



TECHNICAL SOLUTIONS THROUGH EXPERTISE AND PARTNERSHIP

SILICONE KEYPAD CAPSULE

GUIDE

Melrose Nameplate & Label Co. manufactures silicone keypads, which are ideal for a range of products. The average person comes in contact with silicone keypads, also known as "*elastomeric keypads*," almost every day. Because of their low cost, design flexibility, and reliability, silicone keypads are used in various industries, including medical, marine, and military, in addition to consumer applications, such as TV remotes and electronic games.

Additional favorable qualities include:

- Resistance to both high and low temperatures (-55° C to 250° C)
- Minimal noise generation due to soft and elastic contact structure
- Minimal abrasion & high resistance to sulfur dioxide and oxidation even in heavy humidity
- Designed for snap ratio and tactile feedback
- Comes with Translucent color, which is excellent for backlighting
- Multi-color designs easily accommodated
- Water and contamination resistant
- Coating options for increased durability chemical and environmental resistant

Designing a Silicone Keypad with Melrose

As mentioned above, there are many favorable qualities of using silicone keypads. As a manufacturer of silicone, which can be utilized in so many applications, Melrose offers several levels of involvement when it comes to your silicone keypad project. Our team also uses quality assurance and control measures throughout the process to ensure each keypad is completed to your standards.

No matter where you are in your project, Melrose can help:

Yet to start designing the keypad?

Supply Melrose with dimensions and desired snap ratio for a complete design. Not sure what snap ratio you are looking for? We can walk you through it or go with an industry-standard amount of 40-60%.

Already have the keypad designed?

Melrose can review the design and offer suggestions/tweaks for improving the function, fit, and feel.

Need to integrate a keypad into an already designed product?

Supply us with the assembly model of the product and we will integrate a keypad based on your requirements.

Have a keypad you love from another product of yours?

Send us the reference keypad for re-engineering, and we'll match the function and feel.

Creating Silicone Rubber Keypads

Much like plastic molding, silicone keypads can be very adaptable and multifunctional. In terms of adaptability, raw silicone can be made with a specific hardness, color, and level of transparency. Each of these characteristics is customized per a customer's needs.

Once the raw material is created with the desired hardness, color, and transparency, it will go through one of two machine types; injection molding or compression molding machines. Due to cost constraints, most keypads and gaskets are compression molded.

To give you a visual, think of a compression mold as a giant waffle maker. There is a top half and a bottom half which compress a carefully cut and weighed portion of silicone material. Once the mold is preheated to the correct temperature, the mold is then closed under extreme pressure (150 - 250 tons).

During the molding and compression time when the tool is closed, the silicone fills up the entire mold cavity and is then vulcanized. Vulcanizing is the hardening process; molecules are transformed into the desired shape. Once the tool is opened, the machine operator uses compressed air to remove the components from the tooling.



Designing for Snap Ratio & Tactile Feedback

As mentioned above, designing silicone keypads for specific snap ratios and tactile feedback is one of the many favorable qualities of silicone.

Like membrane switches, a user/operator needs to recognize when she fully pressed a key. This action is done when the operator depresses the key, which collapses the webbing and connects the contact area on the bottom of the key to a circuit or mechanical type key below. Then once pressure is removed, the webbing returns to its neutral position.

The differential between the pressure, combined with the movement, creates tactile feedback and can be designed optimally by engineers using the proper snap ratio.

To better understand the snap ratio, it is important to know the ratio is determined by actuation force (the force required to collapse the membrane/web of a rubber switch, also referenced as F1 in the formula below) and contact resistance (F2).

$$\frac{F1 - F2}{F1}$$

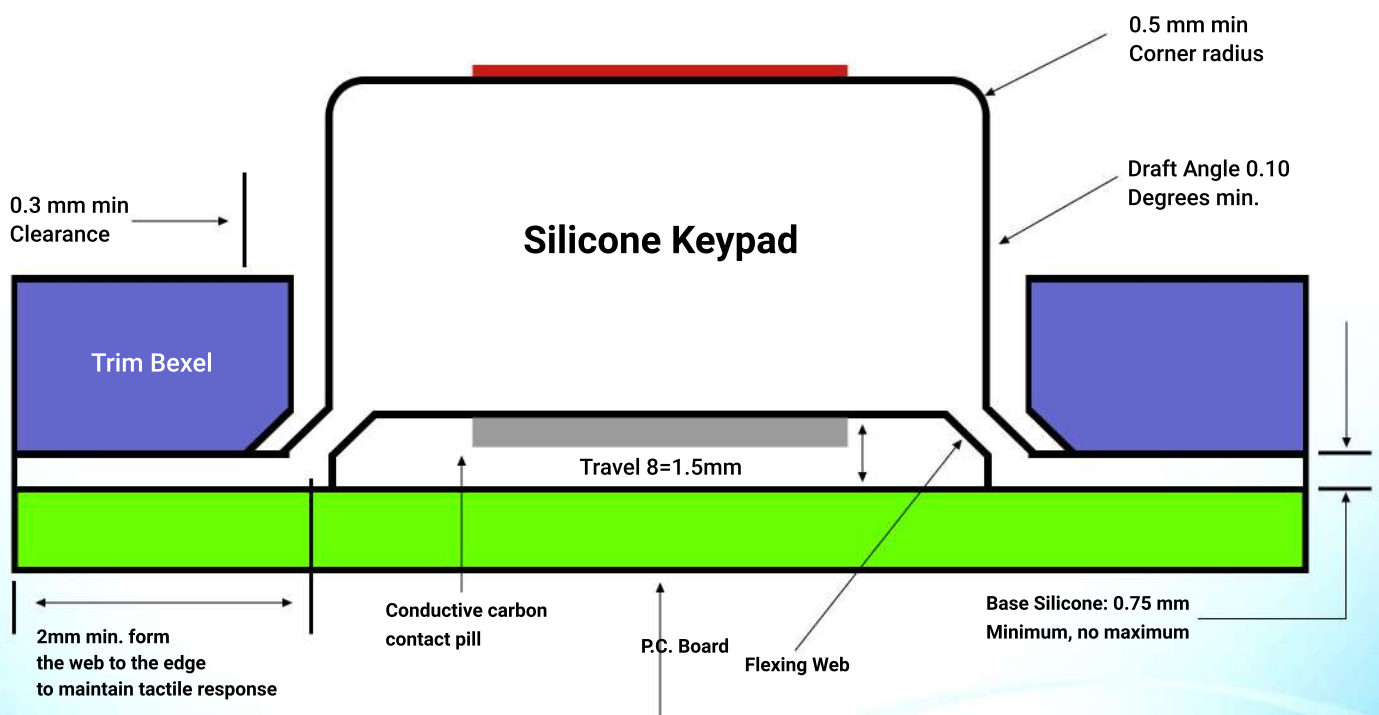
The recommended snap ratio to maintain is 40% - 60%; if dropped below 40%, the keys will lose tactile feel but have an increased life. Loss of tactile feel means the user will not receive a 'click' feedback during actuation. Since most applications require a positive tactile feel and a long life, it is best to design for an actuation force of 125 - 150 grams and an accompanying snap ratio of 40% - 60%.

Since silicone is an adaptable material, the membrane shape and size can be designed to achieve a variety of actuation forces and tactile responses. Additional customization can be achieved by changing the contact stroke, actuation force, key shape, and material hardness. For instance, to create taller or wider keys, the keypad must be designed with a higher actuation force.

Making an Electric Contact

To make a proper connection with the Printed Circuit Board (PCB), it is necessary to use a conductive carbon contact. The contact can be printed carbon or a pre-formed carbon piece known as a “pill”. Printed carbon contacts are sufficient for most constructions. A conductive carbon contact pill can also be used but adds some cost.

Carbon pills are known for long life (>10 million actuations) and low resistance (<100W). Additionally, the pills come in various shapes but are usually circular, with diameters ranging from 1.5 - 10 mm and thickness from 0.4 - 0.6 mm.



Get in touch with us !

Our specialists will work with you to understand your application, identify suitable materials, and provide services that will allow you to move from design to mass production.



Silicone Keypad Design Guide

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