



# General features of silicon rubber keypads

(Physical Mechanical and Electrical Characteristic)

## PHISICAL CHARACTERISTICS

| ITEM                      | CONDUCTOR | INSULATOR            | UNIT                 |
|---------------------------|-----------|----------------------|----------------------|
| Specific Gravity at 25 °C | 1.2       | 1.1 to 1.4           |                      |
| Hardness                  | 65 ± 5    | 30 to 80 ± 5         | Shore A              |
| Tensile Strength          | 60        | 65 to 85             | kg/cm <sup>2</sup>   |
| Tear Strength             | 15        | 10 to 15             | Kg/cm                |
| Compression Set           | 20        | 11 to 22             | %                    |
| Elongation at Break       | 170       | 115 to 600           | %                    |
| Insulation Break Down     |           | 25                   | kV/mm                |
| Volume Resistivity        |           | 3 x 10 <sup>14</sup> | (Ω/cm <sup>3</sup> ) |

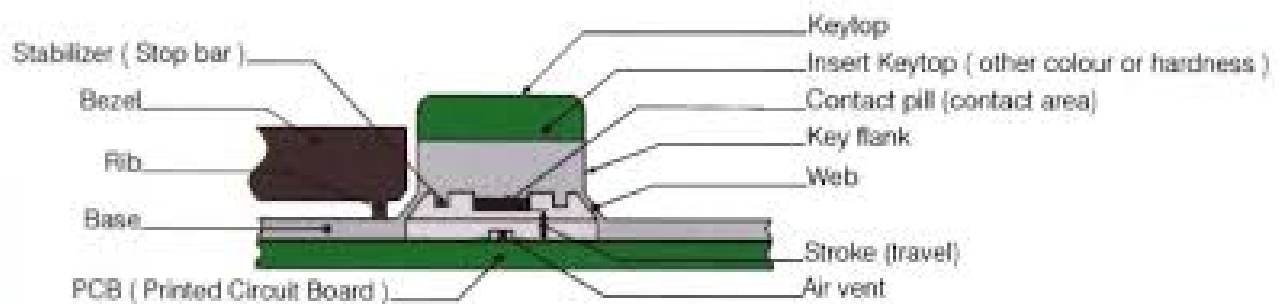
## MECHANICAL CHARACTERISTICS

| ITEM                    | VALUE                                      | UNIT |
|-------------------------|--------------------------------------------|------|
| Operating Temperature   | -40 to +250                                | °C   |
| Storage Temperature     | -55 to +250                                | °C   |
| Operating Life (Cycles) | 5 x 10 <sup>5</sup> to 3 x 10 <sup>7</sup> |      |
| Actuation Force         | 20 to 500                                  | gms  |
| Key Stroke              | 0.2 to 5.0                                 | mm   |
| Switching Force         | 10 to 200                                  | g    |

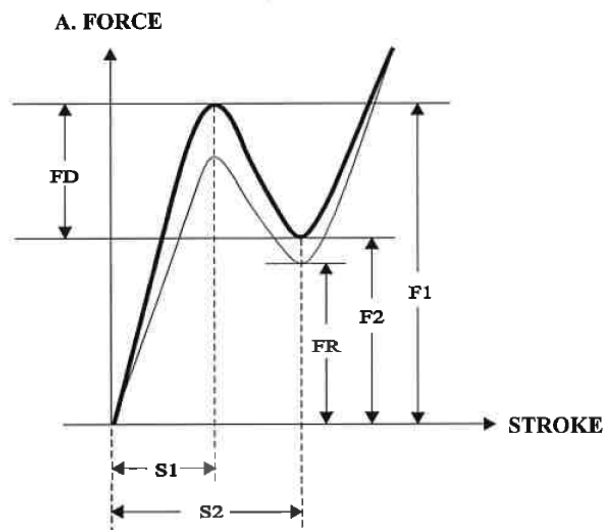
## ELECTRICAL CHARACTERISTICS

| ITEM                  | VALUE | UNIT             |
|-----------------------|-------|------------------|
| Contact Resistance    | <100  | Ω                |
| Insulation Resistance | >100  | MΩ at 500 Vdc    |
| Contact bounce        | <5    | ms               |
| Insulation Break Down | 26    | kV/mm            |
| Switching Current     | 30    | mA at 12Vdc/0,5s |

## BASIC CONSTRUCTION OF SILICONE KEYPAD



## FORCE STROKE CURVE



**F1 : PEAK FORCE ( F MAX )**

**F2 : CONTACT FORCE**

**FR: MIN RETURN FORCE ( F MIN )**

**FD: DROP FORCE ( F1 - F2 )**

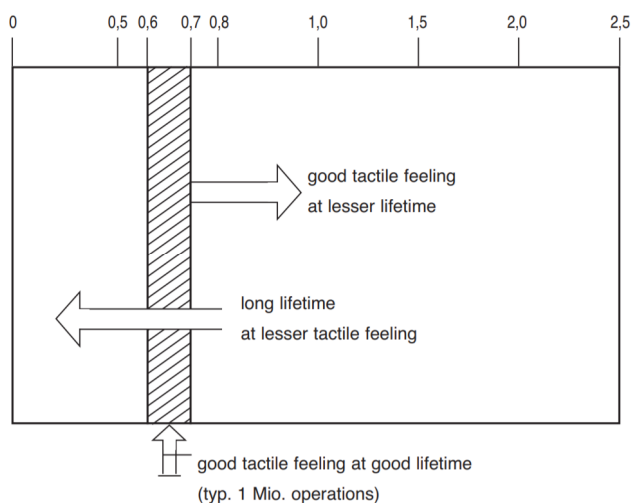
**S1 : PEAK STROKE**

**S2 : CONTACT STROKE**

**— PUSH CURVE**

**— RETURN CURVE**

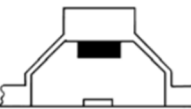
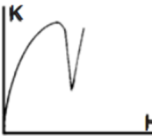
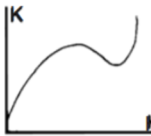
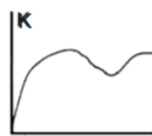
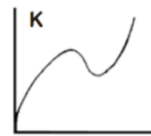
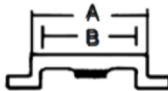
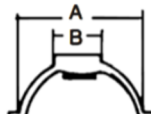
## TACTILE FEELING (mm)



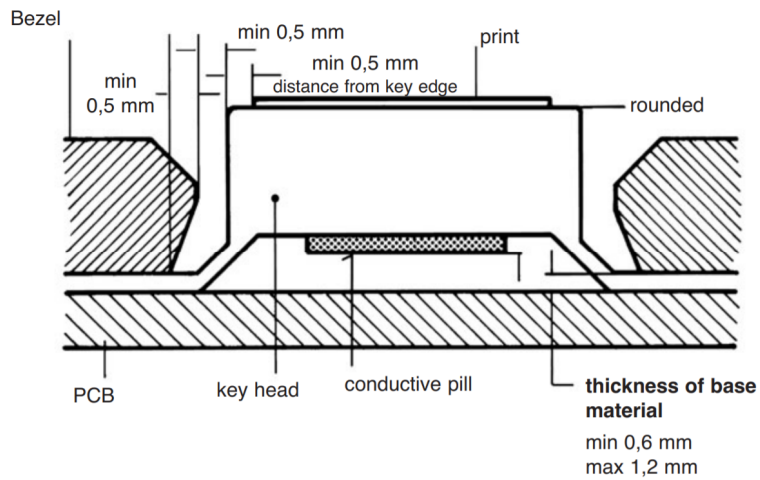
| actuation force | tactile feeling | lifetime (operations) |
|-----------------|-----------------|-----------------------|
| 50 g            | very good       | 1 Mio.                |
| 70 g            |                 | 1 Mio.                |
| 90 g            |                 | 1 Mio.                |
| 100 g           |                 | 1 Mio.                |
| 120 g           | good            | 1 Mio.                |
| 150 g           |                 | 560 K                 |
| 170 g           |                 | 450 K                 |
| 200 g           | less good       | 50K Typ (100 K Max)   |

This table shows typical data

## DESIGN NOTE FOR SILICONE KEY

| KEY-TYPE                                                | A<br>flat type                                                                                                     | B<br>bell type                                                                      | C<br>double bell type                                                                | D<br>cone type                                                                                                         |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
|                                                         |                                 |  |  |                                   |
| pressure/stroke curve                                   |                                 |  |  |                                   |
| relation between pressure (g) and stroke (mm)           | pressure (g)<br>30 – 200<br>stroke (mm)<br>0,3 – 7                                                                 | pressure (g)<br>30 – 80<br>80 – 160<br>160 – 250                                    | stroke (mm)<br>1,0 – 1,8<br>1,6 – 2,8<br>2,6 – 3,5                                   | pressure (g)<br>30 – 200<br>stroke (mm)<br>0,3 – 7                                                                     |
| outer dimensions (A) at a defined key head diameter (B) | <br>$A \geq B + 1,0 \text{ mm}$ |  | $A \geq B + 2,0 \text{ mm}$                                                          |                                                                                                                        |
|                                                         |                                                                                                                    |                                                                                     |                                                                                      | <br>$A \geq B \pm 2,0 \text{ mm}$ |

## ASSEMBLY



## Tolerances

|              |               |
|--------------|---------------|
| below 10 mm  | $\pm 0,10$ mm |
| 10 – 20 mm   | $\pm 0,15$ mm |
| 20 – 30 mm   | $\pm 0,20$ mm |
| 30 – 40 mm   | $\pm 0,25$ mm |
| 40 – 50 mm   | $\pm 0,30$ mm |
| more than 50 | $\pm 0,60$ %  |