mekoprint

Shaping keypads

How to shape keypads with silicone rubber?

HMI design guide series

Applications and design options

Silicone rubber keypads are used across industrial, medical, automotive and consumer electronics – wherever durability, flexibility and tactile control matter. The material is a soft elastomer with high resistance to temperature extremes, chemicals and mechanical wear.

Keypads are made using compression moulding, which allows for complex shapes such as curved surfaces, undercuts and integrated sealing gaskets.

Silicone is naturally translucent, and its light diffusion can be tuned by adjusting pigmentation and wall thickness – making it well suited for backlit designs.

Image: Silicone rubber keypad with fine, compression-moulded details.

Design parameter model

Designing a keypad starts with understanding available space, product geometry and requirements. We assess the following **key design parameters**:

- keypad size and support
- button shape & size
- tactile feedback
- light placement & design
- artwork
- integration & sealing

Each parameter influences the others. Designing the right keypad is about balancing these factors and making the right compromises. In most cases, this involves a few design iterations to get the best overall result.

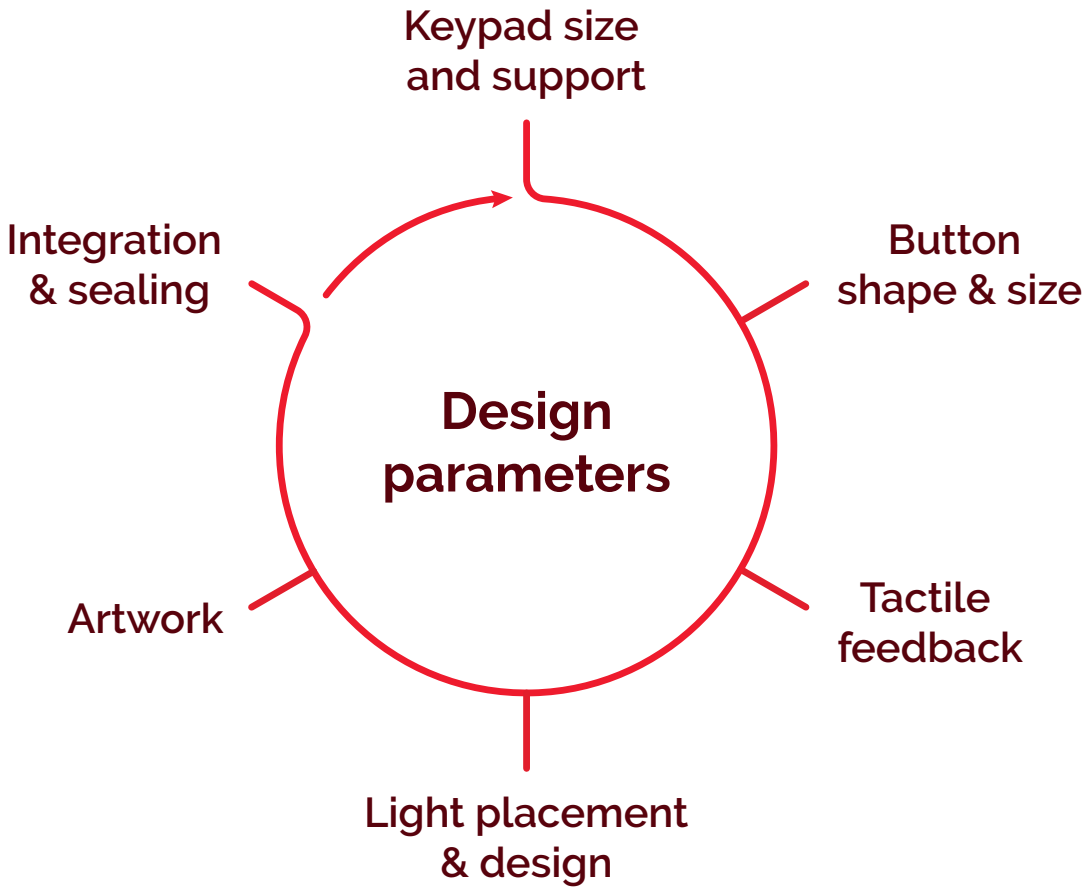

Image: Design parameter model, used for mapping the different criteria and their importance when designing a keypad

Design guidelines

These are the most essential design guidelines for silicone rubber keypads. They are based on real project experience and summarise what matters most early in the process. Each point is explained in more detail on the following pages.

DESIGN PARAMETER

Keypad size and support

When defining the size and layout of a silicone keypad, three factors are especially important: spacing between the buttons, space around the edge of the keypad, and the overall thickness. These all influence how stable the keypad is – and how it feels when used.

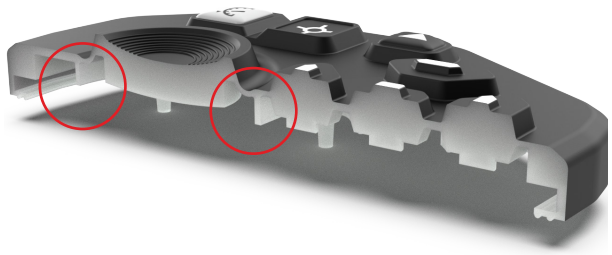

Image: Supporting walls around a key

Supporting walls

When the keypad area is small, consider adding silicone support walls between and around the buttons. A general rule is to use 1 mm thick walls to improve stiffness and avoid wobbling. These walls should be placed where buttons are otherwise unsupported by the housing or PCB.

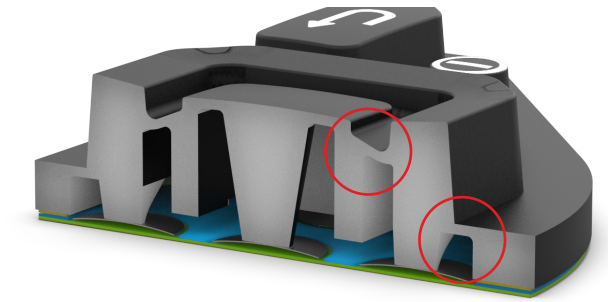

Image: Top and bottom web around a navigation key

Top and bottom web design

In tight layouts, flexibility can be optimised by shaping the silicone's web – the thin, bending area that allows the button to move. A **top web** can be placed inside the button, especially when button spacing is limited. A **bottom web** can be shaped outside the button to provide a better tactile experience for smaller buttons. Combining both can improve tactile behaviour when space is limited.

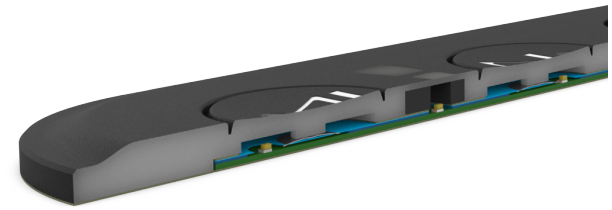

Image: Cross section of a 4mm thin keypad construction

Small thickness

Even in slim designs, it's possible to achieve a clear click and good light diffusion. But it requires careful control of web thickness, actuator geometry and dome characteristics. The web is typically 0.5 mm thick, but this depends on the silicone hardness and overall keypad layout.

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DESIGN PARAMETER

Button shape and size

The shape and size of the buttons influence both user experience and mechanical performance. With silicone keypads, moulded shapes allow for endless design variations – from soft, concave surfaces to raised navigation clusters.

Image: Example of different ways to group buttons

Button spacing and grouping

Button spacing and grouping help reduce accidental presses and support intuitive use. Clear separation between buttons — whether through spacing, raised areas or recessed zones — improves orientation and makes it easier to identify functions by touch alone.

Image: Examples of concave and convex buttons

Recessed or flush design

Recessed or raised buttons, concave or convex shapes help users feel the orientation without looking. This improves the tactile clarity of the keypad. Flush buttons offer a sleek look and good wipe-clean properties but require well-defined web shapes to deliver satisfying feedback.

Image: Example of raised button area in a keypad

Raised button area

A flush button design can be combined with a raised button area to ensure both a sleek look and good tactile feel. This approach adds height to the button itself while keeping the surrounding surface smooth, which supports easier cleaning and makes it simpler to apply artwork.

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DESIGN PARAMETER

Click & tactile feedback

How a button feels is critical for a keypad's usability. Tactile feedback ensures the user can confidently operate the device, even without looking. Several parameters influence this:

Image: Example of 3mm button thickness with smooth sides

Thickness of the buttons

As a rule of thumb, aim for a button thickness of around 3–5 mm to maintain a good tactile feel without feeling the metal dome underneath. Thicker buttons may be harder to clean, so smooth surfaces and angled button sides can help.

Image: Example of high buttons with supporting walls for back-mouting through a front panel

Button height and supporting walls

The button height and silicone structure shape how the click is perceived before you even specify the dome or snap. For rugged applications, slightly taller buttons combined with supporting silicone walls provide clearer tactile feedback while keeping the buttons stable. If buttons are too thin and unsupported, they may feel wobbly and provide poor click definition.

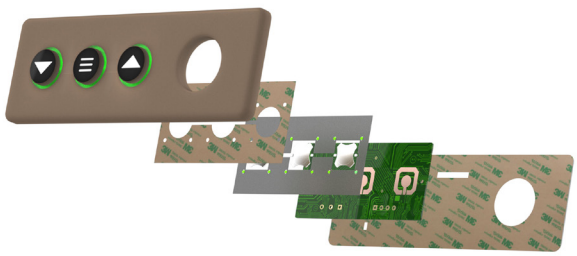

Image: Different layers in a keypad

Anatomy of the click

If you want to define the click in more detail, consider its underlying anatomy, with four key tactile factors:

- Force (how hard to press)
- Travel (how far the button moves)
- Snap ratio (how sudden the click feels)
- Audio feedback (the sound of activation)

For full overview, see our guide for tactile feedback.

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DESIGN PARAMETER

Light placement

Integrating light in silicone keypads requires careful design. Light diffusion depends on material thickness, pigmentation, and LED positioning, and often benefits from several prototype iterations to fine-tune the result.

Image: Pigmentation change to avoid hotspots

Pigmentation and light diffusion

Silicone's translucency can be adjusted by adding milky-white pigments. Higher pigmentation improves light diffusion and reduces visible hotspots from LEDs, but may also affect colour rendering and brightness., Test prototypes with different pigment levels to find the right balance.

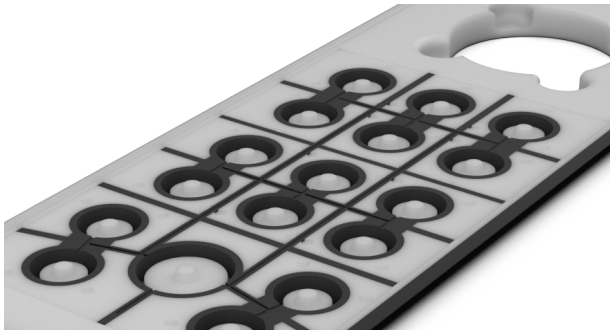

Image: Examples of black silicone rubber light blocks inserted in buttons

Light blocks

Moulded light blocks (solid-colour silicone inserts) help prevent light bleeding between symbols or button areas. These require extra space: typically 1 mm for the block itself, plus 1 mm clearance on each side for silicone stability. This affects button spacing, so compromises on LED positioning may be needed.

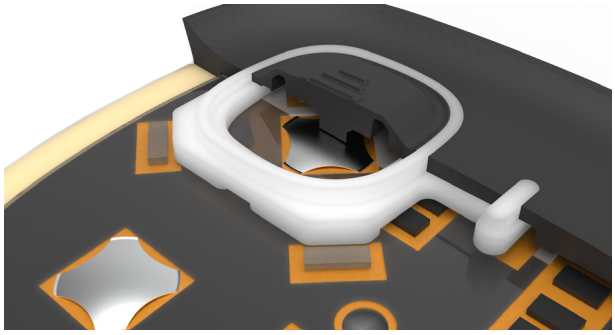

Image: Example of position of LEDs around the light window

LEDs away from window

Positioning the LEDs further away from the illuminated window — either to the side or vertically — helps reduce hotspots and achieve more even light distribution. In compact designs, this can be limited by space, so you may need to balance placement with the use of milky-white silicone to improve diffusion. Always consider moving LEDs sideways instead of only increasing thickness.

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DESIGN PARAMETER

Artwork

Artwork can be created with screen-printing, laser-etching, or with the dead-front effect, where symbols stay hidden until backlit. Plan early whether the icons should emit light or stay opaque.

Image: Example of screen-printing of icons on the flat surface of buttons

Screen printed icons and symbols
Screen-printing is best suited for flat button tops. On raised or shaped buttons, only the top area can be screen-printed, as the printing process cannot reach curved or angled sides. Masking and spray-painting is possible but often leaves uneven edges.

Image: Example of laser-etched icons in an underlying white colour

Laser etched icons and symbols
Areas of the silicone can be laser-etched after painting to reveal a second paint layer in a different colour. This makes laser-etched icons precise, durable, and ideal for symbols that must stand out clearly.

Image: Example of dead-front effect for icons

Dead-front effect
Artwork does not always have to be printed or painted. It can also be created with light, only becoming visible when illuminated. This is known as the dead-front effect, where icons remain hidden until backlit. The effect is made by laser-etching through the surface paint down to the transparent silicone underneath.

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DESIGN PARAMETER

Integration and sealing

Depending on product demands, you can achieve up to IP67 sealing with silicone-based solutions, using gaskets, lips or adhesive. Silicone keypads allow for different sealing solutions depending on space, mechanical strength and cost.

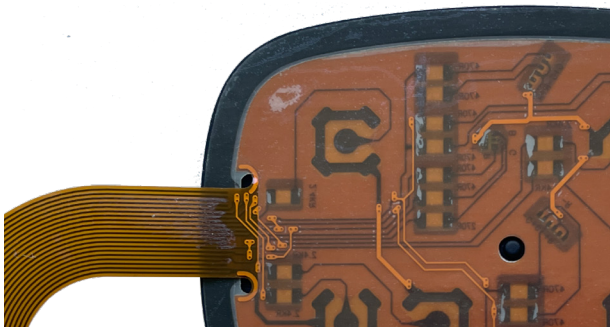

Image: Example of moulded sealing gasket in a silicone rubber keypad

Sealing gasket
By using special silicone adhesive with enough surface area, an IP67 rating can be achieved. By rule of thumb, a 5mm adhesive gasket is required. The rear surface is then adhered to a flat surface, ensuring a strong and reliable fit.

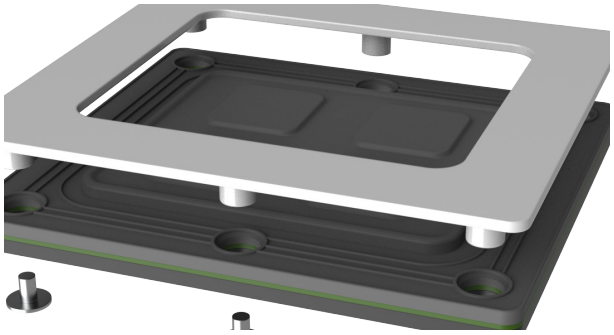

Image: Example of a sealing lip moulded as thin lines around the keypad edge

Sealing lip
A sealing lip can be integrated into the outer edge of the keypad. This lip is compressed against the housing, creating a simple yet effective barrier against water and dust, while also allowing the buttons to remain flush-mounted.

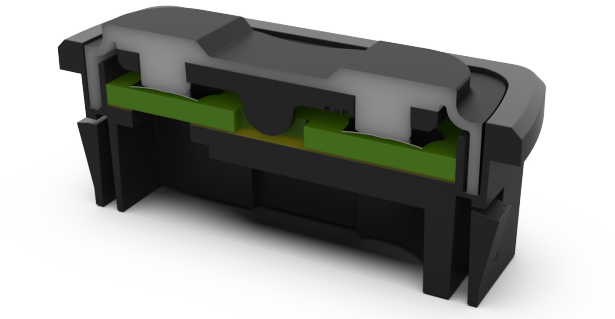

Image: Cross-section of a 2-button keypad showing sealing by glueing between silicone rubber and housing

Sealing by glueing
Where space is limited, gluing can be a good option. By applying adhesive in a controlled section between the silicone and the plastic housing, you can achieve a waterproof bond even in tight designs.

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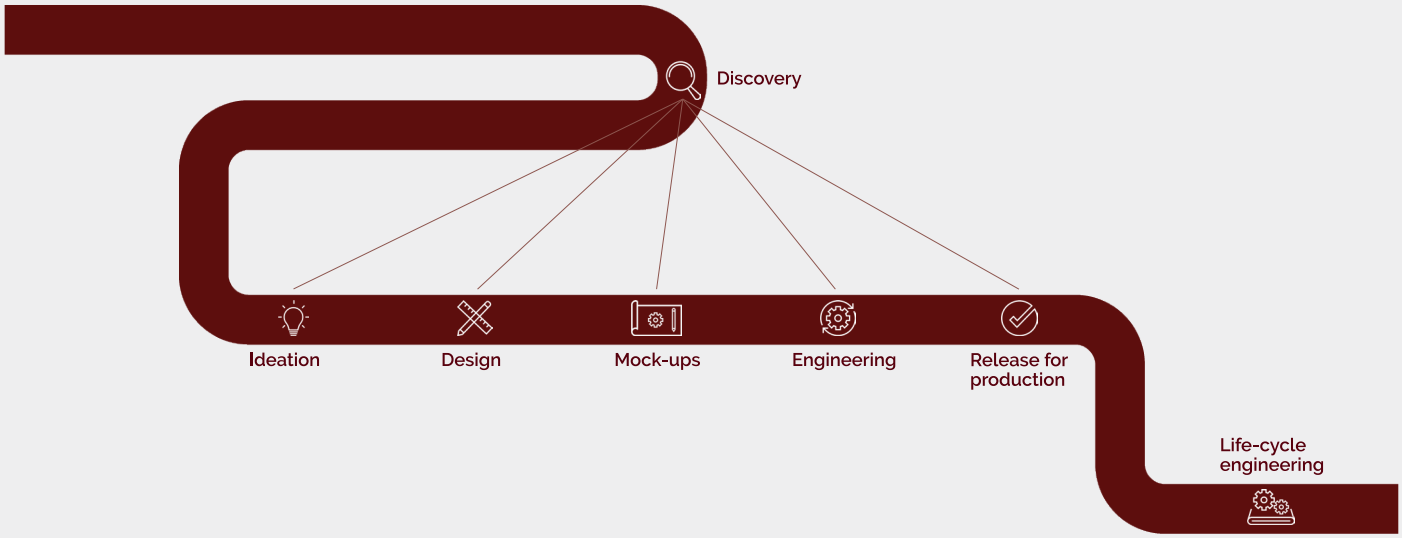
HMI design services

We offer design and engineering services for your HMI solution. Whether you're facing time constraints, resource limitations, or simply need specialised HMI expertise, our specialists are ready to integrate into your development efforts seamlessly.

Our HMI services are structured into distinct development stages, allowing you to select and purchase service packages tailored to your current needs. This modular approach ensures you get exactly the support you require, when you need it.



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