WACKER SILICONES ELASTOSIL®

ELASTOSIL® M MOLDMAKING COMPOUNDS MADE EASY

CREATING TOMORROW'S SOLUTIONS

Where to Find What

THERE'S NO HARM IN ASKING

ELASTOSIL® M moldmaking compounds are room-temperature-curing, two-component (>RTV-2) silicone rubbers distinguished by excellent fidelity of reproduction. There are suitable grades for making all kinds of molds, no matter how intricate, and for use with all types of reproduction material, whether wax, plaster, concrete, casting resin or low-melting metal alloy.

Thanks to their great flexibility and outstanding release properties, ELASTOSIL® M rubbers separate very easily from the model. Their high resistance to the reproduction material means they can be used over and over again.

All these excellent processing properties make ELASTOSIL® M compounds indispensable for mold making: whether for industrial manufacturers or for artists and craftsmen.

This manual is intended to give both beginners and professionals quick answers to specific practical questions.
What types of mold are available?
What is the best moldmaking technique?
What material is most suitable ?

If there are any questions not covered by this booklet, our technical service team are here to assist you.

Call us. We'll be glad to help.

Where to Find What

Moldmaking Techniques

The first silicone rubber layer is critical for faithful reproduction of fine detail. So work with extreme care.

WHICH MOLDMAKING TECHNIQUE SHOULD I USE?

Where to Find What

ELASTOSIL® M moldmaking compounds are suitable for all types of molds whatever the degree of difficulty. Which technique to choose depends entirely on the size and composition of the model to be copied.

The table shown here illustrates the most important types of model and will help you to choose the most suitable moldmaking technique.

Model type	Example	Moldmaking technique	Advantages	Disadvantages
– Flat reverse side – Only shallow, if any, >undercuts or recesses – For models of limited size	Medallion	– One-part >block mold – Casting or impression technique	– Less labor intensive – High mold stability	– Relatively high silicone rubber requirement
– Flat reverse side – Deep >undercuts or recesses – For models of any size	Relief	– One-part >skin mold – Casting or spreading technique	– Low demolding forces – Relatively low silicone rubber requirement	– More labor intensive than for >block mold (>support required)
– Structured on all sides – Complex shape – Deep >undercuts – For models of limited size	Industrial prototyping	– One-part >block mold – Demolding by cutting along a parting line – Use as two or more-part >block mold – Casting technique (with >vacuum if necessary)	– Less labor intensive than with two-part >block mold – High mold stability	– Relatively high silicone rubber requirement
– Pedestal or even base – Complex shape – Deep >undercuts or recesses – For models of limited size	Trophies, small statues	– One-part >skin mold – Demolding by cutting open at the side – Use as one-part >skin mold, which can be folded open – Casting or spreading technique	– Less labor intensive than for two-part >skin mold – Low demolding forces – Relatively low silicone rubber requirement	– More labor intensive than for >block mold (>support required)
– Structured on all sides – Only shallow, if any, >undercuts or recesses – For models of limited size	Fossils, coins	– Two or multi-part >block mold – Casting or impression technique	– High mold stability	– Relatively labor intensive – Relatively high silicone rubber requirement
– Structured on all sides – Complex shape – Deep >undercuts or recesses – For models of any size	Large statues	– Two or more-part >skin mold – Casting or spreading technique	– Low demolding forces – Relatively low silicone rubber requirement	– More labor intensive than for >block mold (>support required)

WHAT DO I NEED TO BEAR IN MIND WHEN PREPARING THE MODEL?

Where to Find What

ELASTOSIL® M moldmaking grades separate easily from the majority of materials from which models are made. Nevertheless, it is generally advisable to spend some time on preparing the model.

Specifics

- Carefully clean all surfaces to remove dust, dirt, oil, etc., not forgetting those that are difficult to access.
- Where possible, secure loose sections of the model; otherwise remove them for safe keeping.

Model made of	Plasticine	Clay, unfired	Plaster	Wax	Wood	Metal
Water-soluble synthetic resins such as methyl cellulose (wallpaper paste) or polyvinyl alcohol in a solution consisting of 4–10 parts by weight of solid to 100 parts by weight of water			yes		yes	
Concentrated solutions of soap or wetting agents (e.g. dishwashing liquid)		if required	yes			if required
Wax or paraffin; liquid or as 5–10 % solution in xylene or sulfur-free white spirit			yes		yes	
Petrolatum (e.g. Vaseline) pharmaceutical grade			yes		yes	
WACKER Protective Film SF 18	if required			if required		

– Fill damaged areas or surfaces, cracks or fissures with a modeling compound (e.g. Plasticine) or filler to prevent the moldmaking compound from adhering to the model.
– Seal porous or absorbent surfaces, or cover them with film.
– Cover sensitive surfaces with film or other suitable materials to prevent soiling, discoloration or other undesirable changes.
– Apply a coating of a release agent (e.g. Vaseline) to any material such as glass, porcelain, ceramics or silicone rubber that might form chemical bonds with the silicone rubber.
– Smooth, non-absorbent surfaces do not generally require a release agent. However, if the model is to be used for several molds, a release agent should be applied to prevent the mold surface from becoming coated with silicone.
– Molds of >addition curing grades might not cure completely (i.e. may be inhibited) if >condensation-curing grades have been used previously on the model. The remedy in such cases is to coat the affected area with WACKER Protective Film SF 18.

Caution:
Remember that preparatory work might affect the model's appearance. For example, wood may be darkened and natural and synthetic stone discolored. For this reason we strongly advise you to carry out preliminary tests on an inconspicuous section to discover exactly what changes are likely. This trial molding will show you how cleanly and easily the cured silicone can be removed.

Porous materials[1]	Smooth materials[2]	Leather	Plastics	Silicone rubber	Inhibiting materials[3]
yes					if possible
yes	yes		if required		
yes	yes	if possible		yes	
yes	yes	yes	if required	yes	
					yes

[1] Fired clay, concrete, cast and natural stone, unglazed porcelain, bones etc.
[2] Glass, porcelain, glazed ceramic
[3] Many modeling compound grades, organic rubbers, cold-curing epoxy resins, polyester resins, polyurethanes, >condensation-curing >RTV-2 silicone rubbers among others

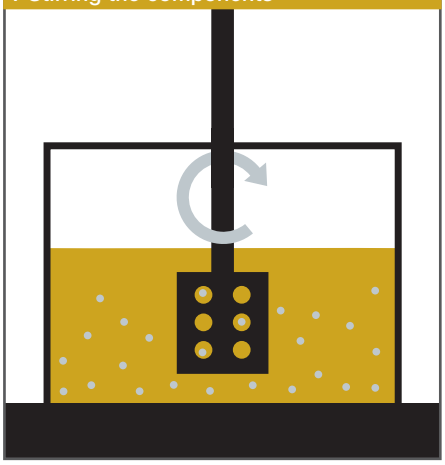
HOW DO I PREPARE THE MOLDMAKING COMPOUND?

Where to Find What

Everything you need

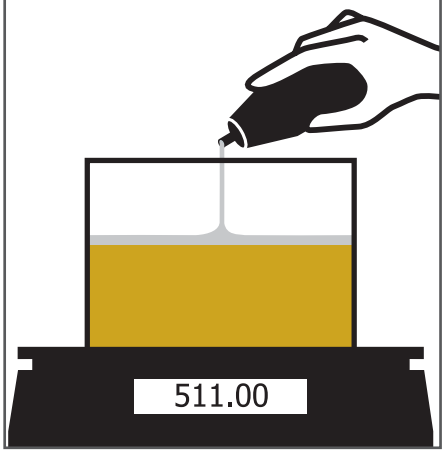
- Balance, accurate to 0.1 g or a measuring vessel, pipette or disposable syringe
- Clean metal or plastic containers, preferably of polyethylene
- Metal, wood or plastic spatula
- Stiff short-bristled brush
- Mechanical stirrer: power drill with stirrer attachment (for kneadable compounds: roll mill or kneader)
- >Vacuum pump (oil or water-jet pump) and >vacuum vessel: e.g. glass or plastic desiccator
- Grease-dissolving solvent: e.g. white spirit or acetone

1 Stirring the components



- Always thoroughly mix all pourable compounds and components before removing them from or processing them in containers, preferably with a mechanical stirrer. Mixing disperses the fillers uniformly and improves the flow properties of those grades with high tear resistances.
- Grades with high tear strength may thicken somewhat on storage. They can be made to flow again by stirring well.

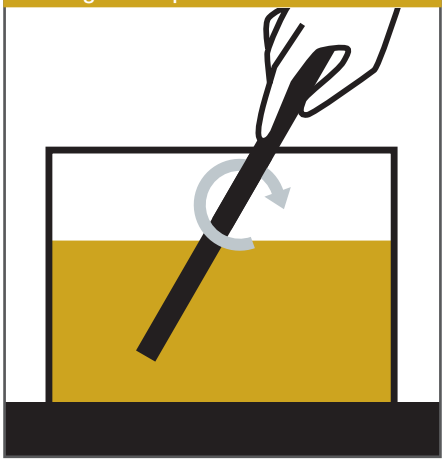
2 Metering of components



- Weigh out the >components exactly, since only strict observance of the mixing ratio will yield >reproducible pot lives and curing time, and cured rubbers with the specified properties

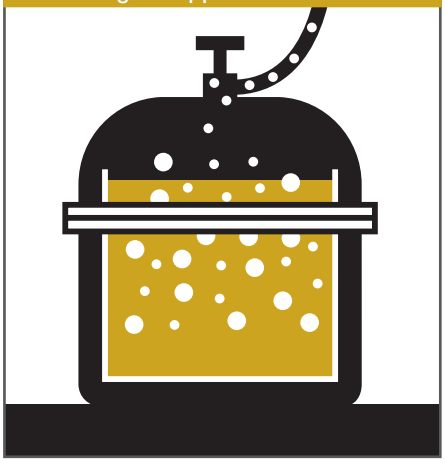
Note:
If you are also using the weighing vessel for >deaeration, its volume must be at least four times that of the >catalyzed rubber compound.

3 Mixing of components



- With >condensation-curing ELASTOSIL® M grades, the rubber and >T-series catalyst must be mixed, and in the case of >addition-curing grades, >components A and B.
- Mix the >components homogeneously using a spatula for pourable and spreadable products, or a mechanical stirrer for large quantities.
- Mix kneadable products by hand, on a roll mill or in a kneader.
- While mixing, regularly scrape the product off the vessel wall with a spatula.

4 Removing entrapped air



- To achieve bubble-free cured rubber products, free-flowing mixtures should be >deaerated (>evacuated) under reduced pressure (10 to 20 mbar) in a >desiccator or >vacuum cabinet.
- Note: >evacuation causes the >catalyzed mix to expand strongly. Only fill the evacuation vessel to at most a quarter of its total capacity.
- During >evacuation, the rubber expands strongly at first and then usually collapses before it reaches the rim. If it looks likely to overflow, admit air briefly. Repeat the process until the mix collapses completely under full >vacuum. Break the >vacuum immediately afterwards.
- Deaeration should not take longer than 5 minutes. It should never be performed until no more bubbles form. Otherwise certain components essential for proper >curing might escape.

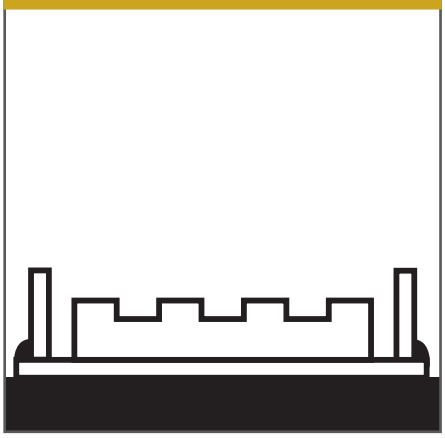
HOW DO I CAST A ONE-PART BLOCK MOLD?

Where to Find What

Everything you need

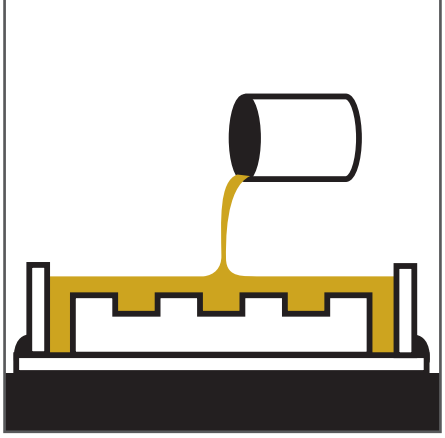
- A suitable smooth, flat, non-absorbent base
- Strips of wood, plastic or metal for making a molding box
- Sealing wax or a modeling compound (e.g. Plasticine) for immobilizing the model and sealing the joints in the molding box
- Short-haired brush
- Release agent and lubricant (Vaseline, liquid soap, dishwashing liquid) to assist with demolding

1 Constructing a molding box around the model



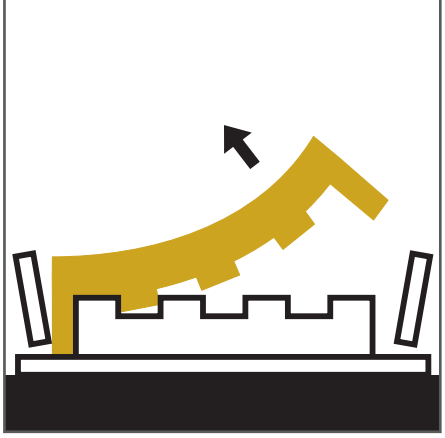
- Prepare the model (see page 6)
- Immobilize it on the base and construct the molding box around the model, making it at least 2 cm wider and higher than the model
- Seal the edges between the molding box and base with a modeling compound (e.g. Plasticine)

2 Pouring in the silicone rubber



- Pour the >catalyzed and >deaerated silicone rubber in a thin stream over the model from as close above the mold as possible. Try not to change the first point of contact of the stream with the model. If >deaeration equipment is not available, apply a thin coat of the >catalyzed mix to the model with a stiff, short-bristled brush (to avoid air bubbles on the surface) and pour the remaining rubber from as great a height as possible.
- Pour in enough silicone rubber to cover the highest point of the model by at least 1 cm.

3 Demolding



- When the >curing time has elapsed – but within 24 hours – remove the molding box and take the mold off the model

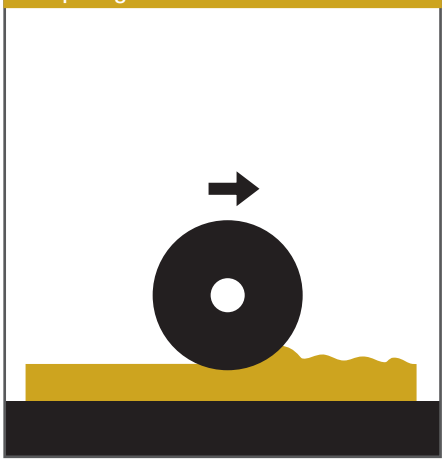
HOW DO I MAKE A ONE-PART BLOCK MOLD BY THE IMPRESSION TECHNIQUE?

Where to Find What

Everything you need:

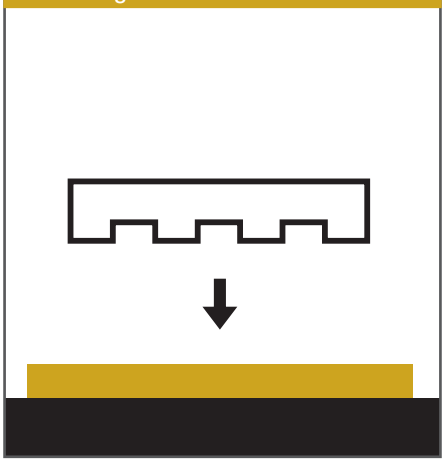
– Smooth, flat base
– Roller or press

1 Preparing the rubber slab



– Use a roller or press to make a slab of the >catalyzed kneadable compound large enough to accommodate the model. The slab should be at least 1 cm thicker than the largest recess in the model.

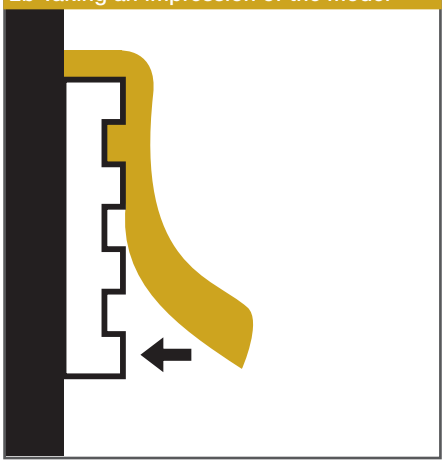
2a Pressing the model into the rubber slab



– Preparing the model (see p. 8)
– Press into the rubber slab from above: e.g. in the case of coins, jewelry, keys

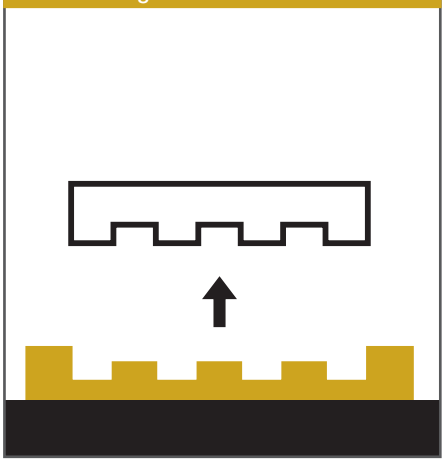
Alternatively:

2b Taking an impression of the model



– Press the rubber slab onto the model surface with a rolling movement: e.g. in the case of shallow relief

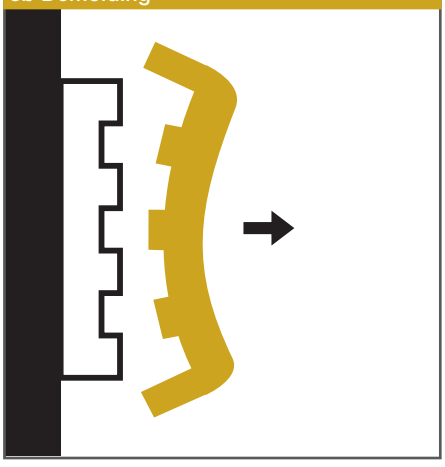
3a Demolding



– When the >curing time has elapsed – but within 24 hours – remove the model from the mold

Alternatively:

3b Demolding



– Peel the mold off the model

HOW DO I CAST A TWO-PART BLOCK MOLD?

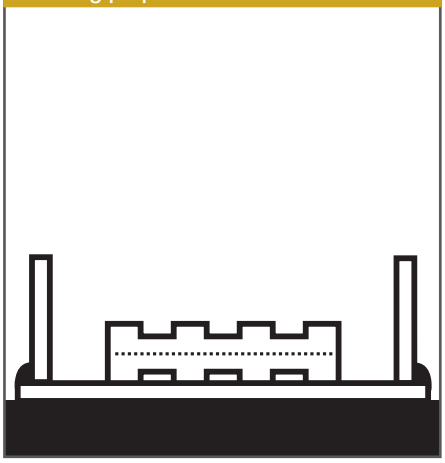
Where to Find What

Everything you need:

- A suitable smooth, flat and non-absorbent base
- Strips of wood, plastic or metal for making a molding box
- Sealing wax or a modeling compound (e.g. Plasticine) for immobilizing the model and sealing the joints in the molding box
- Plastic film or aluminum foil for protecting the model against soiling (optional)
- Embedding material: clay or a modeling compound (e.g. Plasticine)
- Marker for drawing the parting line (optional)
- Tubes or locating pegs to act as >locks or >spacers for vent holes and feeding channels (optional)
- Stiff short-bristled brush
- Release agent: Vaseline, wax solution, WACKER Protective Film SF 18
- Drill (optional)

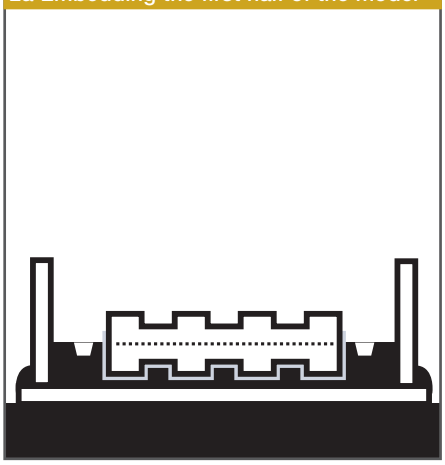
Making the First Part of the Block Mold

1 Making preparations

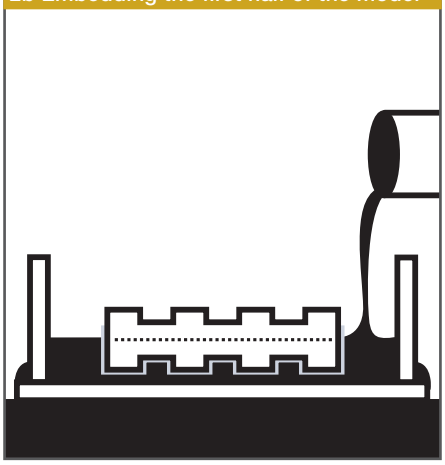


- Prepare the model (see page 8)
- Decide on where the parting line is to be and, if possible, mark it on the model. It should follow edges, should not cross large, smooth areas and should divide the model into two equal parts, intersecting any openings as symmetrically as possible.
- Cover the lower part of the model with foil to prevent it from being soiled by the embedding material.
- Immobilize the model on a base and construct a molding box at least 2 cm wider and higher than the model.
- If the model has a stand, place it such that the stand lies directly against the molding box in order to create a feeding channel for the >reproduction material.
- Seal the edges between the molding box and base with a modeling compound (e. g. Plasticine).

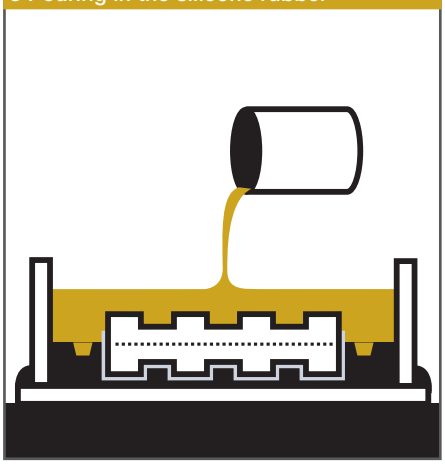
2a Embedding the first half of the model



2b Embedding the first half of the model



3 Pouring in the silicone rubber



If you are using unmeltable embedding material (e.g. clay or a modeling compound such as Plasticine):

– Form the embedding material into a slab of appropriate size: somewhat larger than the model and of a suitable thickness, with a thin section in the middle of the slab for the model.
– Cut >locks in the form of recesses, or insert locating pins into the embedding material to ensure that the two mold parts fit together >accurately.
– Also, if necessary, push tubes or pegs half-way into the embedding material as >spacers for lateral air escape.

If you are using meltable embedding material (e.g. modeling wax):

– Melt the embedding material. If the parting line on the model is horizontal pour in the embedding material up to the parting line. Otherwise pour in the embedding material to the greatest possible height.
– Allow the embedding material to set and, if necessary, adjust it to follow the actual parting line by pressing the material against the model at the parting line.
– Cut >locks in the form of recesses, or insert locating pins into the embedding material to ensure that the two mold parts fit together >accurately.
– Also, if necessary, push tubes or pegs half-way into the embedding material as >spacers for lateral air escape.

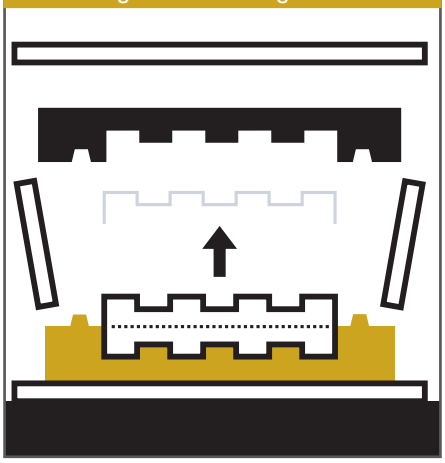
– For the first mold part, pour the >catalyzed and >deaerated silicone rubber in a thin stream from as low a height as possible. Try not to change the first point of contact of the stream with the model.

Alternatively:

– If >deaeration equipment is not available, apply a thin coat of the >catalyzed mix to the model with a stiff, short-bristled brush (to avoid air bubbles on the surface) and pour the remaining rubber from as great a height as possible.
– Pour in enough silicone rubber to cover the highest part of the model in a layer at least 1 cm thick.

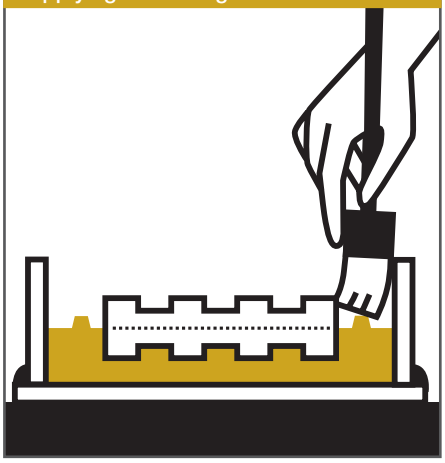
Where to Find What

4 Removing the embedding material



– When the >curing time has elapsed – but within 24 hours – remove the molding box and take the mold off the model
– Remove the base, disassemble the molding box and remove the embedding material and frame. Leave the completed mold part on the model.

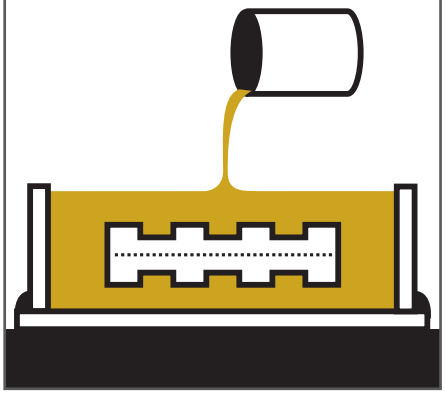
5 Applying release agent



– Reassemble the molding box
– Apply release agent to all exposed areas of the first mold part in order to prevent it from sticking to the second part.

Second block mold part

6 Casting the second mold part

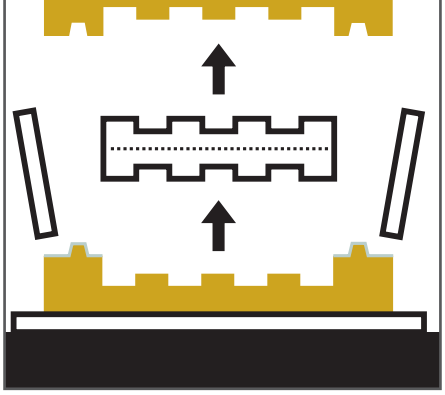


– Pour the >catalyzed and >deaerated silicone rubber in a thin stream from as low a height as possible. Try not to change the first point of contact of the stream with the model.

Alternatively:

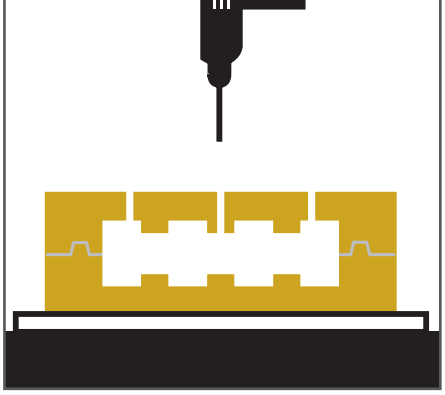
– If >deaeration equipment is not available, apply a thin coat of the >catalyzed mix to the model with a stiff, short-bristled brush (to avoid air bubbles on the surface) and pour the remaining rubber from as great a height as possible.
– Pour in enough silicone rubber to cover the highest part of the model in a layer at least 1 cm thick.

7 Demolding



– After the second part of the mold has cured, disassemble the mold box and peel the mold parts off the model.

8 Drilling casting and vent holes



– If tubes or locating pegs have not been inserted as >spacers for vent holes and feeding channels, drill holes at suitable points to allow pouring in of the >reproduction material.

HOW DO I MAKE A TWO-PART BLOCK MOLD BY THE IMPRESSION TECHNIQUE?

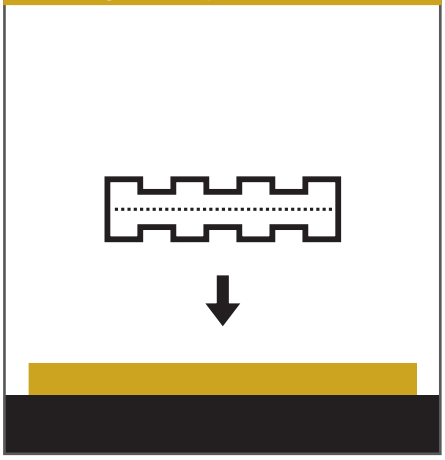
Where to Find What

Everything you need:

- A suitable smooth, flat, non-absorbent base
- Marker for drawing the parting line (optional)
- Roller or press
- Release agent: Vaseline, wax solution, WACKER Protective Film SF 18
- Tubes or locating pegs to act as >locks or >spacers for vent holes and feeding channels (optional)

First block-mold part

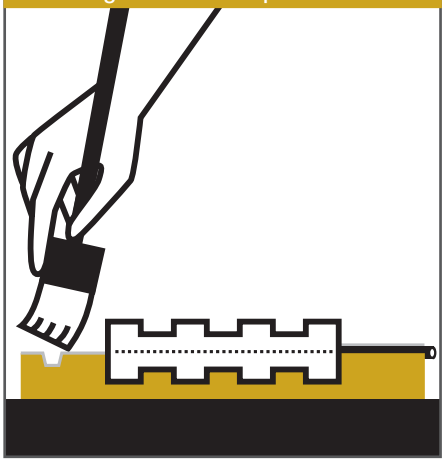
1 Pressing the first part of the mold



- Prepare the model (see page 8) and form the rubber slab to an appropriate size for the object to be copied (see page 5).
- Decide on where the parting line is to be and, if possible, mark it on the model. It should follow edges, should not cross large, smooth areas and should divide the model into two equal parts, intersecting any openings as symmetrically as possible.
- Press the model into the rubber slab.
- Press the rubber against the model along the parting line.

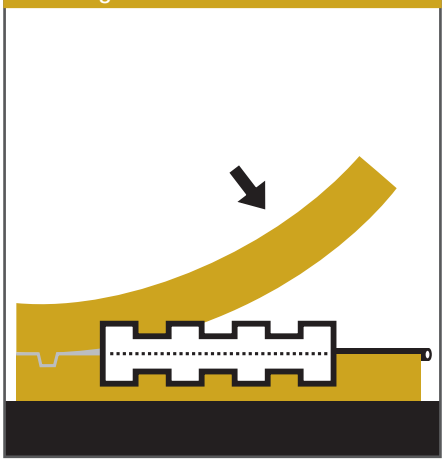
Second mold part

2 Pressing in locks and spacers



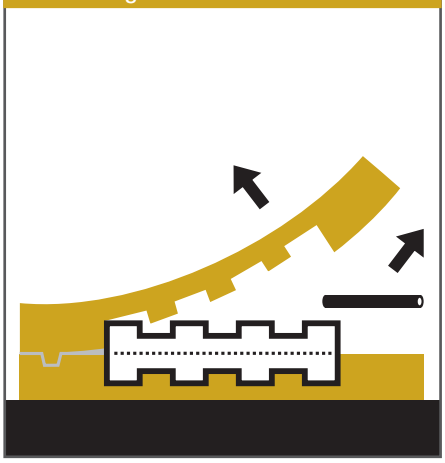
- Smooth the surface
- Cut >locks in the form of recesses, or insert locating pins into the embedding material to ensure that the two mold parts fit together >accurately.
- Also, if necessary, push tubes or pegs half-way into the embedding material as >spacers for lateral air escape.
- When the >curing time has elapsed – but within 24 hours – treat all exposed surfaces with release agent in order to prevent them sticking to the second part.

3 Forming the second rubber slab



- Press a second rubber slab with a rolling movement onto the first mold part with the >embedded model

4 Demolding



- When the >curing time has elapsed – but within 24 hours – peel the two mold parts from the model.
- If tubes or locating pegs have not been inserted as >spacers for vent holes and feeding channels, drill holes at suitable points to allow pouring in of the >reproduction material.

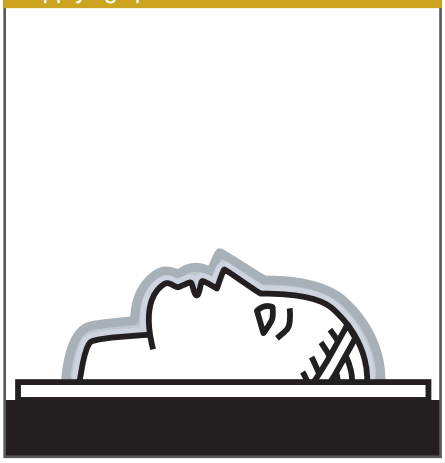
HOW DO I CAST A ONE-PART SKIN MOLD?

Where to Find What

Everything you need:

- A suitable smooth, flat, non-absorbent base
- If the >support is to be made in plaster by pouring: strips of metal to make a molding box
- Sealing wax or a modeling compound (e.g. Plasticine) for immobilizing the model and sealing the edges of the molding box
- Plastic film or aluminum foil for protecting the model against soiling (optional)
- Tubes or locating pegs to act as >locks or >spacers for vent holes and feeding channels (optional)
- Clay or a modeling compound (e.g. Plasticine) as >spacing layer for the rubber
- Plaster or glass-fiber-reinforced polyester or epoxy resin for making the >support by either pouring or spreading
- Spatula
- Short-haired brush (optional)
- Drill (optional)

1 Applying spacers



– Prepare the model (see page 8) and immobilize it on the base
– Cover the model with film or foil to prevent its surface being soiled by the spacer material.
– Cover with a uniform layer of clay or a modeling compound (e.g. Plasticine), about 1 cm thick, to completely fill or cover the >undercuts

2 Casting or spreading of the support

– To cast the >support, construct a molding box: at least 3 cm wider and higher than the model
– Seal the edges between the molding box and base with a modeling compound (e.g. Plasticine)
– Pour in plaster to the rim of the molding box

Alternatively:

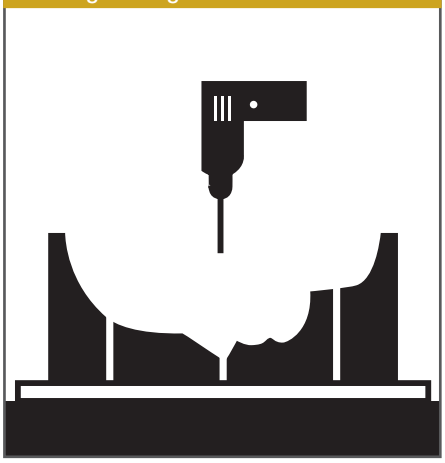
– Apply glass-fiber-reinforced polyester or epoxy resin. With the latter, no molding box may be needed

3 Removing the support and spacers

– After the >support has hardened, remove the molding box and mark the exact position of the >support on the base
– Remove all layers from the model

Where to Find What

4 Drilling casting and vent holes



– If tubes or locating pins have not been inserted as >spacers for vent holes and feeding channels during casting or spreading the >support, drill feeding channels at the lowest points and vent holes at the highest points. This will prevent air pockets being trapped during filling of the cavity.

5 Pouring in the silicone rubber

- Position the >support exactly over the model using the marks as a guide and assemble the molding box.
- Pour the >catalyzed and >deaerated silicone rubber into the feeding channels while shaking/vibrating the mold, so it flows into all surface crevices without trapping any air.
- Continue pouring until the rubber is visible in the vent holes.

Alternatively:

- If >deaeration equipment is not available, use a stiff, short-bristled brush to apply a thin layer of the >catalyzed rubber to the model before covering it with the >support. This will prevent any air bubbles from adhering to the model surface. Reposition the >support and pour in the rest of the rubber in a thin stream from as great a height as possible.

6 Demolding

- Once the >curing time has elapsed – but within 24 hours – remove the >support and >skin mold from the model

7 Inserting the skin mold in the support

- Place the >skin mold in the >support using the spacers for the feeding and vent holes as guides

Note:
Always keep the >skin mold in the >support during storage as otherwise post-curing of the freshly >vulcanized rubber may result in permanent deformation of the mold.

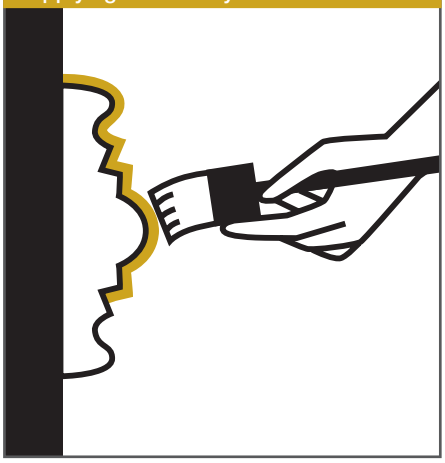
HOW DO I MAKE A ONE-PART SKIN MOLD BY THE SPREADING TECHNIQUE?

Where to Find What

Everything you need:

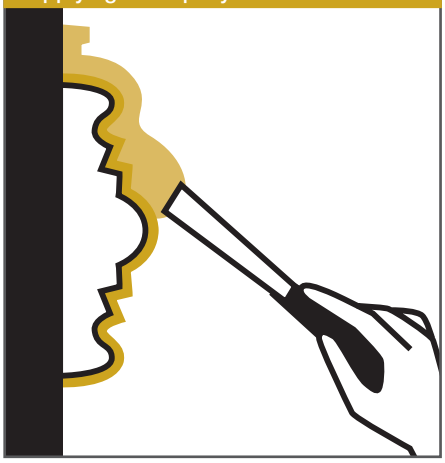
- A suitable smooth, flat base
- If the >support is to be made in plaster by pouring: strips of wood, plastic or metal for making a molding box and a modeling compound for sealing the corners
- Sealing wax or a modeling compound (e.g. Plasticine) for immobilizing the model and sealing the edges of the molding box
- Plaster or glass-fiber-reinforced polyester or epoxy resin for making the >support by either pouring or spreading
- Spatula
- Short-haired brush (optional)
- Pigments for coloring the >top layer
- Soap solution for smoothing the rubber surface
- Release agent e.g. Vaseline, wax solution, WACKER Protective Film SF 18

1 Applying the fine layer



- Prepare the model (see page 8)
- If the model can be moved and is not too large, it can be molded horizontally. In this case, immobilize the model on the base
- Apply a 0.5–1 mm thick layer of the >catalyzed pourable or slightly >non-sag rubber to the prepared model by brush, or work it by hand to eliminate any air bubbles on the model.
- Leave for 1–2 hours to partly cure until the >fine layer cannot be shifted, but is still tacky.

2 Applying the top layer



- You can ensure that all of the >fine layer is covered, by coloring the rubber compound used for the >top layer with 0.1 to 0.3 % WACKER FL pigment paste.
- Using a spatula, apply a 5 –15 mm thick top layer of the >catalyzed, >non-sag rubber compound.
- Completely fill >undercuts. In the case of deep >undercuts apply the >top layer to their interior surfaces and later make separate supporting wedges
- If necessary, make >locks (trapezoidal recesses in the top layer or elevations, such as seams or “buttons”) to allow the >skin mold to be located in the >support later.
- Using soapy water and your hand, smooth the rest of the top layer before the rubber starts to cure in order to prevent the >support from sticking in the >skin mold.

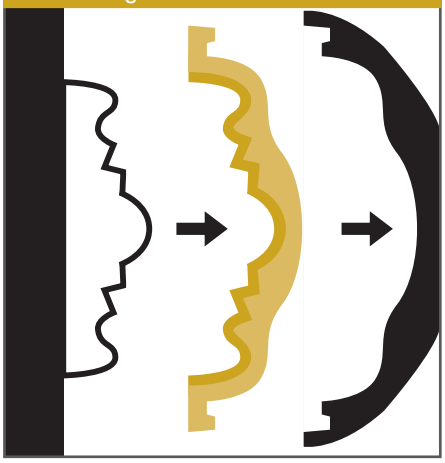
3 Casting/spreading of the support

- When the >curing time has elapsed – but within 24 hours – make the >support by spreading plaster over the mold or making a frame and pouring the plaster around the mold

Alternatively:

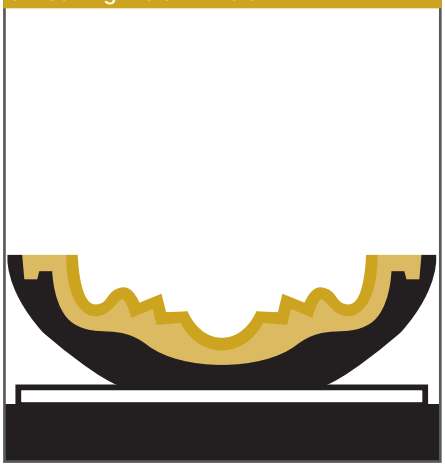
- Spread Vaseline on the rubber surface and apply a glass-fiber-reinforced polyester or epoxy resin.

4 Demolding



- Once the >support has set, remove it and the skin mold from the model.

5 Inserting the skin mold



Turn the >support upside down and insert the >skin mold with the aid of the >locks.

Note:
Always keep the >skin mold in the >support during storage as otherwise post-curing of the freshly >vulcanized rubber may result in permanent deformation of the mold.

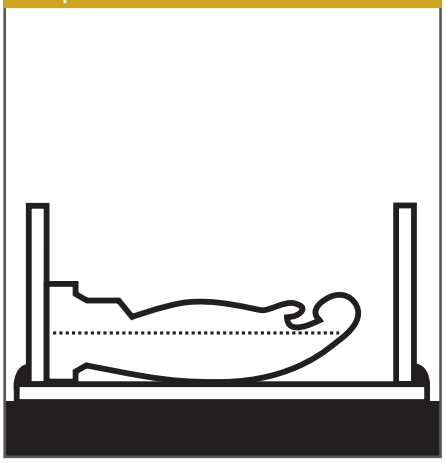
HOW DO I CAST A TWO-PART SKIN MOLD?

Where to Find What

Everything you need:

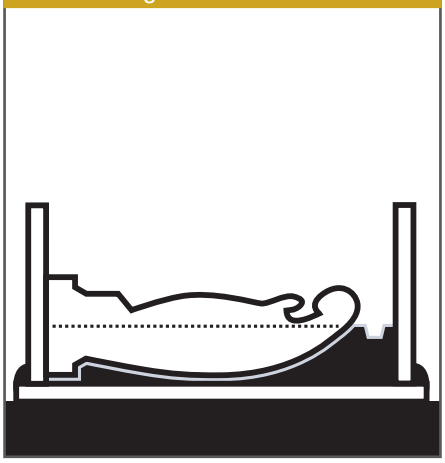
- A suitable smooth, flat, non-absorbent base
- Strips of wood, plastic or metal for making a molding box
- Sealing wax or a modeling compound (e.g. Plasticine) for immobilizing the model and sealing the joints in the molding box.
- Plastic film or aluminum foil for protecting the model against soiling (optional)
- Embedding material: clay or a modeling compound (e.g. Plasticine)
- Blocks as spacers for liquid embedding material (optional).
- Marker for drawing the parting line (optional)
- Tubes or locating pegs to act as >locks or >spacers for vent holes and feeding channels (optional)
- Clay or a modeling compound (e.g. Plasticine) as >spacing layer for the rubber
- Plaster or glass-fiber-reinforced polyester or epoxy resin for making the >support by either pouring or spreading
- Spatula
- Short-haired brush (optional)
- Drill (optional)
- Release agent: Vaseline, wax solution, WACKER Protective Film SF 18
- Clamps or screws to hold together the finished >support

1 Preparations



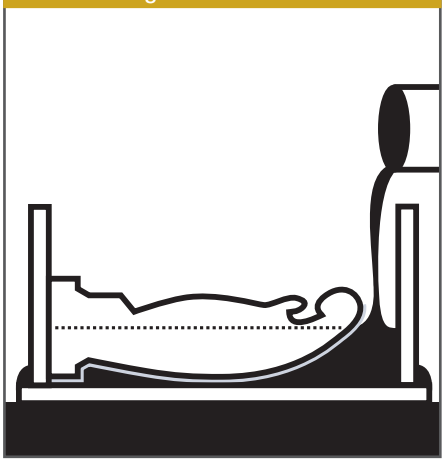
– Prepare the model (see page 8)
– Decide on where the parting line is to be and, if possible, mark it on the model. It should follow edges, should not cross large, smooth areas and should divide the model into two equal parts, intersecting any openings as symmetrically as possible.
– Cover the lower half of the model with film or foil to prevent soiling of its surface by the embedding material.
– Immobilize it on the base and construct the molding box around the model, making it at least 3 cm wider and 3 cm higher than the model.
– If the model has a standing base, place it such that the base lies directly against the molding box in order to create a feeding hole for the >reproduction material.
– Seal the edges between the molding box and the base with a modeling compound (e.g. Plasticine).

2a Embedding the model



If you are using non-meltable embedding material (e.g. clay or a modeling compound such as Plasticine):
– Shape the embedding material into a slab of appropriate thickness, leaving a gap in the middle that is slightly larger than the model.
– Place the slab in the molding box and press the embedding material to fit the box.

2b Embedding the model

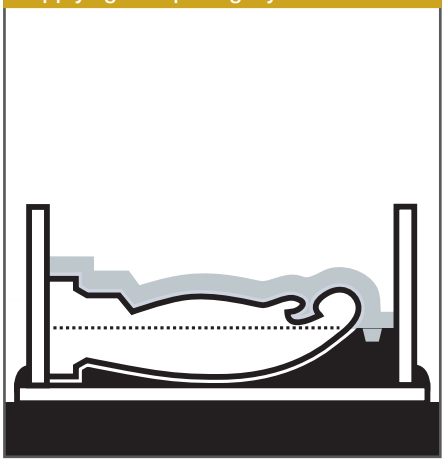


If you are using meltable embedding material (e.g. modeling wax):
– Melt the embedding material. If the parting line on the model is horizontal pour in the embedding material up to the parting line. Otherwise pour in the embedding material to the greatest possible height.
– Allow the embedding material to set and, if necessary, adjust it to follow the actual parting line by pressing the material against the model at the parting line.
– Cut >locks in the form of recesses, or insert locating pins into the embedding material to ensure that the two mold parts fit together >accurately.
– Also, if necessary, push tubes or pegs half-way into the embedding material as >spacers for vent holes and feeding channels.

Where to Find What

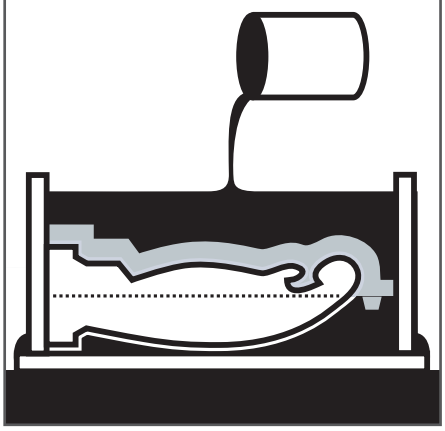
First Part of Skin Mold

3 Applying the spacing layer



– Cover the model surface with film or foil to prevent soiling by the spacer layer.
– Coat with an even 1 cm layer of clay or a modeling compound (Plasticine) to : completely fill or cover over >undercuts.

4 Making the first part of the support



– Pour plaster into the molding box.

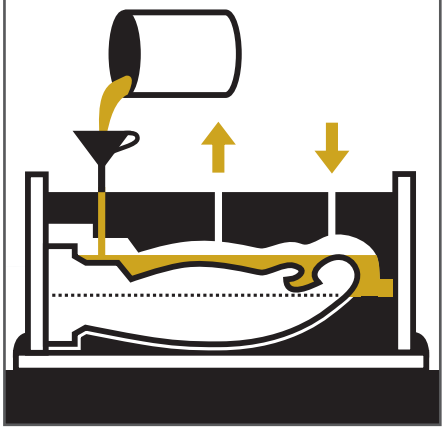
Alternatively:

– Apply glass-fiber-reinforced polyester or epoxy resin. With the latter, no molding box may be needed.

5 Removing the support, drilling holes

– When the >support has set, disassemble the molding box.
– Remove all the layers from the model.
– If tubes or locating pins have not been inserted as >spacers for vent holes and feeding channels during casting or spreading the >support, drill feeding channels at lowest points and vent holes at the highest points. This will prevent air pockets being trapped during filling of the cavity.

6 Casting the first part of the skin mold



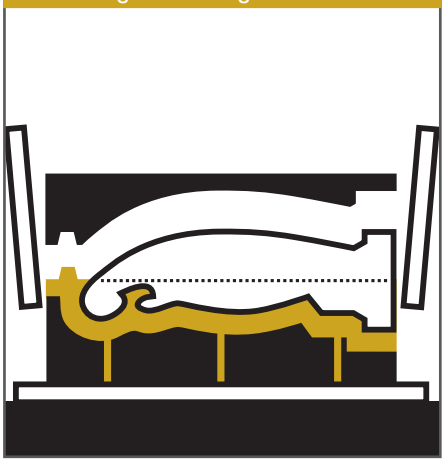
– Assemble the molding box again and position the >support, without the >spacer layer, over the model.
– While gently shaking/vibrating the mold, pour >catalyzed and >deaerated silicone rubber into the feeding channels, so that it flows into all surface crevices without trapping any air.
– Continue pouring until the rubber is visible in the air escape holes.

Alternatively:

– If >deaeration equipment is not available, use a stiff, short-bristled brush to apply a thin layer of the >catalyzed rubber to the model before covering it with the >support. This will prevent any air bubbles from adhering to the model surface. Reposition the >support and pour in the rest of the rubber in a thin stream from as great a height as possible.

Where to Find What

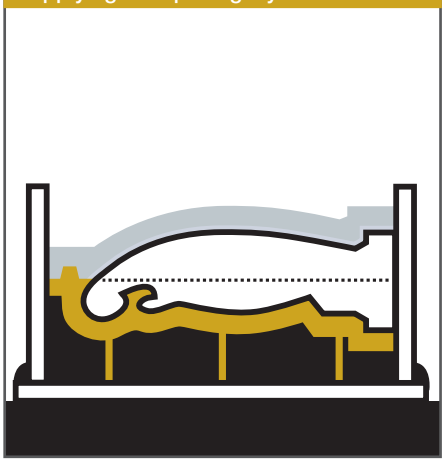
7 Removing embedding material



– When the >curing time has elapsed – but within 24 hours – remove the molding box and lay the mold on its back.
– Remove the base, and embedding material.
– Leave the support and completed mold part on the model.

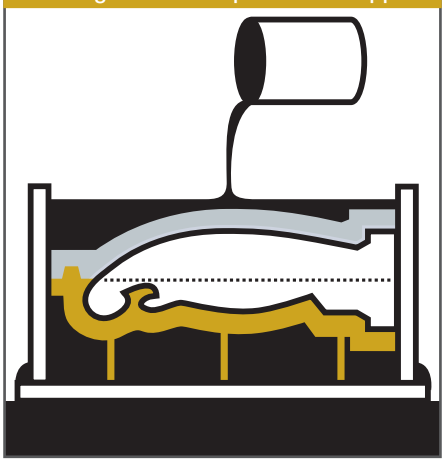
Second part of skin mold

8 Applying the spacing layer



– Reassemble the molding box for the second part of the >support
– Apply a uniform layer of clay or a modeling compound (Plasticine) approx. 1 cm thick onto the film or foil still covering the model surface to completely fill or cover >undercuts.

9 Pouring the second part of the support

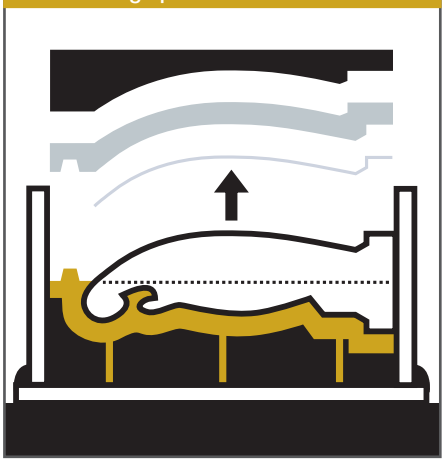


– Pour plaster into the molding box

Alternatively:

– Spread glass fiber-reinforced polyester or epoxy resin over the spacing layer (in this case there is no need to construct a molding box).

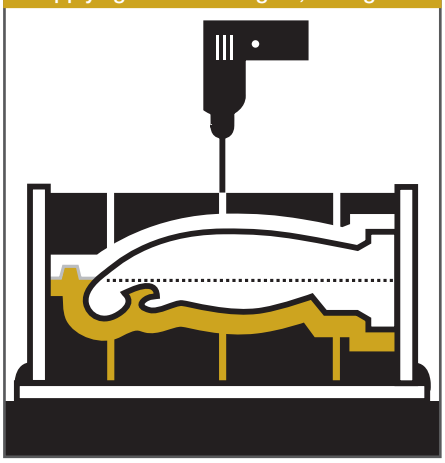
10 Removing spacers



– When the >support has set, disassemble the molding box
– Remove the second part of the >support, >spacer layer and foil from the model.

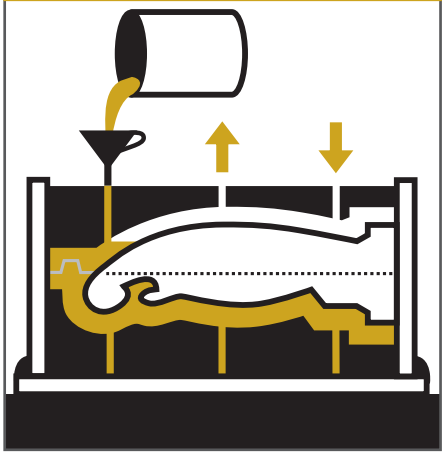
Where to Find What

11 Applying the release agent, drilling holes



– Assemble the molding box again.
– Treat all exposed surfaces of the first part of the skin mold and the >support with release agent in order to prevent them from sticking to the second mold part.
– If tubes or locating pegs were not inserted as >spacers for vent holes and feeding channels during pouring or spreading, drill holes at suitable points to allow pouring in of the >reproduction material.

12 Casting the second part of the skin mold

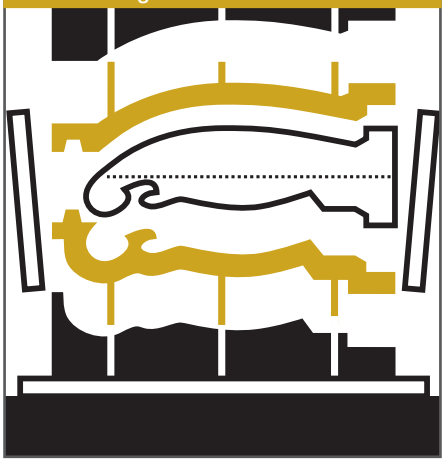


– Position the >support exactly over the model without the >spacer layer
– Pour the >catalyzed and >deaerated silicone rubber into the feeding channels while shaking/vibrating the mold, so it flows into all surface crevices without trapping any air.
– Continue pouring until the rubber is visible in the air-escape holes.

Alternatively:

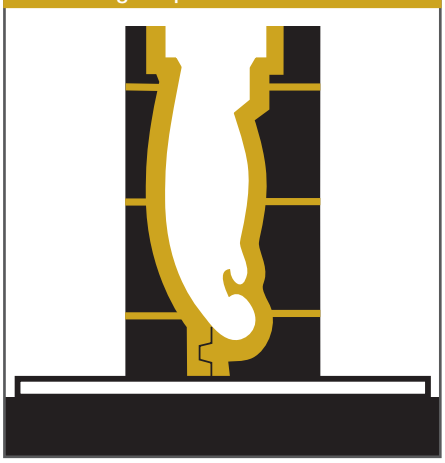
– If >deaeration equipment is not available, before placing the >support, apply a thin coat of the >catalyzed mix to the model with a stiff, short-bristled brush (to avoid air bubbles on the surface). Then place the >support and pour the remaining rubber from as great a height as possible.

13 Demolding



– After the second part of the skin mold has cured, disassemble the molding box and remove the parts of the >support.
– Peel the parts of the skin mold from the model.

14 Inserting the parts of the skin mold



– Turn the parts of the >support upside down and insert the parts of the skin mold using the pouring channels and vent holes as locks.
– >Accurately assemble the parts of the >support and clamp them together.

Alternatively:

– If polyester or epoxy resin laminates are used, screw them together.

Note:
Always keep the >skin mold in the >support during storage as otherwise post-curing of the freshly >vulcanized rubber may result in permanent deformation of the mold.

HOW DO I MAKE A TWO-PART SKIN MOLD BY THE SPREADING TECHNIQUE?

Where to Find What

Everything you need:

- A suitable smooth, flat, non-absorbent base
- Strips of wood, plastic or metal for making a molding box
- Sealing wax or a modeling compound (e.g. Plasticine) for immobilizing the model and sealing the edges of the molding box
- Embedding or dividing-wall material: clay or a modeling compound (e.g.. Plasticine)
- Marker for drawing the parting line (optional)
- Tubes or locating pegs to act as >locks or >spacers for vent holes and feeding channels (optional)
- Plaster or glass-fiber-reinforced polyester or epoxy resin for making the >support by either pouring or spreading
- Spatula
- Short-haired brush (optional)
- Drill (optional)
- Pigments for coloring the >top layer
- Soap solution for smoothing the rubber surface
- Release agent: Vaseline, wax solution, WACKER Protective Film SF 18
- Clamps or screws to hold the >support together

First part of skin mold

1 Preparations

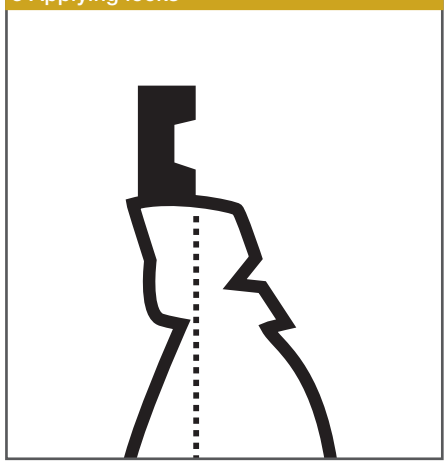
- Prepare the model (see page 8)
- Decide on where the parting line is to be and, if possible, mark it on the model. It should follow edges, should not cross large, smooth areas and should divide the model into two equal parts, intersecting any openings as symmetrically as possible.
- If the model is to be >embedded, cover its lower part with film or foil to prevent its surface being soiled by the embedding material.
- Immobilize the model on the base.

2 Applying a dividing model

Relatively large models are reproduced in an upright position. Create a dividing wall as follows:

- Place a flange of a modeling compound, approx. 1–2 cm wide and 5 cm high, along the parting line.
- Adjust the dividing wall so that it follows the parting line exactly, and press it onto the model.

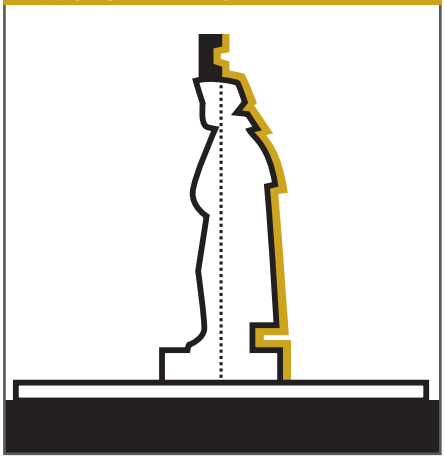
3 Applying locks



- Into the embedding or dividing wall material, cut >locks in the form of recesses, or insert locating pins to ensure that the two mold parts fit together >accurately.
- Also, if necessary, push tubes or pegs half-way into the embedding material as >spacers for lateral air escape and as feed channels.

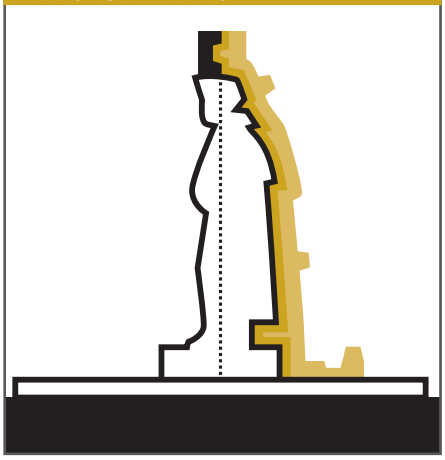
Where to Find What

4 Applying the fine layer



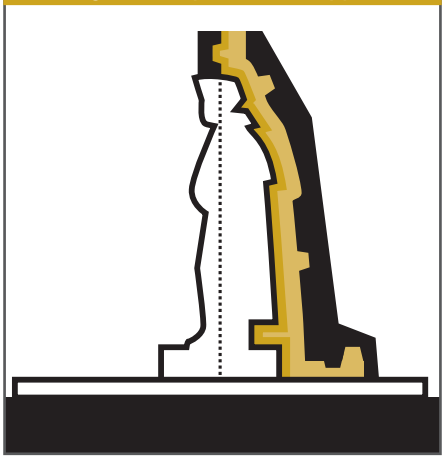
– Apply a 0.5–1 mm thick layer of the >catalyzed pourable or slightly >non-sag rubber to the first half of the model and the entire adjacent surface of the embedding or dividing wall material by means of a stiff short-bristled brush, or work it by hand to eliminate any air bubbles on the model.
– Leave for 1–2 hours to partially cure until the layer cannot be shifted but is still tacky.

5 Applying the top layer



– You can ensure that all of the >fine layer is covered, by coloring the rubber compound used for the >top layer with 0.1 to 0.3 % WACKER FL pigment paste.
– Using a spatula, apply a top layer of the >catalyzed, >non-sag rubber compound 5 –15 mm thick
– Completely fill >undercuts. In the case of deep >undercuts apply the >top layer to their interior surfaces and later make separate supporting wedges
– If necessary, make >locks (trapezoidal recesses in the top layer or elevations, such as “flanges” or “buttons”) to allow the >skin mold to be located in the >support later.
– Using soapy water and your hand, smooth the rest of the top layer before the rubber starts to cure in order to prevent the >support from sticking in the >skin mold.

6 Making the first part of the support



– When the >curing time has elapsed – but within 24 hours – make the >support by spreading plaster over the mold or
– If the model is horizontal, construct a side molding box and pour in the plaster.

Alternatively:

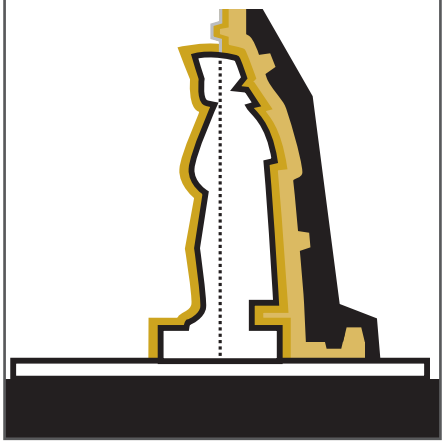
– Coat the rubber surface with Vaseline and then apply glass fiber-reinforced polyester or epoxy resin.
– Leave the material for the >support mold to harden.

7 Removing the embedding or dividing-wall material

– If the model has a >dividing wall, remove the dividing-wall material
– If the model has been >embedded, turn the mold upside down and remove the base, molding box, embedding material and foil. Leave the finished >skin mold and >support on the model.
– Treat all exposed surfaces of the first parts of the >skin mold and the >support with release agent in order to prevent them from sticking to the second parts.

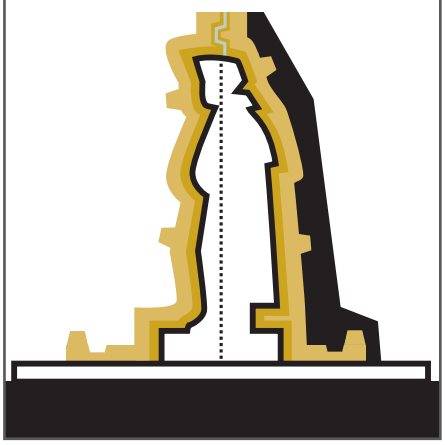
Second part of the skin mold

8 Applying the fine layer



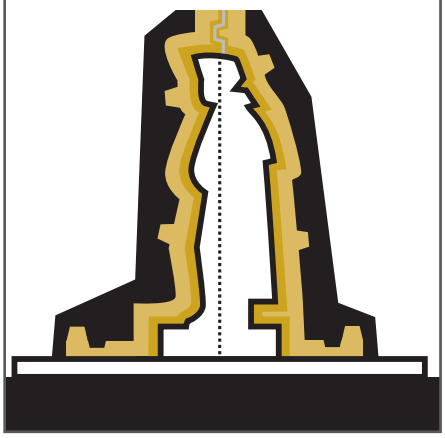
- Apply a 0.5–1 mm thick layer of the >catalyzed pourable or slightly >non-sag rubber to the first half of the model and the entire adjacent surface of the embedding or dividing-wall material by means of a stiff short-bristled brush, or work it by hand to eliminate any air bubbles on the model.
- Leave for 1–2 hours to partially cure until the layer cannot be shifted but is still tacky.

9 Applying the top layer



- You can ensure that all of the >fine layer is covered, by coloring the rubber compound used for the >top layer with 0.1 to 0.3 % WACKER FL pigment paste.
- Using a spatula, apply a 5–15 mm thick top layer of the >catalyzed, >non-sag rubber compound.
- Completely fill >undercuts. In the case of deep >undercuts apply the >top layer to their interior surfaces and later make separate supporting wedges.
- If necessary, make >locks (trapezoidal recesses in the top layer or elevations, such as “flanges” or “buttons”) to allow the >skin mold to be located in the >support later.
- Using soapy water and your hands, smooth the rest of the top layer before the rubber starts to cure in order to prevent the >support from sticking in the >skin mold.

10 Making the second part of the support



– When the >curing time has elapsed – but within 24 hours – make the >support by spreading plaster over the mold or if the model is horizontal, construct a side molding box and pour in the plaster around the mold.

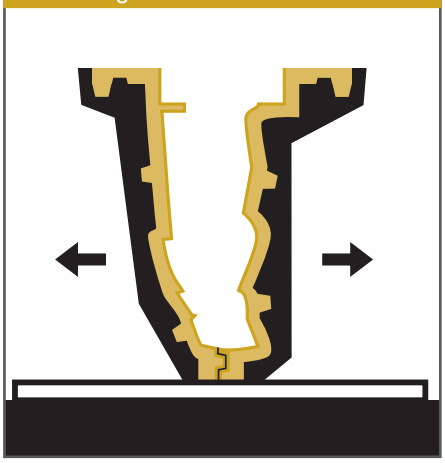
Alternatively:

– Spread Vaseline on the rubber surface and apply a glass-fiber-reinforced polyester or epoxy resin.
– Leave the material for the second part of the >support to harden.

11 Demolding the skin mold

– Remove the parts of the >support. Peel the parts of the skin mold off the model.

12 Inserting the skin mold



– Turn the parts of the >support upside down and insert the parts of the skin mold using the >locks.
– Assemble the complete mold and clamp it together >accurately
– If polyester or epoxy resin laminates are used, screw together.
– If tubes or locating pegs have not been inserted during casting or spreading as >spacers for vent holes and feeding channels, drill holes at suitable points to allow pouring in of the >reproduction material.

Note:
Always keep the >skin mold in the >support during storage as otherwise post-curing of the freshly >vulcanized rubber may result in permanent deformation of the mold.

Where to Find What

It may be just a copy, but the moment it is peeled out of the mold it becomes an original object in its own right, that bears the hallmark of its creator.

WHAT DO I HAVE TO REMEMBER WITH THE DIFFERENT REPRODUCTION MATERIALS?

Where to Find What

Wax

Waxes do not extensively attack molds made from ELASTOSIL® M. However, the molds tend to absorb a certain amount of wax. That is why frequently used molds have waxy deposits on their surfaces that may give rise to unfaithful reproductions. Careful washing with white spirit will remove the deposits, but the mold will not be fully restored unless the wax is melted out in an oven at 150° C. Place the molds upside down on a base to catch the melting wax.

Before casting, heat the mold above the melting point of the wax in order to ensure that the wax flows even into the finest details of the mold surface.

Plaster

ELASTOSIL® M molds are hardly affected at all by plaster. The first castings made from fresh molds may have air bubbles on their surfaces due to poor wetting of the mold surface by the plaster solution. This can be prevented by treating the fresh molds with a concentrated solution of soft soap or dishwashing liquid, or with a slurry of plaster. This treatment can be discontinued after several casts have been made.

White cement, cast concrete, artificial stone mixtures

Basically, the same considerations apply here as to plaster. However, if the systems are highly alkaline (as is frequently the case with synthetic stone), the castings may be covered with white deposits when conventional RTV-2 silicone rubber compounds are used. These deposits are caused by alkaline decomposition products of the silicone. In such cases, we advise the use of addition-curing ELASTOSIL® M grades for the molds. They are more resistant to alkalis and more suited to highly alkaline reproduction materials than >condensation curing grades.

Casting resins

These generally will attack silicone rubber molds the most. The number of castings that can be obtained decreases with

- decreasing filler content of the resin
- decreasing curing rate of the resin
- increasing curing temperature of the resin
- increasing complexity and bulk of the reproduction
- increased frequency of casting

To obtain the maximum number of castings, be sure to choose the most suitable rubber grades, and take great care when preparing and handling the molds (see p. 46). We advise you to condition the molds by heating them to 100 – 150 °C when not in use (e.g. overnight) in order to remove resin components which have swelled the rubber.

Unsaturated polyester resins
The higher the styrene content and the curing temperature, the more extensively do the resins attack the molds. In order to obtain the maximum number of castings, it is particularly important to heat the molds routinely to remove styrene which has swelled the rubber.

Polyurethane resins and foams
The corrosiveness of these compounds towards silicone rubber increases in the order: casting resins, flexible foams, hard foams. In addition, corrosiveness of the foams increases with increase in content of blowing agent.
Casting polyurethane foams requires pressure-resistant molds, and, depending on the depth of the >undercuts, special ELASTOSIL® M grades. Ask our technical service staff.

Epoxy resins
Heat-curing and unfilled grades are much more aggressive than cold-curing, highly-filled systems.
After they have been stored at room temperature, freshly made molds of >condensation-curing ELASTOSIL® M grades must be post-cured for several hours at around 150 °C before first use.

Methacrylate resins
Silicone rubber molds are not suitable for unfilled methacrylates. Generally, not even the first casting can be demolded. Even highly filled methacrylate resins will only allow 10 castings at most to be made.

Metal alloys, electroforming
Silicone rubber molds are suitable for casting metal alloys with melting points of up to 300 °C. Use the ">lost wax" (or investment casting) technique for casting metals with higher melting points. The highly thermally conductive ELASTOSIL® M grades are best suited of all for casting metals. Use thin-walled molds and place them on a thermally conductive surface (metal sheet) during casting. When making the mold, bear in mind that it will expand greatly due to the high coefficient of thermal expansion of the silicone rubber. Consequently, allow it time to cool down between casting operations.
In order to allow the liquid metal to flow into even the finest details, coat the stored, >post-cured mold with an extremely thin layer of talc, silicon carbide, graphite or conductive carbon black. Despite these measures, the first few castings must be discarded, since the mold will still emit gas, which causes pock marks on the surface.

Another technique for making metal reproductions is by electroforming. In this case, silver is sprayed onto the surface of the ELASTOSIL® M mold (silver sprays are obtainable from dental suppliers) to render the surface conductive. Graphite may also be used, but the results are inferior. The electroforming baths are filled with weakly acidic or alkaline electrolytes and operated at the lowest temperature possible. The electrodes should make contact with as great a surface area of the mold as possible.

Foods
Molds made of ELASTOSIL® M are often used for producing shapes from foods, such as chocolate, marzipan or ice cream. Remember to observe the food safety laws applicable in your country. In all cases, however, the moulds should be heated to 200 °C for at least 4 hours before use to remove volatile components. For further information, call our technical service staff.

HOW DO I MAKE A REPRODUCTION?

Where to Find What

First bring the mold into shape

The molds will only perform to specification if all reaction products (mainly low alcohols) have been allowed to evaporate from the cured rubber.

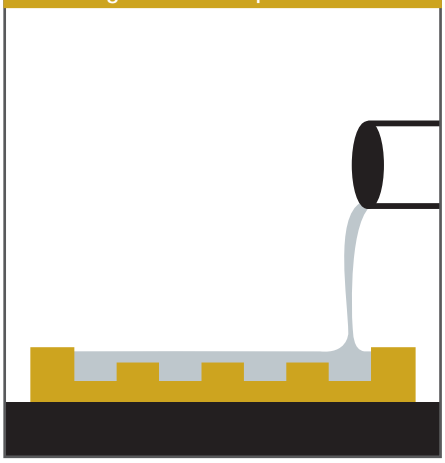
With molds made from >addition-curing ELASTOSIL® M grades, this is the case as soon as they are removed from the model. The molds can be used immediately

Before molds made from >condensation-curing ELASTOSIL® M grades are used to make reproductions, they must be stored at room temperature for between 48 and 72 hours, the exact storage period depends on the time required for curing and on the thickness. The same results can be obtained by storing the molds for 24 hours at room temperature and >post-curing them at 70 °C in a well-ventilated oven. As a rule of thumb, 6 hours are then required per centimeter of layer thickness.

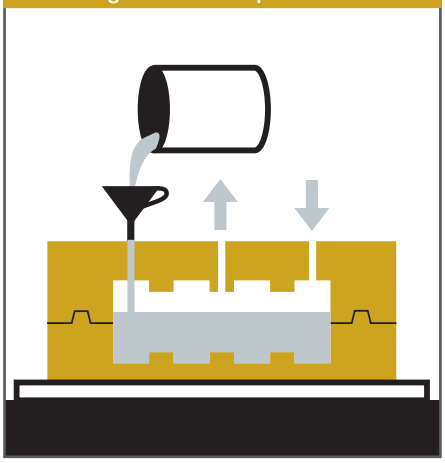
How to make a >reproduction with a one-part >block mold

– Place the prepared mold on a suitable base – level or slightly inclined.
– Having prepared and, where necessary, >deaerated the >reproduction material, pour it slowly into the mold. At the same time shake or vibrate the mold so that the reproduction material flows into every surface detail without trapping any air.
– Once the material has set, demold the casting by pressing on the reverse side and bending back the mold.

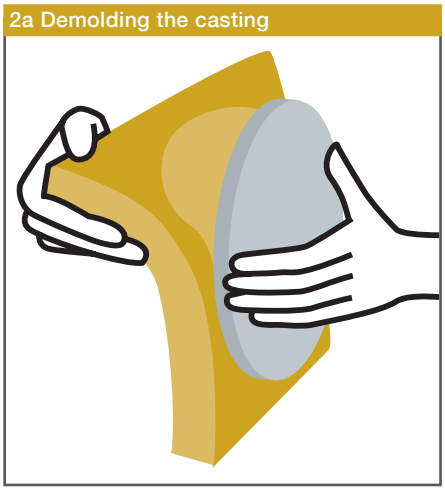
1a Pouring into the one-part block mold



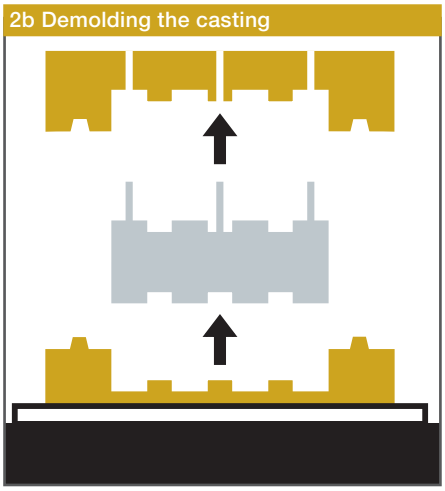
1b Pouring into the two-part block mold



2a Demolding the casting



2b Demolding the casting



How to make a >reproduction with a two-part >block mold

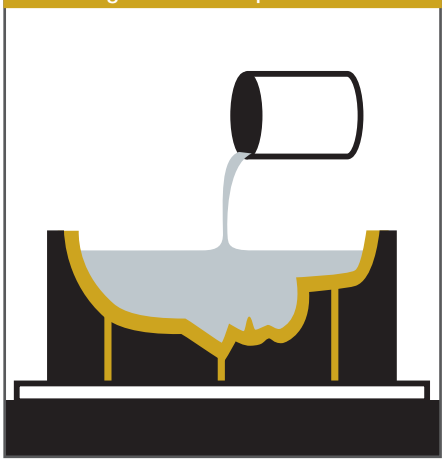
- Using the >locks, assemble the parts of the mold exactly and either clamp them or bind them together with textile tape.
- Having prepared and, where necessary, >deaerated the >reproduction material, pour it slowly through a funnel into the feeding channel(s). At the same time, shake or vibrate the mold so that the >reproduction material flows into every surface detail without trapping any air.
- Stop pouring when the >reproduction material appears in the air holes.
- Once the material has set, demold the casting by removing the mold parts.

Where to Find What

How to make a >reproduction with a one-part >skin mold

– Place the prepared mold in the >support on a suitable base, level or slightly inclined.
– >Deaerate the >reproduction material if necessary and pour it slowly into the mold. At the same time, shake or vibrate the mold so that the reproduction material flows into every surface detail without trapping air.
– Once the >reproduction material has set, remove the >support and the >skin mold from the casting.

1a Pouring into the one-part skin mold



1b Pouring into the two-part skin mold

2a Demolding the casting

2b Demolding the casting

How to make a >reproduction with a two-part >skin mold

- Using the >locks, assemble the parts of the >skin mold and >support exactly. In the case of plaster >support, clamp them together. Polyester and epoxy resin laminates should be screwed together or bound with textile tape.
- If necessary, >deaerate the >reproduction material and pour it slowly into the feeding channels. At the same time shake or vibrate the mold so that the >reproduction material flows into every surface detail without trapping any air.
- Stop pouring when the reproduction material appears in the air-escape holes.
- Once the >reproduction material has set, remove the >support and the >skin mold from the casting.

Where to Find What

To ensure reproducible results, it is advisable to calculate the added amounts precisely when preparing the moldmaking compound.


FICKER

WHAT DO I NEED TO KNOW ABOUT ELASTOSIL® M MOLDMAKING COMPOUNDS?

Where to Find What

Safety

Detailed safety information is given in the relevant safety datasheet. This accompanies your consignment of ELASTOSIL® M mold-making compound. Please keep it in a safe place. Should it ever get mislaid, do not hesitate to ask your WACKER sales office for another copy.

Storage

>Components A and B of >addition-curing ELASTOSIL® M grades and the rubber base of >condensation-curing grades should be stored at between 5 °C and 30 °C in tightly sealed drums. When opened, the drum must be immediately sealed airtight again. Never leave drums open or with a loosely fitted lid for long periods.

>Condensation-curing >RTV-2 silicone rubbers require small amounts of moisture in the rubber base to optimize the subsequent curing process. If the drums are left open or incorrectly sealed, the moisture will evaporate. This results in longer pot lives and faulty >curing. To restore a rubber base, stir in 1 to 2 grams of water per kilogram of rubber base and leave the tightly sealed drum to stand for 24 hours.

>T-series catalysts react with moisture to form a flocculent precipitate. Always tightly seal the containers and store them under as cool conditions as possible, preferably between 5 °C and 25 °C. Small amounts of precipitate will not affect the properties of the cured rubber.

Consistency

As far as >consistency is concerned, ELASTOSIL® M molding compounds are divided into pourable, spreadable, >non-sag and kneadable systems. The flow property is described by means of the >viscosity: the higher the number quoted, the thicker is the compound, or the more pasty is the spreadable composition. >Non-sag spreadable grades differ from spreadable grades according to their flowability. That is to say, up to a particular maximum layer thickness (usually up to 10 mm), they will neither run off under the effects of gravity on vertical or inclined surfaces; nor do they sag (hence >non-sag).

Reactivity

The reactivity of ELASTOSIL® M moldmaking compounds is described by their pot life and by the curing time.

The pot life is the time for which the >catalyzed rubber base can still be readily processed. For example, heating the compound by 7° C halves the pot life, while cooling it by 7°C doubles the pot life. The curing time also shows a similar relationship to temperature.

The curing time covers the time until the cured rubber is tack free as well as the time until curing is complete. Specifications usually only give the former.

The ultimate properties of the cured rubber are usually only achieved after several days. Cured rubbers prepared at relatively high temperatures usually continue to cure to different extents during subsequent storage at room temperature.

Both the pot life and the curing time can be modified by the addition of cure accelerators and retarders.

Properties of the cured rubber
The most important properties of the cured rubber are the mechanical values. Along with the indentation hardness, which is expressed in Shore A, the tear resistance is one of the most important properties. The higher the >Shore A value, the harder is the cured rubber; so-called >high-strength grades are characterized by a high tear strength of well over 10 N/mm. The processing properties and properties of the cured rubbers are determined by the type of curing system used.

>Condensation-curing
>Condensation-curing >RTV-2 silicone rubbers are cured by the addition of a liquid or pasty >T-series catalyst. The rubber base and >T-series catalyst have different lot numbers. The pot life and curing time will vary according to the type of >T-series catalyst, and the amount added. The >T-series catalyst and maximum and minimum amounts to add are specified for each rubber grade: if too much or too little >T-series catalyst is used, the cured rubber will have inferior properties. Curing may even fail completely.
>Condensation-curing >RTV-2 silicone rubbers cure at temperatures between 0 and 70 °C. At above 80 °C, reversion of the curing reaction occurs: the system remains – or reverts to – a tacky to liquid state.
For rapid, complete curing >condensation-curing >RTV-2 systems require small amounts of moisture. At less than 40 % relative humidity, the cured rubber surfaces in contact with the air can remain tacky to liquid. In such cases, the room humidity should be increased by appropriate measures (evaporators, aerosol sprays, damp cloths). Adding water to the rubber does not help here! The curing reaction generally eliminates a lower alcohol, usually ethanol or propanol. The cured rubber can only be used after all the alcohol has evaporated. This evaporation of the alcohol causes a loss in weight that leads to three dimensional >shrinkage of the cured rubber of the order of < 5 % of the volume.

>Addition curing
>Addition curing >RTV-2 silicone rubbers are cured by mixing the two >components A and B. The two >components must always have the same lot number, otherwise there may be severe changes in the product properties. The two >components must also be mixed strictly in the specified weight ratio. A deviation in the ratio of A : B usually leads to >impaired curing.
>Addition-curing >RTV-2 silicone rubbers cure at between 10 and 200 °C. Since the curing reaction does not form any volatile >reaction products, there is neither reversion of the curing reaction at higher temperatures nor chemical >shrinkage of the cured rubber as a result of weight loss. Cured rubbers from >addition-curing >RTV-2 silicone rubbers can therefore be used immediately after demolding.

>Impaired curing
Certain substances or materials impair the action of the platinum-complex catalyst and can >inhibit vulcanization of >addition-curing ELASTOSIL® M grades if they come into contact with the uncured rubber. It suffices even if such substances are present on the surface of a substrate (model, mixing equipment) or in the ambient air. Even the ovens or heating cabinets in which the casting resins are hardened can release the >inhibitors. The most important ones are:
- Sulfur, numerous sulfur compounds and other sulfur-containing substances such as natural and synthetic rubbers (e.g. EPDM)
- Amines, urethanes and amine-containing derivatives, such as polyurethanes or amine-cured epoxy resins
- Organo-metallic (especially organo-tin) compounds and substances containing them, e.g. cured rubbers and >T-series catalysts of >condensation-curing >RTV-2 silicone rubbers.

We strongly recommend carrying out preliminary tests to prevent >inhibition.

ANYTHING ELSE?

Adhesion to non-silicones

>RTV-2 silicones are characterized by their pronounced release effect and, of themselves, do not adhere well, if at all, to other materials. To overcome this, the material surface must be treated with a special adhesion promoter or primer. Primers are low-viscosity solutions of reactive silanes or silicone resins. After the solvent has evaporated, exposure to the atmospheric moisture forms a resin film, which bonds the substrate to the rubber mold. The primer should be chosen according to whether the material surface is absorbent or not, and which ELASTOSIL® M grade is used.

How to form a bond:

- Roughen the mating surface of the substrate, e.g. with sandpaper or by sandblasting
- Remove dust from the surface and degrease with acetone or white spirit
- Apply primer brush, spray or dipping
- Leave to dry for about 1 hour at room temperature and a relative humidity of at least 40 %

Best results are achieved if the rubber is allowed to harden as slowly as possible. The maximum adhesion is achieved no earlier than 72 hours after >curing is complete. For more information about bonding to cured rubbers, please ask for our leaflet “Primers for WACKER >RTV-2 Silicone Rubbers”

Adhesion to cured rubbers

Conventional primers cannot be used for bonding to cured silicone rubbers. However, >condensation-curing ELASTOSIL® M grades generally develop adequately strong bonds when cured in contact with relatively freshly produced cured rubbers that have been cleaned with acetone or white spirit. “Laminar bonding” takes place.

Special measures are required for promoting adhesion of >addition-curing ELASTOSIL® M grades. We will be glad to provide you with the information on request.

Bonding to non-silicones

ELASTOSIL® M cured rubbers can be easily bonded to other materials by the use of a one-component (RTV-1) silicone rubber adhesive.

- Treat and prime the material surface. Clean the silicone rubber surface with acetone or white spirit.
- Apply silicone rubber adhesive to both parts and press together immediately.
- Slide the parts over one another if adjustment is necessary.
- Wipe off any excess adhesive that exudes from the sides.
- A strong bond is usually obtained after 1–2 days, depending on the layer thickness, atmospheric humidity and temperature.
- The odor of acetic acid occurring during curing of the adhesive disappears completely once curing is complete.

Bonding to cured silicone rubber
Clean the surfaces to be bonded with acetone or white spirit. Apply a thin coat of a RTV-1 silicone rubber adhesive and press them together immediately. Otherwise proceed as described under “bonding to non-silicones”.

Repairing damaged molds
Molds made from >addition-curing ELASTOSIL® M grades are also most suitably cured with RTV-1 silicone rubbers. The spreadable material is converted to silicone rubber by atmospheric moisture. The odor of acetic acid occurring during curing of the adhesive disappears completely once >curing is complete.
Damaged molds made of >condensation-curing ELASTOSIL® M grades can be repaired with freshly prepared material of the same grade:
– Clean the damaged areas carefully using acetone or white spirit.
– Carefully pull apart cracks.
– Coat the two sides of the crack with a thin coat of >catalyzed rubber base and close up again.
– Remove any excess material exuding from the sides.

Coloring
ELASTOSIL® M silicone rubbers, provided they have a suitable base color, can be colored in any shade by the addition of up to 4 wt. % ELASTOSIL® Color Paste FL.

Curing retarders and accelerators
The pot life and >curing times can be modified by the addition of accelerators and retarders. For further information, contact our technical support staff.

Removing rubber residues
Residues of uncured ELASTOSIL® M moldmaking compounds can be easily removed from containers and clothing with grease-dissolving solvents such as white spirit or acetone. Residues in containers should be allowed to cure to make them easy to remove. Cured material can only be removed mechanically. This is easier if it is first swelled with a solvent. It cannot be dissolved. Please remember that when choosing suitable work clothes.

Expansion and shrinkage
The ability of silicone rubber to swell, and the shrinkage of solvent-containing silicone rubber molds can be exploited for producing enlarged reproductions from swollen molds, or producing smaller-size reproductions by evaporating the solvent. If an interpositive is used, it is possible to produce enlargement or reduction to a desired scale without distortion. For information about the exact procedure, and points to note, see our leaflet “Expansion and Shrinkage”, or ask our technical service staff.

Thickeners
These additives modify the flow properties or produce a non-sag consistency of the pourable ELASTOSIL® M grades with high tear strength. For example, they are used in the production of >skin molds to allow the silicone rubber compound to be spread with a brush or spatula on non-flat or vertical mold surfaces without run off or sagging. Depending on how much of the particular additive is added, the consistency of the rubber compound can be adjusted precisely in the range from reduced flow to complete non-sag behavior. Please ask our technical service staff for more information.

Increased lifetime
The lifetime of ELASTOSIL® M molds can often be extended by the use of suitable release agents. These differ depending on the application and reproduction material. In the simplest case, it is sufficient to coat the mold with a dishwashing detergent solution or a low-viscosity silicone fluid. Dissolved waxes or high-viscosity silicone fluids are also suitable. In some applications, it is advisable to use barrier coats, which are subsequently transferred to the casting. Your adviser can give you more information.

Where to Find What

Practical questions are easiest to deal with on the spot.

WHO CAN EXPLAIN THE TECHNICAL TERMS USED IN THE TEXT?

Where to Find What

>Accuracy of fit, accurately fitting
The exactness with which the mold parts fit together without giving rise to an unwanted seam, also: distortion-free fitting of the skin mold into the >support

>Addition curing
Curing mechanism for RTV-2 silicone rubber. No volatile by-products are formed and hence there is no shrinkage. The cured rubber can be used immediately after demolding.

>Block mold
A mold that is more than 3 cm thick and is formed either by the pouring or the impression technique. Thanks to its inherent stability it is self-supporting.

>Catalysis/catalyzed
Mixing either the rubber base and the T-series >catalyst or components A and B to obtain a workable rubber.

>Catalyst
A compound that accelerates curing. In the case of >condensation-curing ELASTOSIL® M grades, organo-tin compounds are employed. Platinum compounds are used with >addition-curing grades.

>Component
Part of a two or multi-part system. The >condensation-curing ELASTOSIL® M grades are composed of a rubber base and a >T-series catalyst. >Addition-curing ELASTOSIL® M grades comprise an A and a B component.

>Condensation-curing
Curing mechanism for RTV-2 silicone rubber. A volatile, low molecular weight alcohol is formed as a by-product.

>Consistency
The flow and deformation properties of a material.

>Crosslinking, crosslinker
Substance containing at least three reactive groups, which reacts with the >silicone polymer to produce three-dimensional crosslinking.

>Curing
Chemical reaction between the curing agent and the ends of at least three silicone polymer chains. This reaction transforms the silicone rubber base into an elastomeric form.

>Curing time
Time during which the rubber mold can be removed from the model without risk of damage.

>Deaeration/dearated
Removal of the air trapped when the rubber base and >T-series catalyst or components A and B are mixed.

>Desiccator
Pressure resistant glass or plastic vessel used for >deaerating >catalyzed rubbers by means of a >vacuum pump.

>Dividing wall
Used for molds of two or more parts
Applying a roll of clay or a modeling compound (e.g. Plasticine) to the model along the parting lines to separate the individual mold parts.

>Embedded
Used for molds of two or more parts
Covering the second part or other parts of the model by applying or pouring in a material as far as the parting line(s).

>Evacuation/evacuated
Deaeration of the >catalyzed rubber under >vacuum.

>Fine layer
The first layer of silicone rubber applied to the model in the production of a skin mold: usually by brushing on a pourable to slightly >thixotropic rubber to obtain a completely bubble-free mold surface in contact with the model.

>Flexibility
The ability of a material to return to its initial state after a deformation.

>High-strength
Cured rubbers with high tear resistance.

>Impaired curing
Incomplete or failed >cross-linking that manifests itself in reduced hardness or, in extreme cases, in tacky-to-liquid phases in the rubber or on its surface.

>Inhibition/inhibitors/inhibit
Impaired curing of >addition-curing RTV-2 silicone rubbers due to partial or complete poisoning of the platinum catalyst through contact with certain materials, including:
- Sulfur, numerous sulfur compounds and other sulfur-containing substances such as natural and synthetic rubbers (e.g. EPDM)
- Amines, urethanes and amine-containing derivatives, such as polyurethanes or amine-cured epoxy resins
- Organo-metallic (especially organo-tin) compounds and substances containing them, e.g. cured rubbers and catalysts of >condensation-curing RTV-2 silicone rubbers.

>Locks
Interlocking raised or recessed surfaces for ensuring >accuracy of fit during assembly of parts.

>Lost wax method
Also “investment casting”; method for producing reproductions from high-melting metals with a melting point over 400 °C, which cannot be made directly in a mold of RTV-2 silicone rubber.

>Non-sag
Catalyzed rubbers which do not flow under gravity when applied to vertical or inclined surfaces, but retain their shape or thickness.

>Post-curing/post-cured
Heating the rubber mold after demolding to achieve the ultimate properties of the cured rubber.

>Reaction product
A substance formed in a reaction; the volatile alcohol eliminated during condensation curing, for example, is also a reaction product.

>Reproducible
To produce an exact copy of a model.

>Reproduction
An exact copy of a model.

>Reproduction material
Material used to make a reproduction.

>RTV-1 silicone rubber
One-component rubber that cures at room temperature. It can also be used for bonding RTV-2 cured rubbers.

>RTV-2 silicone rubber
Two-component rubber that cures or vulcanizes at room temperature (RTV).

>Shore hardness
Measure of the hardness of a cured rubber (indentation hardness). Two hardness scales are used:
Shore A for the usual rubber hardness range; Shore 00 for the extremely low hardness range.

>Shrinkage
Reduction in size and weight of the rubber due to evaporation of the volatile alcohol formed during curing; only occurs in >condensation-curing ELASTOSIL® M grades.

>Silicone polymer
Long-chained compound of alternating oxygen and silicon atoms, the latter bearing two organic groups; the chain is terminated at each end by a reactive group.

>Skin mold
A mold less than 2 cm thick that is formed by either pouring or spreading. It requires a >support for stability during use.

>Spacer/spacing
A modeling compound placed between the model and >support when a mold is made, and removed for pouring in the >catalyzed rubber compound.

>Support
A shell made out a rigid material (such as plaster or casting resin) that prevents a skin mold from being distorted when it is filled with reproduction material or while it is in storage.

>Thixotropic
Descriptive of rubber compositions with restricted flow: from slightly thickened to completely non-sag.

>Top layer
The second layer of silicone rubber applied on top of the >fine layer, usually by spreading a >thixotropic or >non-sag ELASTOSIL® M grade.

>T-series catalyst
In >condensation-curing ELASTOSIL® M grades: the second component of the moldmaking compound containing the curing agent and catalyst

>Undercut
A recess or elevation at the surface of the model that tapers towards the surface.

>Vacuum
Space largely devoid of air that is generated by extracting the air by means of a >vacuum pump: >deaerating a pourable ELASTOSIL® M grade requires a >vacuum with a maximum residual pressure of 20 mbar

>Vacuum pump
Device for extracting air to generate a >vacuum.

>Viscosity
A characterization of the consistency of a compound: pourable, spreadable or kneadable. Viscosity is quoted in millipascal seconds (mPa s). The higher the value, the less able the compound is to flow.

>Vulcanization, vulcanizing
See >curing

WACKER AT A GLANCE

WACKER
is a technology leader in the chemical and semiconductor industries and a worldwide innovation partner to customers in many key global sectors. With around 14,700 employees, WACKER generated sales of €3.34 billion in 2006. Germany accounted for 20 % of sales, Europe (excluding Germany) for 28 %, the Americas for 20 % and Asia-Pacific, including the rest of the world, for 32 %. Headquartered in Munich, Germany, WACKER has some 20 production sites worldwide and a global network of over 100 sales offices.
With R&D spending at 5 % of sales in 2006, WACKER is among the world's most research-intensive chemical companies.

WACKER SILICONES
is a leading supplier of complete silicone-based solutions that comprise products, services and conceptual approaches. As a provider of solutions, the business division helps customers press ahead with innovations, exploit global markets fully, and optimize business processes to reduce overall costs and boost productivity. Silicones are the basis for products offering highly diverse properties for virtually unlimited fields of application, ranging from the automotive, construction, chemical, electrical engineering and electronics industries, through pulp and paper, cosmetics, consumer care and textiles, to mechanical engineering and metal processing.

WACKER POLYMERS
is the global leader for high-quality binders and polymer additives. This business division's activities encompass construction chemicals and functional polymers for lacquers, surface coatings and other industrial applications, as well as basic chemicals, i. e. acetyls. Products such as dispersible polymer powders, dispersions, solid resins, powder binders and surface coating resins from WACKER POLYMERS are used in the construction, automotive, paper and adhesives industries, as well as by manufacturers of printing inks and industrial coatings.

WACKER FINE CHEMICALS
As an expert in organic synthesis, silanes and biotechnology, WACKER FINE CHEMICALS supplies innovative biotech products and catalog chemicals for life-science and consumer-care customers worldwide. Its product portfolio includes cyclodextrins and cysteine, organic intermediates and acetyl acetone. A key specialty is the contract manufacturing of pharmaceutical proteins via microbial systems.

WACKER POLYSILICON
has been producing hyperpure silicon for the semiconductor and photovoltaics industries for over 50 years. As one of the largest global manufacturers of polycrystalline silicon, WACKER POLYSILICON supplies leading wafer and solar-cell manufacturers.

Siltronic
is one of the world's leading producers of hyperpure silicon wafers, supplying many major chip manufacturers. Siltronic develops and produces wafers up to 300 mm in diameter at facilities in Europe, the USA, Asia and Japan. Silicon wafers form the basis of state-of-the-art micro and nanoelectronics used, for example, in computers, telecommunications, motor vehicles, medical technology, consumer electronics and control systems.

01.08

WACKER

CREATING TOMORROW'S SOLUTIONS

The data presented in this brochure are in accordance with the present state of our knowledge, but do not absolve the user from carefully checking all supplies immediately upon receipt. We reserve the right to alter product constants within the scope of technical progress or new developments. The information given in this brochure should be checked by preliminary trials because of conditions during processing over which we have no control, especially where other companies' raw materials are also being used. The information provided by us does not absolve the user from the obligation of investigating the possibility of infringement of third parties' rights and, if necessary, clarifying the position. Recommendations for use do not constitute a warranty, either express or implied, of the fitness or suitability of the product for a particular purpose.

6007e/03.08 reprint 6007e/10.06

WACKER SILICONES

Wacker Chemie AG
Hanns-Seidel-Platz 4
81737 München, Germany
info.silicones@wacker.com

www.wacker.com