N&H Technology GmbH

SILICONE RUBBER KEYPAD

System supplier for HMI operating units

ENGINEERING | PRODUCTION | LOGISTICS

COMPLETE SOLUTIONS & ASSEMBLIES

KEYBOARDS & BUTTONS

CABLE ASSEMBLIES & CONNECTORS

MOLDED PARTS & TOOLMAKING

TÜVRheinland ZERTIFIZIERT
Management System ISO 9001:2015

N&H Technology GmbH

2001

Foundation of N&H Technology GmbH with 4 employees in Krefeld.

2012

Construction of a new company building in Willich with its own test laboratory and logistics warehouse.

2013

Opening of the N&H office in Shanghai.

2021

New warehouse extension with 470 additional pallet spaces.

2023

Majority shareholding in SNT Technology Co., Ltd. Own production of input solutions.

2025

51 employees, 13 of whom hold a university degree.

- Your expert for input devices since 2001.
- Over 5,000 completed customer projects
- Long-standing partnerships with leading companies from various industries.
- Own development & exclusive production for maximum flexibility
- Certified processes for the highest quality.

ABOUT N&H TECHNOLOGY

Since our founding in 2001, N&H Technology GmbH has established itself as a leading full-service provider of custom electromechanical assemblies and components.

Our focus is on the development and manufacturing of custom input devices (HMIs) that meet the highest standards of quality and efficiency.

We offer comprehensive manufacturing solutions through an established supplier network in Asia, which is project-specific coordinated in collaboration with our subsidiary in Shanghai.

Our partners meet industry-specific standards such as DIN ISO 9001, ISO 14001, IATF 16949, and DIN ISO 13485. Our own testing and inspection laboratory at our location in Willich complements our strict quality control processes.

In 2023, we expanded our expertise in the field of membrane keyboards through the majority acquisition of the highly specialized FoShan SNT Electronics Technology Co., Ltd. in China. This allows us to address our customers‘ individual requirements even more precisely and offer high-quality solutions.

Our customer base includes leading companies from the automotive, medical technology, telecommunications, industrial automation, building control systems, and other industries. Long-standing partnerships and a high level of customer satisfaction distinguish us.

Our employees are the heart of N&H Technology and the key to our success. We nurture our international, family-oriented team and create an environment that strengthens personal development, innovation, and collaboration.

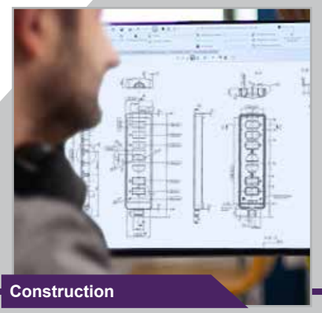
N&H Technology stands for innovation, quality, and reliability – your trusted partner for electromechanical solutions.

Modernity meets history

Since the turn of the millennium, the site of the former Becker steelworks has been transformed into a diverse business park where carefully restored monuments alternate with modern architecture.

WHAT WE DO

Engineering support



Construction

Procurement & Production

Buffer storage *(option)*

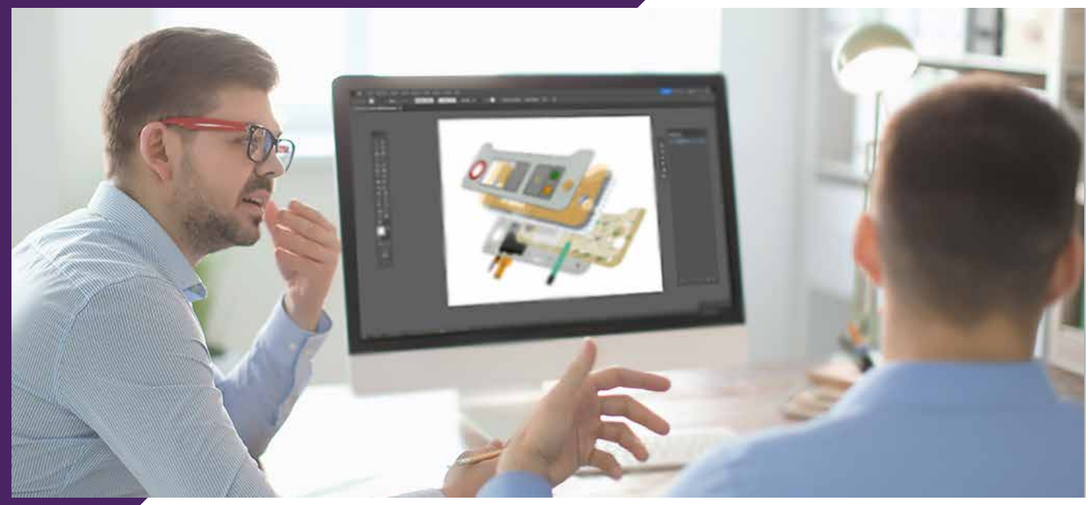
Logistical processing

Assembly

Product

We develop and manufacture customized products for various industries and provide our customers with comprehensive support from the initial idea through to series production. Our portfolio includes electromechanical input units and all components of electronic products, including housings, displays, keyboards and cable assemblies.

Our services range from advisory development and feasibility studies to cost estimates, prototype construction and material selection, right through to cost optimization and product design. We also create technical drawings and, if required, take on the complete design.



WHAT WE OFFER

Technical support

- Support from the concept phase to series development
  Feasibility studies
- Suggestions for improvement
- Advice on material selection and production methods
- Development of cost reduction options

Development & design

- Development of components, molded parts, assemblies and complete solutions
- Sketching, conception and preliminary design
- Design in 3D / 2D CAD
- Optimization of existing customer templates
- Presentation of product views in the form of realistic 3D renderings
- Creation of production documents such as technical drawings and parts lists
- Prototype construction using 3D printing & silicone casting

N&H Laboratories

- Project-specific final testing
- Electromechanical tests
- Optical / acoustic tests
- Material tests
- Surface resistance, volume resistance, conductivity measurements
- Technical problem analysis, also for third-party products

Purchasing

- Outsourcing options for your supply chain
- Procurement of third-party components

Logistics

- Complete logistics handling
- Buffer storage possible at N&H Technology in Willich / Germany

YOUR PROJECT

We are your reliable partner in every phase of your project - from the initial design to series production. Our aim is to provide you with comprehensive support and ensure the success of your project.

YOUR REQUEST

We would be happy to provide you with a non-binding quote tailored to your individual project. We need the following information:

- Technical drawings, sketches or samples
- Technical specifications
- Details of the desired equipment extras
- Required quantity, annual requirement or term

As soon as we have received this information, one of our experienced engineers will contact you as soon as possible. To protect your sensitive data, it is necessary to sign a Confidentiality agreement (NDA) is a matter of course for us.

PERSONAL ADVICE AND MEETINGS

We are always available for technical advice - by telephone or in person by appointment. A personal meeting is often particularly valuable for complex or new projects in order to precisely understand your requirements and needs and offer you the best solution.

Flexible meeting options:

- Visit us in Willich, or we will be happy to come to you.
- If you prefer an online meeting, we offer flexible options via various platforms for efficient communication.

We look forward to supporting you in the implementation of your projects and achieving success together.

N&H Technology GmbH
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D-47877 Willich
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info@nh-technology.de

REFERENCES

Our customer list includes well-known companies from various sectors, including the automotive industry, medical technology, telecommunications, industrial automation, building control technology and many more. We have a successful, long-standing working relationship with many of them.

COMPLETE SOLUTION

A typical product example is a customer-specific input device which, in addition to the keyboard element, includes a housing, a display and the complete connection technology, including cable assembly.

SILICONE RUBBER KEYPADS

INFO

N&H PRODUCT RANGE

Customized components

KEYPADS

- Silicone Rubber Keypad
- Membrane Switch
- Caoacitive Keypads
- Touch-Systems

BUTTONS & SWITCHES

- Pushbuttons
- Piezo Buttons
- Status/Signal Lamps
- Microswitches

CABLE ASSEMBLY

- Cable harnesses
- Data cables
- Coaxial cables
- Special cables
- Single cables

CONNECTORS

- Magnetic connectors
- Spring contact plugs
- Special connectors

PCB

- Flex & Rigid Circuits
- Single layer, double layer, multilayer

FURTHER

- Protective bags
- Battery contacts

We also offer a wide range of standard components, which you can select and request directly from our online catalog!

katalog.nh-technology.de

Standard Components

- Spring contacts / Pogo pins
- Connectors
- High current connectors

- Stainless steel keyboards
- Hygienic keyboards

- Micorswitches
- Pushbuttons, Piezo Buttons
- Status Lamps

- LC-Displays (TFT)

- Buzzer, Transducer
- Speaker, Microphones

Customized moulded parts

PLASTICS

- Precision & large parts
- Single and multiple injection molding

RUBBER

- Protective covers
- O-rings, seals
- Precision parts

2K / 3K PARTS

METAL

- Heat sinks
- Die-cast parts
- Stamped, turned and milled parts
- Deep-drawn parts
- Battery contacts

GLASS

- Front Glasses
- Molded Glass Panes

KEYPADS

SILICONE RUBBER KEYPAD

Silicone keypads have always been one of our core competencies and we provide you with detailed support and advice on the equipment and choice of material. We can also take on the complete development and design of a suitable silicone keypad for your application.

The individual, classic silicone keypad is still one of the most widely used switching elements in the electronics and automotive industries. As the central component, it triggers a direct switching function on the underlying circuit board and determines the haptics, the visual and tactile impression and the electrical behavior via the integrated contact elements. In addition, the safety mat often performs a sealing function on the PCB.

APPLICATION

Silicone keypads are often used in devices and instruments where simple and reliable operation is required. They are used, for example, in remote controls, industrial control systems and electronic measuring devices. In addition, silicone keypads enable noiseless operation, which is an advantage in some areas of application such as medical technology or sound engineering.

FLEXIBILITY
Silicone keypads are extremely flexible and can be produced in a variety of shapes and designs. In addition, the keyboards adapt perfectly to the housing construction.

RESISTANT
Silicone keypads are highly resistant to wear, scratches and other damage. They are also resistant to moisture, dirt, chemicals and thermal influences.

EASY TO CLEAN
Thanks to the water-repellent properties of silicone, silicone safety mats are easy to clean. This is particularly important in environments where hygiene plays a role.

DURABILITY
Their long mechanical service life of up to 10 million switching cycles makes them a durable solution with a low maintenance risk.

TACTILITY
Silicone keypads offer excellent tactile feedback. The force-displacement behavior can be flexibly selected from 20g - 500g, the button stroke from 0.3 to 5.0 mm. The buttons can also be manufactured with different heights and contours to provide an improved user experience.

ELECTRICAL CONTACTING
A wide range of implementation options for electrical contacting - from cost-effective carbon printing to high-quality metal contact pills with a current carrying capacity of up to 2A. The use of metal snap domes or a tact switch is also possible.

LIGHTING
Spot or homogeneous backlighting of the keyboard or individual keys is possible without any problems.

LOW NOISE
Silicone keypads generally produce little noise when the buttons are pressed. This can be particularly important in environments where quiet operation is required.

BUTTON DESIGNS
Individual key colors and shapes can be easily implemented in a mat. Metal and plastic keycaps in various shapes and colors are available for high-quality keyboards.

Reference of a complete solution with silicone switching mat

SILICONE RUBBER KEYPAD

TECHNICAL TYPES

Silicone rubber keypads offer the flexibility for customization with a wide range of technical features, allowing them to be precisely tailored to meet the specific design and functional needs of diverse electronic devices and applications. This customization empowers customers to address the unique requirements of their projects.

SAMPLE SET

Our sample set contains this silicone keypad with a variety of sample buttons and constructions, as well as a membrane keypad with various equipment options. The set can be ordered from us for a nominal fee.

Silicone Rubber Keypads offer a high degree of adaptability to your design preferences, showcasing remarkable flexibility. They provide the flexibility to incorporate diverse key shapes, individual key colors, and the seamless integration of multi-colored keyboard lighting with ease.

They offer a wide range of technical variations, including:

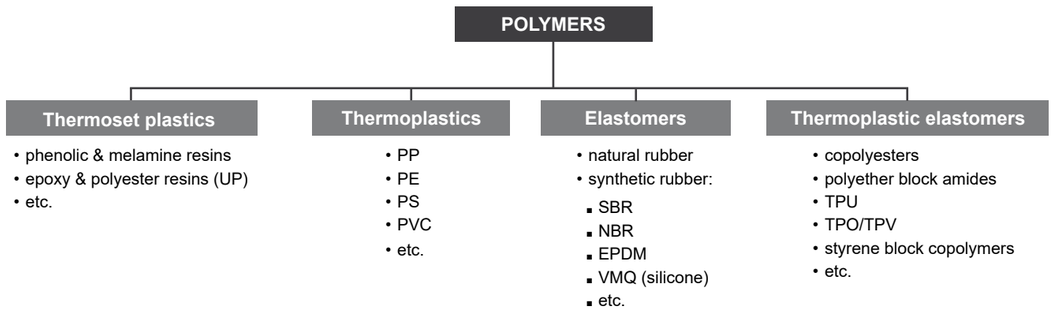
- Keypads with Carbon Pills & Metal Pills
- Keypads with Polydome & Metaldome
- Multiple molding color options
- Keytops with PU or Epoxy Coating
- Silver-painted or Chrome-plated surfaces
- IMD film technique
- Rubber and plastic keys with integrated Light Guide
- Rubber combined with plastic keys
- P+R technique
- Metal keys with backlit legends & Metal Tops
- Integrated EL and LED Backlight functionality
- Laser engraving on rubber keys / plastic caps for Night Design
- Translucent materials for Night Design with positive & negative printing

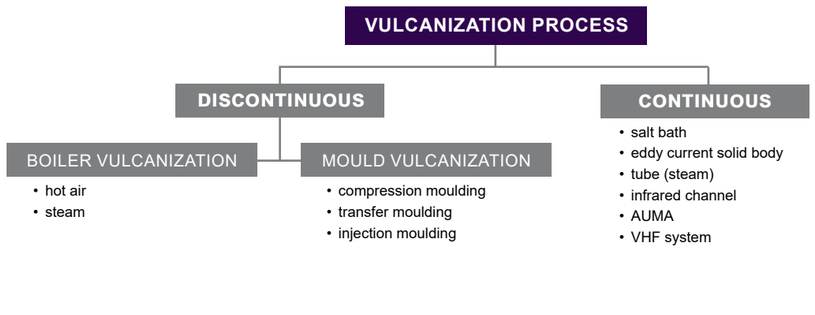
SILICONE RUBBER KEYPAD

MATERIAL

Silicone

Silicone, the basic material of Rubber Keypads, belongs to the elastomers, a subgroup of polymers. Elastomers can be natural rubber and synthetic rubber as well. For a long time natural caoutchouc was the rubber industry´s sole basic raw material. It is produced mainly from the juice of the rubber tree. Synthetic caoutchouc is a product of organic chemistry. Starting material is crude oil.

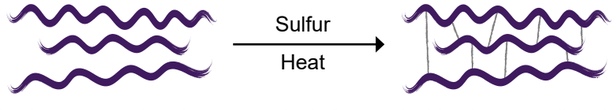




CAOUTCHOUC / ELASTIC RUBBER

Caoutchouc is a sticky, robust, and pliable material composed of lengthy, flexible, and ductile molecular chains. When subjected to force, these molecular chains shift relative to each other, causing caoutchouc to deform. Upon force reduction, the material generally retains its altered shape.

However, through vulcanization and the introduction of specific components, these molecular chains interconnect and become permanent. Consequently, the original plastic caoutchouc transforms into rubber with elastic properties. When subjected to force in this state, the molecular chains change shape without sliding past each other. After the force is removed, they largely revert to their original state



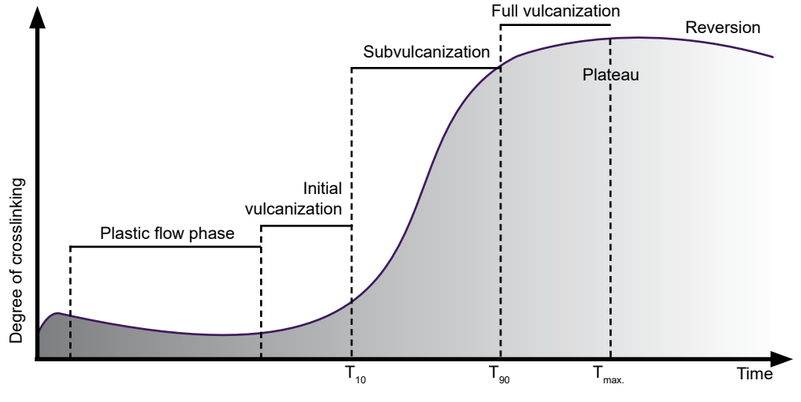
Vulcanization is a process that changes synthetic & natural rubber into cross-linked polymers

ELASTOMERS

The application of heat to the plastic raw materials triggers crosslinking, a process known as vulcanization. This chemical process involves interconnecting the molecular chains, providing the material with its enduring high elasticity. Once rubber is vulcanized, it cannot be reshaped or recycled by reheating. The key benefits of vulcanized rubber include its remarkable elasticity and durability, even when subjected to prolonged thermal and mechanical stress. Furthermore, its viscoelastic properties remain intact across a broad temperature range.

The key parameters in vulcanization are temperature and time, and they must be synchronized to achieve optimal vulcanization for specific parts. Higher vulcanization temperatures result in shorter curing times, which ultimately reduce manufacturing costs.
However, excessive temperatures can lead to process reversal, particularly when precise time control is challenging. Additionally, demolding becomes more challenging at elevated temperatures. The type and size of the keypad are also critical considerations.

Thicker parts require longer curing times at relatively lower temperatures to ensure complete and uniform vulcanization. To economically produce keypads while ensuring optimal rubber vulcanization, a Post Curing Process is incorporated into the standard procedure for Silicone Rubber Keypads. Post Curing also serves to remove uncombined constituents and eliminate rubber colors.



SILICONE RUBBER KEYPAD

PROPERTIES

Silicone

Silicone is a remarkable material prized for its ability to thrive in extreme temperatures, its flexibility, chemical resistance, electrical insulating properties, and biocompatibility. It is a safe, non-toxic material that can repel liquids, is highly durable, and can be made transparent. These qualities have made silicone a cornerstone in industries ranging from aerospace and automotive to medical devices and consumer products, where it excels in various applications.

Silicone can be made transparent or translucent, making it suitable for optical and lighting components.

PHYSICAL PROPERTIES

	Conductor	Insulator
Density (g/cm³) *DIN 53479*	1.2	1.1 - 1.4
Hardness (Shore A) *DIN 53505*	65 ± 5	30 - 85 ± 5 *(55 ± 5 typical)*
Tensile strength (N/mm²) *DIN 53504*	6.0	5.0 - 9.0
Elongation at break (%) *DIN 53504*	170	115 - 600
Compression set (%) *DIN 53517*	20	11 - 22

ELECTRICAL PROPERTIES

Insulation resistance at 250V (MΩ) *DIN 53482*	> 100
Dielectric strength (kV/mm) *DIN 53481*	23 - 27
Contact bounce (ms)	≤ 12
Conductor volume resistivity (Ω•cm)	2.5 - 5.0
Insulator volume resistivity (Ω•cm)	> 2 x 10^{14}

MECHANICAL PROPERTIES

Actuation force (cN)	20 - 500	*180 ± 50 typical*
Snap Ratio (%)	< 80	*50 ± 10 typical*
Stroke (mm)	0.3 - 5.0	*1.1 ± 0.1 typical*
Operating life (cycles)	1 x 10^{5} - 3 x 10^{7}	*2 x 10^{6} typical*
Operating temperature (°C)	- 40 ~ + 85	*typical*
Storage temperature (°C)	- 60 ~ + 120	*typical*
UL flammability	HB and 94V-0	*HB typical*

Silicone keypads adapt to the desired construction.

RESISTANCE

Silicone rubber resists damage from chemicals and food products in the short term, but prolonged high-temperature contact can affect it. It doesn't corrode, thanks to the absence of aggressive agents like sulfur or plasticizers. Brief contact with oils and fuels has minimal impact on its properties. Adjusting the silicone formula can manage continuous exposure to these substances. Additionally, silicone rubber maintains its color and physical properties when exposed to sunlight and weather conditions.

Short-term exposure to these media poses no harmful effects:

Solvents:	**Acids:**
Aceton	Acetic Acid 5%
Butyl Alcohol	Hydrochloric Acid 10%
Ethyl Alcohol	Nitric Acid 10%
Isopropyl Alcohol	Phosphoric Acid 10%
Mineral Spirits	Sulfuric Acid 20%

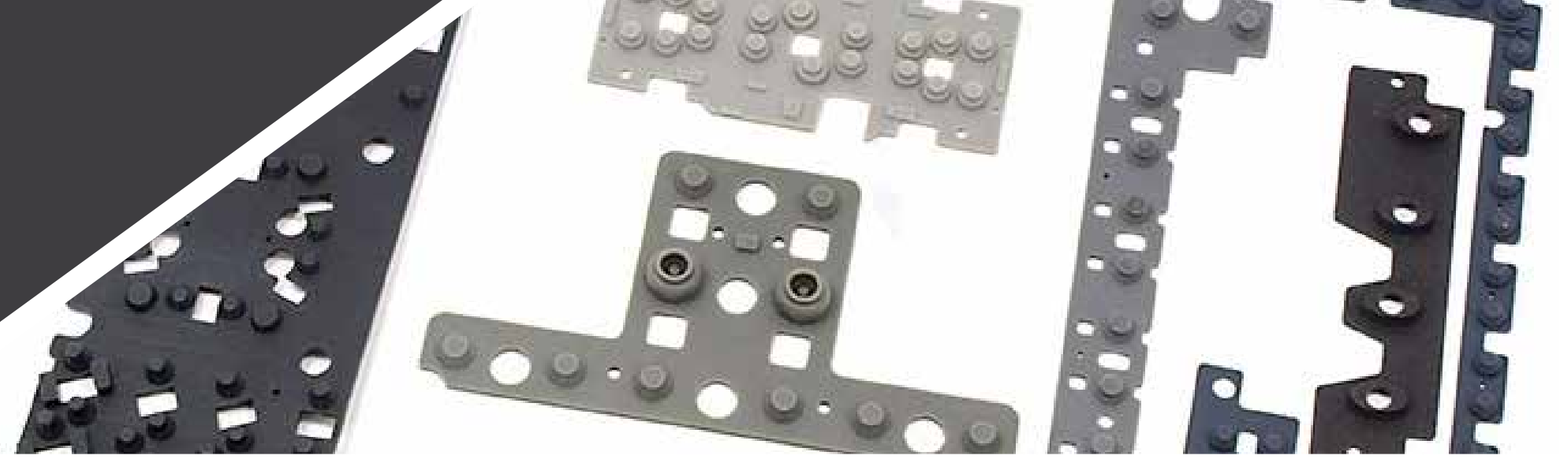
Bases:	**Food Products:**
Ammonium Hydroxide	Beer, Wine, Liquor
Potassium Hydroxide	Cola Syrup
Sodium Hydroxide	Coffee
	Vinegar
	Water & Steam

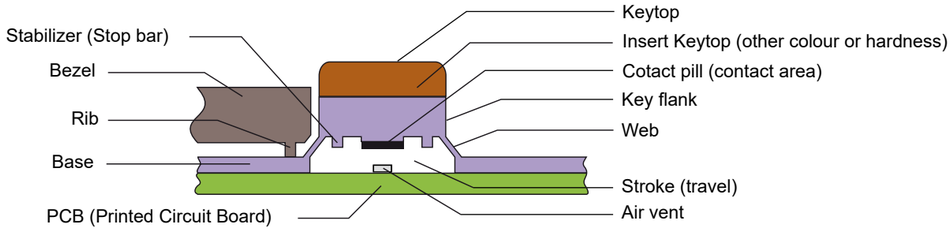
Due to their resistance to many chemicals, silicone rubber keypads are also suitable for industrial and medical applications.

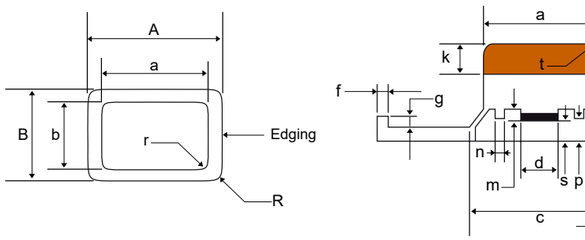
SILICONE RUBBER KEYPAD

TECHNOLOGY

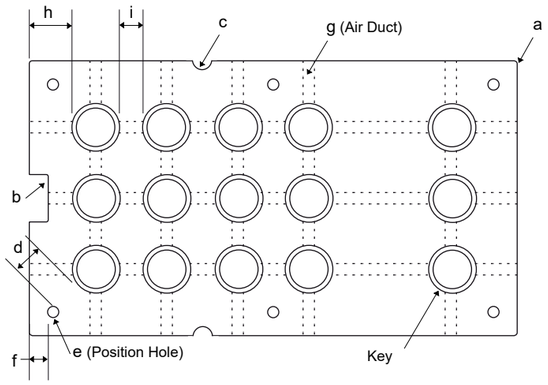
STRUCTURE & DIMENSION







A - a ≥ 0.4 mm	e ≈ 0.8 - 1.2 mm
B - b ≥ 0.4 mm	f ≥ g / 2
a - d ≥ 1.5 mm	l ≥ 1.2 mm
c - a ≈ 2.0 mm	k ≥ 1.5 mm
H ≥ s + 0.4 mm	m ≥ 0.6 mm
p - s ≥ 0.15 mm	n ≥ 1.0 mm
R > r	r ≥ 0.4 mm (R)
	t ≥ 0.3 mm (R)



a ≥ 1.0 mm (R)	f ≥ 2.0 mm
b ≥ 0.5 mm (R)	g ≈ 1.0 mm wide; 0.3 mm deep
c ≥ 2.0 mm	h ≥ 2.0 mm
d ≥ 1.2 mm	i ≥ 1.5 mm
e ≥ 1.5 mm (Ø)	

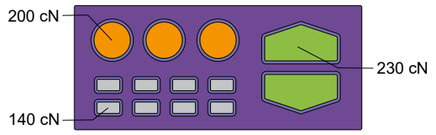
In applications where the keypad is completely sealed, positioning holes (e) are not permitted and ventilation can be achieved through air ducts (g) between the keys, i.e. the ventilation openings should not lead to the outer edge of the keypad.

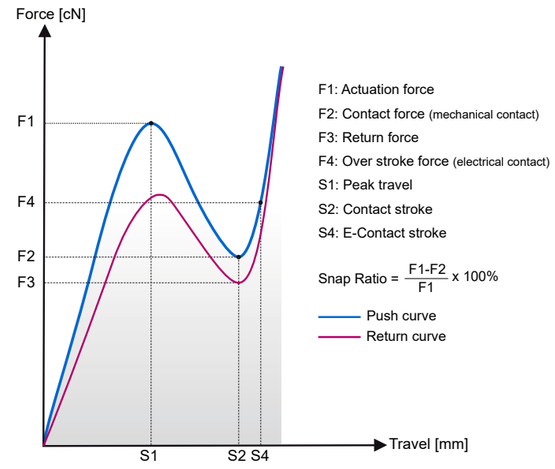
FORCE-TRAVEL DIAGRAM

The drop in force from F1 to F2 gives the tactile sensation. The higher this ratio, the stronger the tactile feel. On the other hand, a higher snap ratio means a lower restoring force F3, which can lead to key jamming.

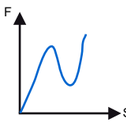
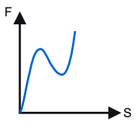
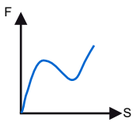
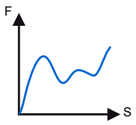
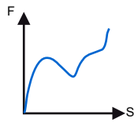
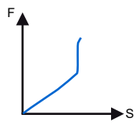
In the case of polydomes or metal domes, the tactile feel is concise and strong even though the snap ratio is nominally low, as the force drop is fast and the force drop curve is steep.

The actuation force should be defined in relation to the size of the keys, especially if the keys are very different in size. In our laboratory we can create force-displacement diagrams.





KEY SHAPES & CHARACTERISTICS

Type	Flat Cone	Single Cone	Single Bell	Double Cone	Double Bell	Flat Bell
Curve						
Force Range	30 - 350 g	30 - 250 g	30 - 200 g	30 - 90 g	30 - 250 g	20 - 80 g
Stroke Range	0.5 - 3.0 mm	0.7 - 2.0 mm	0.5 - 3.0 mm	2.0 - 4.0 mm	1.0 - 2.5 mm	0.3 - 1.0 mm
Life Cycles (x10³)	200 - 2,000	200 - 2,000	1,000 - 5,000	5,000 - 20,000	1,000 - 20,000	1,000 - 30,000
Typical Uses	Telephone, Remote Control, Automotive, Calculator, etc.	Telephone, Remote Control, Automotive, Calculator, etc.	Telephone, Remote Control, Measuring Instruments, etc.	Computer, Typewriter, etc.	Telephone, Test Instruments, Typewriter, etc.	Computer, Calculator, Remote Control, Typewriter, etc.

SILICONE RUBBER KEYPAD

DESIGN RECOMMENDATION

SPECIFICATION DETAILS IN THE DRAWING

NEEDED SPECIFICATIONS

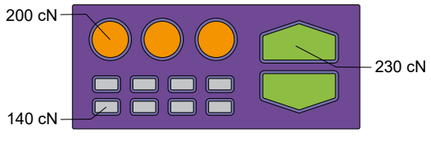
In addition to the dimension definitions of the keypad, the drawing should incorporate the following specifications:

1. Actuation force (F1) in cN with specified tolerance.
2. Snap Ratio (%) with a tolerance of ± 10%.
3. Minimum return force (F3) in cN.
4. Stroke (S2) in mm with a tolerance of ± 0.1 mm.
5. Minimum expected life in cycles.
6. Contact type.
7. Material color(s) in RAL, Pantone, or NCS.
8. Legend color(s) in RAL, Pantone, or NCS.

The shape and dimensions of the web will be determined by the tool designer.

FORCE DEFINITION

The Actuation Force should be defined in proportion to the size of keys, especially when the keys have considerably different sizes.



DOUBLE SNAP KEYS

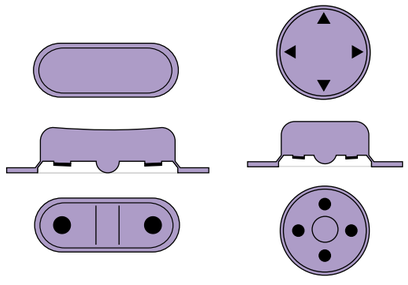
For guidance and solutions in designing double snap keys, please reach out to N&H Technology.

LONG KEYS

Longer keys pose a higher risk of wobbling and jamming compared to circular and rectangular keys. N&H offers solutions to mitigate these issues.

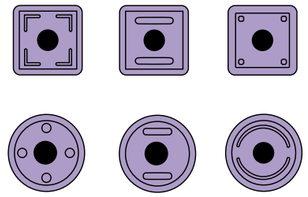
ROCKER KEYS

For Rocker and Cursor Keys, kindly submit the PCB Contact Circuit to N&H for approval.



STABILIZER (STOP BAR)

When the contact size is significantly smaller than the key size, it becomes necessary to use stabilizers. This helps reduce keytop wobbling.



STRETCHING JOINT

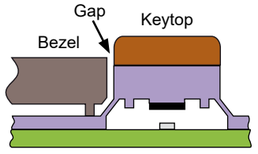
The Stretching Joint is essential for rubber keypads with larger dimensions, as it helps compensate for assembly tolerances.

SEPARATING GROOVE

The Separating Groove allows the rubber keypad to be easily divided into sections.

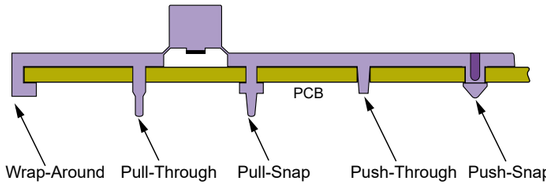
GAP BETWEEN KEYTOP & BEZEL

If the initial definition of the gap between the keytop and bezel is uncertain and requires clarification during the project, N&H will furnish specific procedural details.



MOUNT BOSS

For manufacturing purposes, maximizing the diameter of the mounting boss is advantageous.



Wrap-Around & Push-Through

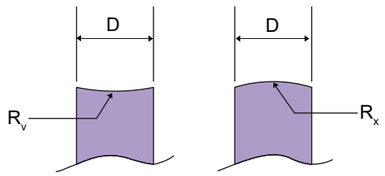
SILICONE RUBBER KEYPAD

DESIGN RECOMMENDATION

SPECIFICATION DETAILS IN THE DRAWING

KEYTOP PRINTING RADIUS (SILKSCREEN)

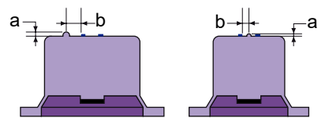
Printing can be applied to both concave and convex keytop surfaces.

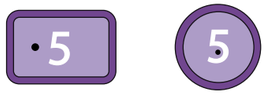


R_v = D + 1 mm, R30 min. **R_x** = D + 1 mm, R20 min.

KEYTOP „5“ WITH ORIENTATION DIMPLE

The Orientation Dimple can potentially affect the quality of Silkscreen Printing. For the definition of dimensions a and b, as well as the shape of the Dimple, please get in touch with N&H.





CHOICE OF COLOURS

Adding another rubber color is straightforward and cost-effective, while introducing an extra printing color involves a whole new printing process, making it more expensive. As a result, opting for an additional rubber color is the more affordable choice than adding another legend color.

KEYTOP COATINGS

The durability of printed legends can be improved through surface coating. PU Coating provides a matte touch feel and ensures optimal finger grip. Epoxy Coating, on the other hand, offers a plastic-like appearance and can be either matte or glossy.

- Matt silicone spray (MSS)
- PU
- Epoxy (Standard / UV-resistant)
- Others

SILICONE RUBBER KEYPAD

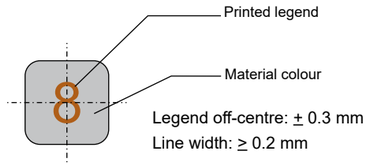
DESIGN RECOMMENDATION

LEGENDS & NIGHT DESIGN

ILLUMINATION OPTIONS

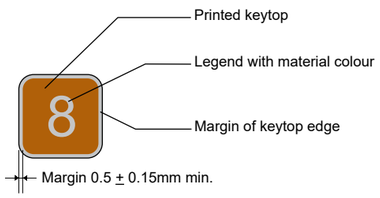
POSITIVE PRINTING

The keytop and the key flank can be backlit by using transmissive materials.



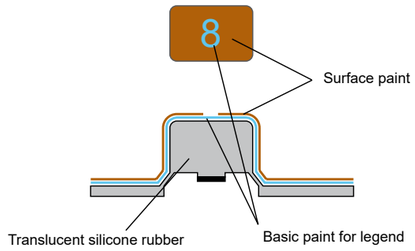
NEGATIVE PRINTING

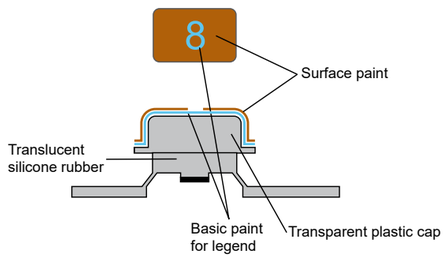
Transmissive material is used to illuminate the legend, the edge margin of the keytop, and the key flank.



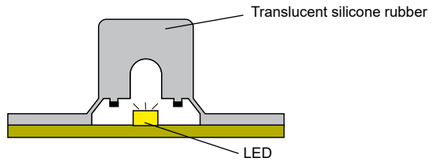
LASER ENGRAVING LEGENDS

The surface paint in the legend area is removed by directing a laser beam onto it. The basic paint, responsible for the legend color, serves as a layer that allows light to pass through, while the surface paint acts as a barrier to light. When the basic paint is omitted, the legend color is determined by the color of the key material itself.

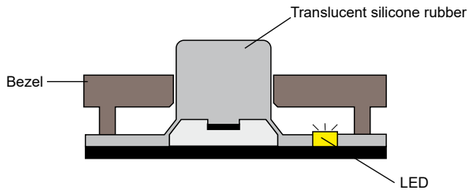




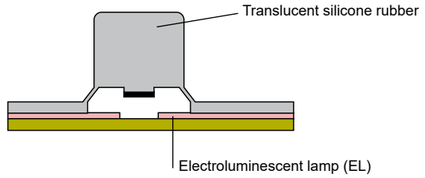
CENTER LED ILLUMINATION



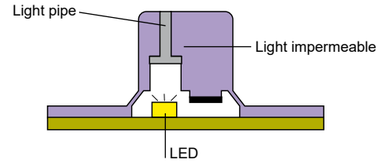
SIDE LED MOUNTING



EL BACKLIGHTING



LIGHT GUIDE INTEGRATION



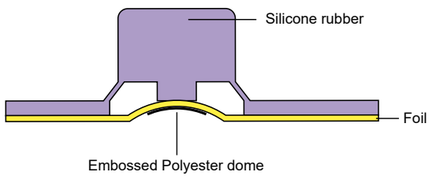
> **i** To prevent the dark color of the Carbon Contact from showing through translucent silicone rubber, you can either pre-print the contact area in white before Carbon Dip Printing or opt for Carbon Pills with white printing on one side.

SILICONE RUBBER KEYPAD

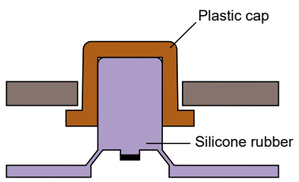
TECHNICAL OPTIONS

Silicone rubber keypads offer various technical options and features for customization and functionality. These technical options can be combined or customized to meet specific design and functionality requirements for various electronic devices and applications.

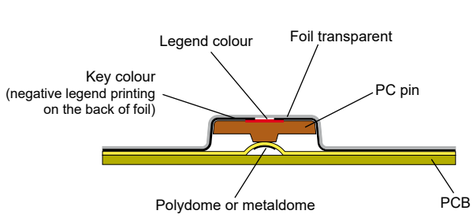
WITH POLYDOME



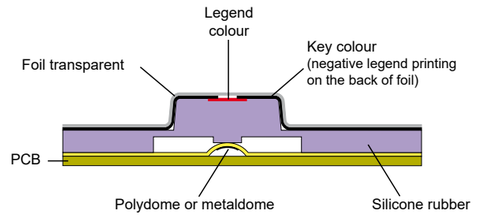
WITH SNAP-ON PLASTIC CAPS



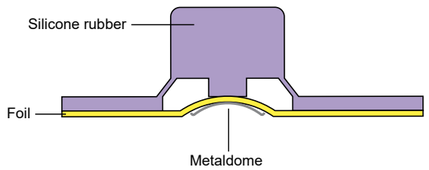
IMD-FILM WITH POLYCARBONATE PIN

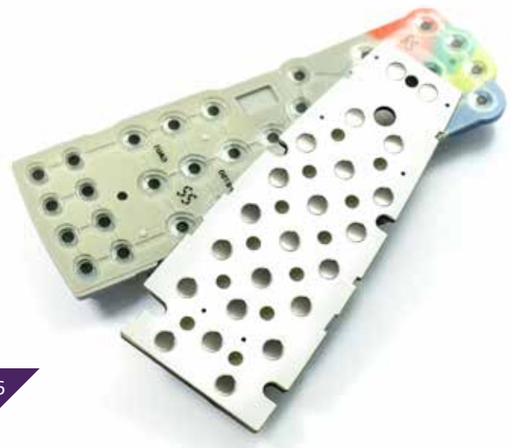


IMD-FILM



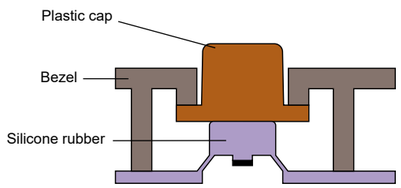
WITH METALDOME



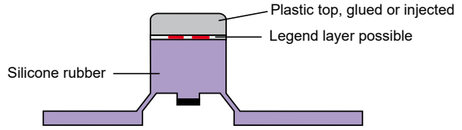


WITH FREE FLOATING PLASTIC CAPS

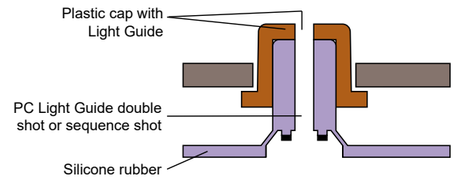
Necessary preloading of the keytop through plastic cap: 0.1-0.2 mm



P+R TECHNIQUE



PLASTIC CAP WITH LIGHT GUIDE



SILICONE RUBBER KEYPAD

ELECTRICAL CONTACT

Silicone rubber keypads offer various electrical contact options to register keystrokes and facilitate electrical connections in electronic devices. These electrical contact options can be chosen based on factors such as cost, durability, tactile response, and specific requirements for the electronic device or application.

CONTACT TYPE

The contact resistance value depends on the size of the contact pill, the dimensions of the PCB circuit, and the force applied during contact closure.

Contact Surface of PCB:		Gold	Carbon	Gold	
Type	Contact Shape	Contact Resistance		Max. Rating	Life Cycles
Carbon Dip Printing	no limit	150 - 300 Ω	< 600 Ω	30 V_{DC} / 3 mA	1-3 Mio
Carbon Pill	circular	< 100 Ω	< 200 Ω	30 V_{DC} / 5 mA	> 5 Mio
Low Resistance Carbon Pill	circular	< 10 Ω	< 30 Ω	30 V_{DC} / 5 mA	> 5 Mio
Polydome	circular	1 - 10 Ω	< 30 Ω	42 V_{DC} / 20 mA	> 1 Mio
Metal Powder Pill	circular	10 - 50 Ω	< 100 Ω	30 V_{DC} / 30 mA	1 - 5 Mio
Metal Pill	circular	1 - 5 Ω	< 20 Ω	100 V_{DC} / 100 mA	> 5 Mio
Metaldome	circular, square, oval	1 - 5 Ω	< 30 Ω	42 V_{DC} / 30 mA	> 1 Mio

STANDARD SIZE OF CARBON PILL

Carbon pills typically come in circular shapes ranging from Ø 2.5 mm to Ø 8.0 mm in 0.5 mm increments. Different diameters and shapes can be accommodated, but may incur additional costs.

Keypad with
Carbon Contact Pill & Gold Contacts

CONTACT SHAPE

Circular | Circular Ring | Semi-Circular Ring | Oval | Square | Square Ring | Semi-Square Ring

PCB CONTACT SURFACE OPTIONS

In high-reliability applications, a preference is given to gold-plated PCBs. Silkscreen-printed carbon is commonly used due to its cost-effectiveness and strong chemical.

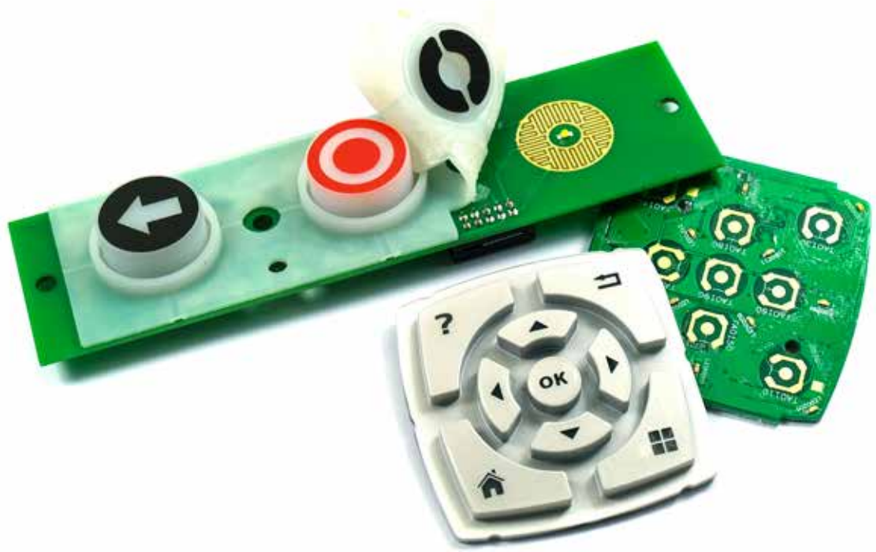
PCB Contact Surface	Material	Contact Surface
Rigid	FR4, CEM1, etc.	Gold, Nickel, Carbon
Flexible	Polyimide	Gold, Nickel
Flexible	Polyester	Carbon, Silver, Carbon-Silver-Mixture

PCB CIRCUIT TYPE

The PCB contact area in each direction should have a minimum 0.5 mm larger dimension than the keypad's contact area. For Rocker Keys and Keys with Metaldomes, please submit the PCB Contact Circuit to N&H for approval.

Gold Traces

Carbon Traces



SILICONE RUBBER KEYPAD

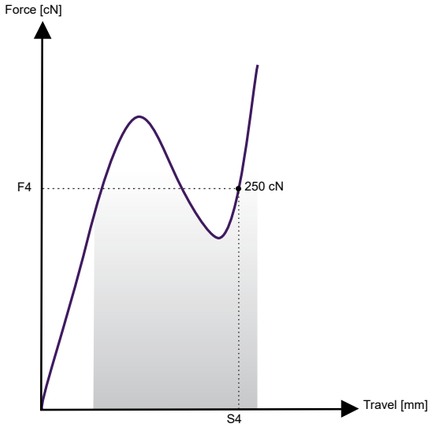
STANDARDS

Silicone rubber keypads are typically evaluated and designed to meet standards related to factors such as durability, actuation force, abrasion resistance, electrical contact reliability, and post-curing processes. These standards ensure the keypads' performance and longevity in various applications.

LIFE MEASURING

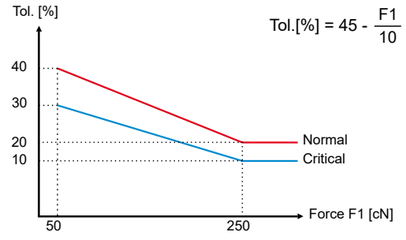
First, the key is subjected to an Over Stroke Force (F4) of 250 cN. The resulting Over Stroke (S4) is then determined. Subsequently, a Life Tester's push head applies a constant travel of S4 and a frequency of 3.3 Hz to the key.

Mechanical life evaluation occurs when cracks appear in the web or when the Actuation Force (F1) decreases by more than half. The lifespan is influenced by Material Hardness, Actuation Force, Press Travel, and Snap Ratio. The higher these factors, the shorter the key's lifespan.



ACTUATION FORCE TOLERANCE (CN)

The Normal criterion represents the standard tolerance, while the Critical criterion is determined only after N&H has evaluated the drawing.



$$Tol.[\%] = 45 - \frac{F1}{10}$$

Note: Force measurement after 10 actuations.

	≤ 50	≤ 80	≤ 100	≤ 120	≤ 150
Normal	± 20	± 30	± 35	± 40	± 45
Critical	± 15	± 20	± 25	± 30	± 35

	≤ 180	≤ 210	≤ 250	> 250
Normal	± 50	± 50	± 50	± 20
Critical	± 35	± 40	± 40	± 15

DIMENSION TOLERANCE DIN ISO 3302-1 M2

	≤ 4	≤ 6,3	≤ 10	≤ 16	≤ 25
F	± 0.10	± 0.15	± 0.20	± 0.20	± 0.25
C	± 0.15	± 0.20	± 0.20	± 0.25	± 0.35

	≤ 40	≤ 63	≤ 100	≤ 160	> 160
F	± 0.35	± 0.40	± 0.50	± 0.70	± 0.50
C	± 0.40	± 0.50	± 0.70	± 0.80	± 0.70

Dimension: mm
F = tool bound dimension
C = dimensions depending on tool closure

Note: Dimension Tolerance Standard according to DIN ISO 16901

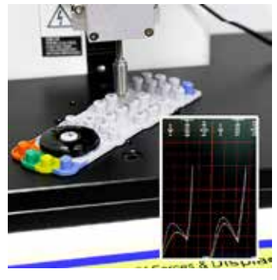
ABRASION RESISTANCE

The abrasion resistance of legends is evaluated using various methods. At N&H, the standard tests include:

- Norman Tester
- STO Tester
- Wazau Tester APG

In these tests, a paper strip is continuously drawn over a printed or painted sample. A specified weight applies pressure to the paper strip on the specimen. The test result is determined by either the length of paper (STO and Wazau Tester) or wheel cycles (Norman Tester) required to rub off a maximum of 0.25 mm² of the legend area.

In our **in-house testing laboratory**, we can test silicone rubber keypads.



ELECTRICAL CONTACT RESISTANCE

Contact Resistance is influenced by several factors, including the contact material, size, keypad and PCB circuit design, the Force-Travel-Behavior, and the applied force. To facilitate result comparison, we employ the following standard measuring method:

The rubber keypad is positioned on a Gold-plated PCB featuring a comb layout with 0.3 mm line width and 0.3 mm line spacing. Contact resistance is measured when the key is subjected to an Over Stroke Force (F4) of 250 cN.

POST CURING

To ensure that the rubber keypad has undergone sufficient post-curing, we perform the Weight Loss test in accordance with ETR-2 Part 2 from October 1992. The procedure includes:

1. Storing the rubber keypad at room conditions for 24 hours.
2. Measuring the weight.
3. Storing the keypad at 200°C for 24 hours.
4. Immediately measuring the weight again.

The weight loss must not exceed 2% to meet the specified criteria.

SILICONE RUBBER KEYPAD

COMPLETE SOLUTION

In addition to the pure silicone rubber keypad, we also manufacture the complete assembly with a matching plastic housing and the connecting technology. We also provide comprehensive advice on the suitable input solution for your application.
Membrane keyboard or silicone rubber keypad?
We will find out!

KEYPAD

- SILICONE RUBBER
- MEMBRANE SWITCH
- CAPACITIVE
- PUSH BUTTONS

HOUSING

MOLDED PARTS

- PLASTIC
- RUBBER
- METAL
- GLASS

CABLE

CONNECTORS

PCB & MORE

YOUR ADVANTAGES WITH OUR ALL-IN-ONE SOLUTION:

+ Complete in-house production of your product - one supplier for all components.
+ Design and development - a dedicated project engineer as your point of contact.
+ Feasibility assessment, initial cost estimates, prototype creation.
+ Series production realization starting from medium quantities.
+ Cost advantages of higher production volumes and reduced transportation costs.
+ Comprehensive logistical support from sea freight to air freight, including customs clearance - you receive your finished product delivered directly to your doorstep.
+ Competitive prices meeting European quality standards through our long-standing, exclusive supplier network in Asia.



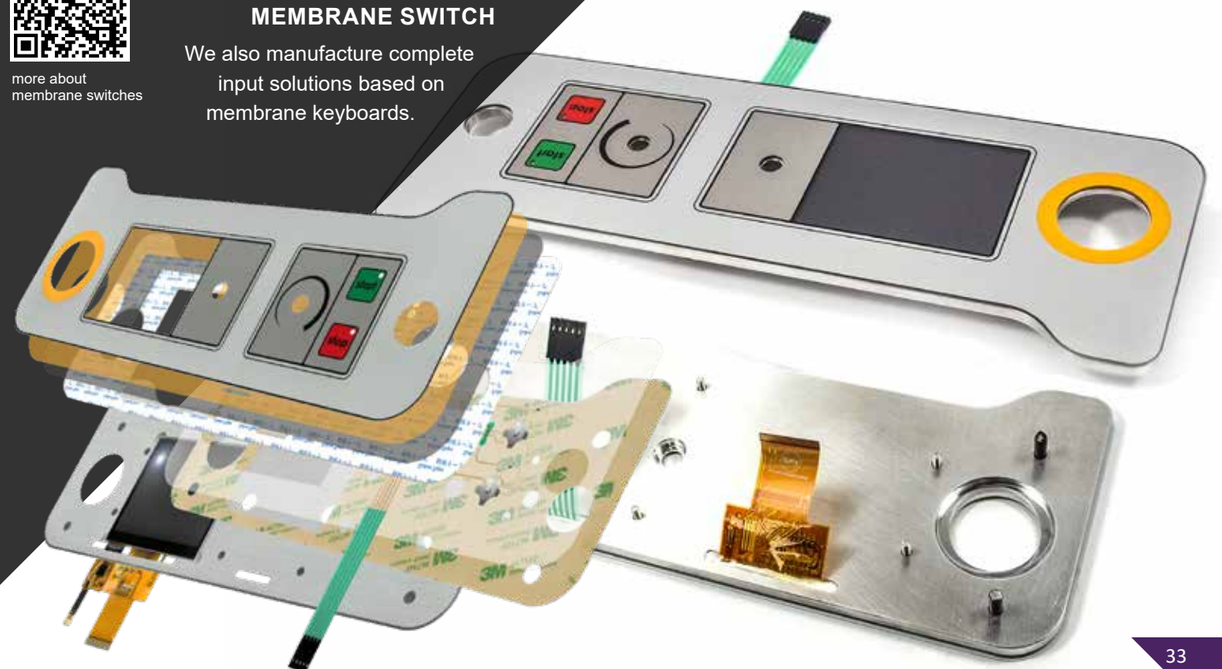




more about membrane switches

MEMBRANE SWITCH

We also manufacture complete input solutions based on membrane keyboards.



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