



Faserverbundwerkstoffe®
Composite Technology

A close-up photograph of a hand holding a circular saw blade. The blade is dark grey with a serrated edge and is positioned over a white circular object. A bright blue light reflects off the surface of the blade.

Silicone moulding compounds

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Product	Description	Viscosity mPas (before catalysing, 23 °C, Brookfield)	Density g/cm ³ (DIN 53479)	Hardness Shore A (DIN 53505)
KDSV-25	Casting compound, white condensation-curing two components	19.000 ¹⁾	1.15	25
KDSV M 4503	Casting compound, white condensation-curing two components	40.000	1.16	25
KDSV M 4440	Casting compound, white condensation-curing two components	20.000	1.22	37
KDSV M 4470	Casting compound, red brown condensation-curing two components	10.000	1.44	60
ADDV-25	Casting compound, translucent, addition-curing two components	6.000 ¹⁾	1.05	25
ADDV-42	Casting compound, translucent, addition-curing two components	10.000 ¹⁾	1.05	42
ADDV M 4601	Casting compound, red brown, addition-curing two components	20.000	1.13	28
ADDV M 4641	Casting compound, transparent, addition-curing two components	30.000	1.07	43

¹⁾ after catalysing

	Tensile strength N/mm ² (DIN 53504, S3A)	Elongation at break % (DIN 53504, S3A)	Tear resistance N/mm ² (ASTM D 624 B)	Linear shrinkage % (after 7 days)	Processing time minutes
	---	380	>18	0,5	30 ± 15
	5,0	350	>20	0,5	90
	2,5	200	>3	0	50
	4,5	120	>4	0,8	20 - 40
	---	300	>12	<0,1	30 ± 10
	---	200	>7	<0,1	30 ± 10
	6,5	700	>30	<0,1	90
	4,5	300	>25	<0,1	100

Silicone moulding compounds



Highly flexible moulds of silicone rubber are ideal for the reproduction of complex parts with undercuts. These moulds are **used primarily** in the manufacture of model parts, decorative elements for furniture, reliefs, ornamental candles, architectural models, decorative buttons, dolls' bodies, sealing sections, and reproductions for the preservation of historical monuments.

Master patterns of the usual materials such as wood, metal, plastic, plaster, stone, and wax are highly suitable for making moulds with silicone rubber. Smooth, non-absorbent surfaces, e.g. of plastic or metal, generally do not need release agents (solely silicone adheres to silicone, so the surfaces must be pretreated with R&G priming wax).

The surfaces of **porous models**, e.g. of plaster, wood, or stone, are highly absorbent, so they must be sealed beforehand. The sealants commonly used for this purpose are water-soluble synthetic resins such as methyl cellulose (wallpaper paste), polyvinyl alcohol, acrylic penetrating stopper, nitro primer, etc. The high flexibility of the rubber means that moulds can be made with extreme undercuts.

Mould making

Moulds of silicone rubber can be used to make male casts not only of polyester, epoxy, and polyurethane resin, but also of plaster, wax, and concrete. Special **release agents** generally do not need to be applied to the mould (with the **exception of epoxy resins**).

Moulds of polyester or polyurethane resin are recommended for greater piece numbers.

Amine-hardened epoxy resins attack silicone. The service life of the mould is extended when a thin coat of R&G **priming wax** is applied before the first cast. This **priming wax** was developed specially for surfaces with low wetting properties, e.g. silicone. This release agent also becomes necessary when EP or UP overlay resins are to be applied as the first coat in a silicone mould. Otherwise, the silicone's poor wetting properties could give rise to voids in the form of bubbles or brush marks.

General information

Consistency: This property can be divided into pourable, spreadable, firm-spreadable, and kneadable systems. The viscosity is an approximate measure of the flow characteristics. The higher the value for the viscosity, the thicker the pourable compound or the stiffer the pastiness of the spreadable compound.

The processing time (pot life) and the vulcanisation time are a measure of a system's **reactivity**. Usually the processing time is specified as the period after which the catalysed rubber compound has just become pourable, spreadable, or kneadable. However, where very high demands are placed on flowability, e.g. when the compound is to embed electronic components separated by narrow gaps, the processing time is usually specified as the time needed for the viscosity to reach double the initial value.

As a rule, the vulcanisation times specify only that period after which the rubber has fully cured (to exhibit a tack-free surface) for further processing. In most cases, the final vulcanisate properties are not reached

until the system has undergone vulcanisation a number of days at room temperature. ausvulkanisiert und damit handhabbar ist.

Even when vulcanisates are manufactured at higher temperatures, they generally undergo differing degrees of post-cross-linking during subsequent storage at room temperature. The fastest method for obtaining the final vulcanisate properties is to store the products for several hours at temperatures that are not too high (100–120 °C). This method is so-called **annealing**.

Vulcanisate properties

The most important vulcanisate properties include the **mechanical and electrical properties**.

Of a **vulcanisate's mechanical properties**, the tear propagation strength is one of the key characteristics next to the indentation hardness (mostly specified in Shore A, whereby the higher the Shore A value, the harder the vulcanisate). Tear propagation strengths greater than about 10 N/mm mean that the vulcanisate exhibits a high notch toughness, i.e. a far higher tear and tear propagation strength than the standard mechanical properties.

The **elastic properties** of silicone rubbers maintain within a range of - 50° to + 200 °C. With certain types, this range can be extended to - 100°C.

The resistance against high temperatures is on the one hand depending on the type itself and on the other on the environment it is going to be used in. In general vulcanisates of silicone rubbers stay elastic at extreme temperatures, however the presence of atmospheric oxygen plays an important role. During access of air silicone rubbers are able to permanently withstand temperatures up to + 200 °C. Exceptionally heat resistant types maintain their elasticity at 250 °C for over 1000 h. For a short period of time even + 300 °C are possible. At a heat exposure of over 180 °C and the presence of oxygen cross-linking will occur between the polymer chains.

This irreversible process will show through weight loss, shrinking and increasing embrittlement. It is affiliated with an increase in shore hardness, a decline in tear strength and elongation at break as well as a degradation of tear propagation strength. The domination of aging processes through polymerization or reversion will appear with air exclusion in closed systems.

This applies in particular at the presence of humidity (respectively hydroxyl groups) or organotin compounds which are contained in hardeners of **condensation-curing** silicone rubbers. Therefore close attention has to be paid to completely removing of degradation products from condensation types. In this regard, most of the **addition-curing** silicone rubbers are superior to **condensation-curing** types due to the absence of organotin compounds.

A **vulcanisate's electrical properties** are to a great extent independent of the consistency, reactivity, mechanical properties, and curing (cross-linking) system. However, the type of curing system is an essential factor affecting most of the processing and vulcanisate properties.

There are two types of curing systems:

1. Condensation-curing

KDSV-25, KDSV M 4503, KDSV M 4440, KDSV M 4470

Silicone rubbers from the **condensation-curing** category undergo vulcanisation on the addition of a liquid or pasty hardener from the **T series**, which has been developed for silicone rubber compounds. Different types and added quantities of hardener serve to lengthen or shorten the processing and vulcanisation times. These hardeners and quantity ranges are fixed for every rubber type. Introducing less than the prescribed quantities of hardener (**underdosing**) leads to undervulcanisation: the rubber stays soft or even tacky, the mechanical strength is considerably reduced, and its resistance to the swelling effects of solvents and cast resin constituents clearly suffers.

Introducing a greater amount of hardener than that specified (**overdosing**) gives rise to an excess of catalyst in the vulcanisate. Not only does the rubber's resistance to the separating procedure increase, the vulcanisate undergoes post-curing under the effects of air humidity, with the result that it loses most of its mechanical strength.

Silicone rubbers that undergo **condensation-curing** can be vulcanised at temperatures between 0 and max. 70 °C. It is important to note that temperatures higher than 80 °C cause the cross-linking reaction to switch directions: so-called reversion, whereby the system remains or again becomes tacky or even liquid.

For vulcanisation to take place without problems, what is needed is not only the organotin catalyser contained in the hardener, but also small quantities of moisture in both the rubber compound and the ambient air. The reaction product generated by the cross-linking is a low-concentration alcohol, in most cases ethanol or propanol. The alcohol thus formed must first volatilise out of the vulcanisate before it can be used. This volatilisation leads to a loss in mass, which in turn causes the vulcanisate to shrink along all three axes by as much as 5 % vol.

Storage

For vulcanisation to take place properly (and especially in a thick coat), this category of silicone rubbers, as mentioned above, needs small quantities of water vapour in the rubber compound. So that this moisture added to the compound during its manufacture cannot escape from the unvulcanised rubber, the packaging must be sealed tightly at temperatures between 5 and 30 °C.

When only part of the contents is removed, the packaging holding the rubber compound must be resealed tightly immediately afterwards: it must not remain open for a long time or be stored with a loose lid. Otherwise, undervulcanisation is the consequence, i.e. considerably longer times until the part is ready to demould or develops a tack-free surface, delayed curing in thick coats, and a strong tendency to adhere to the mould. Should **lack of moisture** disrupt vulcanisation in this manner, it can be made to progress properly with a simple measure: simply mix 1–2 g of water for every kilogram of rubber in the unvulcanised rubber compound (without added hardener), and then store this in its tightly sealed packaging at room temperature for at least twenty-four hours. During this time, the water evaporates, saturating the rubber compound with the required moisture in the process.

The hardeners from the T series, on the other hand, react with moisture to form a flocculent precipitate. In other words, when only part of the contents is removed from the hardener's packaging, it must be resealed tightly immediately afterwards. The hardener must be stored in as cool an environment as possible, at best between 5 and 25 °C. Small quantities of precipitate, however, have no effect on the processing or vulcanisate properties.

Hardeners that have been stored for longer than the specified period (over six months) can cut the processing time for the silicone considerably. The contents of packaging must be consumed within the period specified.

2. Addition-curing

ADDV-25, ADDV-42, ADDV M 4601, ADDV M 4641

Silicone rubbers from the **addition-curing** category undergo vulcanisation when the two constituents A and B are mixed.

These two constituents must be **precisely matched to one another** and so are always supplied together, i.e. it is not possible to purchase the one constituent only.

The constituents A and B must be processed exclusively in the prescribed ratio of weights. A different mixing ratio A:B generally gives rise to undervulcanisation with similar consequences to those described above for **condensation-curing**.

Addition-curing silicone rubbers can be vulcanised at temperatures between 10 and 200 °C. This type of cross-linking does not form volatile reaction products, so the cross-linking reaction is not reversed at higher temperatures, nor does the vulcanisate undergo chemical shrinkage as a result of any loss in mass. So vulcanisates that have been made from these silicone rubbers can be used directly after demoulding.

However, the possible applications for **addition-cured** silicone rubbers can be severely restricted and even made impossible should the unvulcanised rubber come into contact with so-called inhibiting substances, i.e. substances whose reactivity suppresses the cross-linking ability of the platinum complex catalyser.

Storage

The constituents of these types should be stored at temperatures between 5 °C and 30 °C in tightly sealed packaging.

Important! Even a minute quantity of the platinum catalyst is enough to initiate a reaction should it (accidentally) come into contact with the constituent containing the cross-linking agent.

In this event, unvulcanised material may contain vulcanised zones with diameters up to several centimetres, or the material may possibly release hydrogen. The material is so susceptible to contamination with the platinum catalyser that the packaging for the constituents A and B should not even be placed next to each other when they are open. When only part of the contents is removed, the packaging must be **tightly sealed** immediately afterwards.

It is imperative that the processor also ensures that tools and equipment used to prepare the constituent containing the catalyser or the mixture of the two constituents do not under any circumstances come into contact with the constituent containing the cross-linking agent. For this reason, we urgently recommend that the tools and equipment used separately to process the respective constituents are provided with different and highly visible markings so that they cannot be confused.

Notes on safety/ safety precautions

The experience gained from several decades of applications involving silicone rubbers has shown that the rubber compounds from both categories of **condensation-** and **addition-curing** may be regarded as neither toxic nor aggressive in the delivered state. For this reason, no special precautions need be taken beyond those specified in the general rules for industrial hygiene.

On the other hand, the hardeners from the T series used to process the **condensation-curing** types may cause irritation when, in the undiluted state, they come into contact with the skin or eyes. Particularly susceptible persons may show allergic symptoms, so the corresponding protective measures must be taken.

Other notes

Unvulcanised silicone rubber residue can be easily removed from receptacles and clothing with grease solvents such as petrol or acetone. The best method for residue in curing pots is to vulcanise it first: afterwards, it can be removed from the curing pot with the minimum of effort.

“Scorched” (prevulcanised) or even fully cured residue, on the other hand, can no longer be dissolved. Instead, it must be removed with a mechanical aid after the residue has undergone prior swelling under the effects of one of the solvents named above. The processor should take this into account when choosing suitable working clothes.

There must be adequate ventilation at the workplace when solvents are handled.

Processing

Silicone rubbers are **highly developed technical products** that require a certain level of knowhow if the full potential of these products is to be utilised and fundamental **errors are avoided in their application**. So before commencing work on processing, you should always convince yourself that you have all the required product information to hand.

Recommended basic equipment

When smaller quantities are processed, we recommend the following basic equipment:

- **Balance** (precision 0.1 g) and measuring vessel or pipette or disposable injector
- Clean **mixing vessels** of metal or plastic (ideally of PE or PP) or cardboard mixing cups
- **Spatulas** of metal, wood, or plastic
- Stiff **short-bristle brushes**
- Mechanical **mixing device** (e.g. drill with paddle agitator)
- Vacuum pump and vacuum vessel (e.g. **desiccator** of glass or plastic)
- Grease **solvent** (e.g. petrol, acetone, MEK)

Preparing the constituents

The pourable compounds or constituents (excluding the transparent types) must be thoroughly mixed before they are removed from or processed in the packaging. This ensures that the fillers that may have precipitated during the storage period are distributed uniformly throughout. Stirring also ensures that types with high tear propagation strength, which may have thickened slightly during storage, regain their optimal flowability.

Dosing the constituents

It is essential that the constituents are precisely dosed. Only meticulous adherence to the mixing ratio ensures reproducible processing and vulcanisation times and, more importantly, the vulcanisate properties required for the respective application. Either the weight (determined with the balance) or the volume (determined with the measuring vessel, pipette, or disposable injector) can serve as the basis for dosing.

In most cases, the processing instructions specify the mixing ratio in parts by weight only, so the volume ratio needed for volumetric dosing must first be calculated from the densities given on the product's information and safety data sheets.

Important! If the catalysed compound is de-aired in the weighing receptacle, the receptacle must be able to hold at least four times the initial volume of the catalysed rubber compound (see the section "Removing trapped air"). In the case of **condensation-curing** silicone rubbers, dosing the wrong quantity of hardener can cause the problems listed below.

Overdosing

- Shortened processing times (extreme overdosing suppresses vulcanisation)
- Tendency to adhere to contacting materials ("primer effect")
- Sharp increase in chemical shrinkage
- Vulcanisates post-cure, and so embrittle under the effects of air humidity
- High tear and tear propagation strengths drop sharply after a short time

Underdosing

- Retarded cross-linking reaction (in extreme cases there is no or only partial curing)
- Tendency to adhere to contacting material ("adhesive effect")
- Soft, limp vulcanisates with low mechanical strength and an exaggerated tendency to swell

In the case of **addition-curing** silicone rubbers, the specific effects of a **wrongly dosed quantity** of constituent B vary, depending on the mixing ratio A : B and on which of the constituents contains the cross-linking agent and which the platinum catalyser. In all cases, both the optimal ratio of polymer to cross-linking agent and the concentration of the catalyser are changed as a result.

The consequences are

- Extended or shortened processing times (with extreme deviations from the specified mixing ratio there is no or only partial curing)
- Soft, limp vulcanisates with low mechanical strength and an exaggerated tendency to swell
- Vulcanisates undergo post-curing (owing to the excess of cross-linking agents)
- Increased susceptibility to inhibiting effects (inadequate quantity of catalyser)

Mixing (catalysing) the constituents

It must be ensured that the two constituents, rubber and hardener, are mixed completely uniformly (homogeneously) when the result is a **condensation-curing** type. Pourable and spreadable products can be homogeneously mixed by hand with the spatula or, for larger quantities, with a mechanical mixing device or an automated mixing and dosing system. Perforated paddle agitators set at a slight angle to the axial plane have proved efficient in mechanical mixing devices, but also toothed discs are used in high-speed mixers (dissolvers).

Important! If the two constituents exhibit too great a difference in their viscosities, e.g. a liquid hardener from the T series must be mixed into the rubber compound, then the lower-viscosity constituent tends to accumulate on the sides of the mixing vessel. So that local overvulcanisation and its negative consequences (inhomogeneous curing or consistency) cannot arise, a spatula must be used to scrape down the sides of the receptacle at short intervals for the whole mixing process – even when a mechanical mixing device is used.

Removing trapped air

When the compound and hardener or the two constituents A and B are mixed in a vessel exposed to air, it is inevitable that a certain quantity of air becomes trapped in the rubber compound. Only in very few cases, however, is the viscosity of the catalysed mixture so low that the full or an adequate quantity of the air trapped in the rubber compound can escape within the respective processing time. Vulcanisates **completely free of air bubbles** are obtained only when pourable, i.e. flowable mixtures (max viscosity 200,000 mPa·s) are de-aired (evacuated) under a reduced pressure (10–20 mbar) in a desiccator or vacuum chamber. During evacuation, the catalysed compound undergoes extreme expansion. So that the rubber compound can expand to the maximum extent in the shortest possible evacuation time, the vessel holding the compound should not be filled to more than a quarter of its capacity. During the evacuation process, the compound first expands and then (provided that the capacity of the mixing vessel is large enough) collapses before reaching the vessel's rim. Should the compound be on the point of spilling over, air must be introduced into the chamber for a short period. This procedure must be repeated until the compound collapses in the hardest obtainable vacuum. The evacuation process is now stopped.

The full duration of the evacuation process should not exceed **five minutes**. Under no circumstances should evacuation be continued until bubbles no longer form: this could cause volatile constituents to escape that are needed for vulcanisation to take place properly. Moreover, too long an evacuation adds to the processing time.

In contrast to pouring compounds, **higher-viscosity spreadable** compounds cannot be de-aired through evacuation. Instead, one of two methods can be applied. The first involves intensive mixing to minimise the size, and therefore the disruptive potential of air bubbles. Alternatively, **a thin, bubble-free coat of a pourable compound** is applied to the contact surfaces (the surfaces forming the cast) and left to prevulcanise slightly (but not until the surface becomes tack-free) before serving as the base coat for the spreadable compound containing air bubbles.

Application

After the de-airing process in a vacuum, pourable silicone rubbers are applied in thin jets as close to the base surface as possible.

If evacuation is not possible, a certain de-airing effect is achieved when the compound is applied in as thin a jet as possible from a greater height.

If, however, the contact surfaces should not exhibit any bubbles at all or the rubber compound is a spreadable type, then the catalysed pourable compound is first of all applied in a thin, bubble-free coat with a stiff short-bristle brush. Once this coat has prevulcanised slightly, but is still tacky, the pourable system is introduced as described above or the spreadable system applied with a spatula. Kneadable compounds are applied by hand or with a roller.

Processing and vulcanisation times

Whether **condensation-** or **addition-curing** types, the processing time or pot life, i.e. the time during which the catalysed rubber compound can be processed without difficulty, depends greatly on the temperature. Higher temperatures essentially shorten the processing time, lower temperatures essentially increase it. A general rule of thumb is that a rise in temperature of about 7 °C halves the pot life, the equivalent drop in temperature doubles it.

A perceptible sign of **incipient vulcanisation is the constant increase in viscosity** (inspissation, drop in flowability or plasticity). For this reason, the pot life should not be utilised to the full extent. Instead, the catalysed compound should be used when it exhibits the lowest possible viscosity, i.e. when it is in a free-flowing or soft-pasty state.

Also the **vulcanisation times** depend on the temperature. This applies less to the **condensation-curing** types than to the **addition-curing** types, whose dependency is greater.

The vulcanisation time is divided further into the time needed for the vulcanisate to yield a tack-free surface, thus allowing e.g. demoulding or safe manipulation of the cast or coated part, and the time needed for full curing. Depending on the temperature, the latter can range from a few minutes in the case of **addition-curing** products to several months in the case of **condensation-curing** types. When vulcanisates have not cured completely, post-cross-linking can cause in the long term any deformation of the vulcanisate to become permanent.

If vulcanisation is accelerated at higher temperatures (Important! Condensation-curing types must not be exposed to temperatures higher than 70 °C, otherwise the cross-linking process may undergo reversion), the vulcanisate, when cooled, experiences a thermally induced dimensional shrinkage based on the rubber constituent's coefficient of thermal expansion. Depending on whether the rubber undergoes thermal expansion in the cross-linked or un-cross-linked state (influenced by such factors as the pot life), the three-dimensional progress of vulcanisation can become distorted when the compound is cooled to room temperature. This applies to both **addition-curing** types and **condensation-curing** types (these latter undergo in addition chemically induced shrinkage). If the greatest dimensional accuracy is required, then either vulcanisation must take place at the subsequent working temperature of the rubber, or appropriate consideration is given to the dimensional changes that are calculated or determined beforehand in preliminary tests.

Disruptions to vulcanisation

Condensation-curing silicone rubbers need small quantities of moisture in order to cure completely and quickly. The consequences of a lack of moisture in the rubber compound are described under the section "Storage".

If the relative humidity of the ambient air is less than 40 %, then the surfaces of the vulcanisate exposed to the air can remain tacky or even liquid. In this event, suitable measures must be implemented (e.g. evaporator, atomiser, moist cloths) to raise the moisture content of the air in the processing environment,

which can then be easily measured with a hygrometer. Adding water to the compound is not a suitable measure in this event.

In the case of **addition-curing** silicone rubbers, there are a number of substances or engineering materials that counteract the function of the platinum complex catalyser and so **disrupt**, or inhibit the **progress of vulcanisation** when they come into contact with the unvulcanised mixture. These substances can be found both on the surfaces of the substrate in contact with the rubber compound (model, mixer tools, etc.) and in the ambient air, e.g. in annealing ovens or hot-curing chambers used for cast resins that release inhibitors when curing.

The following is a list of the most important inhibitors:

- Sulphur, certain sulphur compounds such as polysulphides and polysulfones as well as other sulphurous substances such as natural and some synthetic rubbers (e.g. EPDM)
- Amines, urethanes, and substances containing amines such as amine-hardened epoxy resins, some polyurethanes, etc.
- Organometallic compounds, but specifically organotin compounds, and other substances containing these such as e.g. vulcanisates and hardeners for **condensation-curing** silicone rubbers
- Various natural and synthetic oils, greases, waxes, and resins as well as other substances containing these such as e.g. a large number of release agents and almost all plasticine brands

It is therefore urgently recommended to conduct the corresponding preliminary tests which can verify that the materials coming into contact with the unvulcanised **addition-curing** silicone rubber do not inhibit vulcanisation. Liquid zones, tacky or perceptibly softer vulcanisate surfaces in the contact area, or severely retarded curing are indications of the presence of inhibitors.

Preparing the vulcanisate

Before a vulcanised silicone rubber can be put to use in a specific situation, a number of conditions must first be fulfilled or specific measures implemented depending on the curing system as well as the vulcanisation and field conditions.

Vulcanisates of **condensation-curing** rubbers must be absolutely free of the volatile alcohol formed during the cross-linking reaction before they can be:

- Subjected to plastic deformation operations, e.g. for manufacturing gaskets; otherwise, the compression set may be as high as 100 %, i.e. the vulcanisate no longer exhibits a restoring force
- Heated to temperatures over 90 °C; otherwise, the cross-linking reaction will reverse, causing the rubber to soften or liquefy in thicker coats or a closed system
- Sealed tightly against alcohol vapour, e.g. in cast encapsulations for electronic components; otherwise, there will be severe corrosion to metals and plastics, in the long term at room temperature as well
- Brought into contact with chemically aggressive or physically swelling agents, e.g. as moulds for processing cast resins; otherwise, the max number of demouldings will be drastically reduced as a result

The alcohol content of fresh **condensation-cured** vulcanisates can be reduced to zero when they are stored for several days at room temperature (the general rule of thumb is approx. twenty-four hours for every centimetre of coat thickness to the next exposed surface) or for several hours at a max temperature of 70 °C (here the rule of thumb is approx. six hours for every centimetre of coat thickness to the next exposed surface). The vulcanisate must be stored with as much of its surface area exposed as possible.

Vulcanisates of **addition-curing** silicone rubbers do not contain any reaction product and so in principle can be put to use immediately they have completely cured. This process, however, may also take several days at room temperature, so one recommended procedure is subsequent heat treatment at 100 °C over several hours to bring cross-linking to a close, in particular when the lowest possible compression set is required. It is a generally accepted fact that heat treatment of several hours, at temperatures no less than the intended working temperature, yet no greater than 180 °C, is particularly effective as a measure for maximising the service properties of both alcohol-free **condensation-** and **addition-curing** vulcanisates.

Bonding various materials

Silicone rubber adhesives that undergo vulcanisation when exposed to air humidity can be used to bond fully cured silicone rubbers to other materials. The products ELASTOSIL® E 4 (firm) and ELASTOSIL® 43 (flowable) have proved particularly effective in this respect.

First of all, a thin coat of one-component rubber is applied to the pretreated and adequately primed surface of the material to be bonded and then to the surface of the silicone rubber vulcanisate. Both surfaces can now be joined without any further delay. If necessary, the parts can be pushed into place if they are misaligned. Any excess glue extruded from the sides of the join is then scraped off. In most cases, there is good adhesion as early as one to two hours later, depending on the applied thickness of the rubber vulcanisate, the moisture content of the ambient air, and the temperature, all of which greatly affect the vulcanisation time for the adhesive. The odour of acetic acid emitted by the ELASTOSIL® E types when undergoing cross-linking disappears once vulcanisation has completed.

When the two parts to be joined are silicone rubber vulcanisates, ELASTOSIL® E 4 or ELASTOSIL® 43 are spread as thinly as possible over each of the contact surfaces cleaned previously with acetone or petrol. The parts can now be joined without any further delay. Please also see the information provided earlier on bonding RTV-2 silicone rubber vulcanisates with non-silicone materials.



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