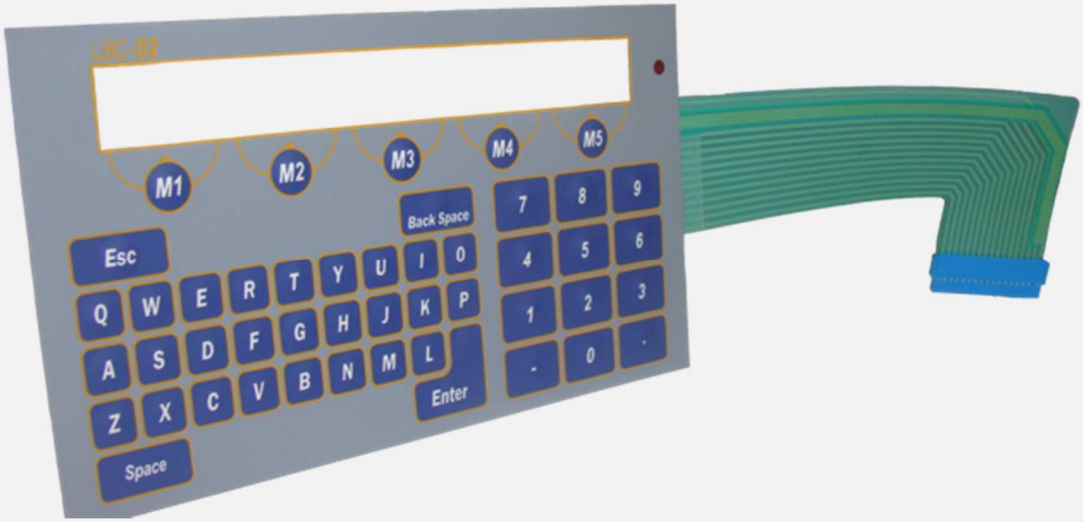
FLEXTEC HUNGÁRIA KFT.
MEMBRANE SWITCHES

Membrane keyboards

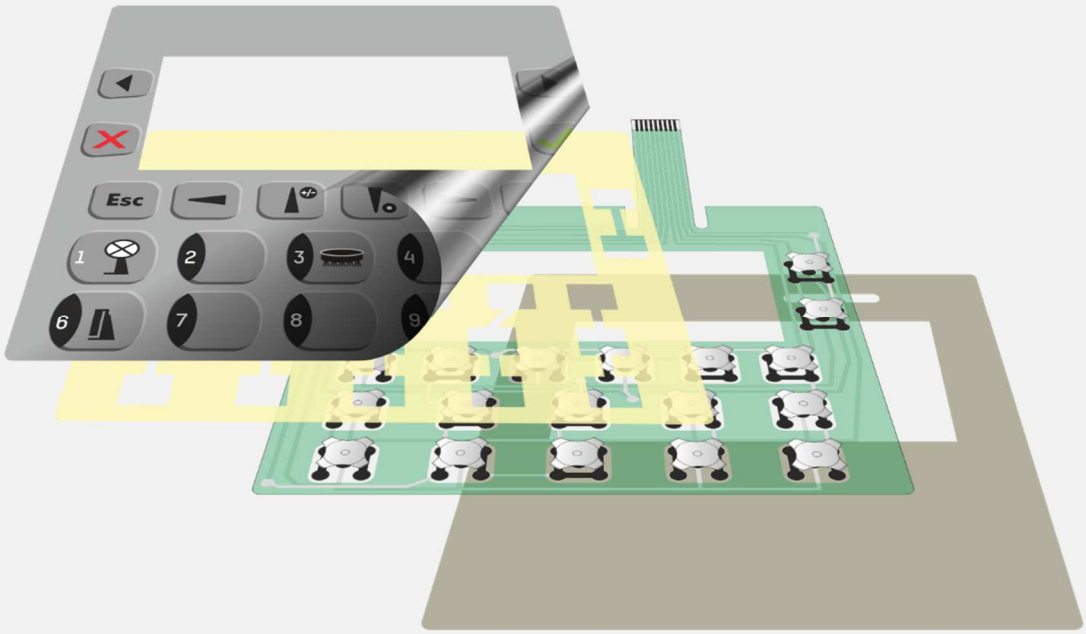
General information: The membrane keyboards provide simple, professional solution to make user interface of most instruments and electrical devices.



Structure

The membrane keyboards structures can be so various. They can be different in the layers, materials and the production technology.

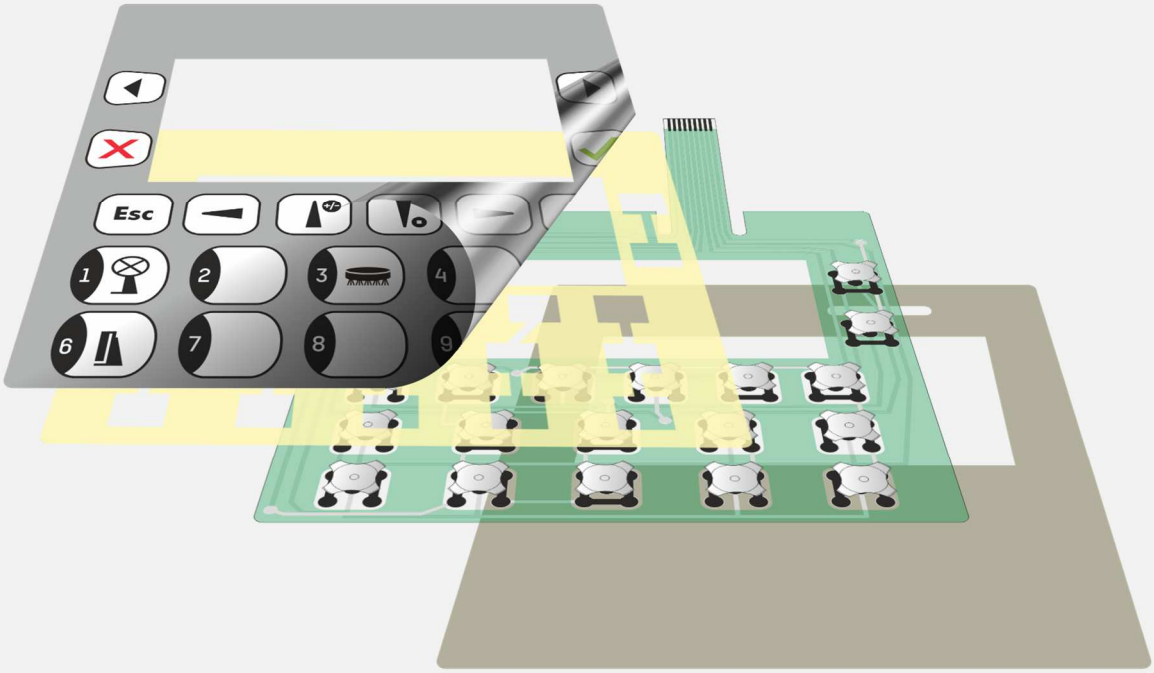
'A' basic type (with metal domes, embossed)



One of the most popular type keypad. The buttons give clear tactile feedback and user can good sense the embossed buttons.

Buttons:	*'Tactile' buttons built with metal domes. Click force can be between 1-4N.*
Switch type:	*Resistive.*
Embossing types:	*Frame and pillow embossing (see in 'Embossing').*
Thickness:	From *0.55 mm*
Backlight buttons:	*No.*
Embedded LED's:	*Yes.*
Connection type:	*See in 'Connections'*

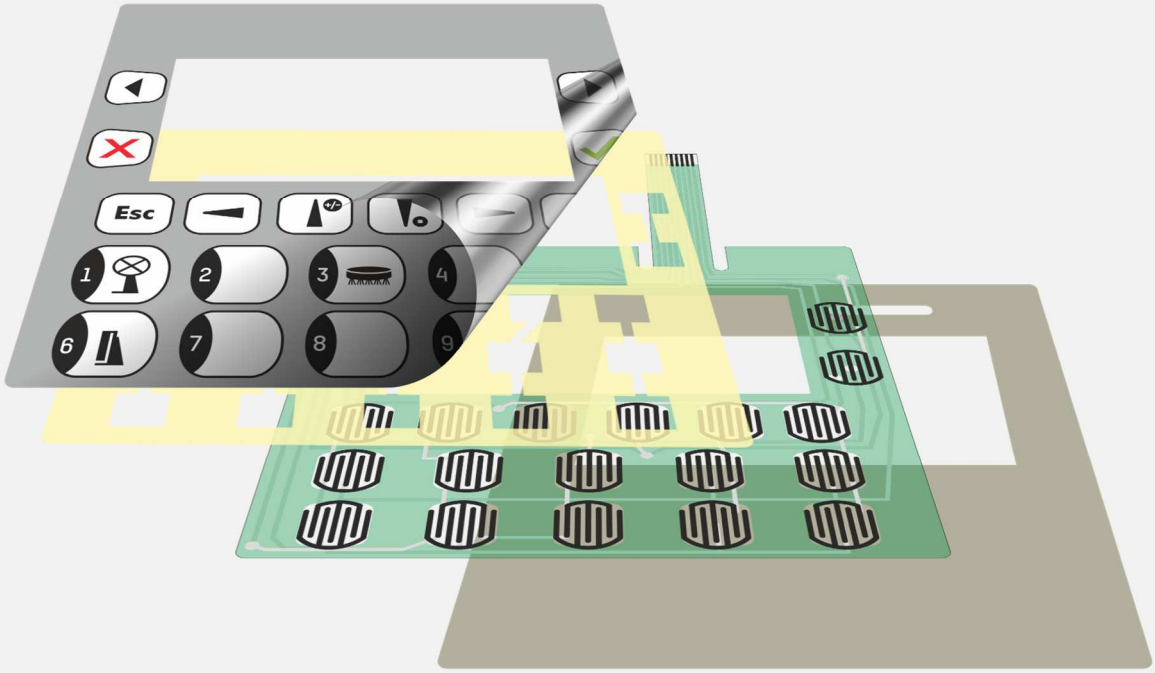
'B' basic type (with metal domes, non embossed)



Similar construction than 'A' type. The only difference that buttons are not embossed.

Buttons:	*'Tactile' buttons built with metal domes. Click force can be between 1-4N.*
Switch type:	*Resistive.*
Embossing types:	*No.*
Thickness:	*From 0.85 mm*
Backlight buttons:	*No.*
Embedded LED's:	*Yes.*
Connection type:	*See in 'Connections'*

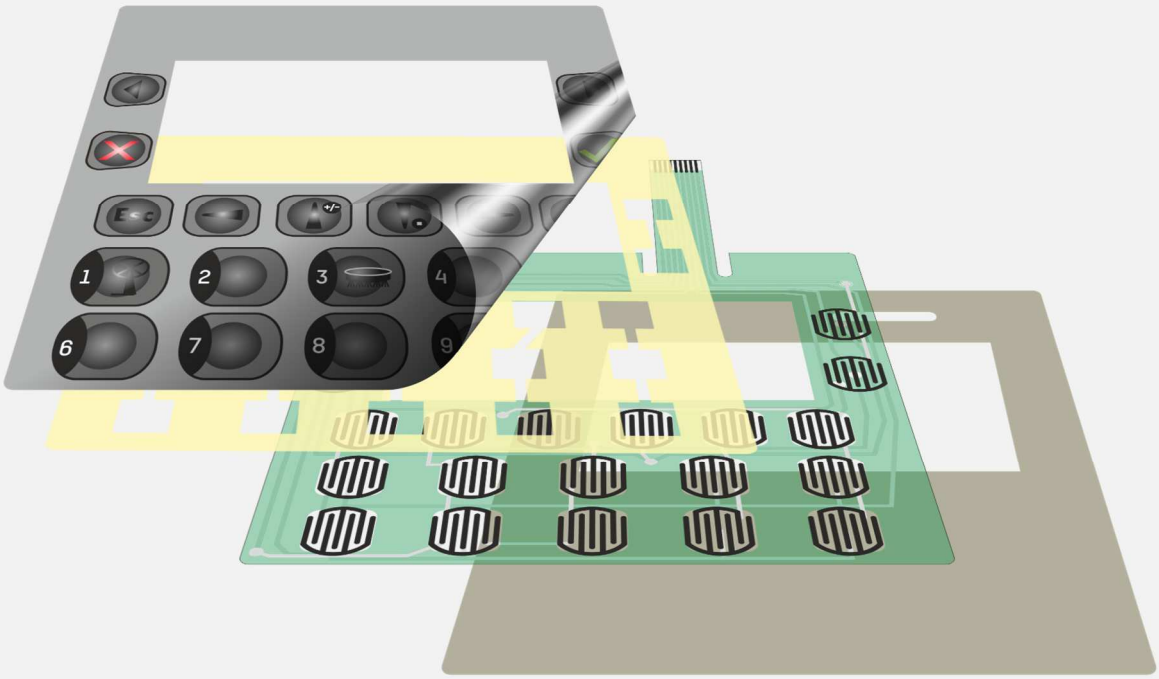
'C' basic type (touch type)



The make very similar than resistive touch panels. In case of buttons touch the conductive layer on rear of buttons will close the contacts of circuit layer. Thouch keypads offer modern design and they can be very thin and cost effective.

Buttons:	*Touch type buttons.*
Switch type:	*Resistive.*
Embossing types:	*No.*
Thickness:	*From 0.5 mm*
Backlight buttons:	*Yes.*
Embedded LED's:	*Yes.*
Connection type:	*See in 'Connections'*

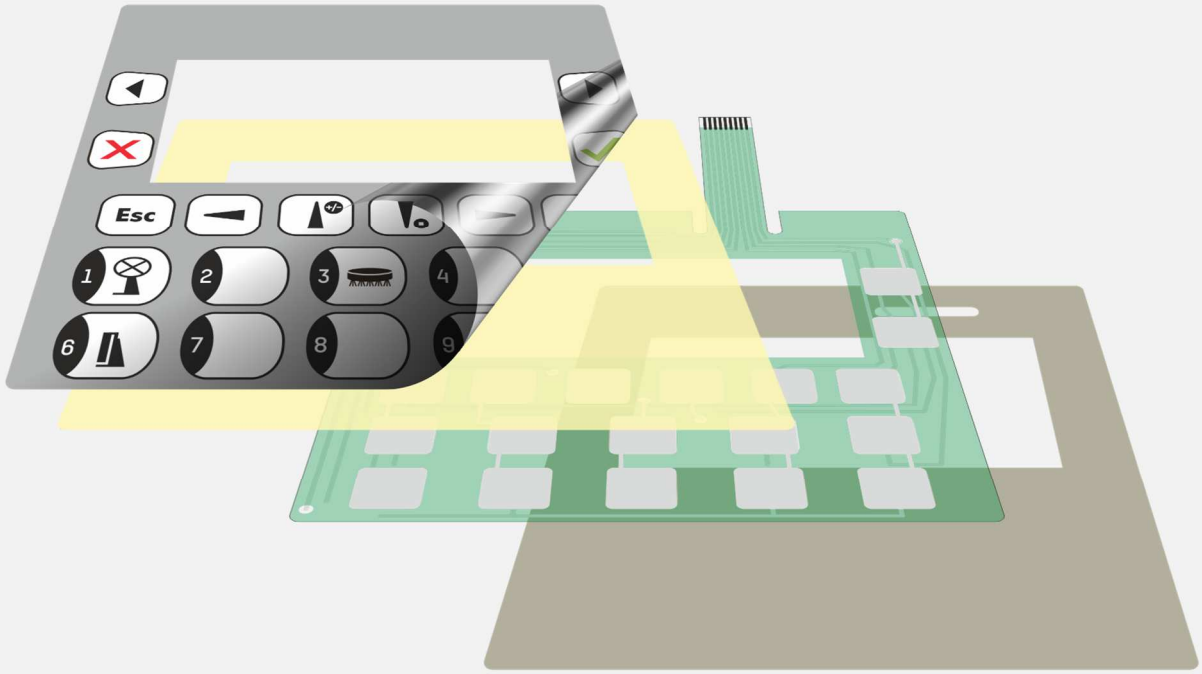
'D' basic type (dome embossed with foil switch)



The dome embossed buttons guarantee the tactile feedback to the user. Thanks for this solution no need additional inserted metal domes which can be high cost in high volume (and many buttons keypad) production.

Buttons:	*'Tactile' buttons, dome embossed thick foil. Click force can be around 1N.*
Switch type:	*Resistive.*
Embossing types:	*Dome embossing.*
Thickness:	*From 0.5 mm*
Backlight buttons:	*Yes.*
Embedded LED's:	*Yes.*
Connection type:	*See in 'Connections'*

'E' basic type (capacitive keypad)



One of the big benefits of capacitive keypads that they don't include any moving parts. Becaouse of this they have very high mechanical resistance and they are well vandal-proof. Different type capacitive sensors can be integrated to the keyboard. Sensors capacitance change can be detected with any proper decoder electronics.

Buttons:	*Touch type capacitive sensors.*
Embossing types:	*No.*
Thickness:	*from 0.4 mm.*
Backlight buttons:	*Yes.*
Embedded LED's:	*Yes.*
Connection type:	*See in 'Connections'*

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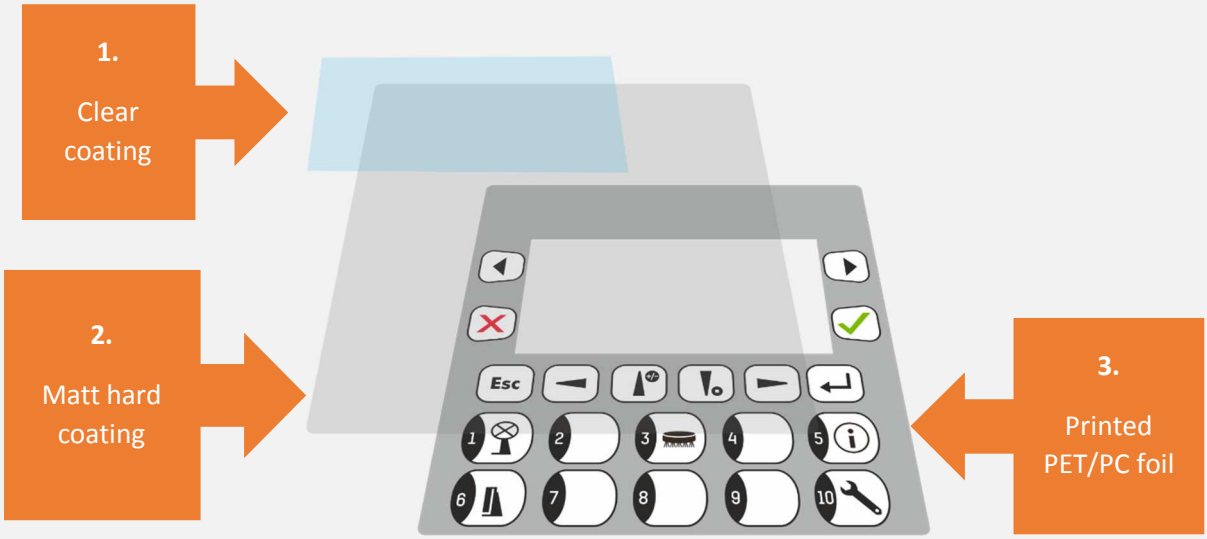
Graphic overlays of membrane keypads

The graphic overlays are in direct contact with the environment and users. Therefore the resistance from the environmental effects is very important.



Types of graphic overlays:

- Matt, fine-matt, anti-glare, glossy and soft-touch surface.
- Anti-microbial surface.
- Indoor (not UV-proof), medium and extreme UV-proof.
- Conductive overlays (ESD area, discharge protected).
- Thickness: 130, 150, 180, 200 micron (metric).

Properties, technical details:

Chemical resistance: The keypad surface protected from most chemicals, includes: alcohols, diluted acid, diluted alkalis, esters, hydrocarbons, ketones, household cleaners. (DDIN 42 115)

UV stability:

- Basic overly foil has not or limited UV stability
- UV stable overlay foil: High UV radiation resistance. Tested after 12 months intense sunshine with 5 million button press (1600 hours UVCON lamp test / 12 months, placed to 45° in Miami/Florida sunshine.)

User surface dielectric strength: > 15.6 kV, surface resistance: 1013 Ohm/m2 500VDC.

Embossing

The embossed buttons are good sensible, offer professional looks and they can reduce the total thickness of the keypad.

Embossing made with heat forming technic, used custom 3D aluminum/copper tool. The tool cost increase the initial cost which up to the tool type and size.

Frequent embossing shapes

Pillow embossing *Dome embossing* *Rim embossing*

Usually the embossing high is between 0.2-0.5 mm. Recommended to fit the embossing sizes to buttons dimensions. General size of dome embossing is d = 10 mm (this is comfortable to fingers) and 12 x 12 mm for pillow and frame embossing.

Metal domes

The metal domes one of the most specific component of type 'A' and 'B' membrane keyboards. These components are in various sizes, shapes, forces and they are plated or not.

Technical properties:

- Non plated stainless steel metal dome.
  This is the cheapest version of metal domes. The disadvantage is that it can oxidize. Because of the oxidation the contact resistance (Rs) can be so high and it can fluctuate. Resistance depend from the usage frequent and press force. But it can compensate with sufficient electronics and it can result cost effective keypad.

  Rs < 500 Ohm Imax = 100 mA Umax = 50 V Pmax = 1 Watt

- Nickel plated stainless steel metal dome.
  Price value for money choice. The nickel coating result low stable contact resistance (Rs).

  Rs < 200 Ohm Imax = 100 mA Umax = 50 V Pmax = 1 Watt

- Gold plated stainless steel metal dome.
  The contact resistance is very low and stable. Good choice where the keypad has to be very reliable and accurate. But the cost of this part can increase significantly the price of membrane keypads, mainly in high volume production or by many buttons keypads.

  Rs < 100 Ohm Imax = 100 mA Umax = 50 V Pmax = 1 Watt

- Normal dimensions: d = 6 mm, d = 8 mm, d = 12 mm

Electrical flex cable and connection

Membrane keyboards can connect to electrical device with theirs flat cable.

1) Outlet position of flat cable

When plan the outlet position of flat cable need to keep some rules:

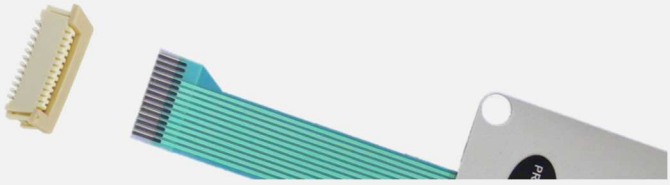
- Cable can come direct from edges or outlet distance has to be minimum 4 mm from the edges.
- Outlet can't be under the buttons / LED's and distance has to be minimum 5 mm from them.

2) Insulation of flat cables

- Insulation can be dielectric UV coat or dielectric laminate foil or combination of them.

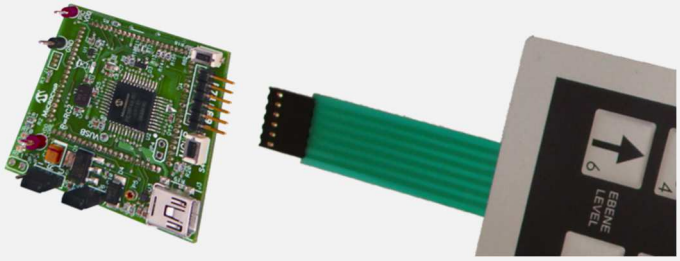
3) Connection possibilities

- FFC / ZIF: One of the most popular choice. Cost- and space-efficient solution. It can connected to compatible FFC PCB connector. Proposed pitch is 1.25 or 1.27 mm. Do not solder FFC cable!



- Crimp contact + house

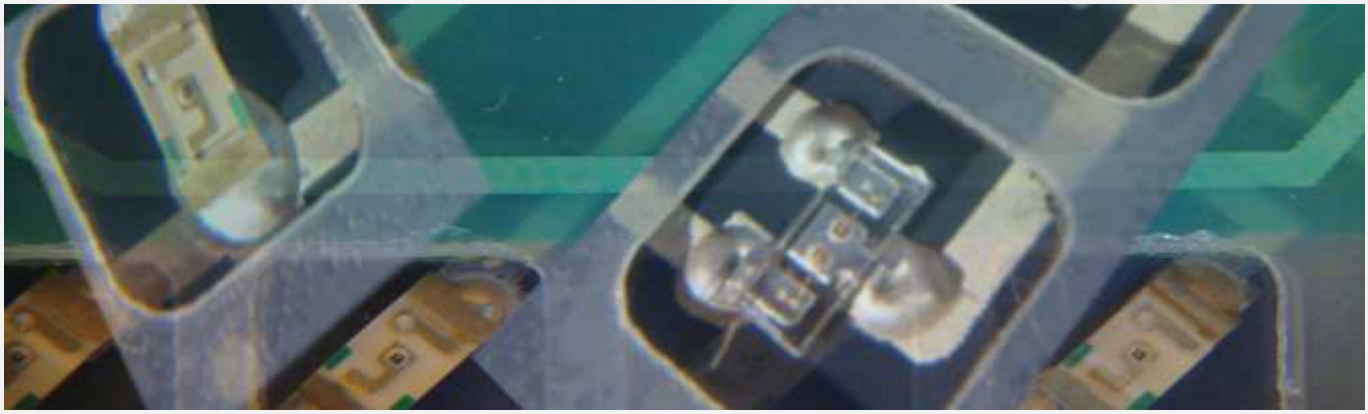
  2.54 pitch crimped contact female line. It can tin or gold plated. Easy to connect to any row header.



LED insertion

Possible to insert LEDs into the keypad. This can save additional works of case and PCB assembly and can save space and material cost of the device.

The special, ultra-thin LEDs are inserting with 2 component silver-epoxy adhesive. After the insertion the LEDs will get an UV coating to protect them from mechanical damages.

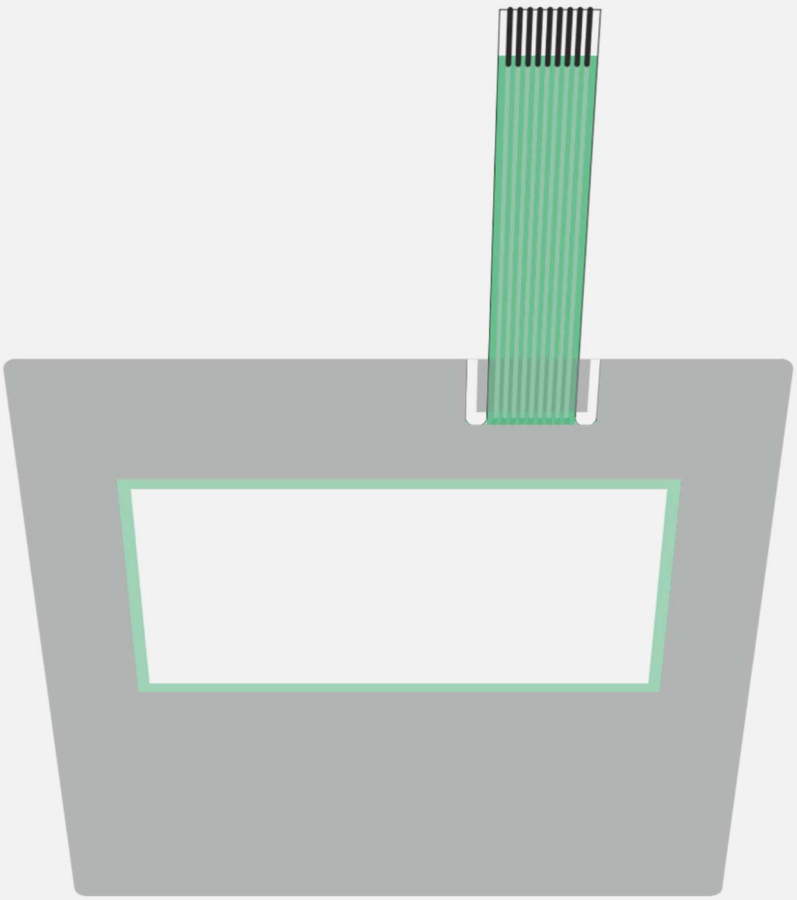


Membrane keyboards IP protection

Keypads IP protection can be from IP63 to IP68 depend from the theirs structure.

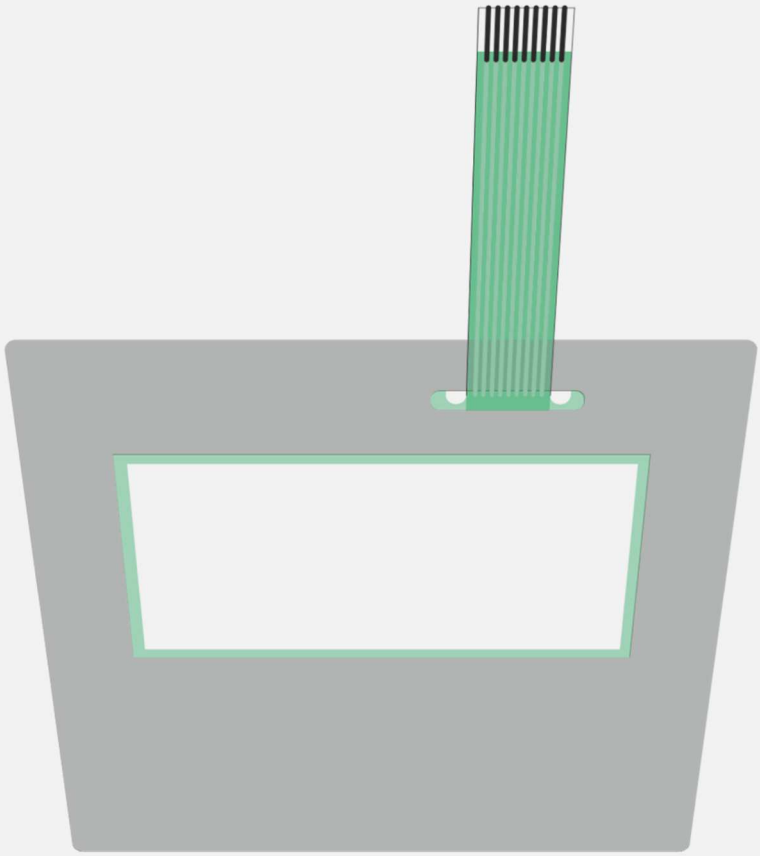
1. IP63 make

Under the flat cable, separated filler adhesive part will be inserted. This make offer cost-efficient production but there will stay two small gap (0.3-0.6 mm). These gaps can be closed if keypad will assembly into a 'nest'. This case IP rating will be better.



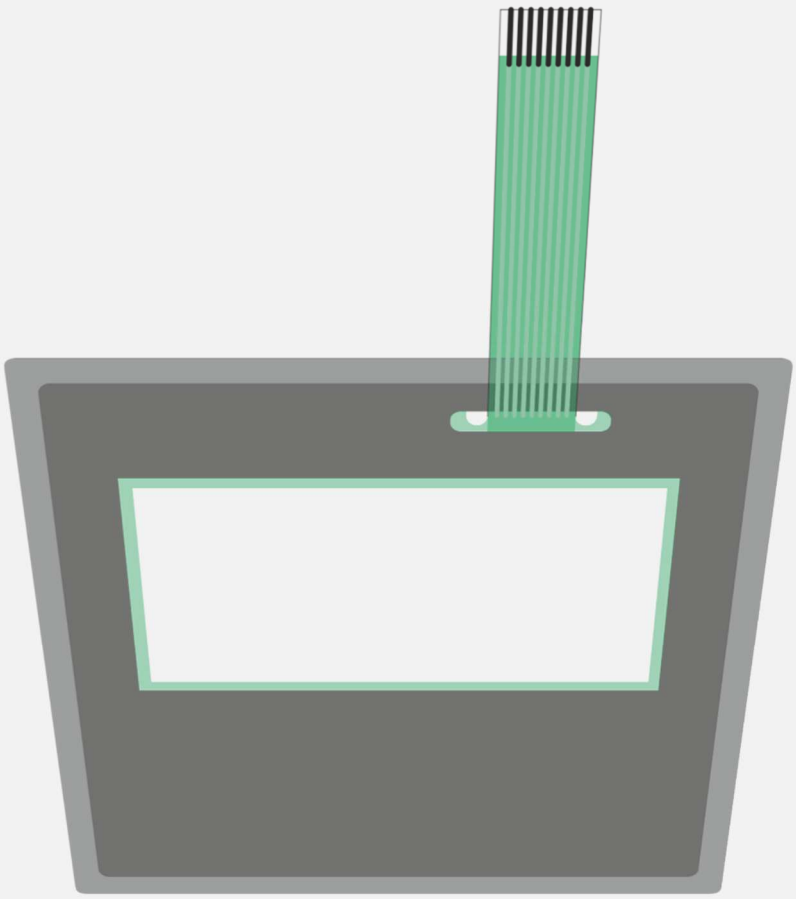
2. IP67 make

The flat cable go through the rear adhesive cut out. This result additional production steps but this structure can significantly increase the IP rating of keypad.



3. IP68 make

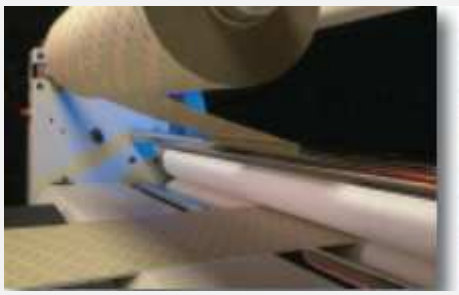
Similar than IP67 make. The difference is that the hole keypad get an outer frame which perfectly close the keypad from the environment. This structure will maximize the IP rating.

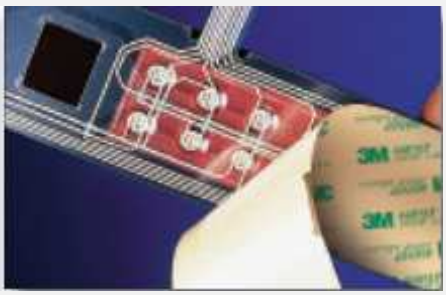


All IP ratings have guaranteed only if the rear adhesive of keypad compatible with the support surface and the surface is well prepared before sticking.

Rear adhesive

The optimal type rear adhesive selection is very important because it will guarantee the perfect adhesion to the support surface and effect the best insulation and lifetime of keypad. However the unnecessary adhesives can have multiple price which can result much higher keypad cost.





Important aspects for selection:

- Surface energy of support surface
  For very low surface energy materials: pl. PE, polypropylene, powder coated surfaces.
  (proposed adhesive: 3M 300LSE)
  For medium surface energy materials: pl. polyester, polycarbonate, ABS, etc.
  (proposed adhesives: Ritrama, Lohman, 3M 467MP, 3M 468MP)
  For high surface energy materials: pl. Aluminum, copper, steel, etc.
  (proposed adhesives: Ritrama, Lohman, 3M 467MP, 3M 468MP)

- Roughness of support surface
  Adhesive glue thickness must be higher than the roughness value. In case the Rz value very low (polished, mirrored surface), than 10 micron film will be enough.
  (proposed adhesives: Ritrama, Lohman (in case LSE -> 3M 300LSE))
  If Rz value higher even 130 micron film may will required.
  (proposed adhesives: Lohman, 3M 467MP, 3M 468 MP (in case LSE -> 3M 300LSE))

- Removal / replacement
  Some of adhesive can be removed without any glue remain and some of them will let tough remains on the support surface.

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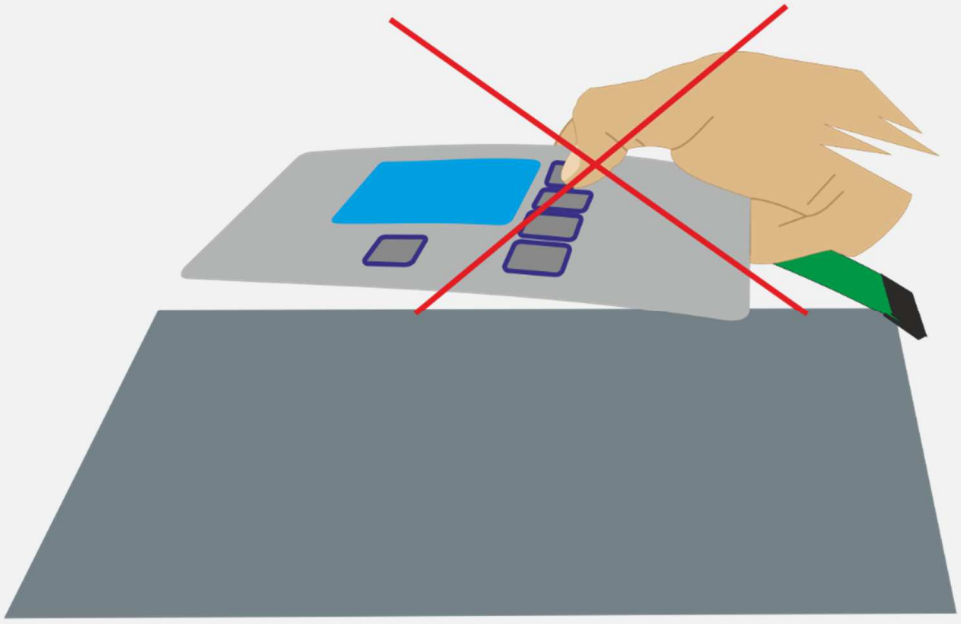
Installation and application

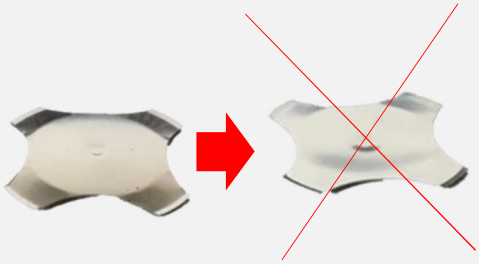
The membrane keyboards care handling during installation and storage is very important because the keypads can easy damage before they will stick to rigid surface.

To stick the keypads to rigid support is mandatory, proper bottom support is required for the buttons care. Otherwise the metal domes in the keypad will be flipped / deformed which will result circuit short or insufficient working at the future.

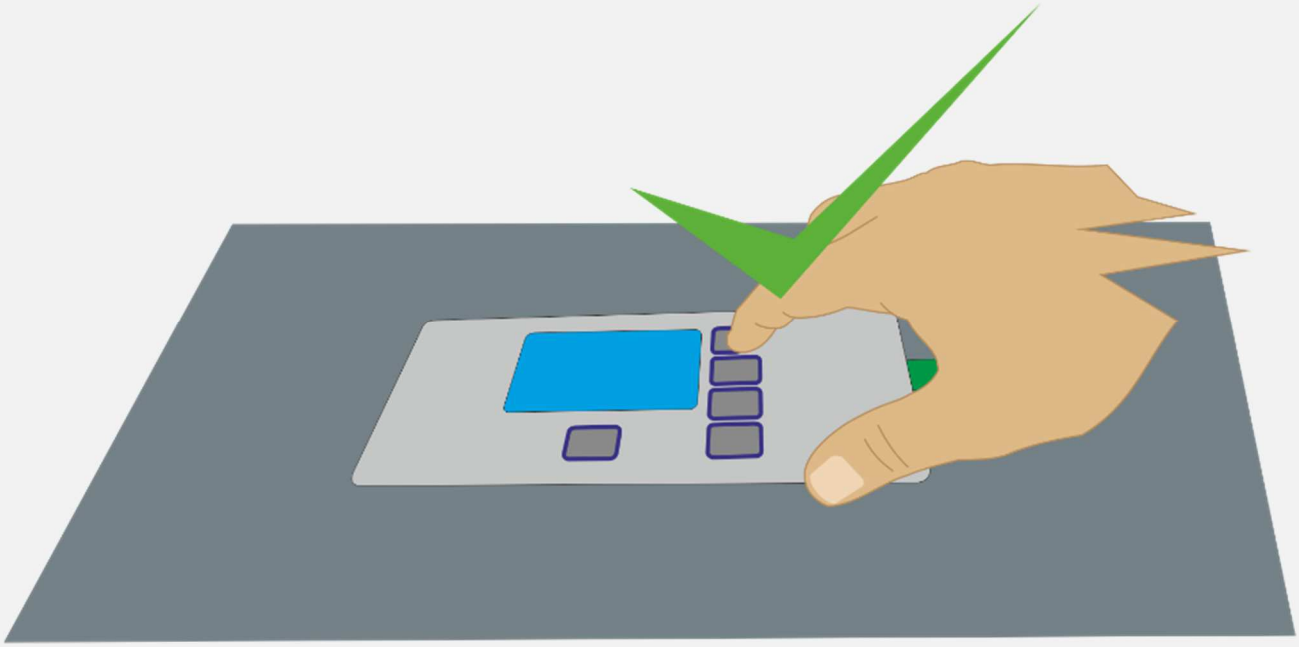
Please handling the keypads with care until the installation has finished because till they can damage easy.

1) To press the buttons without rigid bottom support is not allowed. This case the buttons can be flipped or deformed and keypad will be damaged.

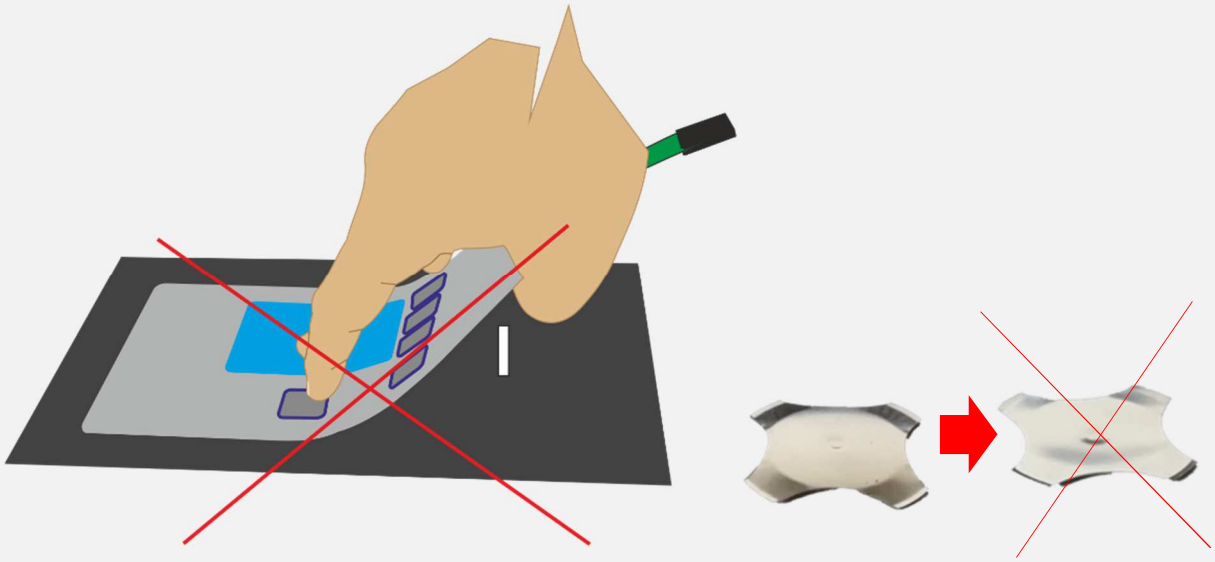


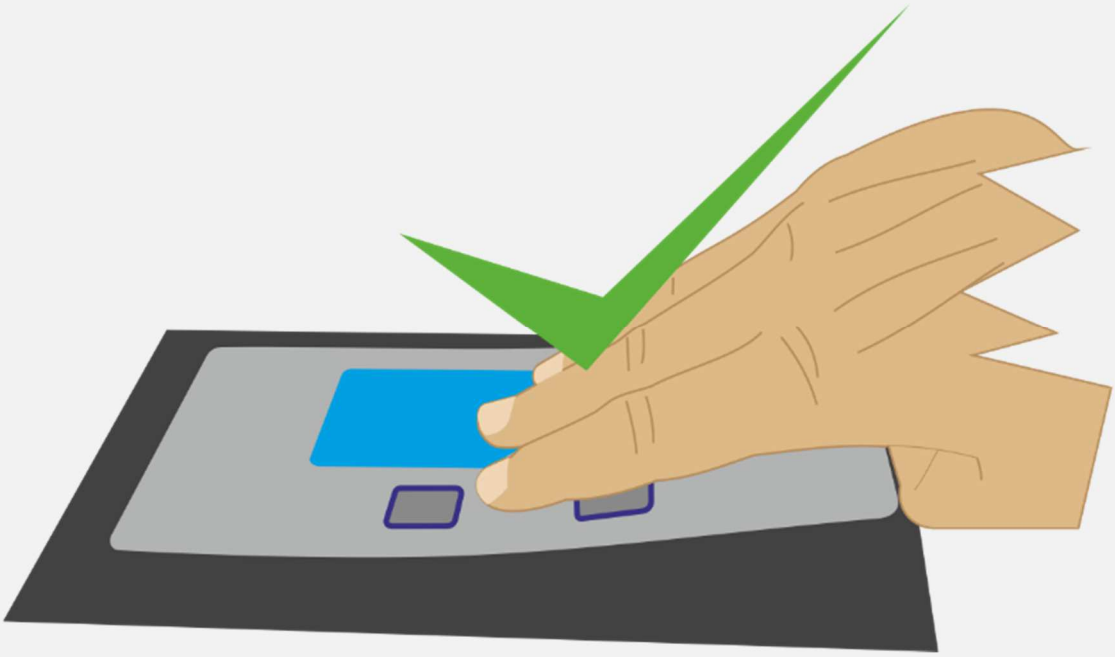


2) If the keypads electrical testing is required before the installation (final stick) place the keypad to rigid, flat surface where the buttons will be properly supported. Thanks to it, you can press buttons safely.



3) During installation do not curve the keypad in sharp angle. This case the buttons can be flipped or deformed and keypad will be damaged. **Allowed minimum radius: R=150 mm.**





4) In case of IP63 basic type keypads installation, do not forget to remove the small silicon paper from filler (under the flex output). If this paper has been left on the keypad it can doming and leak at the future.