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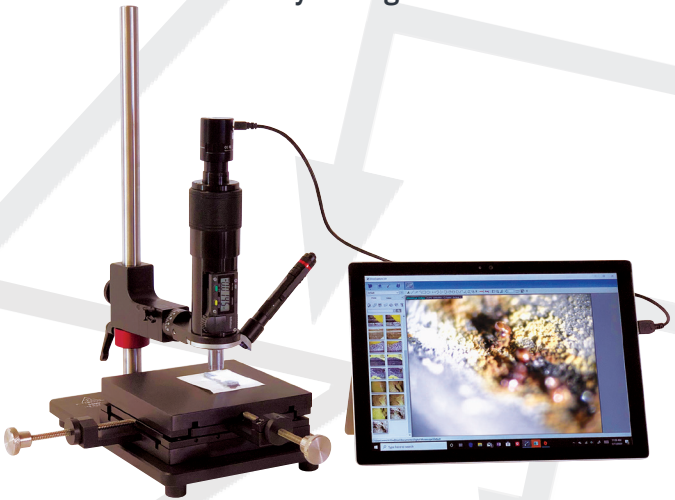
Model 8400 Optical Depth Micrometer

Includes Accessories:

5500 Lab Stand w/ X-Y Stage

4400 Surface Replication Kit

Dino-Eye® Digital Camera



JCHADWICK



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Optical Depth Micrometer

The Optical Depth Micrometer is a visual inspection microscope designed to make quick and repeatable measurements of the depth of small surface features, like pits, scratches, and engraving.

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Micrometer Lab Stand

Designed for use when surface geometry prevents using the handheld Micrometer on a standard base.

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Dino-Eye® Digital Camera

The Dino-Eye connects the Micrometer to a laptop or tablet to create electronic inspection records with detailed notes and high-resolution images.

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Microset® Surface Replication

Microset compounds provide a quick and easy method of obtaining measurements of damage in hard-to-reach places.



Lifetime Warranty

All J Chadwick Co (“JCC”) manufactured products (“Products”) are covered by a limited lifetime warranty.

JCC warrants that the Products will perform substantially in conformance with the published specifications and be free from defects of material and workmanship when subject to normal, proper, and intended usage for the lifetime of the products.

JCC agrees during the warranty period to repair or replace, at JCC’s option, defective Products so as to cause the same to operate in substantial conformance with published specifications.

THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, OR ANY OTHER MATTER WITH RESPECT TO ANY OF THE PRODUCTS.

This warranty does not cover cosmetic damage or damage due to acts of God, accident, misuse, abuse, negligence or improper operation or maintenance. Warranty is null and void if repair or modification is attempted by anyone other than JCC or its authorized representatives.

Repair or replacement as provided under this warranty is the exclusive remedy of the consumer.

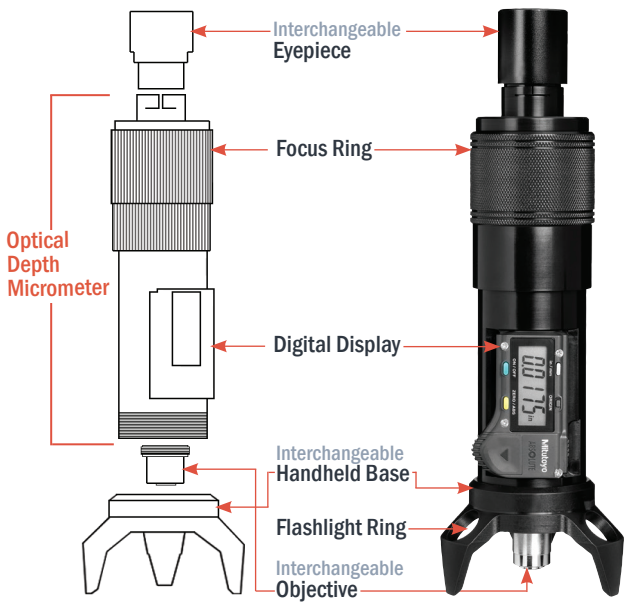
Technical Support



Part Number List

PART#	ITEM
8600C	All-In-One Optical Micrometer Kit
8600R	All-In-One: Microset Add-On
8600CK	All-In-One: 8600C Upgrade
8600-25	Case, 8600C All-In-One Kit
8400K	Optical Micrometer Kit
8400-7	Base, 3-Leg
8400-71	Base, 3-Leg Soft Tip
8400-8	Base, 4-Le
8400-12	Base, 3-Leg Offset
8400-14	Eyepiece, 20X
8400-15	Eyepiece, 10X
8400-16	Objective, 10X
8400-17	Objective, 4X
8400-23	Flashlight
8400-25	Case, 8400K Optical Mictometer Kit
8400-27	Tall Tripod Base 4.5"
8400-32	Scratch Sample Plate
8400-35	Base, Corner
8400-91	Base, Acrylic V-Block
5500L	Lab Stand Kit, w/ X-Y Stage
5500K	Lab Stand Kit, no X-Y Stage
5500-50	X-Y Stage
4400M	Surface Replication Kit
4400-1	Dispensing Gun, 50ml
4400-2RTG	Microset®, Thixotropic, 50ml, Grey
4400-2RFG	Microset®, Fluid, 50ml, Grey
4400-31	Nozzle Pack, 50ml, 50/Pack
4400-4	Microset® Backing Slides, 60mm X 40mm, 50/Pack
4400-5	Microset® Backing Paper, 70mm X 60mm, 100/Pack
4400-6	Case, 4400M Surface Replication Kit
4400-7	Base, Tilting Stage
AM7025X	Dino-Eye Eyepiece Camera

Optical Depth Micrometer



Digital Display Detail

in/mm

Toggles between US standard (in) and metric (mm)



ON/OFF

Turns the display on or off.

ORIGIN

Sets the absolute zero that the tool will reference from by default. Origin is preset so the Micrometer will be in focus on a flat surface at 100X magnification.

Battery

SR44/LR44
Button Cell Battery

ZERO/ABS

Sets starting position (temporary zero) for a depth measurement.

Interchangeable Bases



8400-7
Base, 3-Leg

Tripod bases are used for most flat and simple curved surfaces.



8400-71
Base, 3-Leg, Delrin Tip

Delrin-tipped feet protect windshields and other delicate finishes.



8400-8
Base, 4-Leg

Use the 4-leg base on broad convex and concave surfaces.



8400-91
Base, Clear, V-Block

Use the V-block base for leading edges, small diameters, outside angles, and flat surfaces next to an edge.



8400-12
Base, Offset

Use the offset base on surfaces adjacent to an edge or wall.



8400-35
Base, Corner

Use the 2-Leg corner, or wedge, base on inside angles.

8400-27
Base, Large 3-Leg

Use the large tripod base for small parts (up to 2") or with the tilting stage base for inspection of Microset® replicas.

4400-7
Tilting Stage Base



Optics & Other Components



8400-15
Eyepiece, 10X



8400-14
Eyepiece, 20X

To change the **eyepiece**, remove from the Micrometer by pulling it up and out. There are no threads on the eyepiece tube. Promptly replace the eyepiece to prevent debris from entering the Micrometer through the exposed eyepiece tube.



8400-16
Objective, 10X



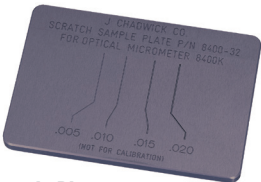
8400-17
Objective, 4X

To change the **objective** lens, rotate the focus ring counter-clockwise (focus down) to expose the objective lens threads. Grip the objective and turn clockwise to remove. Reverse to install. Do not over-tighten the objective lens.



8400-23
Flashlight

AAA Battery



8400-32
Scratch Sample Plate

Use the Scratch Sample Plate to practice positioning and focusing the Optical Micrometer.

Specifications

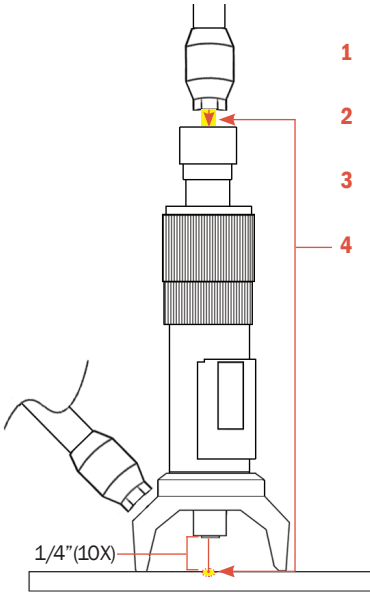
Mag	Eyepc/Obj	Accuracy	Max Depth	Field of View
40X	10X/4X	+/- 0.001"	1.150"	0.18" Dia
80X	20X/4X	+/- 0.001"	1.150"	0.10" Dia
100X	10X/10X	+/- 0.001"	0.250"	0.07" Dia
200X	20X/10X	+/- 0.001"	0.250"	0.04" Dia

Overall **magnification** is calculated by multiplying the power of the eyepiece and objective lens; for example, using the 10X eyepiece and the 10X objective will produce 100X magnification.

Note: The Dino-Eye camera has 20X magnification.

Use 100X and 200X to inspect small features, like corrosion pits. Use 40X and 80X for wider features or to measure the thickness of a transparent surface, like a windshield.

Optical Micrometer Setup



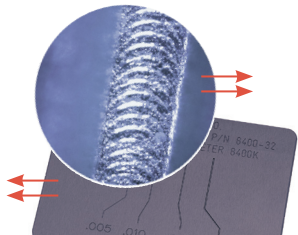
- 1 Install optics for desired level of magnification.
- 2 Install handheld base or mount on a Lab Stand.
- 3 Position directly over the damaged area.
- 4 Shine the flashlight down into the eyepiece. A bright spot will appear directly below the objective, this will be the center of the field of view. Position the Micrometer so that the bright spot is shining on the edge of the step height to be measured, like the edge of a scratch or pit.

- 5 Turn the Focus Ring so that the objective lens is over the subject by approx. $\frac{1}{4}$ " using the 10X Objective, or 1" with the 4X (so the surface will be roughly in focus).
- 6 Once in position, use one hand to hold the Micrometer steady, and the other to insert the flashlight into the base.

Always use one hand to hold the base steady and prevent movement, and the other to focus the Micrometer.



The view through the eyepiece is upside down and backwards. This means that that when the subject is moved left, the image moves right.

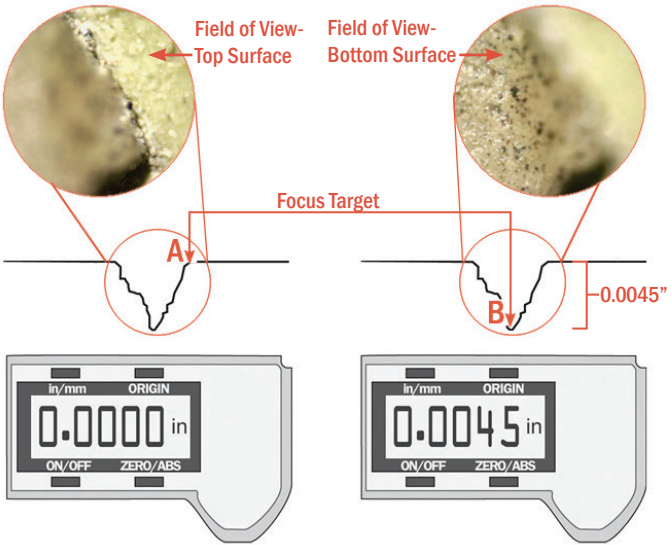
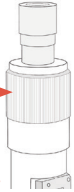


Measuring Depth

The Micrometer uses focus to measure the distance between two points on different surfaces (at different heights). **Features at the same depth will appear in focus and features above or below appear blurry.**

Turn the Focus Ring to move the focus up and down.

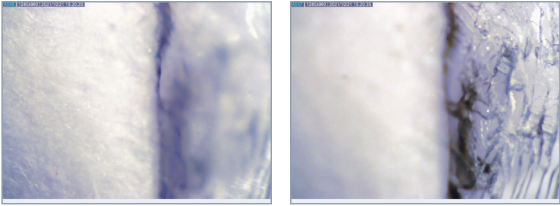
The entire measurement cycle should be completed by the same person. Always reset zero when switching users.



- 1 Position the Micrometer so that the subject is in the center of the field of view.
- 2 Focus on the top surface directly next to the recessed area **(A)**.
- 3 When the surface area is in sharpest focus, gently press the **ZERO/ABS** button on the display to set a starting point for the measurement.
- 4 Without moving the Micrometer, focus down to the bottom of the recessed area **(B)**.

To find the true lowest point, focus down passed what seems to be the bottom until nothing else appears in focus below, then come back up to the first area that comes into sharp focus.
- 5 Record the measurement from the digital display.
- 6 Verify the measurement by refocusing up to the top surface **(A)**. The display should show "0.0000" again.

Transparent Surfaces



The method for measuring **depth** on a transparency (scribe lines, for example) is the same as any other surface: focus on the surface next to the damage, zero the display, and focus down to the bottom.

Measuring **overall thickness** is the same except that, instead the bottom of a pit, the second surface is the far side of the glass.

****VERY IMPORTANT****

When measuring overall thickness (only), the initial result on the display is **not** accurate because the refraction index must be taken into account. **To calculate the overall thickness, multiply the result on the display by the refraction index of the material.**

A normal refraction index for transparent materials is approx. 1.5:

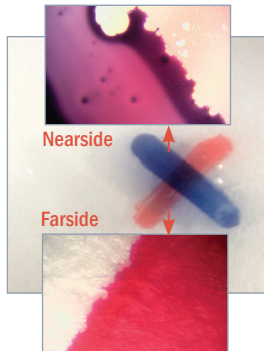
PMMA (acrylic, Lucite)	1.49
Plate/Window Glass	1.52
Polycarbonate (Lexan)	1.58

Tables of refraction indexes of other materials are available online.

Surface and embedded damage, like scratches and bubbles, are air space and not subject to the refraction index.

Transparencies usually have extremely shallow surface marks, like polishing lines and micro-scratches, which make it easy to focus on the surface.

If it difficult to locate the surface, use a felt pen to create a focal target point on either side of the transparency.



Calibration

The Micrometer can be returned to J Chadwick Co for recertification, or any ISO/IEC 17025 accredited calibration lab can provide a calibration certificate using this procedure.

The Micrometer can easily be calibrated in-house. The procedure is a verification of accuracy against standards (gage blocks); no adjustment to the tool is required.

Any unit found out of tolerance (not measuring correctly) must be returned to the manufacturer for repair.

Calibration Procedure

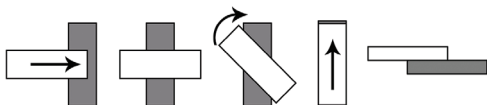
Recommended Cycle: 1 Year

Equipment

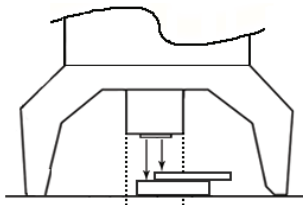
4x Rectangular Gauge Blocks, Grade 0, ASME B89.1.9, NIST, ISO/IEC 17025:2005 calibrated. **Size range 0.005" - 0.200".**

Instructions

- 1 Wring two gage blocks together by sliding one block perpendicularly across the top of the other, then rotate lengthwise and slide to create a step.



- 2 Position the Micrometer so the step between the blocks is the center of the field of view.



- 3 Focus on the surface of the upper gage block. Zero "0.0000" display.
- 4 Refocus on the surface of the lower block. Record displayed result.

If the Micrometer is measuring properly, the display will show the exact thickness of the upper block.

Repeat steps 1-5, using each of the 2 remaining gage blocks as the upper block.

Micrometer Lab Stand



Lab Stand Setup

1 Loosen thumb wheel to remove the Micrometer Focus Block from the Base Plate, set aside.

2 Set the Base Plate on a flat surface.

3 Slide red Safety Ring onto the Lower Pole on the Base Plate. Do not tighten.

4 Thread the Upper Pole onto the Lower Pole on the Base Plate.

5 Slide the Focus Block onto the Upper Pole with the graduated dial facing up and the Flashlight Ring pointing down.

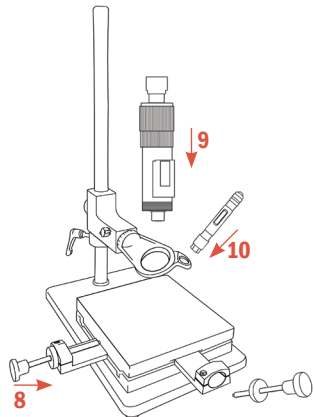
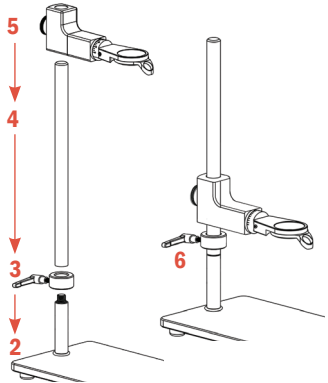
6 Tighten the Safety Ring directly under the Focus Block.

7 Use a 7/64 hex wrench to loosen the set screw on the Lead Screw Clamps, insert Lead Screws until the black collar is flush with the clamp. Retighten set screws.

8 Turn both Lead Screws evenly until the X-Y Stage is centered on the Base Plate.

9 Remove base and thread Optical Depth onto the Focus Block.

10 Install Flashlight into the ring on the Focus Block. The Flashlight Ring rotates for optimal lighting angle.



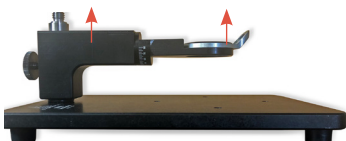
Correct Lab Stand setup with Lead Screws, Micrometer and Flashlight installed.



Lab Stand Disassembly For Storage In Case

- 1** Remove Micrometer Focus Fixture from Pole, set aside.
- 2** Remove Safety Ring from pole assembly and return to case.
- 3** Remove (unthread) the Upper Pole from the Base Plate and return to case.
- 4** (For stands with X-Y Stages only,) Use 7/64 Hex Wrench to loosen the set screw on the Lead Screw Clamp. Pull out Lead Screw and return to case for storage. Re-tighten set screw on Lead Screw Clamp to prevent loss.
- 5** Invert the Focus Fixture and clamp to the Lower Pole on the Base Plate (by tightening thumb wheel). Return to case.

Invert Focus Block on Base Plate before returning to Case.

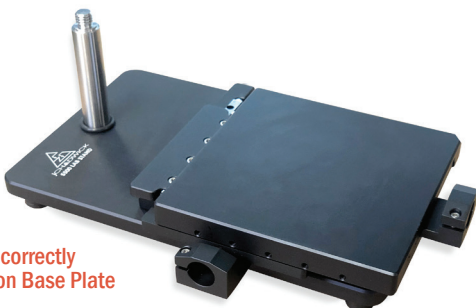
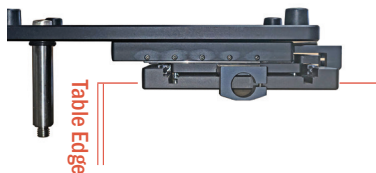
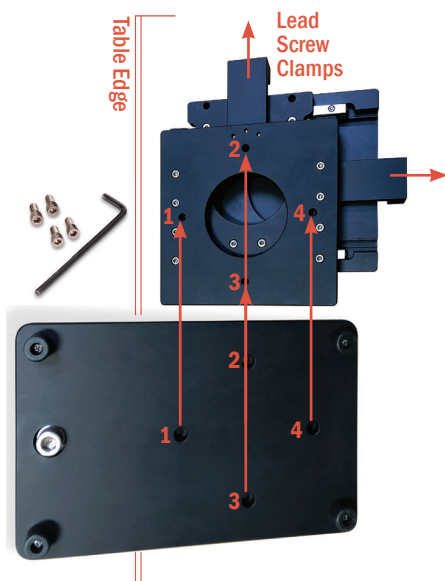


X-Y Stage Installation

1 Invert the X-Y Stage and place near the edge of a flat surface (like the edge of a table).

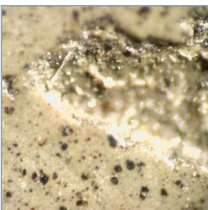
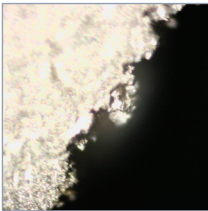
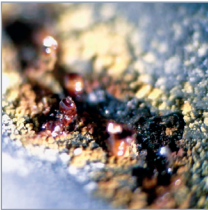
2 Position the Lab Stand Base Plate over the X-Y Stage so that the (4) holes in the Base Plate align with the threaded holes on the underside of the X-Y Stage. The Lead Screw Clamps must be oriented as shown above.

3 Mount the X-Y Stage on the Lab Stand with (4) $\frac{1}{4}$ -20 x $\frac{1}{2}$ " Socket Head Cap Screws on the underside of the Base Plate. Use a $\frac{3}{16}$ " hex wrench to tighten the screws.



Dino-Lite®Eyepiece Camera

J Chadwick Co is an authorized reseller for Dunwell Tech, Inc.



DinoCapture Software is required to use the Dino-Eye eyepiece camera. Scan QR to download the current version of the software and user manual:



<https://www.dinolite.us/en/downloads>

For product support, visit the manufacturer's official website:



www.dinolite.us/products/eyepiece-cameras/dino-eye-edge/am7025x/

Using the Eyepiece Camera

- 1** Position the computer or tablet (*with DinoCapture software installed*) near the subject. Plug Dino-Eye camera into the USB port and open DinoCapture software. Check that the camera is live.
- 2** Position Micrometer over the subject using the flashlight to pinpoint the ROI (see page 8 “Setup Instructions”).
- 3** Use one hand to hold the Micrometer steady. Use the other hand to remove the standard eyepiece and replace with the Dino-Eye camera. Insert the Dino-Eye directly into the Micrometer eyepiece tube.
- 4** The screen will display the view through the eyepiece. Take measurements as usual by manually turning the focus knob on the Micrometer to bring each surface into sharp focus (see page 9 “Measuring Depth”).

Images can be captured, annotated, and saved (refer to software user manual).

The Dino-Eye Camera’s magnification power is 20X; overall magnification is 200X when combined with the 10X objective lens, or 80X with the 4X objective lens.



Tablet Not Included.

Surface Replication with Microset ®



J Chadwick Co is an authorized US reseller for Microset Products, LTD, United Kingdom.

For more products, SDS and other technical information, visit the manufacturer's website:

<https://www.microset.co.uk>

MICROSET® 101 REPLICATING COMPOUNDS are very high resolution, two-part silicone polymers specifically designed for surface replication.

The easy cartridge application system allows replicas to be made of most solid non-porous surfaces, in any shape or size, Microset replicas are dimensionally stable for geometric measurement and can be stored indefinitely for future reference.

When viewed through the Micrometer, the replicas have a bright metallic appearance, allowing very fine details like microstructure, cracking and pitting to be observed. Microset is ideal for the assessment of defects on critical engineering surfaces.

Microset replicas are high strength elastomeric materials that can be removed from holes, tubes and moderate re-entrant geometries without altering the replica. This allows access to, otherwise inaccessible, internal surfaces.

Common applications include surface defect characterization, surface finish assessment and metallography.



Thixotropic vs. Fluid Compounds



Thixotropic compounds can be applied to **vertical and overhead surfaces** without the compound dripping or flowing away from the surface.



The free-flowing nature of **fluid** compounds minimizes the risk of air entrapment in the replica and makes application easy over large areas. Use for replicating **rough surfaces, cavities, tubes, threaded holes, etc.**

101RT FAST CURING THIXOTROPIC

4400-2RTG 101RT, Thixo, 50ml, Grey
4400-2RTB 101RT, Thixo, 50ml, Black

101RF FAST CURING FLUID

4400-2RFG 101RF, Fluid, 50ml, Grey
4400-2RFB 101RF, Fluid, 50ml, Black

Working Life	30 SECONDS
Cure Time	5 MINUTES (25°C)
Resolution	0.1 MICRONS
Shrinkage	<0.1%
Temp Range	-10°C to 180°C
Color	BLACK or GREY



Additional compound formulas are available, call or visit the Microset website for a complete list.



4400-1
Manual Dispensing Gun



4400-4
Backing Slides
60mm X 40mm
(50/Pack)



4400-3
Mixing Nozzle, 50ml
(50/pack)



4400-5
Backing Paper
70mm X 60mm
(100/Pack)

Making Microset Replicas

Microset replicas are made using a simple application system that is comprised of a dispensing gun, compound cartridge (contains both base material and catalyst), mixing nozzles, and backing paper or slides.

Each application delivers fully mixed replicating compound directly to the area of interest. The static mixing nozzle attaches to the cartridge to provide air free mixing of the base and catalyst.

Assemble Dispenser

- 1 Lift the cartridge clip.
- 2 Insert slider from opposite side and push in until flush with holes in slot on the dispenser.



- Raise cartridge clip.
- Insert slider and push in until flush.

Install Compound Cartridge

- 1 Check that slider is installed and pushed in completely.
- 2 Slide cartridge into slot on dispenser.
- 3 Lower cartridge clip to secure.

- Align cartridge with slots on dispensing gun. Lower clip to secure in place.



Install Mixing Nozzle

- 1 Remove cap from cartridge.
- 2 Position mixing nozzle on cartridge and rotate clockwise to lock.
- 3 For new cartridges only, dispense a small amount of compound on to waste paper before applying to subject (to ensure that the first application is fully mixed).



- Align nozzle with holes on cartridge, turn clockwise to lock.

Properly assembled and ready to use.



During application, keep the nozzle touching, or as close as possible, the surface to avoid trapping air in the replica and to push the material into surface features.



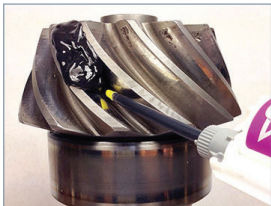
Squeeze dispenser handle slowly and steadily to apply compound.



Push and weave the nozzle from side to side to completely cover area. Each push should overlap the previous one, similar to welding.



When replicating vertical surfaces, apply compound in an upwards direction.



Apply backing slide or paper to surface of exposed compound. Allow the compound to cure (see curing time on cartridge) and then carefully peel off the cured replica from one side.



To prevent damage and loss of recorded detail do not touch the replica surface and store the replica in a plastic bag.

Do not stop flow of the material through the nozzle for longer than the working life of the compound grade. Once the working life has been exceeded, a new nozzle must be used.

After use, remove the nozzle and replace the cap on the compound cartridge. To re-use the cartridge, fit a new nozzle.

Microset Trouble Shooting

Dispensing gun fails to pressurize cartridge.

Check slider and replace if necessary.

Compound does not bond to backing paper.

Wrong side of backing paper used.

Material cures in the nozzle.

Nozzle attached for too long a period before use. Replace nozzle.

Material does not dispense from the nozzle after replacing previous nozzle.

Cartridge ports have cured over. Remove cured material or discard cartridge. The nozzle can be used as a seal for up to 4 months.

When using a new cartridge the first part of the replica does not cure.

Cartridge not leveled before attaching nozzle. Cartridge will not work satisfactorily with subsequent nozzles. To level the cartridge: prior to fitting nozzle, dispense small amount of material until an even amount issues from both cartridge ports.

Material cures too quickly or too slowly.

Incorrect grade being used for the ambient temperature. Choose a grade appropriate for the conditions. See compound chart.

Air bubble entrapment

Poor application. Keep the nozzle in contact with the surface. Overlap runs and use backing paper. For blind holes place the lip of the nozzle at the bottom of the hole.

Replica distorts and resolution is poor

Replica too soft when removed due to incomplete curing. Extend curing period.

Replica surface does not cure.

Cure inhibited by surface contamination e.g. grease, oil, etc. Clean surface with solvent/ suitable cleaning agent and reapply compound.

Replica breaks during removal.

Severe re-entrant geometry or replica not completely cured. Allow adequate curing time. Remove slowly applying constant pressure.

Replica adheres to surface.

Mechanical attachment to fibrous or porous surface. Remove slowly applying constant pressure.

Base piston on cartridge leaks.

Excessive pressure on dispensing gun due to nozzle blockage. Remove cured material if possible or replace cartridge.