



# MICROTHERM

**Thermal motor protector**

**Temperature limiter**

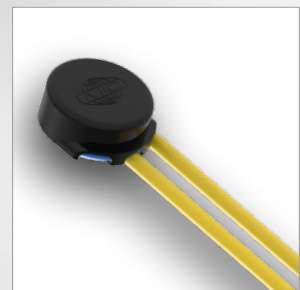
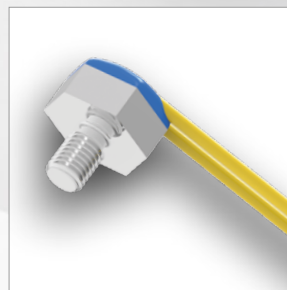
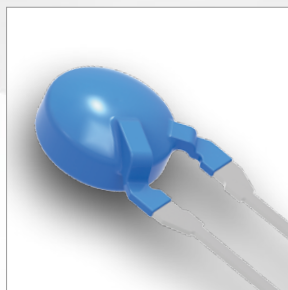
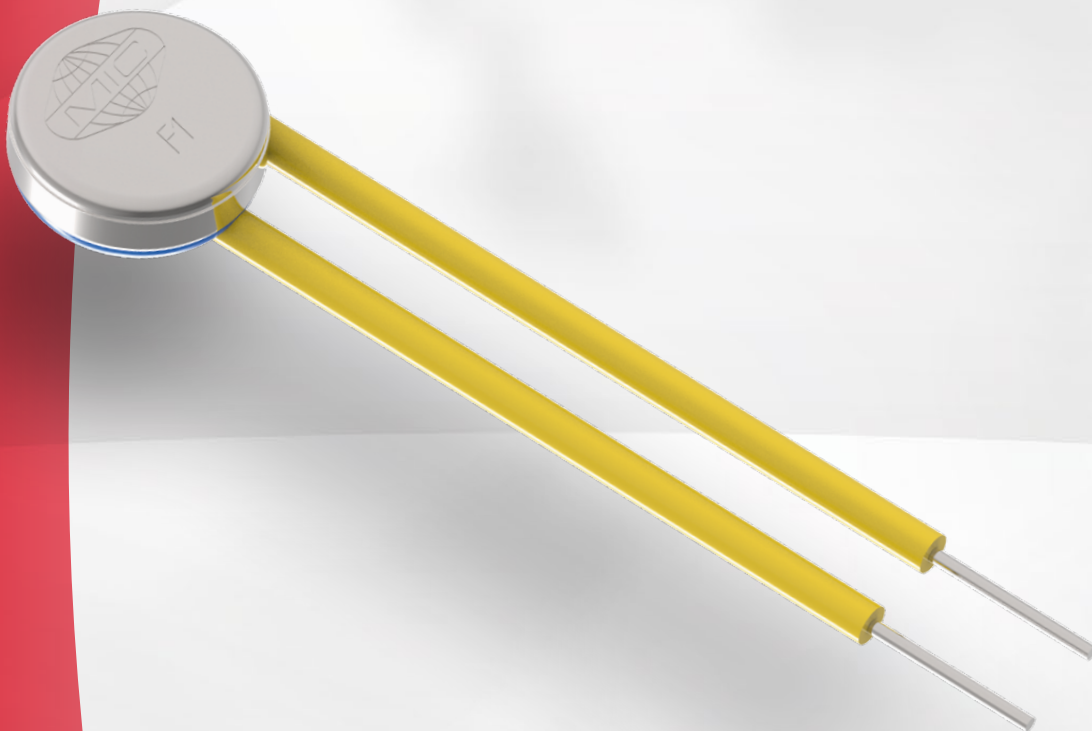
**Thermal cut-out**

**F**

13

20

23



## Applications

- Motors
- Transformers
- Coils
- Electronics, sensors

## Benefits

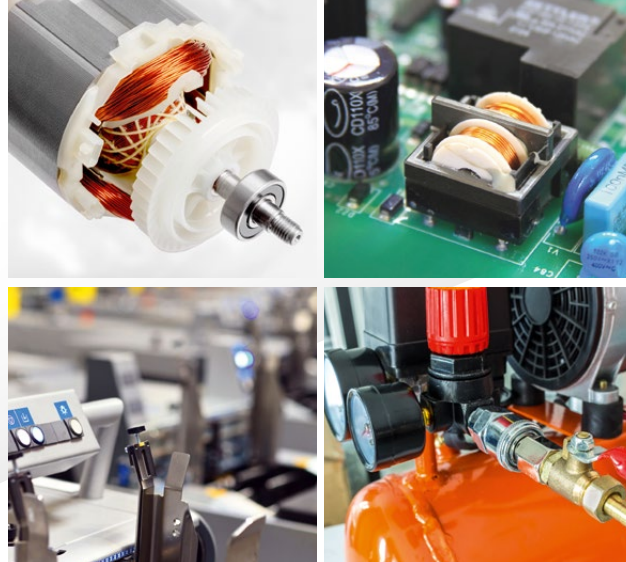
- Small dimensions
- Shock and vibration tested
- Leadframe version
- Various kinds of insulations

## Description





Switches of the **F series** with a minimum size are very suitable for the **installation in confined conditions**. The switching principle consists of a central contact which opens or closes the circuit of the application when there is a temperature input by means of a pressure spring and a thermo-bimetal snap-disc.

Due to the low mass, a **very fast response** of the switch is possible. The heat is thereby preferably absorbed by the round contact surface of the switch and transmitted to the bimetallic element.

In addition to the direct protection of smaller electrical drives and devices with a rated power of up to approx. 750W, F series switches are often used as **thermal sensors**. In twin or triple configurations, they provide a triggering element in the control circuit for contactors, thus also able to thermally protect **larger three-phase Motors**.



## Technical data

| type ratings  |            | control   |  |                |
|---|------------|---|--|----------------|
|   |            | F13A  | F23A / E                                       | F20B / G       |
| version   |            | normally closed   |  | normally open  |
| rated current at 250 V 50/60 Hz ( power factor 0.95 / 0.6 )                   |            | 3.0 A / 2.5 A   | 3.0 A / 3.0 A                                  | 2.0 A / 1.6 A  |
| switching cycles under rated current  |            | 10,000  | 10,000   | 7,000          |
| max. current under failure conditions at 250 V 50/60 Hz ( power factor 0.95 ) |            | 4.0 A   | 6.0 A  | 4.0 A          |
| switching cycles under max. current   |            | 3,000   |  |                |
| temperature rating T <sub>A</sub> ( steps in 5 °C )                           |            | 70°C ... 190°C / ... 160°C ( CQC )  |  | 70°C ... 185°C |
| tolerances  |            | standard: ± 5 °C  |  |                |
| feature of automatic action   |            | 2.C, 1.C  |  |                |
| contact resistance ( incl. wire of 100 mm )                                   |            | < 50 mΩ   |  |                |
| hysteresis  |            | 30 K ± 15 °C <sup>1)</sup>  |  |                |
| dielectric strength ( standard insulation )                                   |            | 2 kV  |  |                |
| shock / vibration testing ( similar to EN 50155 )                             |            | 400 m/s <sup>2</sup> sine half wave / 100 m/s <sup>2</sup> 5 Hz ... 2,000 Hz sine   |  |                |
| resistances to impregnation   |            | tight against ordinary resins and lacquers  |  |                |
| degrees of protection provided by enclosures ( EN 60529 )                     |            | IP00  |  |                |
| suitable for use in protection category                                       |            | I, II   |  |                |
| approvals   | VDE / ENEC |  | EN 60730-1 / -2-9                              |                |
|   | UL         |  | UL 2111 / UL 873 <sup>2)</sup>                 |                |
|   | cUL        |  | C22.2 No. 77 / C22.2 No. 24 <sup>2)</sup>      |                |
|   | CQC        |  | GB14536.1-2008 / GB14536.10-2008 <sup>3)</sup> |                |

<sup>1)</sup> at the T<sub>A</sub> (upper and lower) limits the hysteresis could deviate <sup>2)</sup> on request <sup>3)</sup> different power rating

The variety of our product variations is nearly infinite. Microtherm distinguishes itself by a high expert's know-how in the area of customised developments. We will be pleased to give you specific advice during a personal consultation and present you all the options suitable for your application:

- application of plug connectors
- unique packaging and overmolding variations
- specific cable assemblies and many more



## Versions

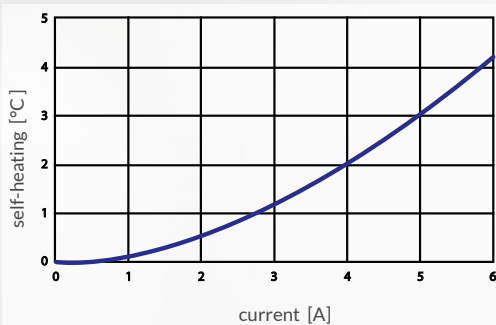
| control type      | n.c.   | n.o. | code         | illustration | drawing dimensions ( mm ) | technical specification   | approvals    |
|-------------------|--------|------|--------------|--------------|---------------------------|---|--------------|
| F13               | A      |      |              |              |                           | not insulated, potted   | VDE, UL, cUL |
| F20<br>F23        | A      | B    |              |              |                           | not insulated, potted   | VDE, UL, cUL |
| F13<br>F20<br>F23 | A<br>A | B    | U254         |              |                           | shrink cap, potted  | VDE, UL, cUL |
| F13<br>F20<br>F23 | A<br>A | B    | U198<br>U185 |              |                           | cap of PPS, potted  | VDE, UL, cUL |
| F13<br>F20<br>F23 | A<br>A | B    | U112         |              |                           | coated<br>$T_A$ max. 160 °C   | VDE, UL, cUL |
| F20<br>F23        | A      | B    | A150 U280    |              |                           | housing of PPS<br>leadframe leads<br>grid dimension 5.08<br>potted    | VDE, UL, cUL |
| F13<br>F20<br>F23 | A<br>A | B    | A800         |              |                           | not insulated, potted   | VDE, UL, cUL |
| F20<br>F23        | E      | G    | G700         |              |                           | aluminium housing<br>thread M4x6<br>potted<br>$T_A$ max. 150 °C       | VDE, UL, cUL |
| F13               | A      |      | U282         |              |                           | housing of PPS, potted  | VDE, UL, cUL |
| F13<br>F20<br>F23 | A<br>A | B    | A150 U112    |              |                           | leadframe leads<br>grid dimension 5.08<br>coated<br>$T_A$ max. 160 °C | VDE, UL, cUL |
| F13               | A      | B    | B224         |              |                           | CuBe mounting cap<br>combined with<br>U198 / U112                     | VDE, UL, cUL |

## Standard wire

| lead           | code | temperature max. | operating voltage max. | approx. diameter insulation | approx. cross section / diameter | UL- Style |
|----------------|------|------------------|------------------------|-----------------------------|----------------------------------|-----------|
| stranded white | L300 | 150 °C           | 300 V                  | 1,50 mm                     | AWG24 / 0,25 mm <sup>2</sup>     | 3398      |
|                | L310 |                  |                        | 1,82 mm                     | AWG20 / 0,50 mm <sup>2</sup>     |           |
|                | L360 | 200 °C           | 600 V                  | 1,20 mm                     | AWG24 / 0,25 mm <sup>2</sup>     | 10086     |
|                | L370 |                  |                        | 1,60 mm                     | AWG20 / 0,50 mm <sup>2</sup>     |           |
| solid yellow   | L400 | 150 °C           | 300 V                  | 1,35 mm                     | AWG24 / 0,50 mm                  | 3398      |
|                | L410 |                  |                        | 1,66 mm                     | AWG20 / 0,80 mm                  |           |
|                | L430 | 200 °C           | 300 V                  | 1,16 mm                     | AWG24 / 0,50 mm                  | 1332      |
|                | L440 |                  |                        | 1,54 mm                     | AWG20 / 0,80 mm                  |           |

Standard length 100 ± 10 mm, stripped 6 ± 1 mm, AWG24 is recommended

## Heating by current

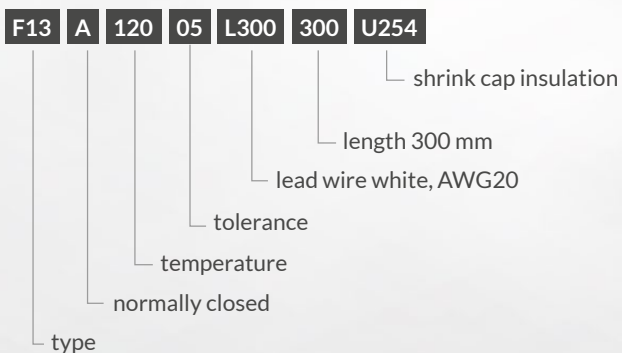


The characteristic curve in the diagram is measured with a thermal switch without any insulation in an oil bath.

Note:

The self-heating depends on the thermal conduction of the control to the equipment or part which should be protected.

## Ordering example



## Marking

|              |  |
|--------------|--|
| <b>F13A</b>  | type (F13 n.c.)  |
| <b>12005</b> | response temperature (120°C), tolerance (± 5°C)          |
| <b>027D</b>  | date of manufacture (February 2015), country (D=Germany) |

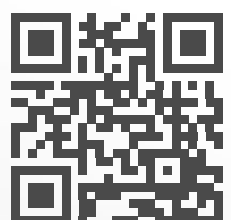
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