MOLDMAKING

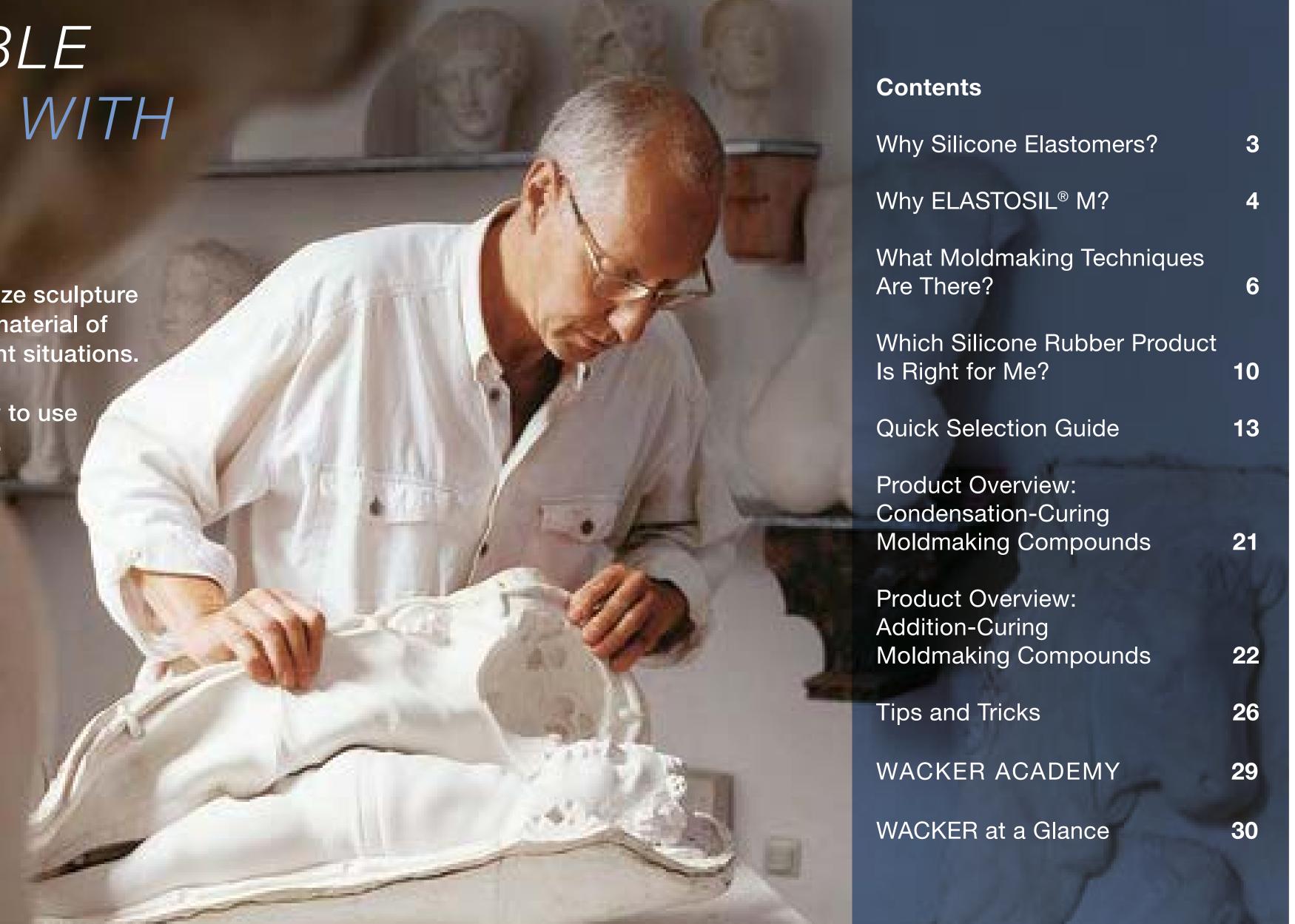
SILICONE RUBBER FOR MOLDMAKING,
PROTOTYPE CASTING AND PAD PRINTING

SIMPLY FLEXIBLE MOLDMAKING WITH SILICONES

Making a boat hull, a chocolate, a bronze sculpture or a prototype? Silicone rubber is the material of choice for moldmaking in many different situations.

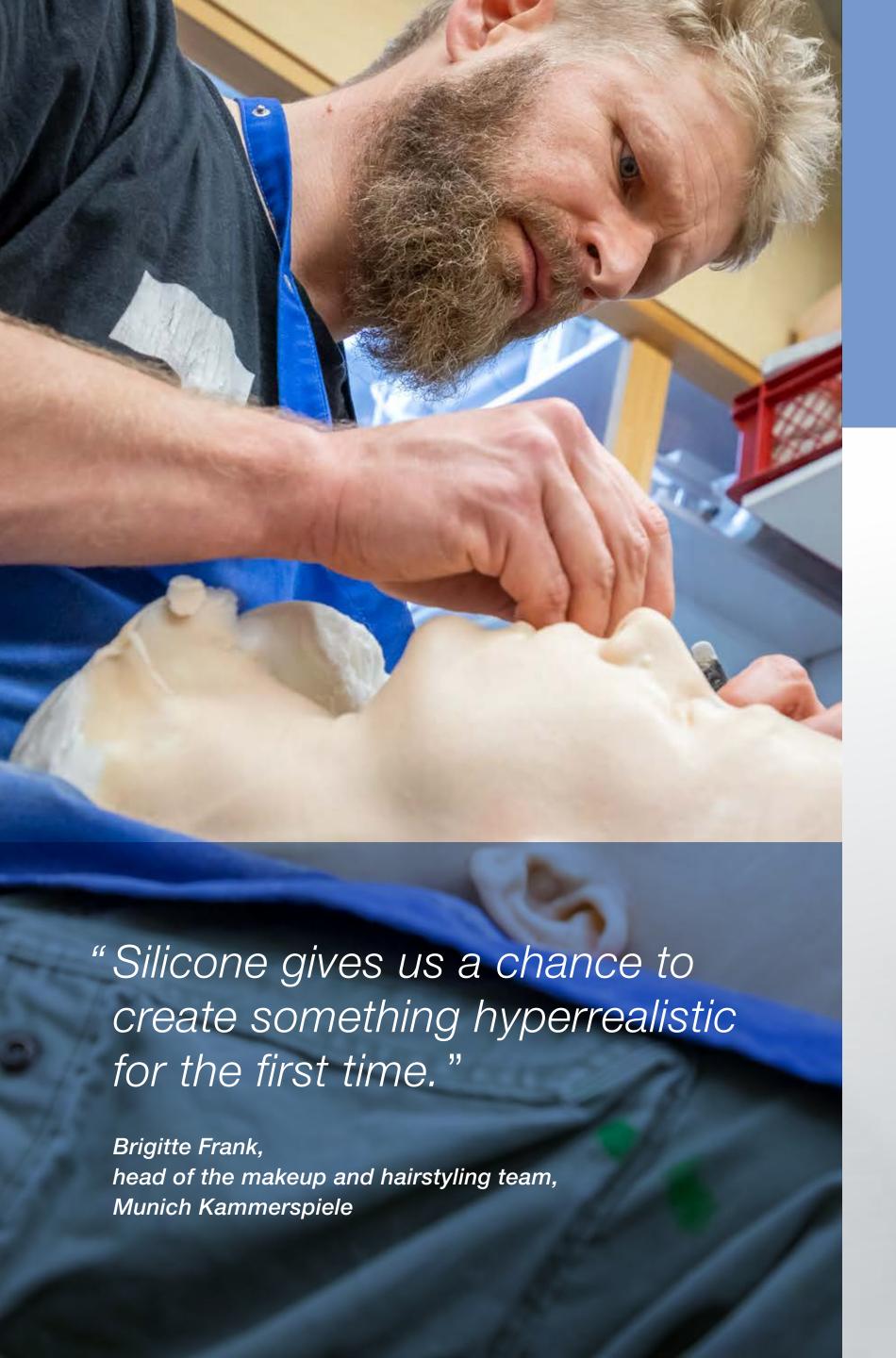
The following pages will show you how to use silicones to make your project a reality.

Rigid vs. flexible molds



WHY SILICONE ELASTOMERS?

ELASTOSIL® M silicone rubber products have unique properties that pay off – especially in moldmaking and prototyping. The diverse product range means you can find the right moldmaking compound to meet your special requirements no matter what the task.



"I've used different materials at other locations. But with silicone, it was love at first sight. It's easy to mix, easy to use, feels good and accurately reproduces the details on the original."

Prof. Annamaria Baciu, restorer for the Old Casino, Arad, Romania

WHY ELASTOSIL® M?

ELASTOSIL® M products are two-part, room-temperature-vulcanizing (RTV-2) silicone molding compounds. ELASTOSIL® M silicone rubber grades are known for their quality and are used in an extraordinarily wide range of applications.

Case studies

WACKER – a silicone production pioneer

i

ELASTOSIL® MOLDMAKING AND PAD PRINTING APPLICATIONS



Pads for pad printing on keyboards, toys, athletic gear and automobile components



Reproduction of artworks for restoration and for museums



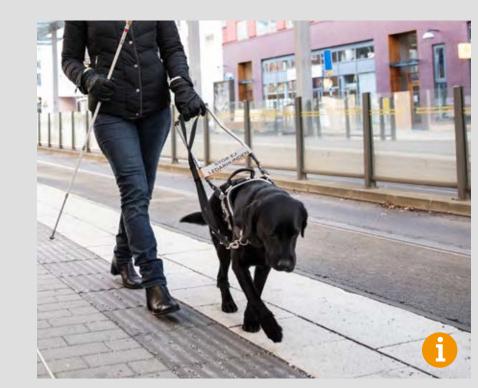
Prototyping (visualization, working and preseries models) and small-scale production



Vacuum bags for infusion and prepreg processes in composite molding



Lifecasting, masks, prosthetics and moldmaking for theater and film



Molds for concrete and artificial stone in facade elements, face brick, tiles and plumbing fixtures



Molds for jewelery / the lost wax process



Molds for cakes, cake decoration, chocolates, desserts, etc.



Molds for manufacturing tire production molds and for developing new tires



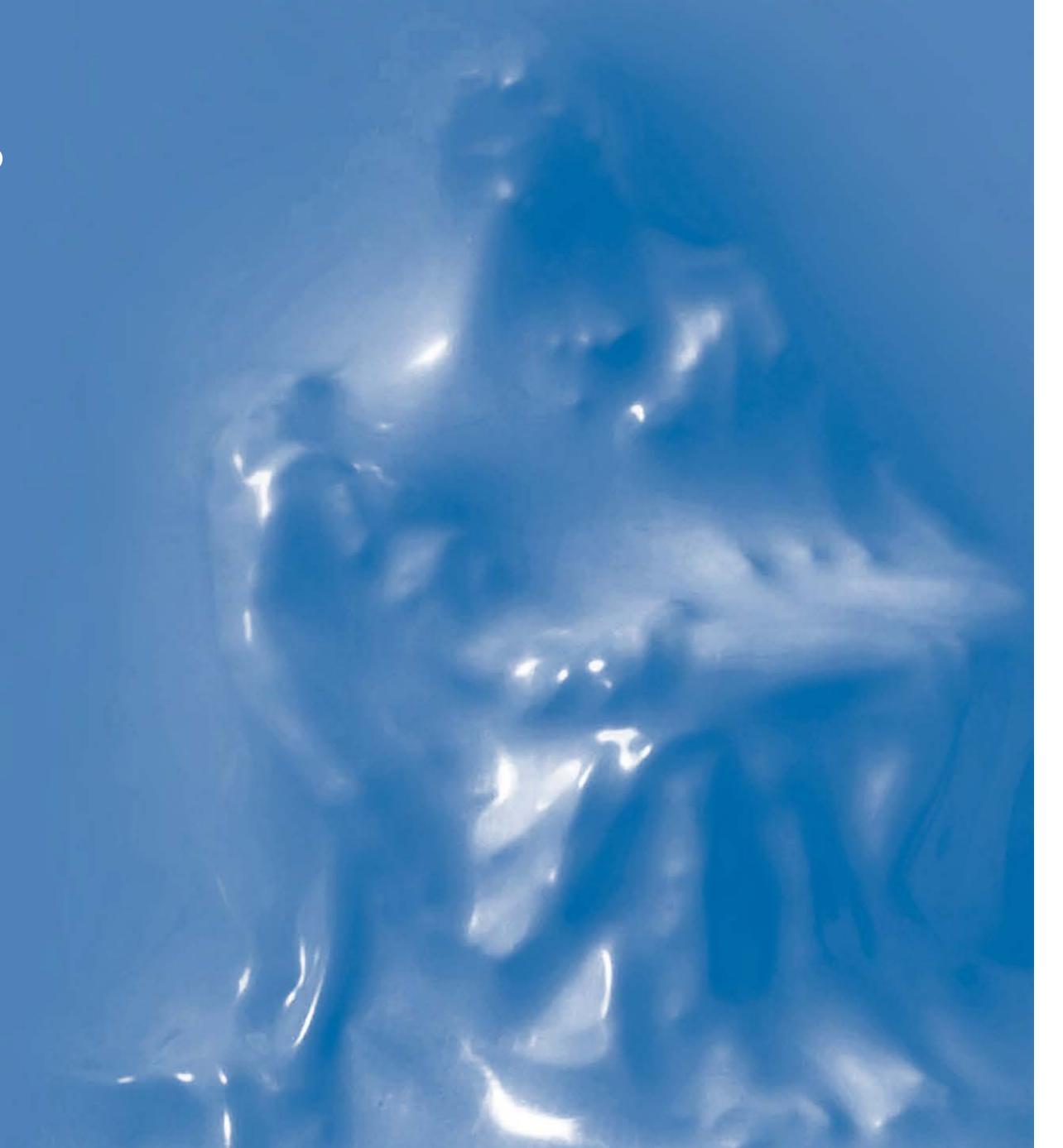
Creative moldmaking: molds for candles and soap, crafting and DIY

WHAT MOLDMAKING TECHNIQUES ARE THERE?

Silicone moldmaking compounds are suitable for reproducing surface details or entire objects with outstanding accuracy.

Uses range from single and multi-part block and skin molds to casting, impression and spreading techniques.

This versatility makes it exceptionally easy to find the right moldmaking technique for every need.



MOLDMAKING TECHNIQUE 1: BLOCK MOLDS

ADVANTAGES:

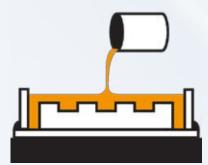
Molds are highly stable and ready for immediate casting

1. Casting Technique

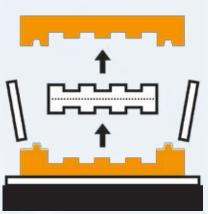
One-Part



1 Two-Part



Place the model in a molding box and fill it with silicone rubber



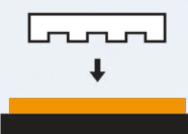
Demolding

2. Impression Technique

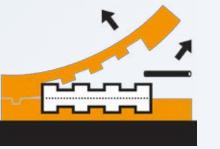




1 Two-Part



Roll out the silicone and press the model into the silicone surface



Demolding

One-Part

- Quick and easy to produce
- No parting lines that need to be reworked at a later time

Multi-Part

• Lower demolding forces relative to 1-part block mold

One-Part

- Quick and easy to produce
- No parting lines that need to be reworked at a later time

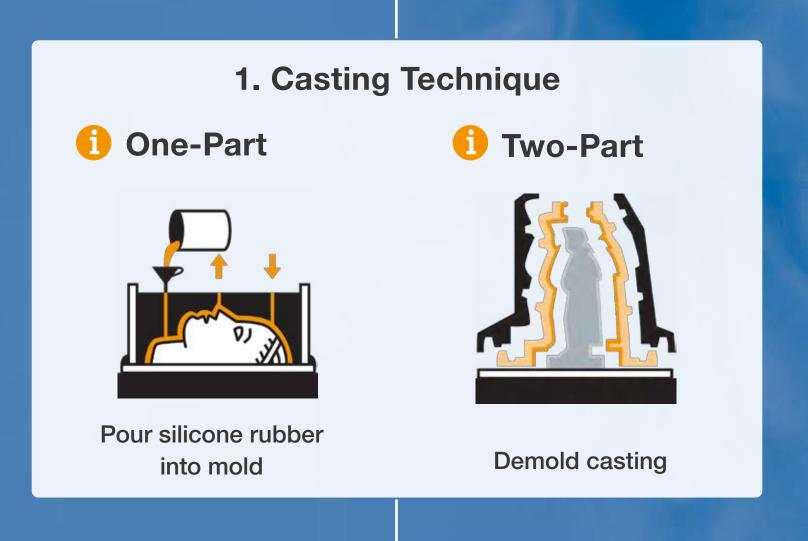
Multi-Part

 Lower demolding forces relative to 1-part block mold

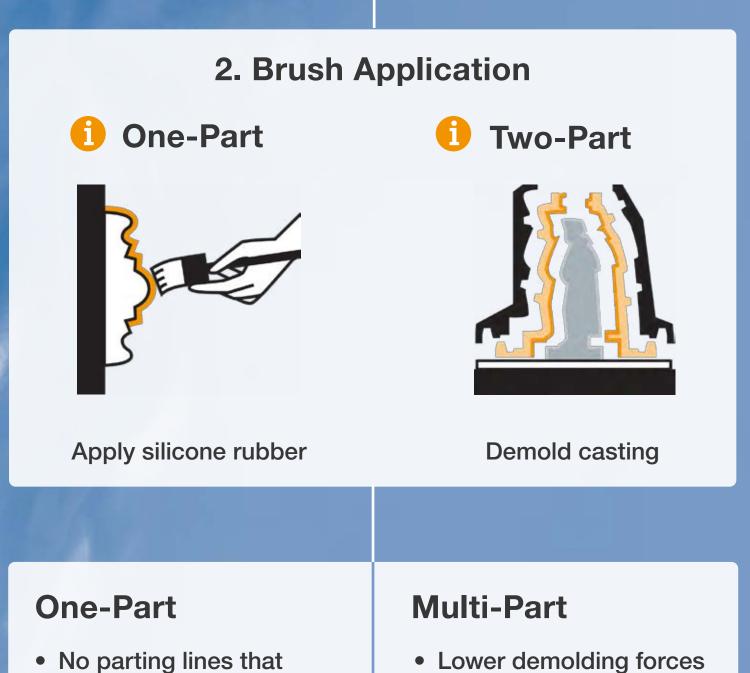
MOLDMAKING TECHNIQUE 2: SKIN MOLD

ADVANTAGES:

Low demolding forces, suitable even for extreme undercuts and cavities

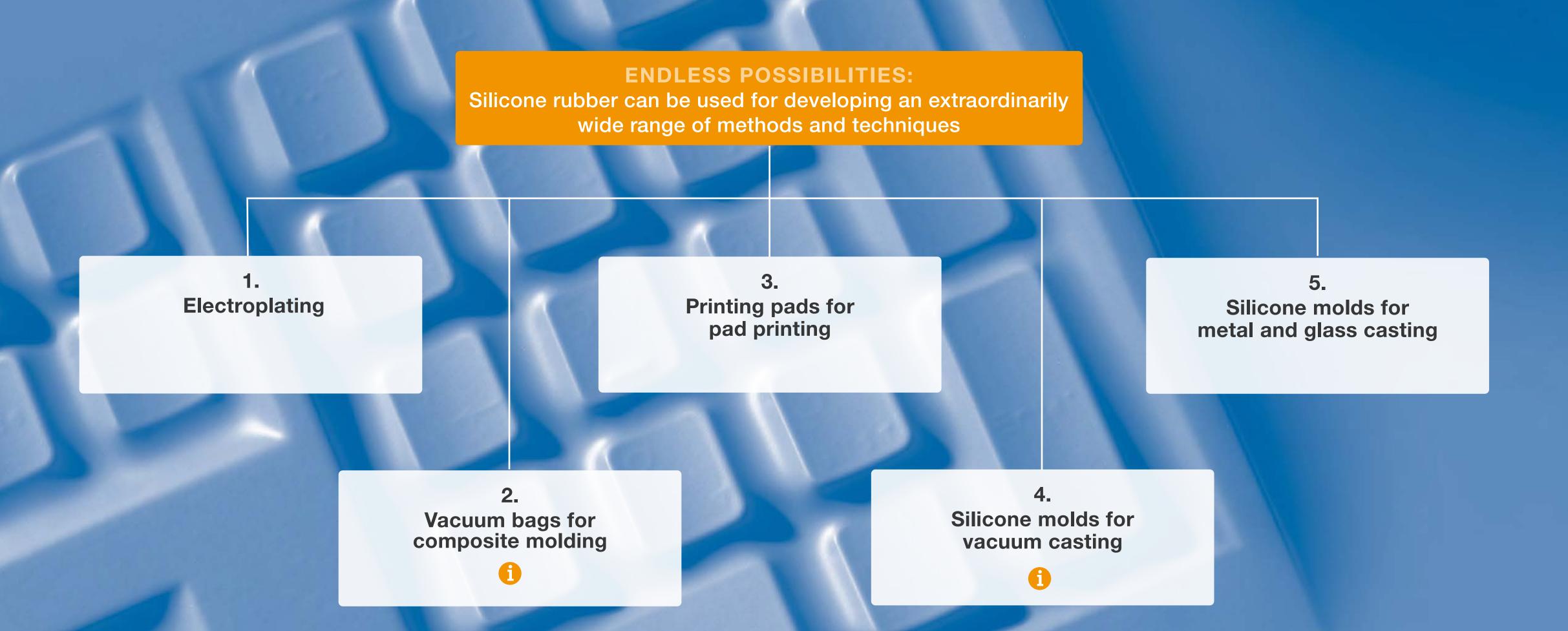






 No parting lines that need to be reworked at a later time Lower demolding forces than for a 1-part mold

MOLDMAKING TECHNIQUE 3: SPECIALTY TECHNIQUES



WHICH SILICONE RUBBER PRODUCT IS RIGHT FOR ME?

ELASTOSIL® M offers optimum solutions to a variety of applications. The following pages will help you find them.

Key Considerations

A few basic questions will help you find the right silicone rubber product. The crosslinking mechanism is one of the most important ones. Other important factors that will help you select a product, however, include pot life, reproduction material and desired number of copies.

Quick Selection Guide

The quick selection guide will give you some initial recommendations for the product that's right for your application.



WHICH CURING METHOD IS MOST SUITABLE?

Like all silicone moldmaking compounds, ELASTOSIL® M silicone rubber products are two-part compounds. Mixing the two components initiates the crosslinking process. Our portfolio contains two product groups that differ in terms of their crosslinking mechanism and specific advantages.

Addition-curing ELASTOSIL® M products are characterized by the following:

- Maximum reproduction accuracy
- Dimensional stability (no shrinkage)
- Multiple copies can be made from a single mold
- Suitable for rapid curing, which can be further accelerated through the application of heat (crosslinking between 15 °C and 200 °C)
- No volatile reaction products
- Ready for use immediately after demolding
- Curing can be disrupted by substances that block the platinum catalyst (inhibition).





Mixing for addition: A + B (1:1, 9:1 or 10:1)

Condensation-curing ELASTOSIL® M products are characterized by the following:

- A cost-effective option for making highly faithful reproductions
- No risk of inhibition
- Crosslinking occurs at temperatures ranging between 15 °C and 70 °C; relative humidity needs to be above 40%.
- Shrinkage of the cured rubber is between 0.4-0.8%, depending on the grade and amount of catalyst.



Mixing for condensation:

Base + hardening agent

100 + 2-5% (standard)

+ 1-2% (specials)





KEY CONSIDERATIONS

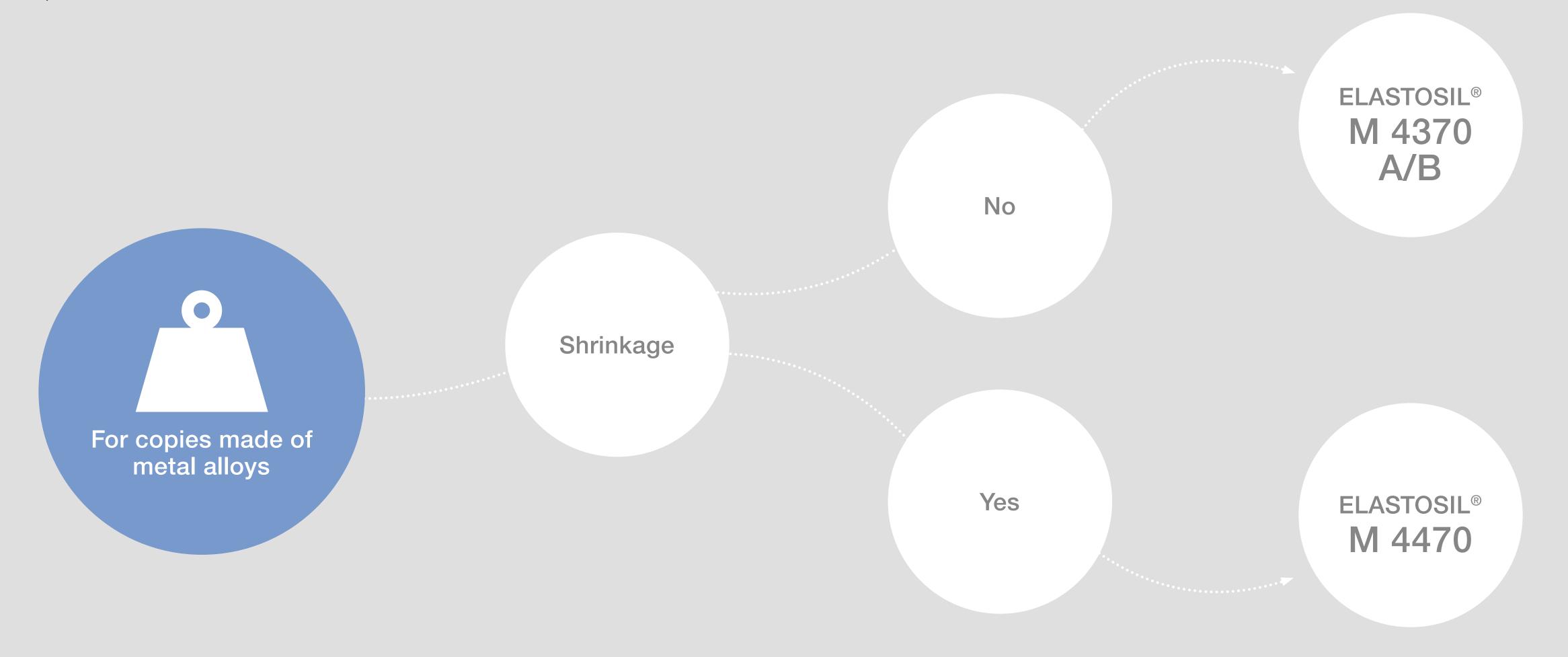
In order to find the right ELASTOSIL® silicone rubber, it helps to consider the following questions:

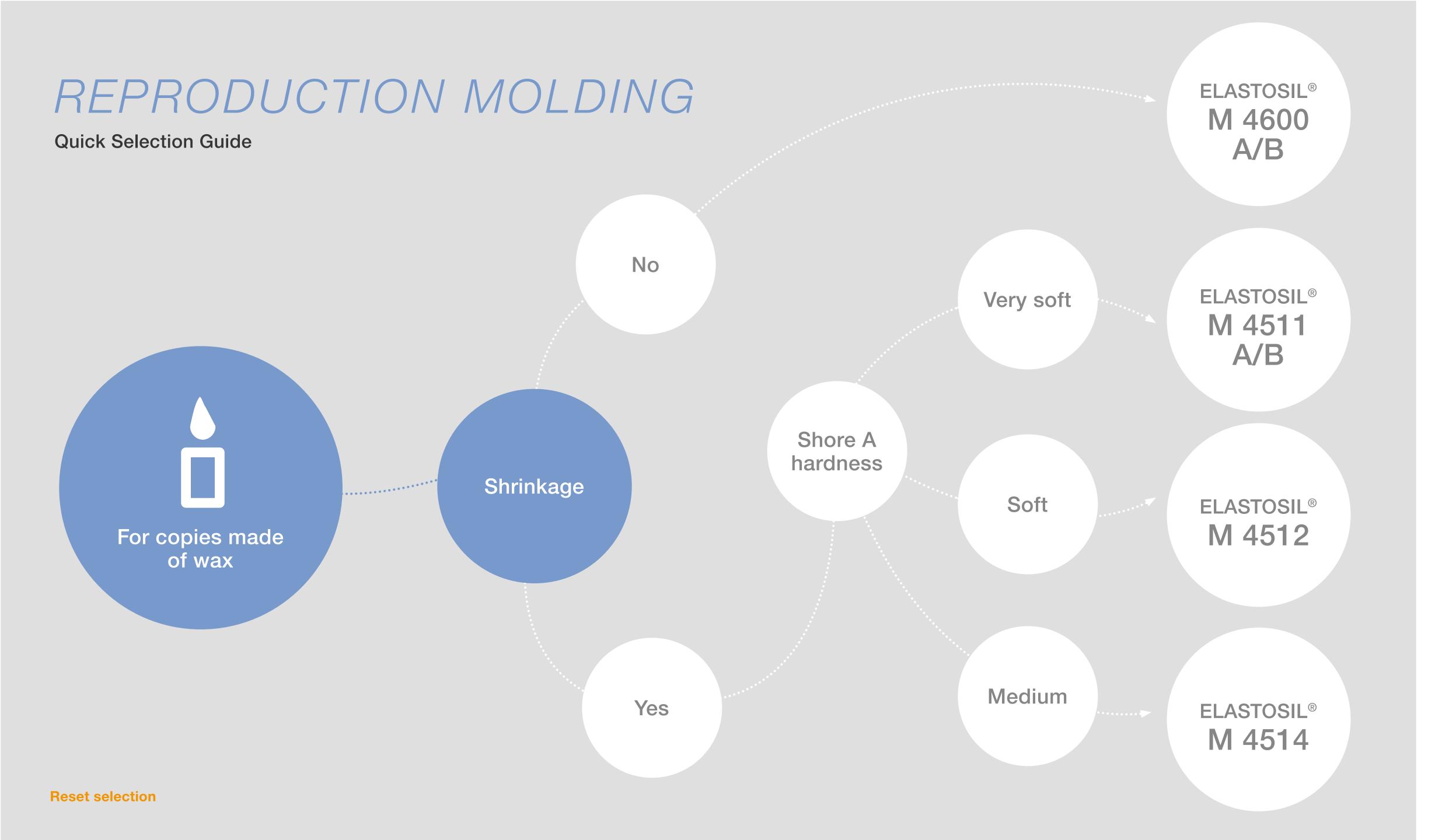
- Do the dimensions of the replica need to be faithful? What material will the replica be made of?
- How quickly does the mold need to be ready?

 Will I be working on vertical surfaces or overhead?
- Is good flowability important?
- 1 How hard or soft does the finished mold need to be?
- Will the mold be subject to strong forces?
- 1 Are there special requirements?

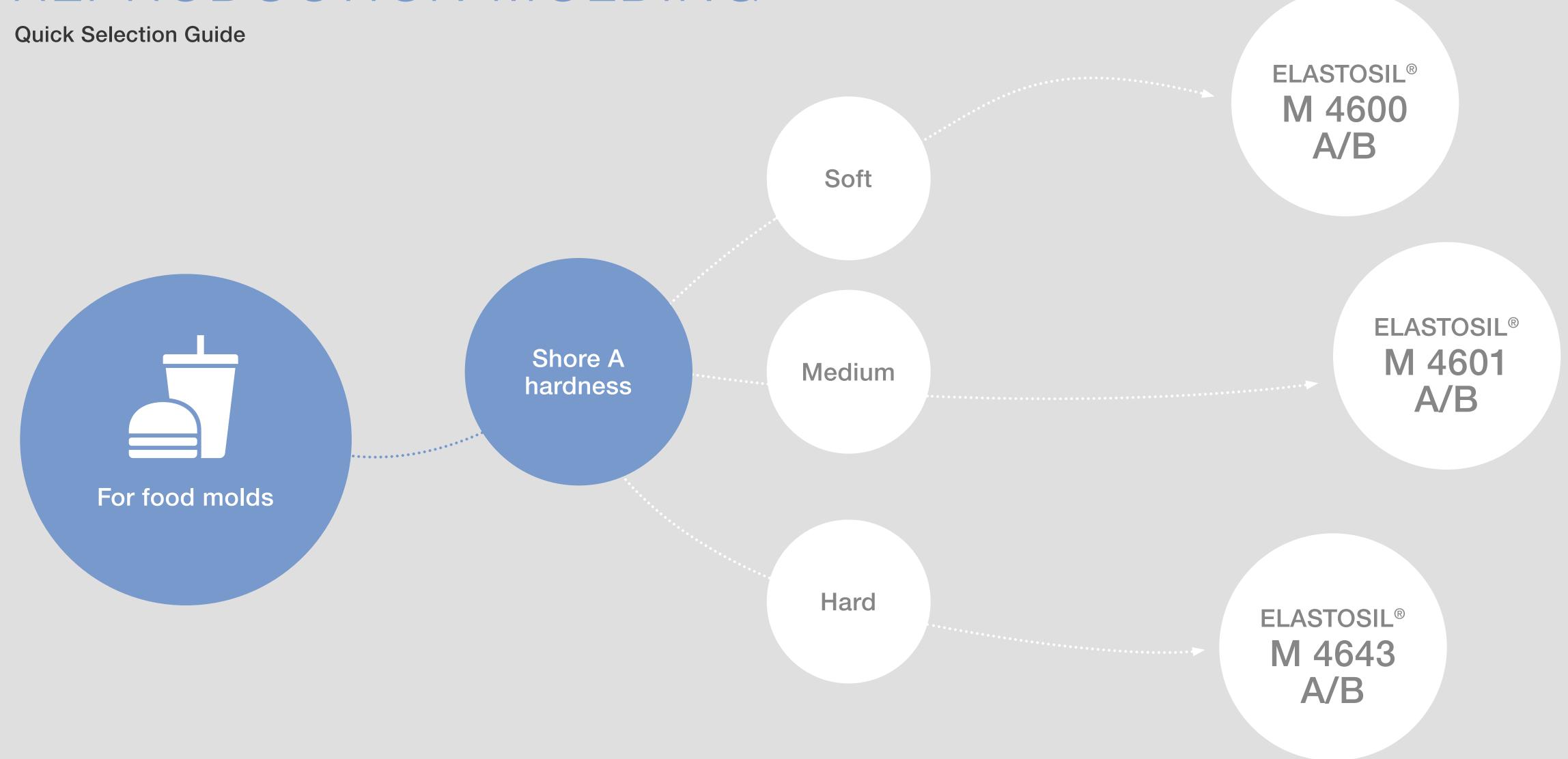
REPRODUCTION MOLDING

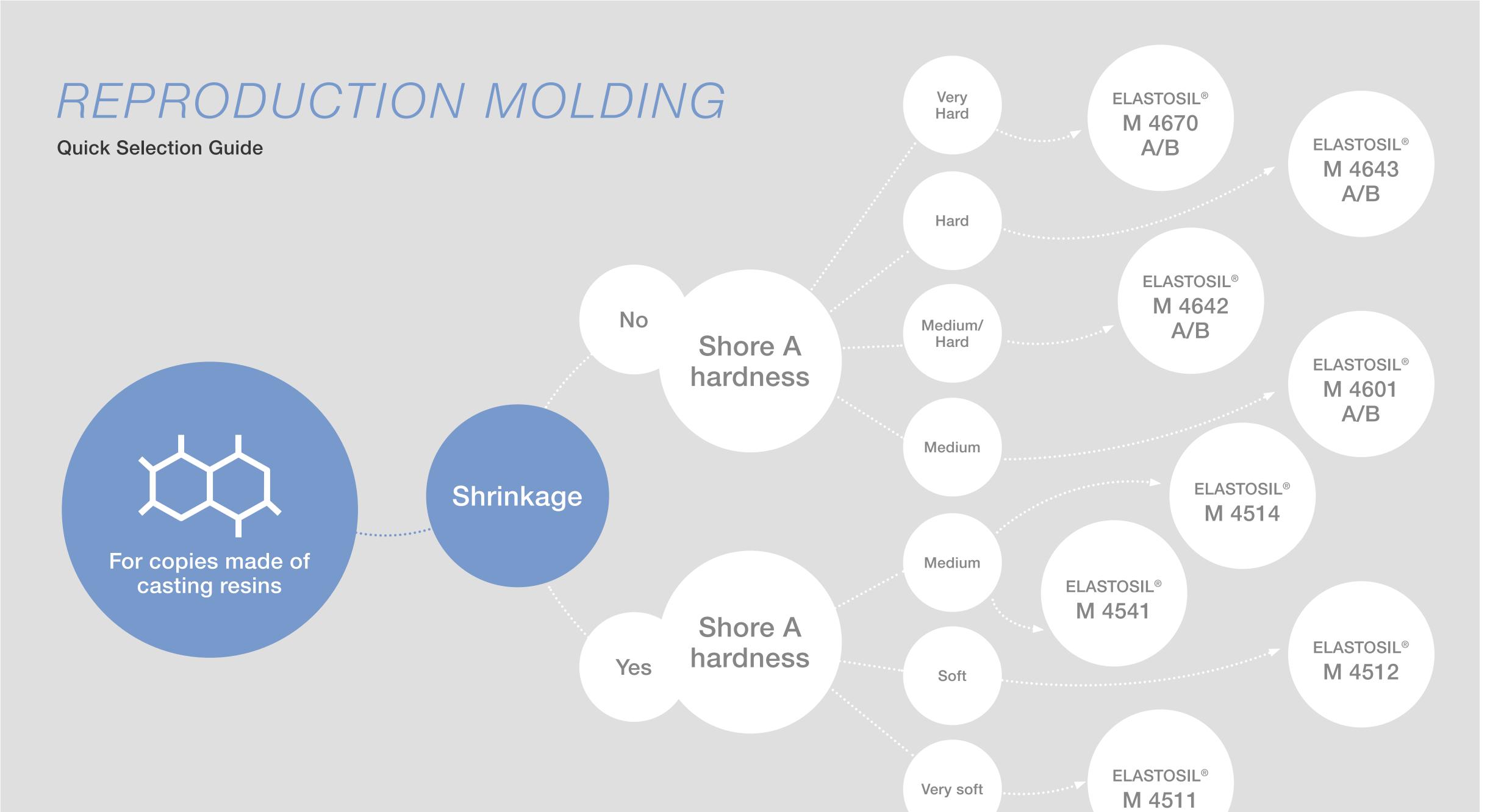
Quick Selection Guide





REPRODUCTION MOLDING

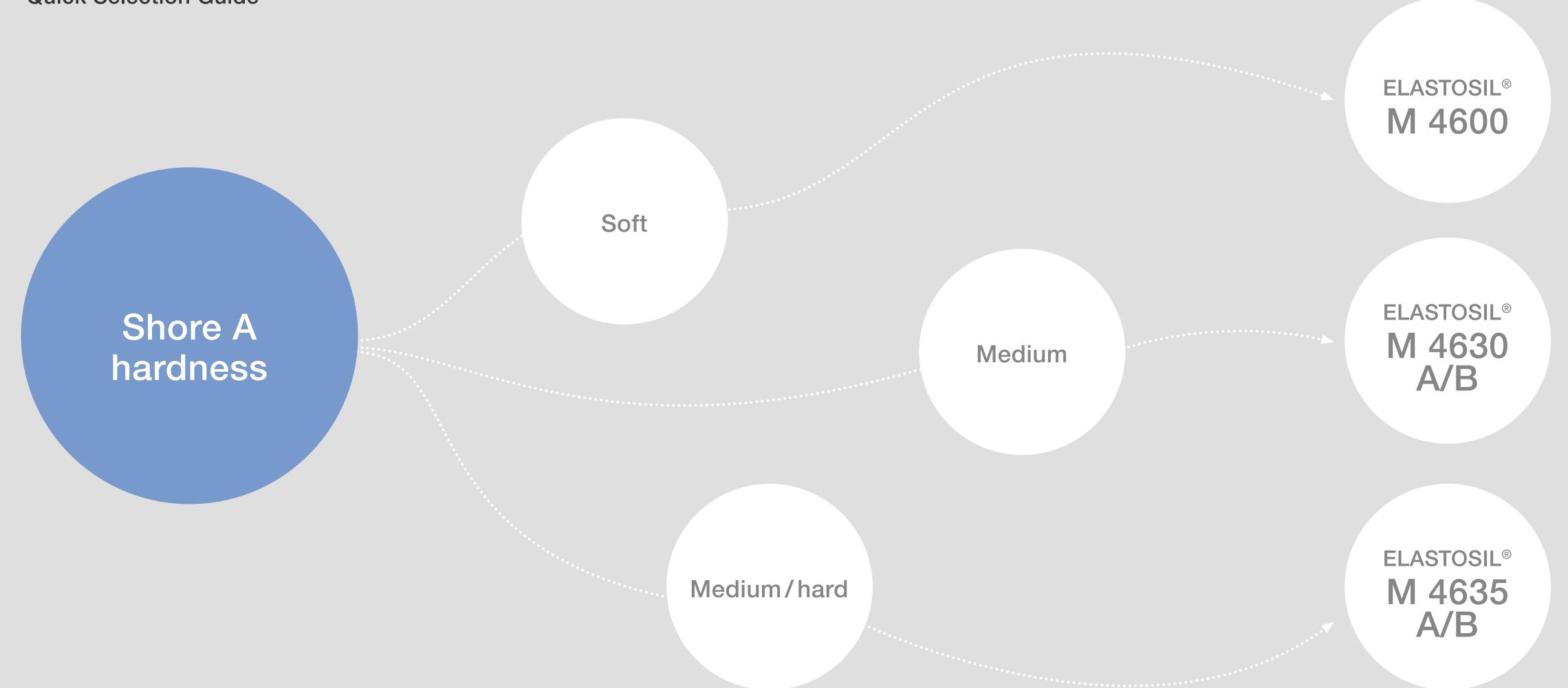


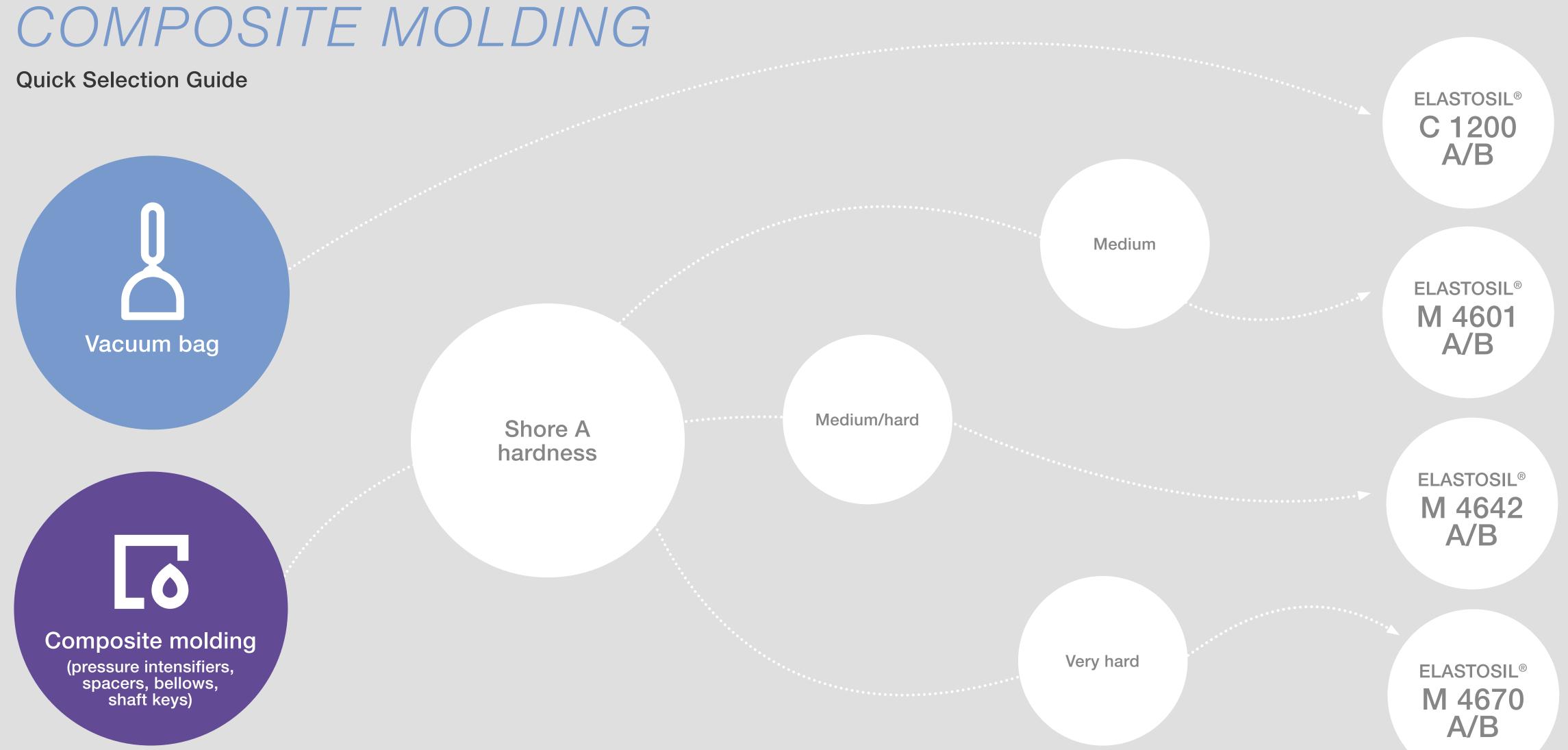


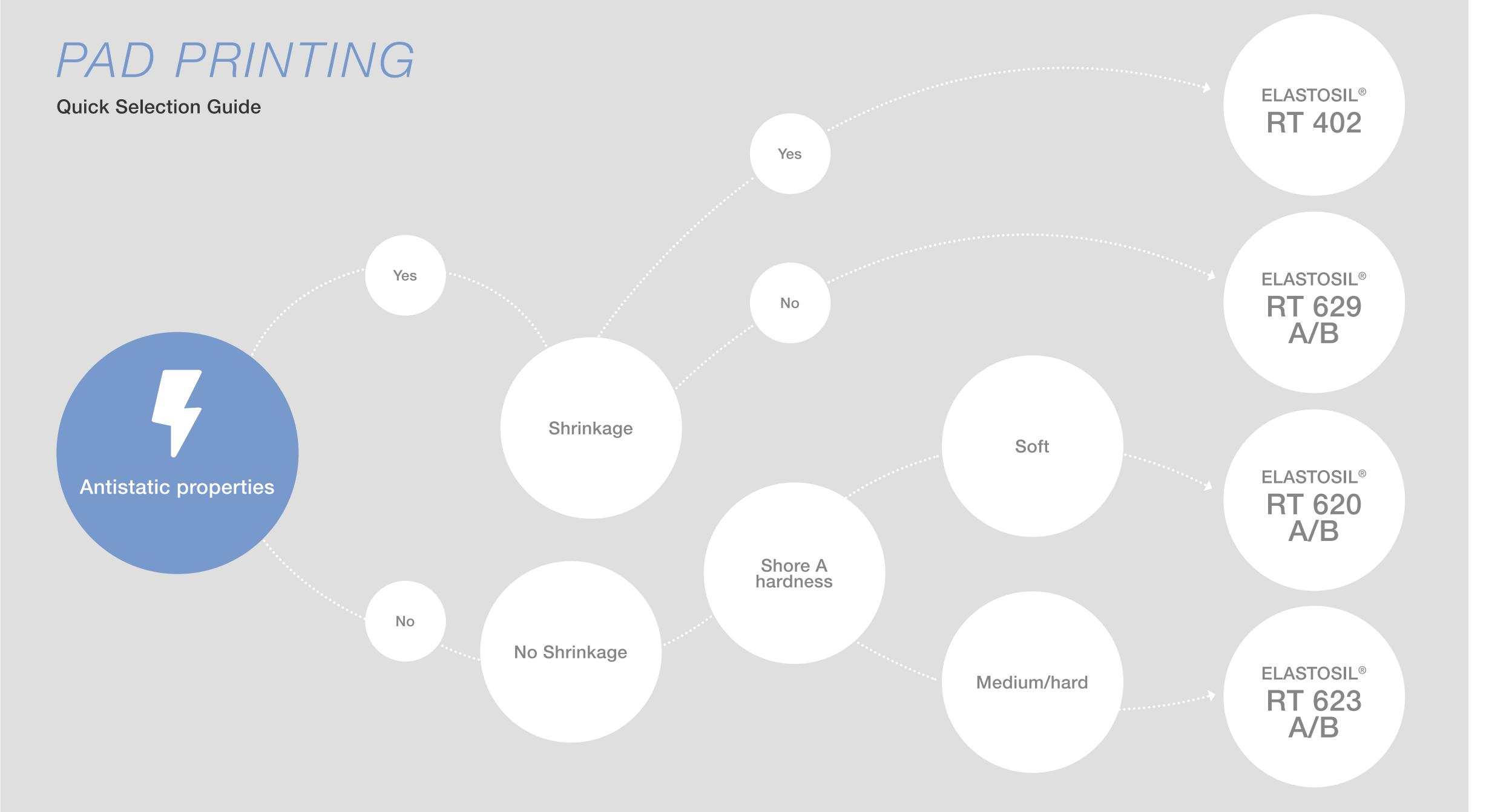
Reset selection

CONSTRUCTION MOLDING (Concrete and Gypsum Casting)

Quick Selection Guide







PROTOTYPE MOLDING



PRODUCT OVERVIEW CONDENSATION-CURING MOLDMAKING COMPOUNDS

									Large Number of Copies Possible With		
	Typical Application and Special Properties	Shore A Hardness*	Color	Standard Catalyst	Mixing Viscosity [mPa•s]	Vulcanization Time [h]	Pot Life [min]	Tear Resistance [N/mm]	Plaster/Wax	Resin Resistance: Polyester	Resin Resistance: Polyurethane
	Skin mold										
ELASTOSIL® M 1470	Kneadable	Hard	Pink	Paste T40	Kneadable	4 – 5	70	>10	•		
ELASTOSIL® M 3502	Spreadable, non-sag	Medium	White	T 21/T 51	Spreadable	8 – 10	60/90	>23	•		
	All-purpose										
ELASTOSIL® M 4400	Pourable, all-purpose	Medium	Yellow	T 37/T 40	25,000	9 – 12 / 5 – 7	90/40	>3	•		
ELASTOSIL® M 4440	Resin-resistant, all-purpose	Medium/hard	White	T 37/T 40	25,000	8 - 10 / 6 - 7	60/50	4.5	•	•	•
ELASTOSIL® M 4503	Highly elastic, excellent mechanical strength	Medium	White	T 35	40,000	15 – 20	90	>20	•		
	All-purpose / casting resins										
ELASTOSIL® M 4511		Very soft	White	T 21/T 51	25,000	8 – 10	60/90	>18	•	•	•
ELASTOSIL® M 4512	Excellent flowability with low viscosity, casting resin resistance and excellent	Soft	White	T 21/T 51	30,000	8 – 10	60/90	>24	•	•	•
ELASTOSIL® M 4514	mechanical properties in a broad	Medium	White	T 21/T 51	35,000	8 – 10	60/90	>25	•	•	•
ELASTOSIL® M 4541	Shore hardness range	Medium/hard	White	T 21/T 51	40,000	8 – 10	60/90	>30	•	•	•
	Pad printing										
ELASTOSIL® RT 402	Antistatic, ink-resistant	Soft	Gray	T 12	15,000	5	75	>3	•		
	Low melting metal alloys										
ELASTOSIL® M 4470	Excellent thermal stability and thermal conductivity	Hard	Reddish brown	T 37/T 40	15,000	20 – 24 / 3 – 4	90/40	>4	•		

Additional product data can be found in the **Moldmaking Product Overview**

Find your representative:

www.wacker.com/h/en-de/distributor-and-sales

Please select product group Silicone Rubber

* Shore A hardness: Very soft: < 15, soft: 15 – 20, medium: 21 – 30,

medium/hard: 31 – 40, hard: > 40

PRODUCT OVERVIEW ADDITION-CURING MOLDMAKING COMPOUNDS – ALL-PURPOSE

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										Large Number of Copies Possible With			
	Typical Application and Special Properties	Shore A Hardness*	Color	Mixing Ratio	Mixing Viscosity [mPa•s]	Vulcanization Time [h]	Pot Life [min]	Tear Resistance [N/mm]	Food (FDA)**	Plaster/Wax	Resin Resistance: Epoxy	Resin Resistance: Polyester	Resin Resistance: Polyurethane
	All-purpose												
CENUSIL® M 810	All-purpose molding grade, very low hardness	Very soft	White	1:1	3,000	4	40	15		•			
CENUSIL® M 820	All-purpose molding grade, low hardness	Soft	White	1:1	6,000	4	40	20		•			
ELASTOSIL® M 4115 A/B	Low viscosity, 1:1	Medium	Translucent	1:1	2,500	1	12	5		•			
ELASTOSIL® M 4119 A/B	Low viscosity, super-fast cure, 1:1	Soft	Translucent	1:1	3,500	0.5	7			•			
ELASTOSIL® M 4125 F A/B	Low viscosity, fast cure, 1:1	Medium	White	1:1	6,000	2	15	25	•	•			
ELASTOSIL® M 4600 A/B	Low hardness and high mechanical strength	Soft	Translucent	10:1	15,000	12	90	>20	•	•			
ELASTOSIL® M 4601 A/B	Good flowability and high mechanical strength	Medium	Reddish brown	9:1	10,000	12	90	>30	•	•	•	•	•
ELASTOSIL® M 4642 A/B	Excellent resin resistance, low viscosity and very high mechanical strength	Medium/hard	Dark red	10:1	15,000	12	90	>30		•	•	•	•
ELASTOSIL® M 4643 A/B	Good resin resistance, high Shore hard- ness and very high mechanical strength	Medium/hard	Gray	9:1	25,000	12	90	>10		•	•	•	•
VARIO® 15	All-purpose tool box system: blend desired	Soft	Translucent	10:1	3,000	6/0.25	150/2	15	•	•			
VARIO® 40	hardness with 2 bases, adjust desired reactivity with 2 catalysts: CAT Vario and CAT VARIO F = fast	Hard	Translucent	10:1	10,000	6/0.25	150/2	15	•	•			

Additional product data can be found in the **Moldmaking Product Overview**

Find your representative:

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Please select product group Silicone Rubber

^{*} Shore A hardness: Very soft: < 15, soft: 15 – 20, medium: 21 – 30, medium/hard: 31 – 40, hard: > 40

^{**} Compliant with relevant FDA regulations if processed correctly

PRODUCT OVERVIEW

ADDITION-CURING MOLDMAKING COMPOUNDS -THE SPECIALISTS 1

Linear shrinkage < 0.	.1 %												
										Large Num	th		
	Typical Application and Special Properties	Shore A Hardness*	Color	Mixing Ratio	Mixing Viscosity [mPa•s]	Vulcanization Time [h]	Pot Life [min]	Tear Resistance [N/mm]	Food (FDA)**	Plaster/ Wax	Resin Resistance: Epoxy	Resin Resistance: Polyester	Resin Resistance: Polyurethane
	Concrete Casting												
CENUSIL M 830	Low viscosity, translucent, fast curing	Medium	Translucent	1:1	8,000	14	60	>20	•	•			
ELASTOSIL® M 4630 A/B	Low viscosity and high mechanical strength	Medium	White	10:1	10,000	12	90	>30	•	•	•	•	•
ELASTOSIL® M 4635 A/B	Low viscosity, medium hardness and high mechanical strength	Medium/hard	White	10:1	15,000	12	90	>30	•	•	•	•	•
	Rapid prototyping												
ELASTOSIL® M 4641 A/B	High mechanical strength, "dry" system	Hard	Translucent	10:1	30,000	12	90	>25	•	•			•
ELASTOSIL® M 4644 A/B	High mechanical strength, slight oil bleeding	Medium/hard	Translucent	10:1	50,000	12	80	>25		•			•
ELASTOSIL® M 4645 A/B	High mechanical strength, considerable oil bleeding	Medium/hard	Translucent	10:1	35,000	12	80	>28		•			•
ELASTOSIL® M 4670 A/B	Rapid prototyping, high mechanical strength, excellent polyamide casting resin stability	Hard	Beige	10:1	80,000	12	90	>12	•	•	•	•	•
	Pad printing												
ELASTOSIL® RT 620 A/B	Ink resistance, low base hardness, very high mechanical strength	Soft	Translucent	10:1	6,000	4	35	>12	•	•			
ELASTOSIL® RT 623 A/B	Ink resistance, very high mechanical strength	Medium/hard	Reddish brown	9:1	10,000	5	30	>30		•			
ELASTOSIL® RT 629 A/B	Antistatic, ink resistance, high mechanical strength	Medium/hard	Turquoise	10:1	8,000	3	40	25		•			

Additional product data can be found in the **Moldmaking Product Overview**

Find your representative: www.wacker.com/h/en-de/distributor-and-sales

Please select product group Silicone Rubber

PRODUCT OVERVIEW

ADDITION-CURING MOLDMAKING COMPOUNDS - THE SPECIALISTS 2

Linear shrinkage < 0.	1 %												
										Large Number of Copies Possible With			
	Typical Application and Special Properties	Shore A Hardness*	Color	Mixing Ratio	Mixing Viscosity [mPa•s]	Vulcanization Time [h]	Pot Life [min]	Tear Resistance [N/mm]	Food (FDA)**	Plaster/ Wax	Resin Resistance: Epoxy	Resin Resistance: Polyester	Resin Resistance: Polyurethane
	Special effects – toolbox system, 4 bases with 4 additives												
ELASTOSIL® FX Gel 30		Gel-like	Translucent	1:1	4,000	0.75	8-12	1.5	•	•			
ELASTOSIL® FX 10	Low viscosity, fast-curing, broad range of Shore hardness values; adjust to skin-like textures with ELASTOSIL® FX Softener;	Very soft	Translucent	1:1	5,000	0.75	8-12	20	•	•			
ELASTOSIL® FX 20	adjust curing speed with WACKER® Catalyst EP or Inhibitor PT 88; adjust flowability with WACKER® Stabilizer 43	Soft	Translucent	1:1	5,000	0.75	8-12	25	•	•	•	•	•
ELASTOSIL® FX 28		Medium	Translucent	1:1	10,000	<1h	10-15	28	•	•	•	•	•
	Vacuum bag												
ELASTOSIL® C 1200 A/B	Vacuum bag for composite molding, sprayable, high mechanical strength	Medium	Blue/ transluscent	1:1	25,000	1	20	25		•	• For prepreg use	•	
	Casting low-melting metal alloys / coating pressure rollers												
ELASTOSIL® 4370 A/B	High heat resistance and good thermal conductivity	Hard	Reddish brown	9:1	8,000	6	80	>4	•	•	•	•	

Additional product data can be found in the **Moldmaking Product Overview**

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Please select product group Silicone Rubber

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^{**} Compliant with relevant FDA regulations if processed correctly

PRODUCT OVERVIEW ADDITIVES

We also offer specialty additives that complement our ELASTOSIL® M product line.

Generating Adhesion to Substrates

WACKER® primers allow you to bond ELASTOSIL® M elastomers with each other or with other materials, such as wood, metal or thermoplastics.

Bonding		
Primer	ELASTOSIL® M Grades	Bonds To:
WACKER® Primer G 790	Addition-curing	Absorbent surfaces and metal
WACKER® Primer G 795	Addition-curing	Absorbent surfaces and metal
WACKER® Primer FD	Condensation-curing	Absorbent surfaces and metal
WACKER® Primer AV A/B (two-part, exceptionally long processing window)	Addition-curing	Absorbent surfaces, wood or metal

Repairing and Bonding

ELASTOSIL® RTV-1 can be used for repairing cracked molds.

Repairing			
Adhesive	Curing System	Consistency	Self-Leveling?
ELASTOSIL® E4	Acetic-acid-curing	Paste-like	No
ELASTOSIL® E41	Acetic-acid-curing	Spreadable	Yes
ELASTOSIL® E43	Acetic-acid-curing	Spreadable	Yes
ELASTOSIL® E43 N	Neutral-curing	Spreadable	Yes
ELASTOSIL® A07	Amine-curing	Paste-like	No

Color

Transparent ELASTOSIL® M grades can be formulated in different colors through the addition of ELASTOSIL® FL pigments.

ELASTOSIL® Red color concentrate is often used for modifying the color of the tin catalyst of condensation-curing grades. Doing so gives the user a clear means of judging when the catalyst has been uniformly distributed during the mixing process.

Dilution

ELASTOSIL® M grades can be diluted through the addition of WACKER® AK 35 or WACKER® AK 100 silicone fluids, thereby making them softer.

Thickening

Condensation-curing ELASTOSIL® M grades become more paste-like through the addition of WACKER Thickening Agent C. For addition-curing ELASTOSIL® M grades, we recommend adding WACKER Stabilizer 43.

Modifying Pot Life and Curing Time Addition of WACKER Inhibitor PT 88 extends the pot life of addition-curing ELASTOSIL® M grades. WACKER Catalyst EP accelerates crosslinking.



1. Safety

Always read the safety data sheet for each of our products. This document contains relevant information on how to stay safe and healthy when working with our products. You will receive a safety data sheet (MSDS) with the product, but you can also download it from www.wacker.com.





2. Storage

In order to avoid compromising quality, please note the following:

- The optimum storage temperature lies between 5 °C and 30 °C.
- Seal opened containers as tightly as possible immediately after taking out your material.
- Use up the material remaining in the containers as quickly as possible.
- Make a note of the use by date indicated on the label.
- The product is not necessarily unusable once the use by date has passed; simply check to make sure the desired properties of the material have not changed.

3. Pretreating Models

Silicone rubber does not stick to many materials. Nevertheless, we recommend pretreating the surface of the model:

- Remove any dust, dirt or oil.
- Secure or remove any loose parts.
- Seal any cracks, gaps or other damage to the surface using model putty or mastic.
- Seal any porous or highly absorbent surfaces.
- Protect sensitive surfaces that could discolor or be stained, or that could be destroyed during the demolding process.
 Please contact us if needed.
- Silicone rubber forms chemical bonds with models made of glass, porcelain, ceramic, silicone rubber, etc. In these cases, apply a release layer such as a soap solution, Vaseline, paraffin or a liquid or diluted wax (freshly cured).

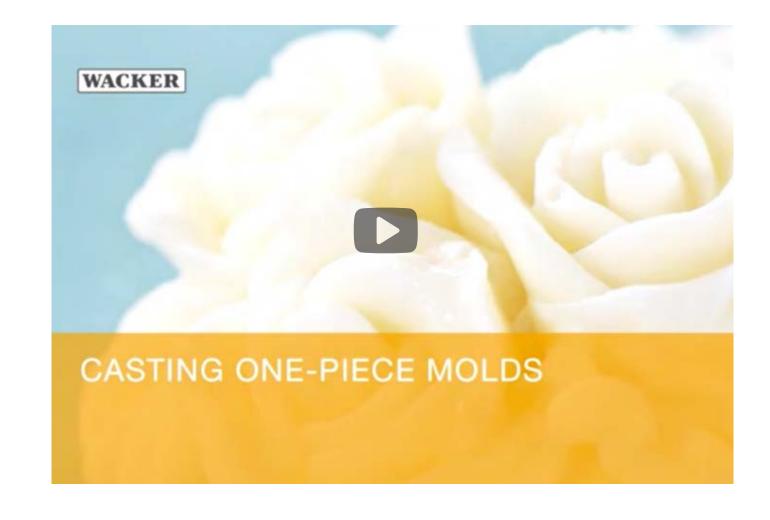




4. Prep the Material

- For addition-curing ELASTOSIL® M grades only: check if the batch numbers are identical for A and B component.
- For all colored ELASTOSIL® M grades: in order to ensure even distribution of the pigments, mix each individual grade in its container prior to use.
 This step does not apply to transparent grades.
- Weigh out the components using different mixing tools:
- For addition-curing products: A + B components
- For condensation-curing products:base product + hardening agent
- Weigh out all additives used (pigment pastes, silicone fluid, thickening agents, etc.). Seal all containers immediately after removing the required amount product.





5. Mixing and Dearating

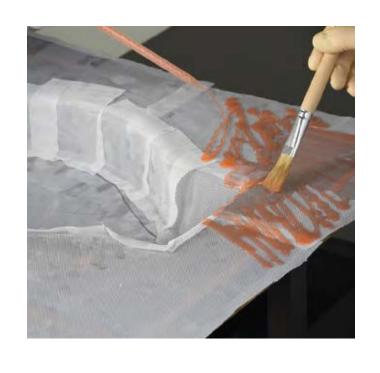
- If you would like to deaerate the blended silicone rubber in a vacuum container, prepare this container prior to mixing.
- Deaeration should be performed under reduced pressure (10 to 20 mbar) in a vacuum chamber.
- Carefully mix the components, making sure no materials remain in the corners and along the bottom; scrape the interior walls of your mixing vessel.
- Crosslinking starts now, as well as the processing window.

6. Applying the Silicone Rubber

- Pour the liquid, deaerated silicone rubber into the mold in a thin stream from the lowest possible height.
 If the material has not been deaerated, pour it into the mold from as high up as possible. Keep the position of the stream as constant as possible.
- For spreadable silicone rubber, first apply a thin, bubble-free oating using a stiff, short-bristled brush; apply the actual layer after this.
- Kneadable silicone rubber is usually applied by hand.

7. Curing

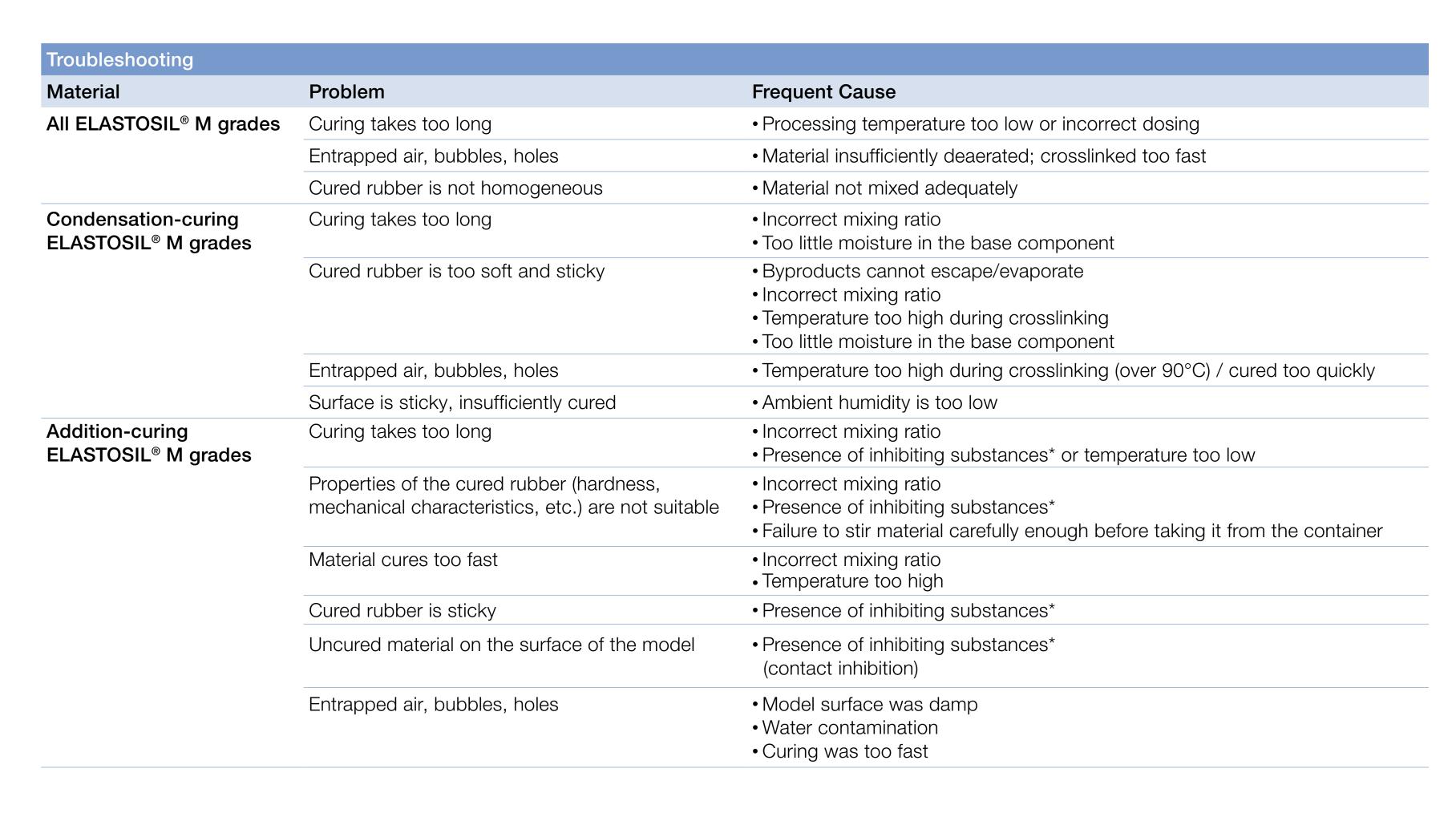
- Wait until the specified curing time has elapsed before demolding.
- For addition-curing ELASTOSIL® M grades, curing can be accelerated with heat.





TIPS AND TRICKS

Troubleshooting



Didn't get the results you expected? Check this list of common causes.

^{*} These include sulfur and sulfur-containing compounds such as EPDM, amine-cured epoxy resins, organometallic or organotin compounds or substances that contain these compounds (such as tin catalysts for condensation-curing silicone rubber).



CREATING TOMORROW'S SOLUTIONS

A Diverse Array of Products for Growing Markets

Our product portfolio ranges from silicones, binders and polymeric additives all the way up to bioengineered pharmaceutical actives. Rounding these out is hyperpure silicon for semiconductors and solar applications.

Innovations that Improve Quality of Life

As a technology leader focusing on sustainability, WACKER promotes products and ideas that offer a high value-added potential to ensure that current and future generations enjoy a better quality of life, based on energy efficiency and protection of the climate and environment.

Global Knowledge for Local Markets

When you work with WACKER, you have 100 years of chemistry expertise at your disposal, with access to the research findings and best practices of our experts throughout the world. Our knowledge base consists of a network of 23 technical competence centers,14 WACKER ACADEMY training centers and our basic research center.

And most importantly: we are there wherever you need us – worldwide. Our local specialists know your markets and speak your language. Working with them, you will find innovative solutions that win over your customers and make you more competitive.

Follow us:

Find us on LinkedIn, YouTube and Twitter, and we'll keep you up to date on the latest and discuss current issues with you.



All figures are based on fiscal 2021.



Silicones and Polymers

3,200 specialty products from organic and inorganic chemistry



Global Market Leader

In dispersions and dispersible polymer powders based on vinyl acetate-ethylene (VAE), in building-protection silicones and in the production of cyclodextrin and cystein.



Globally Active

- Sites worldwide
- Headquartered in Munich
- 26 production sites in Europe,
 Asia and the Americas
- 23 technical competence centers
- 14 WACKER ACADEMY training centers
- 52 sales offices



Employees: 14,400



Total Sales € 6.21 billion



Wacker Chemie AG

Hanns-Seidel-Platz 4 81737 Munich, Germany

www.wacker.com/contact
www.wacker.com/moldmaking

www.wacker.com

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Please select product group Silicone Rubber.

The data presented in this medium 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 recommendations made in this medium 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 expressed or implied, of the fitness or suitability of the product for a particular purpose.