TERAPRESS TP-7000 Mounting Press

INSTRUCTION MANUAL

3601 E. 34th St. Tucson, AZ 85713 USA Tel. 520-882-6598 Fax 520-882-6599 email: pace@metallographic.com Web: http://www.metallographic.com

Equipment Type:	Automated Compression Mounting Press
Model:	***TERAPRESS TP-7000 Compression Mounting Press***
Electrical Requirements:	110 Volts (optional 220V)
Frequency:	60 Hz
Manual Revision Date:	December 10, 2010

Please read this instruction manual carefully and follow all installation, operating and safety guidelines.

PACE TECHNOLOGIES

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4. ACCEPTANCE:
Customer shall inspect the Products promptly upon receipt of delivery. Unless customer objects in writing within five (5) business days thereafter, customer shall be deemed to have accepted the Products. All claims for damages, errors, or shortage in Products delivered shall be made by Customer in writing within such five (5) business days period. Failure to make any claim timely shall constitute acceptance of the Products.

Any returns for credit may be subject to 25% restocking fee and must be returned within ten (10) business days from initial delivery.

5. PAYMENT:
Customer agrees to provide timely payment for the Products in accordance with the terms of payment set forth on the reverse side hereof or in any proposal submitted herewith. If any payment is not paid on or before its due date, Customer shall pay interest on such late payment from the due date until paid at the lesser of 12% per annum or the maximum rate allowed by law.

6. MISCELLANEOUS PROVISIONS:
This agreement has been made in and shall be governed by the laws of the State of Arizona. These terms and conditions and the description of the Products on the reverse side hereof or in any proposal submitted herewith constitute the entire agreement and understanding of the parties with respect to this sale and supersede all prior and contemporaneous agreements or understandings, inducements or representations, expressed or implied, written or oral, between the parties with respect hereto. Any term or provision of this Agreement may be amended, and any observance of any term of this Agreement may be waived, only by a writing signed by the party to be bounds. The waiver by a party of any breach shall not be deemed to constitute a waiver of any other breach. Should suit be brought on this Agreement, the prevailing party shall be entitled to recover its reasonable attorneys' fees and other costs of suit including costs and attorneys' fees incurred on appeal or in collection of any judgment.

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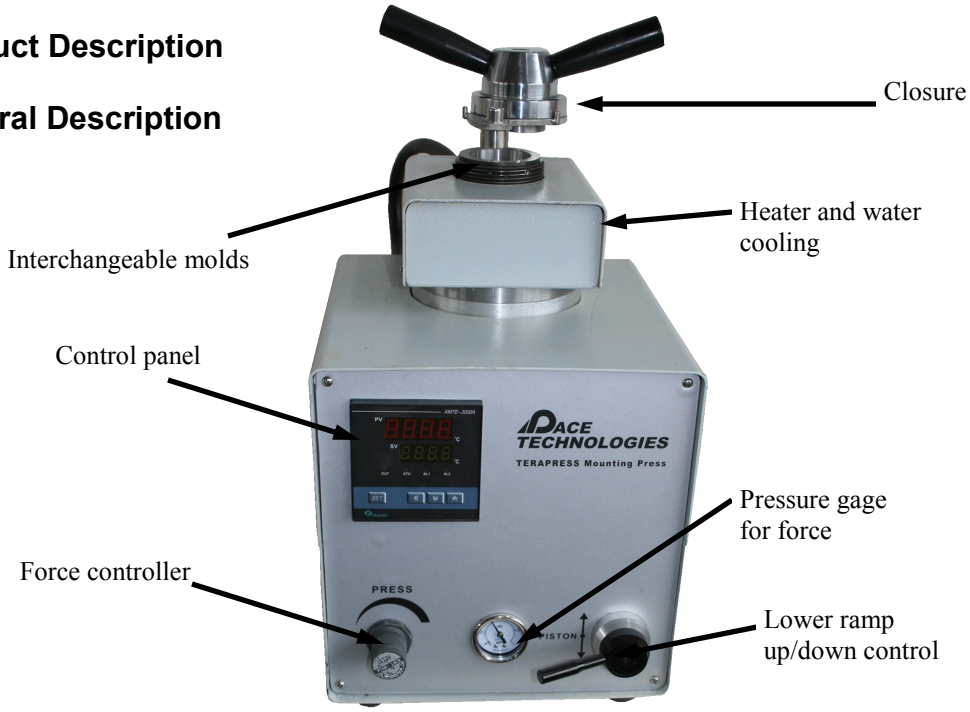
1.0 Product Description

1.1 General Description



The ***TERAPRESS TP-7000*** compression mounting press is designed for ease of use and reliability. The ***TERAPRESS TP-7000*** mounting press uses air pressure to maintain a constant force on the specimen, thus eliminating the requirement to continually monitor and increase the force as the resin begins to melt.

This bench top unit is easy to set-up and operate. The **TERAPRESS TP-7000** press provides rapid heating with a heater that completely surrounds the outside diameter of the mold assembly. Cooling is also accelerated with a water cooling jacket. The result is complete curing of both theromoset and thermoplastic compression mounting resins.

Whether you need to produce 1” or 2” mounts, the interchangability of the mold assemblies are easy and fast with the ***TERAPRESS TP-7000*** mounting press.

With the use of a spacer, the ***TERAPRESS TP-7000*** mounting presses can produce two mounts simultaneously. This increases the productivity of your metallographic laboratory.

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1.2 Technical Specifications

Electrical specifications:	110V / 60 Hz (optional 220V)
Heating power:	900 Watts
Thermostat range:	Room temperature to 575ºF (300ºC)
Timer:	0 - 99 minutes
Mold sizes:	1, 1.25, 1.5 and 2-inch
Weight:	55 lbs (25 kg)
Dimensions (WxHxD):	12” x 16” x 26” (305mm x 400mm x 635mm)
Working temperature:	32° - 100°F (0 - 40ºC)
Shipping temperature:	32° - 100°F (0 - 40ºC)
Storage temperature:	32° - 100°F (0 - 40ºC)
Water supply connection:	8 mm quick connect
Water drain connection:	1/4” heater hose
Air supply connection:	6 mm quick connect

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1.3 Mechanical Schematic

Note: Installation of the ***TERAPRESS*** should be on a flat sturdy surface, with easy access to electrical, water, air and drain connections

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1.4 Features

Mounting Force

The **TERAPRESS TP-7000** applies force through a robust pneumatic system. The actual pressure varies, depending upon the mold size.

Heating / cooling system efficiency

The heating elements and water-cooling jacket have been integrated into the upper part of the mold cylinder for efficiency. Heating is controlled by a thermostat, with the heating times being variable up to 99.99 minutes. The cooling cycle begins automatically after the heating cycle is completed. The cooling is to a pre-set temperature setting which initiates a buzzer when reached

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2.0 Unpacking, Shipping and Installation

2.1 Unpacking

Unit is delivered in a box. Unpack and check for completeness of parts.

Measures WxHxD: 12" x 16" x 25" (305mm x 40mm x 635mm)

Weight: Approx. 55 lbs

2.2 Shipping

When moving box, lift from bottom.

The **TERAPRESS TP-7000** ***compression mounting press*** is constructed of sensitive electronic and mechanical components. **Do not drop.**

! **Use caution when unloading to prevent injury**.

2.3 Installation

! Install unit carefully! Improper installation voids warranty.

The ***T*****TERAPRESS TP-7000** ***compression mounting press*** should be placed on a flat stable surface. Connect to water supply, drain and electrical connections.

After water, air, drain and electrical connections are completed, the system is ready for operation by activating the main power switch.

Installation continued on next page

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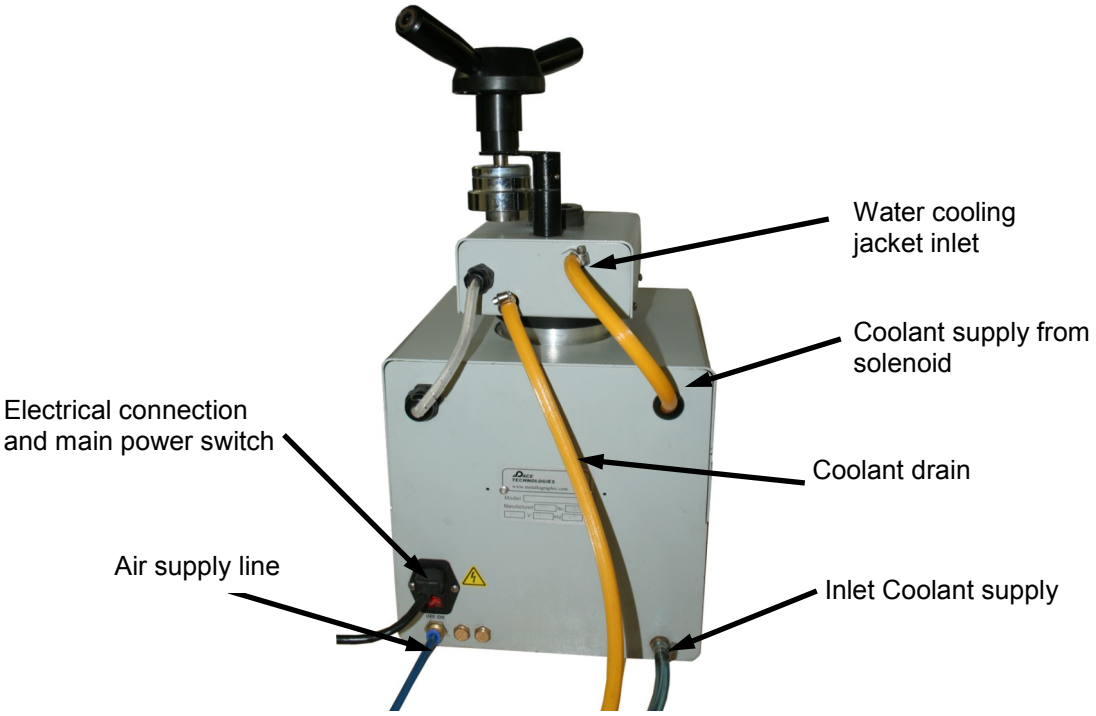
Backside connections



Electrical connection: Verify the operating voltage which is printed on the name plate. The standard voltage is 110V; however, the system is also available in 220V.

Coolant drain: The coolant drain line requires a 1/4-inch hose. **CAUTION:** The mold temperature is very hot and the initial contact of the cooling water turns to steam, which exits the drain hose very hot.

Coolant supply: The coolant supply line requires an 8 mm hose. It is recommended that the water supply be turned off when the unit is not in use. Inlet water should be clean and contamination-free to extend the life and cooling performance of the system.

Air supply: Air supply line requires a 6 mm pressure hose. Clean dry air is recommended (a filter lubricator is recommended)

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3.0 Safety Guidelines

3.1 Warning Sign

! This sign points to special safety features on the machine.

3.2 Safety Precautions

! Careful attention to this instruction manual and the recommended safety guidelines is essential for the safe operation of the **TERAPRESS TP-7000** compression mounting press.

! Proper operator training is required for operation of the **TERAPRESS TP-7000** compression mounting press. Unauthorized mechanical and electrical changes, as well as improper operation, voids all warranty claims. All service issues need to be reported to the manufacturer / supplier.

(Safety Precautions continued on next page)

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3.2 Safety Precautions (continued)

! During operation, the closure and upper parts of the heating and cooling block can get very hot. For safety, do not touch the closure unit. Use protective gloves if required.

! Always completely screw tighten the mold cover and back off a fraction so it is not too tight. Improper installation can result in hot molten mounting material leaking (**danger of burning).**

! Initial cooling water coming into contact with mold will produce an initial burst of steam. To avoid **danger of burning**, secure the drain line and use caution when the ***TERAPRESS*** compression mounting press is in use.

! Mold cylinder and ram get very hot during the mounting process. Take care before changing (**danger of burning).**

! Mounting samples must be chemically compatible with the mounting material. **Do not mount flammable samples.**

! Before opening the unit, disconnect main power plug. Replacement parts should be installed only by qualified personnel.

! Follow proper operating instructions (Section 4.0) and obtain proper training before operation.

! Do not leave press unattended during operation.

! Turn-off external water supply when press is not in operation.

3.3 Emergency Statement

The **TERAPRESS TP-7000** mounting press has been designed for mounting non-flammable metallographic specimens up to 2-inch diameter. Always follow proper operational guidelines and avoid contact with moving parts, lubricants and abrasives. Seek appropriate medical care for cutting injuries.

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4.0 Start-up and Operation

4.1 General

The ***TERAPRESS TP-7000*** compression mounting press has been designed for ease of use in producing high quality metallographic mounts. Metallographic mounting materials such as phenolics (bakelites), diallyl phthalates, hard glass-filled epoxies and conductive thermosets are easily produced with the ***TERAPRESS TP-7000*** compression mounting press.

4.2 Control Panel (see Appendix I for more detail)

Automatic start: Depress button  for 4 seconds to starts last mounting program.

Heating timer: Adjusts heating time (up to 99.99 minutes).

Temperature controller: Adjusts mounting temperature up to 300ºC (575ºF).

Pressure controller: Adjusts the applied air pressure.

Ram up / down: Moves the ram up, down and hold in a neutral position

Pressure gage: Displays the ram force / pressure.

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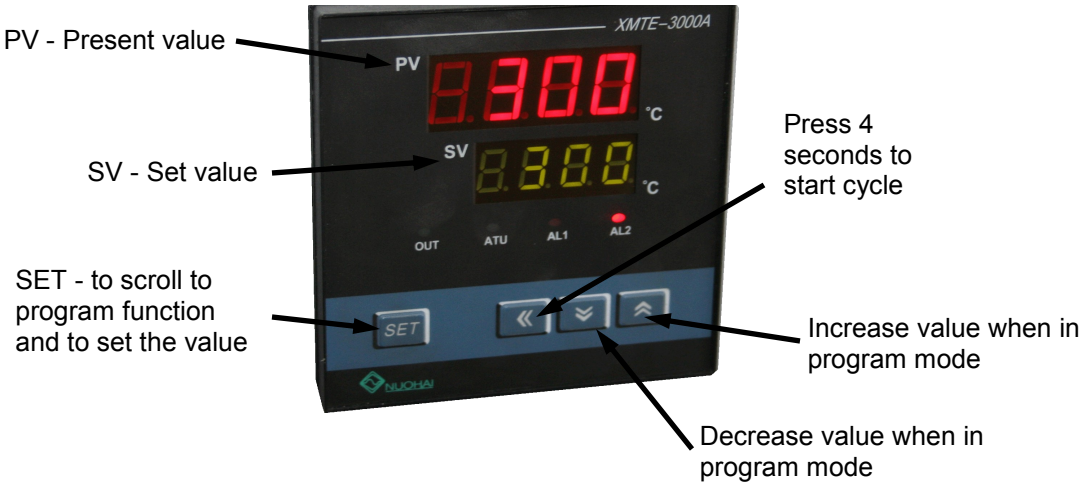
4.2.1 Controller



4.2.2 Controller (Temperature, Time, Cooing Time, Temperature Holding Range

1. To enter program mode either press the SET 

button to set parameter (SP) or temperature using up and down keys.

2. Use SET button to select ST parameter (time) and enter time in minutes up to 999 minutes.

3. To change the cooling temperature, press the SET button and hold for 5+ seconds. Adjust cooling temperature by setting parameter AL2 (cooling temperature).

4. To adjust the +/- holding temperature (not a common adjustment, press the SET button for 5+ seconds. Adjust ALT (+/- temperature at holding temperature. Exit by pressing SET button.

5. Exit program by pressing SET button. 

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4.6 Pressure

To change the maximum mounting pressure adjust the air regulator, increasing by turning clockwise, decreasing by turning the knob counterclockwise. Press in the knob to lock in the force.

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4.7 Preparing a Mount

1. Lower ram to release pressure.
2. Turn bayonet closure handle to remove.
3. Lift bayonet closure and swing to move out of the way.
4. Raise lower ram and place sample on the ram.
5. Lower the ram.
6. Add molding resin. and tighten bayonet closure.
7. Raise lower ram.
8. Adjust parameters
9. Start Program cycle by pressing for 4 seconds.

To check the time within the cycle, press up button.

Note: The **TERAPRESS TP-7000 *compression mounting press*** is capable of single and double

! **Caution:** Mold and ram assemblies can remain hot even after cooling cycle is completed. Use caution to avoid burning.

4.7.1 Changing mold and ram

1. Unscrew bayonet closure.
2. Raise lower ram up and unscrew to remove (regular thread).
3. Unscrew (reverse threaded) the upper ram to remove.
4. Mold can be removed by loosening the three hex screws by the top of the mold.

Unscrew bayonet closure

Raise lower ram up and unscrew to remove

Unscrew the upper ram to remove

Remove by loosening the three hex screws and lifting mold

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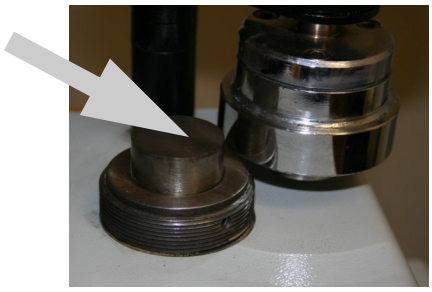
Sample placement

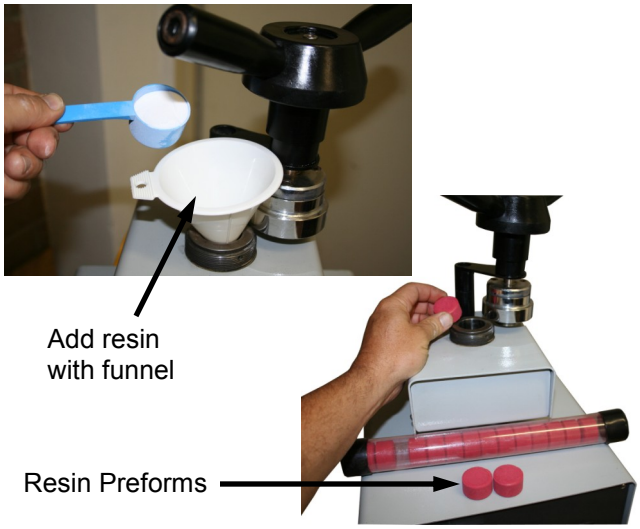


To position sample, raise the lower ram for easy access. Position sample on ram and lower into mold.

! Caution: Do not mount flammable materials.

Mounting material

Lower ram and add mounting material. It is recommended that a funnel be used to minimize spilling and to keep the top of the mold clean (easier installation and removal of upper ram).



Locking bayonet closure

Upper ram and bayonet closure must be lowered into position for bayonet closure to lock properly. After properly positioning upper ram and bayonet, turn to tighten. It is recommended that the bayonet be turned 1/8 turn counterclockwise for easier removal after mounting is complete.

! Caution: Improper closure can result in hot mounting material being extruded out of the mold. If such a case arises, turn off mounting press and let it cool before cleaning.

! Caution: If you need to handle the top mold assembly while the mold is hot it is recommended that you use proper heat resistant gloves to prevent burning

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Setting temperature

Set temperature according to mounting material recommendations (see Tables 4-1 to 4-5 on the following pages).

Setting heating time

Set heating time according to mounting material recommendations (see Tables 4-1 to 4-5 on the following pages).

Setting pressure

Set pressure according to mounting material recommendations (see Tables 4-1 to 4-5 on the following pages).

Summary

1. Select and install required mold assembly.
2. Insert sample and add mounting material.
3. Select temperature, heating time and pressure.
4. Activate mounting operation by pushing start button.

Sample removal

Upon completion, a buzzer rings and the green light on the start button turns off. Open closure as described under “Releasing bayonet closure” and lift ram to remove completed mount.

! Caution: Bayonet closure and upper ram may still be very hot.

Recommendation: Clean ram before producing next mount and remove and clean mold assembly after every 40 hours of operation.

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4.5 Mounting Guidelines

Table 4-1 Phenolic Mounting Powders

Parameters	1-inch mounts	1.25-inch mounts	1.5-inch mounts	2-inch mounts
Temperature (ºC)	200°C (420°F)	200°C (420°F)	200°C (420°F)	200°C (420°F)
Machine force (MPa)	0.6	0.65	0.75	0.80
Time (minutes) - minimum	8	10	12	12
Grams of powder*	10.2	16.0	23	40.8

Table 4-2 Diallyl Phthalate Powders

Parameters	1-inch mounts	1.25-inch mounts	1.5-inch mounts	2-inch mounts
Temperature (ºC)	200°C (420°F)	200°C (420°F)	200°C (420°F)	200°C (420°F)
Machine force (MPa)	0.65	0.8	0.8	0.85
Time (minutes) - minimum	8	10	12	12
Grams of powder*	10.2	16.0	23	40.8

Table 4-3 Epoxy Powders

Parameters	1-inch mounts	1.25-inch mounts	1.5-inch mounts	2-inch mounts
Temperature (ºC)	200°C (420°F)	200°C (420°F)	200°C (420°F)	200°C (420°F)
Machine force (MPa)	0.5	0.65	0.65	0.65
Time (minutes) - minimum	8	10	12	12
Grams of powder*	13.7	21.4	30.8	55

* Grams of powder to produce a 5/8” mount without any sample

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4.5 Mounting Guidelines (continued)

Table 4-4 Conductive Mounting Powders

Parameters	1-inch mounts	1.25-inch mounts	1.5-inch mounts	2-inch mounts
Temperature (ºC)	200°C (420°F)	200°C (420°F)	200°C (420°F)	200°C (420°F)
Machine force (MPa)	0.65	0.8	0.8	0.85
Time (minutes) - minimum	8	10	12	12
Grams of powder*	10.2	16.0	23	40.8

* Grams of powder to produce a 5/8” mount without any sample

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5.0 Maintenance

5.1 Introduction

The **TERAPRESS TP-7000** ***compression mounting press*** requires very minimal maintenance. However, it is recommended that the mold and assembly be removed after every 40 hours of operation to remove any mounting material build-up. This will extend the life of the mold assemblies.

5.2 Cleaning outside cabinet

Cabinet and front shield should be cleaned occasionally with a moist cloth. Do not use any chemicals or cleaning medium containing abrasive particles.

5.3 Cleaning inside cabinet

Over time, small quantities of mounting residual can build up inside the cabinet. It is recommended that *once a year* the **TERAPRESS TP-7000** ***compression mounting press*** be cleaned with a vacuum cleaner (be sure to disconnect the power before opening the panel).

5.4 Filter

It is recommended that a filter be used on the incoming water line and cleaned as required.

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6.0 Trouble Shooting

Problem	Cause	Solution
Upper ram hard to remove	a. Temperature of top ram is too hot	a. **Allow to cool or wrap with a moist cloth**
a Bayonet cover hard to screw on or off	a. Temperature of top ram is too hot	a. **Allow to cool or wrap with a moist cloth**
No function at all (system does not turn on)	a. Unit is disconnected from main electrical power supply b. Main switch off	a. Connect main cable b. Turn on main switch
Heating temperature is not reached	a. Mounting time is too short b. Defective heating element c. Leaking solenoid.	a. Correct heating time b. Replace c. Replace
Bayonet closure and upper ram do not fit into mold	a. Mold cylinder is too hot (thermal expansion) b. Ram or mold cylinder is defective c. Closure is tilted d. Ram is dirty	a. Let system cool. b. Replace c. Reposition closure d. Clean ram
Closure cannot be removed	a. Has not been opened completely b. Upper ram coated with mounting material	a. Turn to open position b. Cool down and push out. ram with hydraulics, clean ram
Lower ram does not move down	a. Contamination b. Air cylinder defect	a. Remove and clean b. Check cylinder and replace if necessary
Mold cylinder cannot be removed	a. Temperature difference b. Contamination or corrosion between the cylinder and heating / cooling block	a. Completely cool down b. After cooling, slowly heat up and disassemble immediately
Cooling water flow is weak or none at all	a. Water supply is off b. Filter is clogged	a. Open valve b. Open unit, remove filter set and clean
Water leaking	a. Cooling water supply tube leaks b. Screw coupling is loose c. Cooling water return line leaks	a. Check and seal b. Tighten or replace c. Replace
Pressure cannot be changed	a. Defective pressure switch	a. Replace switch

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7.0 Technical

COMPRESSION MOUNTING

Compression mounting is a very useful mounting technique which can provide better specimen edge retention compared to castable mounting resins. Compression mounting resins are available in different colors and with various fillers to improve hardness or conductivity (Figure 7-1).

Several compression mounting characteristics include:

- Convenient means to hold the specimen
- Provides a standard format to mount multiple specimens
- Protects edges
- Provides proper specimen orientation
- Provides the ability to label and store the specimens

Figure 7-1 Wide variety of compression mounting resins.

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Compression mounts are quick and easy to produce, requiring several minutes to cure at the appropriate mounting temperature. Most of the time required in compression mounting occurs during the heating and cooling cycles. When choosing a compression mounting machine, the most important features include its maximum heating temperature and how intimately the heater and water cooler are connected to the mold assembly. The better compression mounting machines have heaters which can reach temperatures of at least 200°C (450°F). For faster turn around time, water cooling is essential (see Figure 7-2).

Figure 7-2 Automated heating and water cooled compression mounting press.

The primary compression mounting resins include:

- Phenolic Resins (standard colors are black, red and green) (see Figure 7-3)
- Acrylic Resins (clear)
- Diallyl Phthalate Resins (blue and black) (Figure 7-4)
- Epoxy Resins (glass-filled) (Figure 7-5)
- Conductive Resins (phenolics with copper or graphite filler) (see Figure 7-6)

Figure 7-3 Red phenolic resin, 100X.

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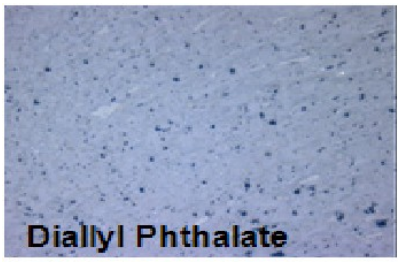

Figure 7-4 Glass-filled diallyl phthalate resin, 100X.

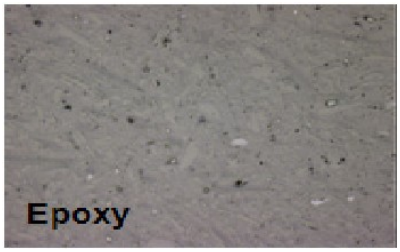

Figure 7-5 Glass-filled epoxy resin, 100X.

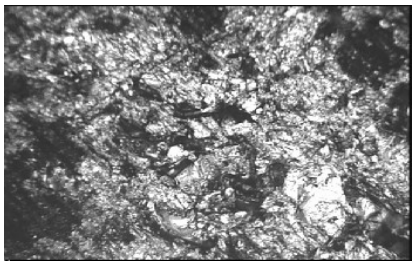

Figure 7-6 Conductive graphite mount, 100X.

7.1 COMPRESSION MOUNTING RESIN PROPERTIES

There are a variety of compression mounting materials. The two main classes of compression mounting materials are thermoset and thermoplastics. Thermoset resins require heat and pressure to cross-link the polymer and the reaction is irreversible. Thermoplastic, on the other hand, can theoretically be remelted. Table Ia provides a relative comparison of the most common compression mounting resins, whereas, Table Ib provides more specific information for the various compression mounting resins.

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TIP: Compression mounting at higher then the recommended minimum temperature generally improves the properties of the mount.

TIP: A useful tip for marking or identifying a specimen is to mold the label inside of the mount (Figure 7-7). If the entire mount is an acrylic, just place the label on top the mount and cover it with a little acrylic powder. To label other compression mounting resins, add a thin layer of acrylic over the other mounting material and then position the label on this layer. Finish off the mount with another layer of acrylic.

Figure 7-7. Example of labeling mounts using acrylic resin on top of a phenolic base.

TABLE Ia. Compression Mounting Resin Characteristics

	PHENOLICS	ACRYLICS	EPOXY (Glass-filled)	DIALLYL PHTHALATES
Type	Thermoset	Thermoplastic	Thermoset	Thermoset
Cost	Low	Moderate	Moderate	Moderate
Ease of use	Excellent	Moderate	Good	Good
Availability of Colors	Yes	No	No	Yes
Cycle times	Excellent	Moderate	Good	Good
Edge retention	Fair	Good	Excellent	Excellent
Clarity	None	Excellent	None	None
Hardness	Low	Medium	High	High

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TABLE IIb. Compression Mounting Resin Characteristics

	PHENOLICS	ACRYLICS	EPOXY (Glass filled)	DIALLYL PHTHALATES
Form	Granular	Powder	Granular or Powder	Granular
Specific gravity (gm/cm3)	1.4	0.95	1.75-2.05	1.7-1.9
Colors	Black, Red, Green	Clear	Black to gray	Blue, Black
Shrinkage (compression) (in/in)	0.006	N/A	0.001-0.003	0.001-0.003
Coefficient of Linear Thermal Expansion (in/in °C 10E-6)	50	N/A	28	19
Chemical resistance	Glycol, petrochemicals, solvents, some acids and bases	Alcohol, dilute acids & alkalies, and oxidizers	Solvents, acids, alkalies	Solvent, acids, alkalies
Molding temperature (recommended)	200°C (420°F)	>200°C (420°F)	200°C (420°F)	200°C (420°F)
Hardness	N/A	Rockwell M63	Barcol 72	N/A
Min. curing time (1/2 mounts at temp. and pressure	8-12 minutes	10-20 minutes	8-12 minutes	8-12 minutes

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7.1.1 Phenolics

In general, phenolics are used because of their relatively low cost. In addition, phenolics are available in a variety of colors (Figure 7-8).

Figure 7-8 Phenolic resins are available in a variety of colors.

TIP: Use different color phenolics to color code jobs, specimens types, or for different testing dates. For example, changing the phenolic color each month will show which samples or jobs are getting old.

TIP: If the color dye in the mount bleeds out when rinsing with an alcohol, this is an indication that the mount was not cured either at a high enough temperature or for the proper length of time (see Figure 7-9).

Figure 7-9 Insufficient curing of phenolic resin causes alcohol to dissolve the dye.

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Figure 7-10 Glass-filled diallyl phthalate and epoxies have a glass filler to provide better edge retention during grinding and polishing.

7.1.3 Epoxies / Diallyl Phthalates

Glass-filled epoxies and diallyl phthalates are compression mounting resins used to provide a harder mounting support edge next to the specimen (see Figure 7-10). These resins are commonly used to support the edges of coatings, heat treated samples and other specimens requiring better flatness. Figure 7-11 shows the polished interface between a glass-filled epoxy and tungsten carbide specimen. Note that there is no noticeable gap between the specimen and the mounting material, therefore showing that glass-filled epoxies provide excellent support to the specimen edge even for extremely hard specimens.

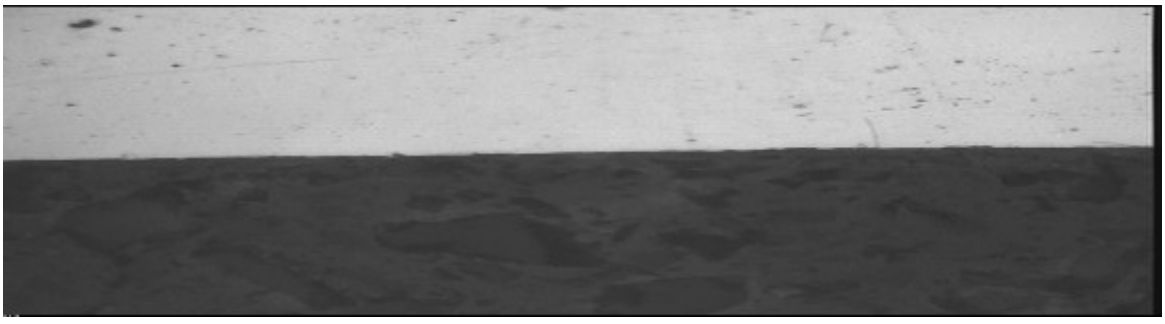

Figure 7-11. Polished edge for tungsten carbide mounted in glass-filled epoxy.

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TIP: Epoxies (glass-filled) and diallyl phthalates are significantly more expensive then phenolic and acrylics. In order to reduce the cost of these mounts, they can be laminated with a lower cost mounting compound such as a phenolic. The technique is to place a sufficiently thick enough layer of the glass-filled epoxy or diallyl phthalate around the specimen in order to compensate for any grinding loss. The rest of the mount can then be supported with a lower cost compression mounting compound such as a phenolic. Red phenolics are used frequently for this technique (Figure 7-12).

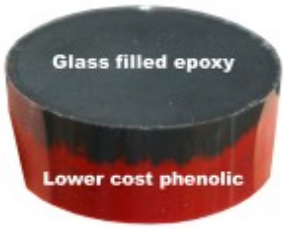

Figure 7-12 Glass-filled epoxy laminated with phenolic to reduce the cost of the mount.

7.1.4 Specialized Compression Mounting Resins

With the addition of fillers such as graphite or copper, the compression mounting compounds can be made conductive (Figure 7-13). Conductive mounts are used in scanning electron microscopes (SEM) to prevent the specimen from building up a charge. Conductive mounts are also used for specimens requiring electrolytic etching or polishing.

Figure 7-13 Graphite and copper are common fillers used to increase the conductivity of compression mounting resins.

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7.2 COMPRESSION MOUNTING PROCEDURES

- Clean specimens to remove cutting and handling residues
- Remove debris from mold assembly
- Apply thin coat of mold release compound to mold assembly
- Raise mold ram to up position
- Center specimen on ram
- Lower ram assembly
- Pour predetermined amount of resin into mold
- Clean and remove any excess resin from around the mold assembly threads
- Lock mold assembly cover
- Slowly raise ram into up position
- Apply recommended heat and maintain pressure for specified period of time
- Cool to near room temperature
- Remove mounted specimen
- Clean mold and ram assembly

TIP: Preheat resin and sample to 35°C (95°F) to expedite the initial heating process and for increasing throughput.

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APPENDIX II
Electrical Diagram