



OPERATING MANUAL

VACUUM CASTING MACHINE

TYPE MCP LC4/01

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MCP EQUIPMENT

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A DIVISION OF MINING & CHEMICAL PRODUCTS LTD.

Thank you for choosing an MCP vacuum casting machine.

The equipment combines a vacuum pump with fast exhaust rate and a highly efficient mixing unit to ensure the production of premium quality castings in a variety of moulding materials.

The vacuum chamber itself is used for de-gassing both the silicone rubber mixture from which moulds are formed, and the two-component MCP resins used for the actual castings.

Please follow carefully the instructions for installation and use that are to be found in this Operating Manual, which also covers routine checks and adjustments. A separate SERVICE MANUAL is provided to deal with specific repairs, fault-finding and replacements.

A further Manual, VACUUM CASTING TECHNIQUE, gives an overview of the system. A copy is supplied with every machine.

HEALTH AND SAFETY

All units supplied on or after 1st January, 1995, bear the CE mark. The Declaration of Conformity will be found at the end of this Manual.

ELECTRICAL SAFETY

Certain of the tasks described in this manual require access to the electrical control enclosure, and should therefore be carried out only by a suitably qualified person.

MATERIALS SAFETY DATA

Though no special hazard is likely when they are used in accordance with the suppliers' recommendations, each of the materials used in the process is the subject of a Safety Data Sheet, supplied at the time of first purchase and giving information in conformity with both European Directive 91/155/EEC and (in the United Kingdom) the Consumer Protection Act 1987.

NOISE

The equivalent continuous A-weighted sound-pressure level during working of this machines does not exceed 70dB(A).

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VACUUM CASTING MACHINE

TYPE MCP 4/01



Fig. 1 General front view

VACUUM CASTING MACHINE

TYPE MCP 4/01



Fig. 2 General view with chamber open

VACUUM CASTING MACHINE

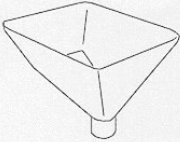

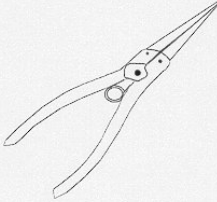
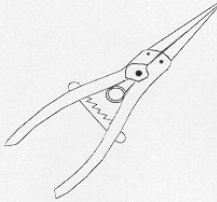

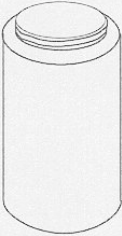





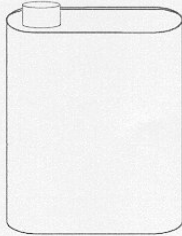
TYPE MCP 4/01



Fig. 3 Side view with access panel open

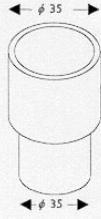


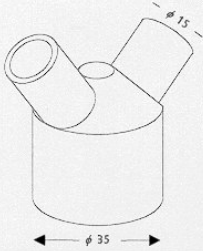
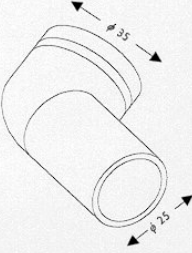
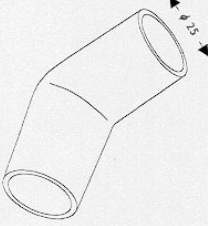
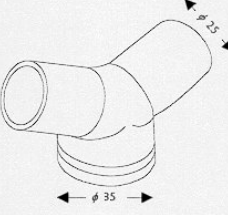
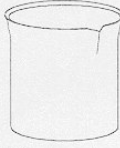

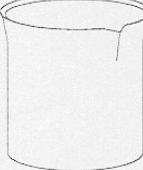
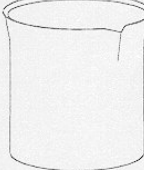
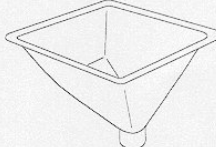
STANDARD ACCESSORIES RANGE

([REDACTED] NOT AVAILABLE FOR MCP 4/01)

<p>Funnel liner (no. 2) Re-order no. 831.00209</p> 			<p>Paddle no. 1 Re-order no. 831.00101 (001 models only)</p> 
		<p>Mould opener Re-order no. 831.00214</p> 	<p>Mould opener (with ratchet) Re-order no. 831.00215</p> 
<p>Resin pigment 200gm (Special order by colour)</p> 	<p>Resin pigment 1 kg (Special order by colour)</p> 	<p>Resin pigment (black) 1 kg Re-order no. 832.40007</p> 	<p>Silicone release agent Re-order no. 831.00014</p> 
<p>Silicone-free release agent Re-order no. 802.00033</p> 	<p>Pattern lacquer spray Re-order no. 802.00034</p> 	<p>Pattern release agent (green) Re-order no. 802.00032</p> 	<p>Pattern sealant Re-order no. 802.00031</p> 

STANDARD ACCESSORIES RANGE

([REDACTED] NOT AVAILABLE FOR MCP 4/01)

<p>Hose joint 35/26 Re-order no. 831.00203</p> 	<p>Hose joint 35/20 Re-order no. 831.00202</p> 	<p>Hose joint 20/10 Re-order no. 831.00201</p> 	<p>Hose joint Y-16/16/35 Re-order no. 831.00204</p> 
<p>Hose joint 36/25 Re-order no. 831.00109</p> 	<p>Hose joint 25/25 Re-order no. 831.00110</p> 	<p>Hose joint Y/25/25/35 Re-order no. 831.00108</p> 	<p>Cup (small, 0.5 litre) Re-order no. 831.00223 (001 models only)</p>  <p>500 cc</p>
<p>Cup liner (small, 0.5 litre) Re-order no. 831.00212 (001 models only)</p> 	<p>Cup (large, one-litre) Re-order no. 831.00224 (001 models only)</p>  <p>1000 cc</p>	<p>Cup liner (large, one-litre) Re-order no. 831.00213 (001 models only)</p> 	<div style="background-color: black; width: 100%; height: 100%;"></div>
<div style="background-color: black; width: 100%; height: 100%;"></div>	<div style="background-color: black; width: 100%; height: 100%;"></div>	<div style="background-color: black; width: 100%; height: 100%;"></div>	<p>Funnel no. 2 Re-order no. 831.00206</p> 

INSTALLATION

WEIGHT AND DIMENSIONS

- * Weight: shipping weight, 234kg; unpacked 160kg
External dimensions (mm): 1180 high x 900 wide x 630 front-to-back.

POWER REQUIREMENTS

- * The unit requires a single-phase, 230 volt supply.
Normal current rating, 6.5A; maximum surge 16A.
In countries of the European Union, units are supplied with the appropriate plug, fused as necessary.
- * An earthing point and a circuit breaker must be provided.

SITING THE MACHINE

- * Do not site the unit in an area subject to excessive heat or high humidity.
- * Choose a well-ventilated room. If possible, provide local exhaust ventilation to an outside vent.
- * Avoid areas exposed to dust or vibration.
- * If required, the complete unit may be lifted by using the two supplied D-bolts connected to the vacuum chamber as shown in Fig.4 under the top cover plate.
- * Ensure that the unit stands on a level surface (adjustable feet are not provided)



Fig. 4 Lifting Bolts in position.

INSTALLATION SEQUENCE

*Before installing, please read through the instructions and ensure that you can identify each of the parts referred to.
Note that access to the main electrical panel is by the lockable side panel on the right-hand side of the cabinet.*

1. Open the vacuum pump access panel. Check the oil level and, if necessary, fill the vacuum pump to the level indicated by a market on the sight glass using the oil supplied.
Close the access panel
2. Ensure that the main isolator is set to 'OFF' and that the Emergency Stop, shown, (fig. 4a) is pushed into the 'OFF' position.
3. Open the side electrical access panel and ensure that the circuit breaker switch is in the 'up' position (i.e. switched on).
Make and check the earth connection to the unit.
Close the access panel.
4. Connect to the power supply, using the cable and plug supplied. Switch on at the main isolator switch.
5. Release the Emergency Stop knob by turning it anti-clockwise.
6. Press the 'Re-set' (blue) button (at the top right side corner of the machine).



Fig. 4a Operating panel

7. Check that the chamber illumination light is now on. If it is not, turn off the machine at the isolator, open the side access panel and check the light bulb.
8. Insert and adjust the mixing paddle (*fig. 5*).

Note that the paddle has a slot (1), which fits over a pin within the slot in its holder and is retained by pressure from a spring-loaded steel ball. The locked grub screw (2) that carries the ball may be adjusted (using an M6 spanner and 3mm AF Allen key): it should be possible to remove and replace the paddle by hand, without slackness when it is in position.

A cup and liner should be in position while height adjustment is made. To adjust the height, use a 2mm AF Allen key to slacken the grub screw (3) to allow the holder to slide up or down the shaft. When correctly positioned, the paddle should rotate with a clearance of 1-2 mm from the cup liner. Re-tighten the grub screw.

9. The slow leak valve is accessible from the back panel (*fig. 3*). Check the adjustment of the flow-control governed by this device. The valve handle should be inclined at approximately 45° to the valve body.



Fig. 5 Adjusting the paddle and holder

WARNING

DO NOT operate the vacuum pump for longer than 30 seconds while the vacuum chamber is open. Failure to observe this precaution might result in excessive wear on the pump's components.

SAFE WORKING PRACTICES

Users of equipment should satisfy themselves that they comply with the requirements of the relevant legislation within the United Kingdom (or equivalent regulations within the country of use).

Particular attention is drawn to the following:-

- Health and Safety at Work etc. Act 1974;
- Personal protective Equipment at Work Regulations 1992;
- Provision and Use of Work Equipment Regulations 1998;

Provision and Use of Work Equipment Regulations

In general terms, the Regulations require that equipment provided for use at work is:

- Suitable for the intended use;
- Safe for use, maintained in a safe condition and, in certain circumstances, inspected to ensure this remains the case;
- Used only by people who have received adequate information, instruction and training; and;
- Accompanied by suitable safety measures, e.g. protective devices, markings and warnings.

Personal Protective Equipment

Users should be aware of the requirements of the Personal Protective Equipment at Work Regulations 1992 when providing equipment.







The main requirements of the PPE at Work Regulations 1992 is that personal protective equipment is to be supplied and used at work wherever there are risks to health and safety that cannot be adequately controlled in other ways.

Because the effectiveness of PPE can easily be compromised, e.g. by not being worn properly, it should always be considered as a last resort and only used where other precautions cannot adequately reduce the risk of injury.

Even where engineering controls and safe systems of work have been applied, some hazards might remain. In considering methods of safeguarding machinery the use of personal protective equipment may be used to minimise the risk of injury. This includes the need for special clothing, including footwear, hearing, eye and respiratory protection.

The guidance shown below may be used to consider the risks which may or may not be present. The user should make his own assessment of risks depending upon the circumstances of use.

SAFE WORKING PRACTICES CONTINUED

	Hazards	Options
<p>HANDS</p> 	<p>Abrasion; Temperature extremes; cuts and punctures; impact; chemicals; skin irritation.</p>	<p>Gloves, gauntlets</p> <p>Notes:</p> <ul style="list-style-type: none"> • Don't wear gloves when operating machines where gloves might get caught. • Care in selection is needed.
<p>EYES</p> 	<p>Chemical or metal splash; dust; projectiles.</p>	<p>Spectacles, goggles, visors.</p> <p>Notes:</p> <ul style="list-style-type: none"> • Make sure the eye protection chosen has the right combination of protection for the task.
<p>FEET</p> 	<p>Wet; slipping; falling objects; heavy loads; metal and chemical splash</p>	<p>Safety boots and shoes.</p> <p>Notes:</p> <ul style="list-style-type: none"> • Consider conditions of use.
<p>BODY</p> 	<p>Heat; chemical or metal splash; spray from pressure leaks; impact; entanglement of own clothing.</p>	<p>Conventional or disposable overalls, aprons.</p> <p>Notes:</p> <ul style="list-style-type: none"> • Consider choice of materials in relation to the chemicals involved.
<p>RESPIRATORY</p> 	<p>Dusts; gases and vapours.</p>	<p>Disposable respirators, half masks or full face masks, powered respirators.</p> <p>Notes:</p> <ul style="list-style-type: none"> • The right type of respiratory must be used for the substance being handled.
<p>HEARING</p> 	<p>Impact noise; intensities; pitch.</p>	<p>Ear plugs or defenders.</p> <p>Notes:</p> <ul style="list-style-type: none"> • See Noise at Work Regulations 1989.

NOTE: Use personal protective equipment only as a last resort. Wherever possible engineering controls and safe systems of work should be used instead. All those required to wear protective equipment should be given training in its proper use, care and maintenance.

PREPARATION FOR CASTING

The sequence of operations (explained in general terms in the companion Manual *VACUUM CASTING TECHNIQUE*) requires the resin component cups, the whisk for mixing, a funnel and hoses all to be put correctly into place above the entrance gate(s) to the mould.

PREPARING THE MOULD AND FLOW-SYSTEM

The standard accessory range includes several joints (see page 5), which may be employed in conjunction with clear plastic hose to direct the mixed resin into the mould, with the flow being split through Y-joints if need be

Fit the funnel (see *fig. 7*) into the centre of the carriage in the upper part of the chamber, locating the front edge over the guard plate on the funnel position, and place the prepared mould (on a support platform in necessary) in the lower chamber. NB – do not use any form of support that might inflate under vacuum.

Decide on the pattern and sizes of hose and any connectors that may be needed, keeping the runs as short as conveniently possible.

Prepare the hose outlets, fixing to both funnel and mould. Ensure that you obtain a good fit, but one that is not too tight. Leave no end open.

PREPARING THE RESIN

Two- or three-component resins should be prepared in accordance with the supplier's instructions and placed in the appropriate cups.

Although casting may be carried out without them, it is recommended that cup liners be always used.

For general guidance, refer to the manual *Vacuum Casting Technique: a guide for new users* supplied with the machine.

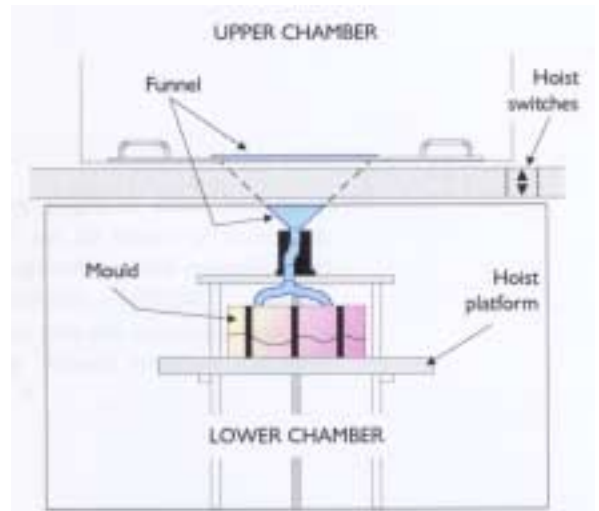


Fig. 6 Arrangement of the mould and accessories

FITTING THE CUPS AND PADDLE

Fit the cups into their cradles, ensuring always that component 'A' is in cup 'A' (the upper right cup).

- (a) Place cup A in its cradle, engaging the spout with the V-shaped cut-out. Ensure that the lip of the cup (and that of its liner, if used) is beneath the lip of the retaining clip.
- (b) Remove the paddle from its clip (above cup B).
- (c) Pull open the retainer assembly (with V-shaped cut-out) for cup B. Slide the cup B into the cradle, ensuring that the lip of the cup (and that of its liner, if used) is beneath the lip of the retaining clips at the side and rear of the cradle. Close up the retainer place, keeping the spout of the cup in the V-shaped cut-out, and lock it by turning anti-clockwise the knob at its left.

Re-fit the paddle by sliding it into its holder, ensuring that it is fully engaged by the spring-loaded ball.

BEFORE BEGINNING A CASTING, ALWAYS HAVE READY THE APPROPRIATE SOLVENT FOR CLEANING UP RESIDUAL RESIN.

WORKING PROCEDURES

1. TO MAKE THE MACHINE READY FOR USE

Switch on the machine at the isolator.
Press the green re-set button (the inside of the chamber is now illuminated).

The machine is now ready for use.

ALWAYS CHECK THAT BOTH RESIN COMPONENTS –
AND THE MOULD – ARE IN POSITION BEFORE
ATTEMPTING TO MIX AND CAST

2. OPERATING MODE

The machine is operated entirely in manual mode.

KEEP YOUR HANDS OUT OF THE VACUUM CHAMBER
WHILE ANY OF THE MECHANISMS ARE OPERATING

3. OPERATING INSTRUCTIONS

Press the green 'Vacuum Pump' pushbutton to begin chamber evacuation.

Rotate 'Speed Control' knob to select the required mixing speed.

Press the green 'Mixer' pushbutton to start the mixing of part B.

Once mixing has been completed, stop the mixer by pressing the raised red pushbutton. Using the tilt wheel (A) on the left hand side of the machine, tilt cup 'A', allowing the resin component 'A' to drain into cup 'B'. Return cup 'A' to the starting position.

Re-start the mixer.

When the mixing is complete, stop the mixer and tilt cup 'B' by operating the pour lever (B). Allow it to drain before returning it to the starting position.

When the pouring is complete and the resin has settled, gently open the leak control lever on the operating panel. The leak will start to force resin further into the mould; this should be continued for up to 30 seconds, after which complete opening of the leak valve will release the remaining vacuum fully, forcing the resin completely into the mould.



Fig.7 Cup Tilt Controls

4. STOPPING IN AN EMERGENCY

To deal with unforeseen or unplanned steps in operation (for example, forgetting to load with a resin component, or an apparent malfunction as a result of faulty programming):

Operate the red STOP button (it will lock into place)

The machine is now completely shut down: nothing with operate.

5. RE-STARTING AFTER EMERGENCY

Rotate and release the red STOP button
Press the blue re-set button
Press 'Esc' to return to the main screen.

The machine can now be operated again. Gain access to the chamber after first operating the FAST LEAK control to release the vacuum. It will then be possible to correct any fault before continuing.

6. SHUTTING DOWN

Complete shutdown: turn off the power supply at the isolator switch.

AFTER CASTING – A REMINDER

Remove the cups and liners, the funnel and the pipes as soon as possible and clean them out with the recommended solvent, ready for re-use.

ROUTINE MAINTENANCE PROCEDURES

Apart from keeping the unit in a generally clean condition, routine maintenance of the Vacuum Casting Machine is concerned with the vacuum pump and its associated filters. Users are referred to the Service Manual for other repair or replacement procedures.

- * Before carrying out any operation on the vacuum pump or its filters, allow the equipment to stand idle for at least one hour.
- * Never use any oil but the correct grade as recommended.
- * Check the oil level regularly. The optimal frequency depends greatly on usage and should be set after observation at short intervals (e.g. daily or weekly) during the first periods of use.

OIL CHANGES

The first oil change for a new pump should be made after 150 hours of operation.

The period between subsequent changes may be varied to match actual usage. Assuming a full working week of forty hours, MCP Equipment suggest that the oil be changed at intervals of three months, corresponding to 520 hours (refer to the maintenance schedule in the pump manufacturer's manual in case of any doubt). Longer periods allow the build-up of sludge and other deleterious matter, which may shorten the life of the pump by causing excessive wear.

A copy of the pump manufacturer's manual is supplied with the casting machine. For the user's convenience, the following instructions summarise the procedure for maintenance of the pump, but the manual itself should be consulted for explicit instructions for changes of oil and/or filter as well as other cleaning operations.

1. Remove the oil filler cap from the top of the pump
2. Open the drain tap at the bottom left of the pump and allow it to drain (through a hose) into a suitable receptacle.
3. When the oil-flow appears to have ceased, operate the pump for **no more than thirty seconds** with the vacuum chamber doors open.
4. Close the drain tap and put in one litre of fresh, clean vacuum pump oil. Replace the filler plug.
5. Close the vacuum chamber doors and operate the pump for three or four minutes, to flush out residual deposits.
6. Repeat operations 1, 2 and 3.
7. Close the drain tap and refill the pump with fresh, clean oil to the gauge on the sight window. Replace the oil filler cap.

Operating the machine in very humid conditions can cause moisture to be drawn into the vacuum pump, where it will form a layer of water at the bottom of the sump and cause the level to rise about the gauge line. If you notice this effect (which is most easily discernible after a period of non-use, such as over a night), drain off the layer through the drain tap to bring the oil down to its correct level.

DECLARATION OF CONFORMITY

Manufacturer's name and address: MCP EQUIPMENT
(A DIVISION OF MINING & CHEMICAL PRODUCTS LTD.)
UNIT 8, WHITEBRIDGE INDUSTRIAL ESTATE,
STONE
STAFFORDSHIRE ST15 8LQ

Equipment type and designation: Vacuum Casting Machine
Type MCP 4/01LC and variants

Serial Number:

Directives/Regulations to which the equipment conforms:

1. Council Directive 98/37/EEC and its amending directives, leading in the United Kingdom to The Supply of Machinery (Safety) Regulations (SI 1992 No. 3073) (as they apply to equipment with a moving part and intended for treating or moving material.
2. Council Directive 92/31/EEC and its amending directives, leading in the United Kingdom to The Electromagnetic Compatibility Regulations (SI 1992 No. 2372).
3. Council Directive 72/23/EEC and its amending directives, leading in the United Kingdom to The Low Voltage Electrical Equipment (Safety) Regulations (SI 1989 No. 728).

Safety standard to which the equipment uses:

BS 2771 : Part 1, as applicable to the electrical and electronic equipment of machines not portable by hand when working, used in industrial production and operated from a supply up to 1000 VAC. (equivalent to European standard EN 60 204). The equipment also complies with the essential Health and Safety requirements.

Person responsible for Technical File:

Simon Scott,
Manager for Technical Data – MCP Equipment Division