Limitations

- The instrument may be used with nonmetallic test panels, but the meter will not function due to non-conductivity of the test panels.
- Maximum test thickness is limited to 1.6mm.
- Maximum coating thickness is 0.3mm for the 705 only.
- Do not use on soft material panels e.g. rubber.
- Do not exceed the stated maximum applied mass for the test methods:
 - 705: 20N

8 Accessories

SH4811 Weight set in {N} for 705 (new BS specification)

Consists of 0.5Nx2, 1.0Nx1, 2.0Nx2, 4.0Nx1, 10.0Nx1

SH4783 Spare weight set in {g} for 705 (old BS specification)

Consists 100gx1, 200gx2, 500gx1, 1000gx1

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