WACKER SILICONES

ELASTOSIL®

ELASTOSIL® M MOLD-MAKING COMPOUNDS FOR MAXIMUM PRECISION

INTELLIGENT INDUSTRY SOLUTIONS

IT MAY SOUND COMMONPLACE. BUT IN FACT IT'S THE SECRET TO SUCCESS: A REPRODUCTION CAN ONLY BE AS GOOD AS ITS MOLD.

WHERE TO FIND WHAT

ELASTOSIL® M mold-making compounds are two-component, room-temperature-vulcanizing silicone rubbers >(RTV-2) with 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.

The following pages contain a summary of the properties of ELASTOSIL® M mold-making compounds and their wide range of applications. This summary is intended only as a guide and not as a substitute for personal dialog. After all, no two models are identical, and each mold-making technique is a science in its own right.

Please don't hesitate to contact our technical support team if you have specific questions concerning your application.

Call us. We'll be glad to help.

Many molding problems are fastest solved on location – in a personal discussion with your WACKER technical support specialist.

WE GET CALLS FROM ALL KINDS OF PEOPLE: FROM MUSEUM DIRECTORS, THROUGH PROTOTYPERS, TO DESIGNERS OF DECORATIVE BUTTONS

ELASTOSIL® M mold-making compounds are ideal for an amazing range of applications. This is effectively due to their nature, since they are easy to process, require no expensive equipment and >cure at room temperature.

ELASTOSIL® M mold-making compounds have all the properties that a mold-maker can wish for: the users of this >elastic material range from hobbyists to manufacturers of imitation leather and from archeologists to prototypers. Our comprehensive range of pourable, spreadable and kneadable ELASTOSIL® M grades includes the ideal product for every application.

Nothing is impossible

The fields of application for ELASTOSIL® M mold-making compounds are as varied as the products:

Prototypes

- Design and working models
- Preseries models
- Wax models
- Small production runs

Industrial mass production of

- Imitation leather
- Plaster working molds for porcelain and sanitary ceramics manufacture
- Ornamental door, window, mirror and picture frames
- Ornamental fronts for furniture
- Costume jewelry, ornamental buttons, chocolates, figures of chocolate, etc.
- Electroformed parts
- GRP laminates

>Reproductions and copies

- Museum pieces
- Archeological findings
- Hobbyist applications

With more than 25 standard products in our range, there is sure to be one to meet your needs. But if that is not the case, we will work on a solution for you.

A QUICK GLANCE AT THIS TABLE WILL TELL YOU WHICH MOLDING TECHNIQUE IS BEST FOR YOUR TYPE OF MODEL

Type of model	Example	Mold-making technique	Advantages	Disadvantages
• Flat reverse side • Only shallow, if any >undercuts or depressions • For models of limited size	Medallion	• One-part >block mold • Pouring or impression techniques	• Low labor input • Self-supporting mold	• Relatively high silicone rubber consumption
• Flat reverse side • Pronounced >undercuts or depressions • No limit on model size	Relief	• One-part >skin mold • Pouring or spreading technique	• Easy to demold • Relatively low silicone rubber consumption	• Higher labor input than for >block mold (necessity of making a >support mold)
• Structured on all sides • Complex shape • Pronounced >undercuts • For models of limited size	Prototypes for industry	• One-part >block mold • Demolding by cutting along a parting line • Use as two- or more-part >block mold • Pouring technique (possibly under >vacuum)	• Lower labor input than for two-part >block mold • Self-supporting mold	• Relatively high silicone rubber consumption
• Base or pedestal with flat standing surface • Complex shape • Pronounced >undercuts or depressions • For models of limited size	Trophies, small statues	• One-part >skin mold • Demolding by cutting open side • Use as openable one-part >skin mold • Pouring or spreading	• Lower labor input than for two-part >skin mold • Low demolding forces • Relatively low silicone rubber consumption	• Higher labor input than for >block mold (necessity of making a >support mold)
• Structured on all sides • Absence of or only shallow >undercuts or depressions • For models of limited size	Fossils, coins	• Two- or more-part >block mold • Pouring or impression technique	• Self-supporting mold	• Relatively high labor input • Relatively high silicone rubber consumption
• Structured on all sides • Complex shape • Pronounced >undercuts or depressions • No limit on model size	Large statues	• Two- or more-part >skin mold • Pouring or spreading	• Low demolding forces • Relatively low silicone rubber consumption	• Higher labor input than for >block mold (necessity of making a >support mold)

Only quality endures: whether you are making complicated technical moldings or restoring spectacular objects.

WE CAN TELL YOU A LOT ABOUT THE ADVANTAGES OF ELASTOSIL® M MOLD-MAKING COMPOUNDS. BUT WHY NOT FIND OUT FOR YOURSELF?

ELASTOSIL® M mold-making compounds are available as >condensation-curing and >addition-curing systems. Thanks to their variable >consistency and reactivity, and the properties of the >cured rubber, they offer users practically unlimited scope.

ELASTOSIL® M mold-making compounds are divided into two groups which differ in the way they >cure:
>Condensation-curing ELASTOSIL® M grades are >cured by adding a liquid or pasty >catalyst at temperatures between 0 °C and 70 °C. Higher temperatures reverse the cross-linking reaction, a phenomenon known as reversion: the system remains in, or reverts to, a tacky or liquid state. With >condensation-curing systems, the cross-linking reaction typically eliminates a low alcohol, usually ethanol or propanol. The >cured rubber is ready for use as soon as all the alcohol has evaporated. Evaporation of the alcohol does, however, cause a loss in weight and slight >shrinkage of the rubber.
>Addition-curing ELASTOSIL® M grades are >cured by mixing >components A and B at temperatures between 10 °C and 200 °C. Since no volatile >reaction products are eliminated during >cross-linking, there is neither reversion of the cross-linking reaction at elevated temperatures nor any chemical >shrinkage of the >cured rubber due to weight loss. Accordingly, these grades can 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.
In the case of >condensation-curing ELASTOSIL® M grades, it is important to monitor the air humidity. If it is too low, the rubber will not >cure completely, remaining tacky to liquid at the surface.

ELASTOSIL® M should always be stored cool and dry in tightly closed containers at 5 to 25 °C.

THE FIGURES IN THIS TABLE ARE ONLY A GUIDE. HOW COULD THEY POSSIBLY REPLACE YOUR TECHNICAL SUPPORT SPECIALIST?

	>Consistency Color of the >cured rubber	>Properties of the >cured rubber	Special features
ELASTOSIL®			
>Condensation-curing			
M 1470	Kneadable, pink	Hard; high mechanical strength	General-purpose grade
M 2471	Spreadable, pale gray	Hard; high mechanical strength	General-purpose grade
M 3500	Spreadable, >non-sag, translucent	Soft; extremely high extensibility and mechanical strength	For >skin molds
M 3502	Spreadable, >non-sag, white	High extensibility and mechanical strength	For >skin molds; excellent resistance to polyester and polyurethane resins
M 4400	Pourable, pale yellow	Soft; high extensibility	General-purpose grade
M 4440	Pourable, beige	Moderately hard	General-purpose grade
M 4441	Pourable, white	Moderately hard	High resistance to polyurethane resins
M 4470	Pourable, reddish-brown	Hard	High thermostability and thermal conductivity
M 4500	Pourable, white	Very soft; very high extensibility and high mechanical strength	High resistance to polyester resins
M 4503	Pourable, white	Soft; high extensibility and mechanical strength	General-purpose grade
M 4511	Pourable, white	Very soft; very high extensibility and mechanical strength	Excellent resistance to polyester and polyurethane resins
M 4512	Pourable, white	Soft; very high extensibility and mechanical strength	Excellent resistance to polyester and polyurethane resins
M 4514	Pourable, white	Soft; very high extensibility and mechanical strength	Excellent resistance to polyester and polyurethane resins
M 4541	Pourable, white	Moderately hard; high extensibility and very high mechanical strength	Excellent resistance to polyester and polyurethane resins
>Addition-curing			
M 4370 A/B	Pourable, reddish-brown	Hard	High thermostability and thermal conductivity
M 4600 A/B	Pourable, translucent	Soft; very high extensibility and mechanical strength	General-purpose grade
M 4601 A/B	Pourable, reddish-brown	Soft; very high extensibility and mechanical strength	General-purpose grade
M 4641 A/B	Pourable, transparent	Moderately hard; high mechanical strength	High resistance to polyurethane and epoxy resins
M 4642 A/B	Pourable, deep red	Mod. hard; high extensibility, v. high mech. strength	General-purpose grade
M 4643 A/B	Pourable, gray	Moderately hard; high mechanical strength	High resistance to polyurethane and epoxy resins
M 4644 A/B	Pourable, transparent	Moderately hard; high mech. strength; in-mold release	Excellent resist. to polyurethane and epoxy resins
M 4645 A/B	Pourable, transparent	Moderately hard; high mech. strength; in-mold release	Excellent resist. to polyurethane and epoxy resins
M 4647 A/B	Pourable, chrystal clear	Moderately hard; high mechanical strength	Excellent resist. to polyurethane and epoxy resins
M 4648 A/B	Pourable, translucent	Moderately hard; high mechanical strength	Excellent resist. to polyurethane and epoxy resins
M 4670 A/B	Pourable, beige	Hard; high mechanical strength	High resistance to polyurethane and epoxy resins

>Viscosity of the ready-to-use mix	Density (DIN 53 479 A)	Hardness (DIN 53 505)	Tensile strength (DIN 53 504 S3 A)	Elongation at break (DIN 53 504 S3 A)	Tear resistance (ASTM D 624 B)	Linear >shrinkage after 7 days
[mPa s]	[g/cm³]	[>Shore A]	[N/mm²]	[%]	[N/mm]	[%]
> 1,000,000	1.28	50	4.5	230	> 10	0.2
> 250,000	1.20	55	4.5	170	> 7	0.4
> 1,000,000	1.10	20	4.0	700	> 30	0.6
> 1,000,000	1.24	26	4.5	450	> 23	0.4
25,000	1.30	23	2.0	250	> 3	0.7
20,000	1.22	37	2.5	200	> 3	0.4
7,000	1.22	45	2.0	130	> 3	0.3
10,000	1.44	60	4.5	120	> 4	0.8
20,000	1.20	14	3.0	450	> 15	0.6
40,000	1.16	25	5.0	350	> 20	0.5
20,000	1.22	12	3.5	600	> 18	0.4
25,000	1.19	20	3.5	500	> 24	0.4
25,000	1.25	25	4.5	450	> 25	0.4
30,000	1.16	32	5.0	400	> 30	0.4
8,000	1.43	55	3.0	130	> 4	< 0.1
15,000	1.10	20	7.0	800	> 20	< 0.1
20,000	1.13	28	6.5	700	> 30	< 0.1
30,000	1.07	43	4.5	300	> 25	< 0.1
15,000	1.14	37	7.0	550	> 30	< 0.1
25,000	1.35	48	5.0	300	> 10	< 0.1
50,000	1.07	40	5.5	400	> 25	< 0.1
35,000	1.06	40	5.0	330	> 20	< 0.1
70,000	1.02	45	4.5	250	> 10	< 0.1
15,000	1.11	36	6.0	400	> 20	< 0.1
80,000	1.34	55	5.5	300	> 12	< 0.1

ELASTOSIL®	>Catalyst	Proportion of >catalyst [wt %]	Pot life at 23 °C/50 % rel. humidity [min]	Demoldable after (tack-free time) 23 °C/50 % rel. humidity [h]
M 1470	Paste T 40	2 / 5	70 / 20	5 / 2
M 2471	T 37 / T 37 // T 40 / T 40	3 / 4 // 2 / 4	180 / 120 // 50 / 10	15 / 10 // 8 / 2
M 3500	T 35 / T 35 // T 46 / T 46	4 / 5 // 4 / 5	150 / 80 // 40 / 20	24 / 20 // 10 / 8
M 3502	T 10 / T 10	2 / 3	15 / 10	3 / 2
	T 21 / T 51 // T 26 / T 56	5 / 5 // 5 / 5	65 // 30	9 // 6
M 4400	T 37 / T 37 // T 40 / T 40	3 / 4 // 2 / 3	90 / 60 // 40 / 20	12 / 9 // 7 / 6
M 4440	T 37 / T 40 // T	3 / 2 // 2 / 4	80 / 50 // 40 / 15	10 / 7 // 5 / 2
M 4441	TK // T / T	4 // 2 / 4	150 // 90 / 30	20 // 8 / 4
M 4470	T 37 / T 37 // T 40 / T 40	3 / 4 // 2 / 3	90 / 80 // 40 / 20	24 / 6 // 4 / 3
M 4500	T 12 / T 12	3 / 4	60 / 30	7 / 5
M 4503	T 35 / T 46	5 / 5	90 / 30	20 / 12
M 4511	T 21 / T 51	5 / 5	75	10
	T 26 / T 56	5 / 5	30	6
M 4512	T 21 / T 51	5 / 5	75	10
	T 26 / T 56	5 / 5	30	6
M 4514	T 21 / T 51	5 / 5	75	10
	T 26 / T 56	5 / 5	30	6
M 4541	T 21 / T 51	5 / 5	75	10
	T 26 / T 56	5 / 5	30	6
M 4370 A/B				
M 4600 A/B				
M 4601 A/B				
M 4641 A/B				
M 4642 A/B				
M 4643 A/B				
M 4644 A/B				
M 4645 A/B				
M 4647 A/B				
M 4648 A/B				
M 4670 A/B				

Mixing ratio of A : B	Pot life at 23 °C	Demoldable after (tack-free time) 23 °C	Demoldable after (tack-free time) 70 °C	
[pbw]	[min]	[h]	[min]	ELASTOSIL®
				M 1470
				M 2471
				M 3500
				M 3502
				M 4400
				M 4440
				M 4441
				M 4470
				M 4500
				M 4503
				M 4511
				M 4512
				M 4514
				M 4541
9 : 1	80	6	15	M 4370 A/B
10 : 1	90	12	20	M 4600 A/B
9 : 1	90	12	20	M 4601 A/B
10 : 1	90	15	30	M 4641 A/B
10 : 1	90	12	20	M 4642 A/B
9 : 1	70	12	20	M 4643 A/B
10 : 1	90	15	30	M 4644 A/B
10 : 1	90	15	30	M 4645 A/B
10 : 1	120	15	30	M 4647 A/B
10 : 1	90	12	20	M 4648 A/B
10 : 1	60	24	30	M 4670 A/B

Integrated Management System certified to ISO 9001 and ISO 14001. Elastomers Business Unit also certified to QS 9000.

YOUR ELASTOSIL® M MOLD-MAKING COMPOUNDS WILL DO MOST OF THE WORK FOR YOU. AND THE REST IS EASY.

ELASTOSIL® M mold-making compounds are very easy to process. To exploit their full potential and avoid basic errors in their application, however, the user should observe some basic rules. We have published a whole manual containing detailed information on the various mold-making techniques. Please ask us for a copy.

Safety first

Your consignment of ELASTOSIL® M mold-making compound will automatically be accompanied by the relevant safety data sheet. Please read it carefully before processing the compound, and keep it in a safe place. Should it ever get mislaid, do not hesitate to ask us for another copy.

Preparing the >components

To ensure uniform distribution of the fillers, all pourable compounds or >components must be thoroughly stirred – preferably with a mechanical stirrer – in the drum each time before a quantity is removed.

Metering the >components

It is essential to meter the >components accurately, since only by following the mixing ratio precisely is it possible to obtain a >reproducible pot life and >curing time as well as a >cured rubber whose properties comply with the specification.

Mixing the >components

Make sure that the two >components are thoroughly (homogeneously) mixed: rubber and >catalyst in the case of >condensation-curing ELASTOSIL® M grades and A and B in the case of >addition-curing grades.

Removal of entrained air

To obtain >cured rubber without any air bubbles, free-flowing mixtures should be >deaerated (>evacuated) in a >desiccator or >vacuum cabinet at reduced pressure (10 to 20 mbar).

Applying the mold-making compound

Pourable ELASTOSIL® M grades that have been >deaerated are poured in a thin stream from as low a height as possible. If the mixture has not already been >deaerated, pour it from as great a height as possible. With spreadable grades, first apply a thin, bubble-free layer of >catalyzed mix using a stiff, short-bristled brush. Then apply the spreadable compound. Apply kneadable compounds manually or using a roller.

To ensure that there are no bubbles in the >cured rubber, always aim the liquid rubber at the same point in the mold when pouring it.

YOU DON'T HAVE TO READ THESE TWO PAGES. BUT IF YOU'RE INTERESTED, YOU'LL FIND SIMPLE DEFINITIONS OF ALL THE TECHNICAL TERMS.

>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

>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 the addition-curing grades

>Catalysis
Mixing either the rubber base and the catalyst or components A and B to obtain a workable rubber

>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

>Cured rubber
Rubber in which cross-linking is complete

>Curing agent
Substance with at least three reactive groups that reacts with >silicone polymers and induces three-dimensional cross-linking

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

>Deaeration
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

>Evacuation
Deaeration of the catalyzed rubber under vacuum

>Elastic, elasticity
Ability of a material to return to its original size and shape after deformation

>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. See also inhibition

>Inhibition, 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

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

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

>Reproducible
Amenable to reproduction

>Reproduction
An exact copy of a model

>Reproduction material
Material used to make a reproduction

>RTV-2 silicone rubber
2-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

>Support mold
A mold made out of a rigid material that prevents a skin mold from being distorted when it is filled with reproduction material or while it is in storage

>T-series catalyst
The second component of condensation-curing ELASTOSIL® M grades which contains the >curing agent and the catalyst

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

>Vacuum
A space largely devoid of air that is produced by extracting the air with a vacuum pump. Proper deaeration of a pourable ELASTOSIL® M grade requires a vacuum with a maximum residual pressure of 20 mbar

>Vacuum pump
Device for extracting air to create 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, vulcanize
See curing

WACKER AT A GLANCE

WACKER
is a technology leader in the chemical and electrochemical industries, as well as an innovative global partner for its customers in key industries worldwide. Our portfolio mix focuses on semiconductor technology, silicone chemistry, specialty chemicals and ceramic materials.

With some 16,600 employees, WACKER generates annual sales of around EUR 2.7 billion. Germany accounts for over 20% of sales, Europe (excluding Germany) and North America (NAFTA) for approx. 30% each and Asia-Pacific + ROW for almost 20%. Headquartered in Munich, Germany, WACKER has 24 production sites worldwide and a global sales network of over 100 subsidiaries and sales offices.

With R&D spending of almost 6% and capital expenditures of over 10% of sales, WACKER is among the top research companies worldwide.

WACKER SILTRONIC

ranks among the world's top producers of hyperpure silicon and supplies leading global manufacturers of electronic devices used in telecommunications and consumer electronics, as well as in the computer, automotive and aerospace industries. WACKER SILTRONIC's product portfolio includes hyperpure polycrystalline silicon, silicon monocrystals and silicon wafers up to 300 mm in diameter.

WACKER SILICONES

is one of the world's top three silicone producers. With a portfolio of over 2,000 products, this division is number one in many global markets. Silicones are the basis for materials offering highly diverse product properties for virtually unlimited applications. These are found in a broad range of industries from the automotive, construction and chemical sectors, through electrical engineering, electronics, cosmetics, consumer care, pulp and paper, and textiles, to mechanical engineering and metal processing.

WACKER SPECIALTIES

is the global leader for high-quality binders and polymer additives. Products such as redispersible powders, dispersions, solid resins, powder binders and surface coating resins are used in the construction, automotive, and paints and coatings industries, as well as by manufacturers of printing inks. Additionally, this division has expertise as a provider of customized solutions in fine chemicals and biotechnology, including building blocks for syntheses in the pharmaceutical, cosmetics and agrochemical industries.

WACKER CERAMICS

is a provider of high-tech materials which fulfill the most demanding requirements. Its product portfolio encompasses advanced ceramics and ceramic powders, functional coatings and microporous insulation materials. WACKER CERAMICS is the world's number one in focused market segments, such as advanced ceramic components used in the mechanical engineering and automotive industries.

WACKER

CREATING TOMORROW'S SOLUTIONS

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