



SILICONE RUBBER CENTRIFUGAL CASTING DISCS

Centrifugal casting enables costume jewellery, e.g accessories, buttons, buckles, as well as toys such as model boats and cars, tin soldiers medals etc. to be economically produced in small quantities, with little capital outlay.

PROPERTIES

Because of the soft, plastic character of silicone rubbers, even complex master models, with deep undercuts can be embedded in these discs without difficulty. The excellent flexibility of the vulcanised rubber, coupled with the marked release effect of the silicone rubber enables the castings to be demoulded quickly and without damaging the mould. Thanks to the material's superior heat resistance, numerous castings can be produced even when using high melting alloys or solid models. When casting extremely flat objects such as medals, coins or tin soldiers, the finished mouldings will be 10-20% thinner than the master model because of the high clamping pressures that are needed to prevent molten alloy spurting out of the two part mould if it has been made from the very flexible pink grade. In such cases it is advisable to use the harder blue grade, which offers sufficient resistance to the clamping pressure, so that the mould cavities are not deformed so much. The blue grade is successfully employed where deeply undercut master models are manifolded.

PROPERTIES

Colour	:	<u>pink</u>	<u>blue</u>	<u>grey</u>
Density(gcm ³)	:	1.52	1.57	1.62
Shore A hardness	:	60-65	70-75	75-80

How to order

Due to the large range of customer size requirements discs are only made to order. The following information is required with your order.

<u>Grade</u>	:	Colour/hardness
<u>Discs diameter</u>	:	max 600mm
<u>Discs thickness</u>	:	max 15mm - min 6mm
<u>Number of sets</u>	:	one set = two discs

The discs are supplied with a polyethylene film. If discs thicker than 15mm are required they may be plied up to the desired thickness.

STORAGE STABILITY

The unvulcanised discs should be stored as cool as possible and out of direct sunlight, and not kept for more than **9 months**.

PROCESSING

To produce castings of the desired dimensions, it should be remembered, when making the master models, that silicone rubber shrinks on cooling. Shrinkage varies between 3.5 and 4.5% depending on the vulcanising temperature.

Flat master models are fixed to the bottom disc by applying slight pressure. In the case of models with deep undercuts, or with solid models, these must be embedded by removing some rubber, hollow spaces being filled up again as necessary. Because of the plasticine like consistency of silicone rubber, this is quickly and easily done. To prevent the two mould halves sticking together during subsequent vulcanisation, the surfaces should be treated with a release agent such as talc.

Different methods may be used to avoid displacement of the vulcanised discs during the pouring of the alloy. One mostly impresses small, cone-shaped metal caps with the models. Because of the different coefficients of the linear thermal expansion of silicone rubber and metal, the impressions produced by these fixing caps in the top discs are smaller than the metal fixing caps themselves. When the two discs are assembled, the resultant fit is not perfect so they must be pressed together with more pressure than normal when centrifuging.

We would therefore recommend using fixing devices which take the form of hexagonal bolt heads or small washers. Another technique which has proved useful is to drill a number of holes into the fully vulcanised pair of discs before these are separated, and to push accurately fitting metal cylinders into these holes so that they are deeply embedded in one of the discs and protrude by at least 5mm. Although the disc mould is then more difficult to open and shut than with cone shaped fixing caps – whose advantage is that they facilitate faster operation – the two halves are much more firmly fixed, thereby avoiding the formation of flash or loss of alloy during centrifugal casting. In this way, too, displacement of the two mould halves with respect to one another is totally prevented. It has been found useful to build up a cone-shaped raised area in the centre of the bottom disc. This is done with the help of a truncated cone whose top diameter should be 35mm. In this way the pouring hole is accurately filled and fixed during the moulding operation is achieved.

VULCANISATION

To vulcanise the mould, the two discs, master models and, if necessary, the fixing devices, are placed in the mould box. The disc with the pouring hole is then pressed down slightly and the metal cover placed in position.

In the case of complicated models with deep undercuts it is advisable to place the mould box into the cold press and leave it there for about 10 minutes at 0.5 – 0.8 Mpa. If, on opening and separating the mould, it is found that not all the activities have been completely filled, this can be remedied. To achieve extreme

accuracy of reproduction the technique can also be used in all other instances. In this way the flowing of the silicone rubber which occurs at the start of vulcanising under pressure can be anticipated.

To vulcanise the mould, the cold mould box is placed into the preheated press, the necessary minimum temperature being 165°C, although one normally heats the press up to 180°C to speed up vulcanisation. The pressure at the beginning should be about 1Mpa. Within the next few minutes the pressure will increase slightly or considerably, depending on the heating efficiency of the press and on how quickly the heating unit is able to compensate the heat loss due to the cold mould box. If the pressure increases very slowly, it is manually increased every two minutes, until it has reached about 1.5-2 Mpa. If there is a considerable increase in pressure, due to fast heating and expansion of the silicone rubber, no manual pressure increase is necessary. If the pressure is 1.5-2 Mpa after about 10 minutes, timed from the moment the press is closed, then this will increase until the end of vulcanisation, to about 4-5 Mpa. If the pressure rises to above 5 Mpa during the course of vulcanisation, then it must be reduced, for such a high pressure could cause the discs to warp.

The following general points should be observed:

If the pressure during vulcanisation was too low, the rubber will be full of small bubbles. If, on the other hand, the pressure was too high, the two discs will move with respect to one another and the mould parting line will no longer be plane.

After vulcanisation is complete, the press is opened and the mould box removed. The mould is allowed to cool down for at least 15 minutes so that it is easier to take out.

If, on removal of the vulcanised discs, these are found to stick to the inside of the vulcanising pot, the walls of the box should be coated with a release agent before the next vulcanisation.

Since the discs usually fuse at the edges during vulcanisation, due to slight flow of rubber, the thick skin is cut with a sharp knife after the fixing devices have been fitted as described above.

After the runners have been cut into the discs, the mould is ready to use. In the case of solid mouldings, the runners should be very thin and arranged radially so that the air can escape to the surroundings when the alloy is poured in.

If an oven is available which can be fed with preheated fresh air, we strongly recommend that the vulcanised discs be post-cured for about 4 hours at 200°C. If the hot alloy is poured into moulds which have not been post cured, there will be localised "post curing", resulting in slight warpage of the discs and displacement. This is why it is best to post-cure beforehand.

VULCANISATION TIME

The time required to fully vulcanise the mould is dependent on two main factors:

1. Vulcanisation temperature
2. Total mould thickness

Other factors effecting the time include heat loss from the press and mould box, ambient temperature of the silicone rubber etc. It is therefore necessary for each operation to determine their own optimum vulcanisation times.

The following may be used as a starting point.

Vulcanisation temperature:

180°C Top & bottom plates

(Start to finish)

Total thickness

Time

12mm

20 min

25mm

45 min

30mm

60 min

It should be noted that over vulcanising (within reason) will not damage the silicone, however under vulcanising will cause damage to the mould. Therefore start with a longer vulcanising time and gradually reduce until the optimum is obtained.

Alloys

Suitable alloys include tin/zinc and lead based products containing added antimony, copper and/or cadmium. Alloys containing equal parts of tin and lead are worth mentioning. They are very useful in that they have a low melting point and will remain in a liquid form for some time. Because of their high density however (app. g/cm³), they are not suitable for all applications.

For further information and placing of order, please contact:

Tel: (011) 474 1903 or email: info@silex.co.za

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