

## Description

Single, double and three pole thermal-magnetic circuit breakers with high rupture capacity to UL 489 (5 kA), EN/IEC 60934 (6kA) and UL 1077 (5 kA). With toggle actuation, positively trip-free mechanism, a choice of characteristic curves and a wide range of current ratings in finely graded steps from 0.1 A through 32 A. Auxiliary contacts (make or break contacts) are optionally available. Track-mountable design, width only 12.5 mm. Ease of wiring by means of an integral busbar concept: line entry busbar LINE+ and signal busbars/signal jumpers.

**US patent number:** US 8,098,119 B2 (Modularity)

**US patent number:** US 7,978,033 B2 (Release Mechanism)

**US patent number:** US 7,834,290 B2 (Quenching Chamber)

## Typical applications

Protection of power supplies, equipment and cables in centralised control systems and in decentralised installations serving automation, petro-chemical, power plant, steel industry and similar industrial applications.

## Ordering Information

### Type number

**4220** thermal-magnetic high performance circuit breaker

### Mounting

**T1** track-mounting

### Number of poles

**1** single pole

**2** double pole

**3** three pole

### Additional feature

**0** without actuator guard

**1** with actuator guard

### Main terminals

**K0** screw terminals 16 mm<sup>2</sup> / 10 mm<sup>2</sup>

### Characteristic curve

**F1** thermal-magnetic, extremely fast, DC

**F2** thermal-magnetic, fast, AC/DC

**M1** thermal-magnetic, medium delay, AC/DC

**T1** thermal-magnetic, long delay, AC/DC

### Auxiliary contacts

**H0** without

**H1** with auxiliary contacts in all poles

**H2** with auxiliary contacts only in pole 1 (2-pole plus)

**H3** with auxiliary contacts only in poles 1+3 (3-pole plus)

**H4** with auxiliary contacts only in pole 2 (3-pole plus)

**H5** with auxiliary contacts only in the last pole

**H6** with auxiliary contacts only in poles 1+2 (3-pole plus)

### Auxiliary contact function

**0** without

**2** make contact (N/O)

**3** break contact (N/C)

**A** pole 1 make contact, all other poles break contacts (2-pole plus)

**B** poles 1+2 make contacts, other poles break contacts (3-pole plus)

**C** pole 1 break contact, other poles make contacts (2-pole plus)

### Auxiliary contacts – terminal design

**0** without

**1** screw terminals 1 mm<sup>2</sup>

### Voltage rating

**A** ≤ AC 277 V or ≤ DC 60 V

### Current rating range

**0.1...32 A**

### Approval logo (optional)

**V** UL 489 (1-pole)

**4220 - T1 1 0 - K0 M1- H1 2 1 - A - 10 A - V** ordering example



single pole

**4220-T...**

three pole

## Technical data

**For further details please see catalogue section: Technical Information**

**Voltage rating** AC 240 V; 3 AC 415 V (50/60 Hz); DC 60 V  
UL: AC 120 V; AC 277 V; 3 AC 415 V; DC 60 V

**Current rating range** 0.1...32 A

**Auxiliary circuit** DC 10 - 30 V, 10 - 500 mA, resistive

### Typical life

|           |              |                                                     |
|-----------|--------------|-----------------------------------------------------|
| IEC 60934 | AC 240/415 V | 1,000 cycles at 1 x I <sub>N</sub> , ind. load      |
|           | AC 240 V:    | 6,000 cycles at 1 x I <sub>N</sub> , inductive load |
|           | DC 60 V:     | 6,000 cycles at 1 x I <sub>N</sub> , resistive load |
| UL 489    | AC 120 V:    | 6,000 cycles at 1 x I <sub>N</sub> , inductive load |
| UL 1077   | AC 277/480 V | 3,000 cycles at 1 x I <sub>N</sub> , inductive load |
|           | AC 277 V:    | 6,000 cycles at 1 x I <sub>N</sub> , inductive load |
|           | DC 60 V:     | 6,000 cycles at 1 x I <sub>N</sub> , resistive load |

**Ambient temperature** -30...+60 °C (-22...+140 °F, T60)

**Storage temperature** -40...+60 °C (-40...+140 °F)

**Insulation co-ordination** IEC 60664 2.5 kV / 2  
re-inforced insulation in the operating area

**Dielectric strength operating area** IEC 60934  
test voltage AC 3,000 V  
(reinforced insulation)  
test voltage AC 1,500 V

|                                   |                         |
|-----------------------------------|-------------------------|
| pole to pole                      | test voltage AC 1,500 V |
| main circuit to auxiliary circuit | test voltage AC 1,500 V |
| open main circuit                 | test voltage AC 250 V   |
| open auxiliary circuit            | test voltage AC 250 V   |

**Insulation resistance** > 100 MΩ (DC 500 V)

**Interrupting capacity**  
I<sub>nc</sub> PC1 AC 240 V, AC 240/415 V: 6,000 A  
IEC 60934 DC 60 V: 6,000 A

**Interrupting capacity**  
UL 489 AC 120 V: 5,000 A

**Interrupting capacity**  
UL 1077 AC 277 V, AC 277/480 V: 5,000 A  
DC 60 V: 5,000 A

**Protection class**  
(IEC 60529) operating area IP30  
terminal area IP00

**Vibration (sinusoidal)** ± 0.38 mm (10-57 Hz), 5 g (57-500 Hz)  
test to IEC 60068-2-6, test Fc,  
10 frequency cycles/axis

**Shock** 25 g (11 ms)  
test to IEC 60068-2-27, test Ea

**Corrosion** 96 hrs in 5 % salt mist,  
test to IEC 60068-2-11, test Ka

**Humidity** 240 hrs in 95 % RH,  
to IEC 60068-2-78, test Cab

**Housing material** moulded material

**Mounting** on symmetrical rail to EN 50022-35x7.5

**Mounting dimension**  
(w x h x d) 12.5 x 89.3 x 87.1 (per pole)

## Dimensions

|                                                         |                           |
|---------------------------------------------------------|---------------------------|
| screw terminals                                         | M5                        |
| max. cable cross section                                |                           |
| flexible with wire end ferrule w/wo plastic sleeve      | 1 – 16 mm <sup>2</sup>    |
| multi-lead connection<br>(2 identical cables)           |                           |
| flexible with wire end ferrule without plastic sleeve   | 1 – 6 mm <sup>2</sup>     |
| flexible with TWIN wire end ferrule with plastic sleeve | 0.75 – 10 mm <sup>2</sup> |
| wire stripping length                                   | 14 mm                     |
| tightening torque                                       | 2.5 – 3 Nm                |

|                                                         |                           |
|---------------------------------------------------------|---------------------------|
| screw terminals                                         | M4                        |
| max. cable cross section                                |                           |
| flexible with wire end ferrule w/wo plastic sleeve      | 0.5 – 10 mm               |
| multi-lead connection<br>(2 identical cables)           |                           |
| flexible with wire end ferrule without plastic sleeve   | 0.5 – 2.5 mm <sup>2</sup> |
| flexible with TWIN wire end ferrule with plastic sleeve | 0.5 – 6 mm <sup>2</sup>   |
| wire stripping length                                   | 10 mm                     |
| tightening torque                                       | 1.2 – 1.4 Nm              |

|                                                       |                             |
|-------------------------------------------------------|-----------------------------|
| screw terminals                                       | M2                          |
| max. cable cross section                              |                             |
| flexible with wire end ferrule w/wo plastic sleeve    | 0.25 – 0.75 mm <sup>2</sup> |
| multi-lead connection<br>(2 identical cables)         |                             |
| flexible with wire end ferrule without plastic sleeve | 0.25 – 0.34 mm <sup>2</sup> |
| wire stripping length                                 | 6 mm                        |
| tightening torque                                     | 0.22 – 0.25 Nm              |

### Current ratings and typical internal resistance values

Technical drawing of the M4 terminal block, showing dimensions and labels for the front, side, and detail views.

**Front View Dimensions:**

- Overall width: 45
- Distance between main contact terminals: 1.77
- Distance between auxiliary contact terminals: 1.732
- Overall height: 80.2
- Distance from top to main contact terminals: 3.157
- Distance from top to auxiliary contact terminals: 73.2
- Distance from top to main contact terminals (alternative): 2.882
- Distance from top to auxiliary contact terminals (alternative): 43.5
- Distance from top to main contact terminals (alternative): 1.713
- Distance from top to auxiliary contact terminals (alternative): 6.9
- Distance from top to main contact terminals (alternative): 2.72
- Distance from top to auxiliary contact terminals (alternative): 44
- Distance from top to main contact terminals (alternative): 45.3
- Distance from top to auxiliary contact terminals (alternative): 1.783

**Labels:**

- label see accessories
- OFF
- ON
- snap-in socket for symmetrical rail EN 50022-35x7,5
- protection against brush contact: remove slide from the bottom of the device

**Side View Dimensions:**

- Overall height: 37.3
- Distance between main contact terminals: 1.47
- Distance between auxiliary contact terminals: nx12.5
- Distance between main contact terminals (alternative): .492
- Distance between auxiliary contact terminals (alternative): 12.3
- Distance between main contact terminals (alternative): .484

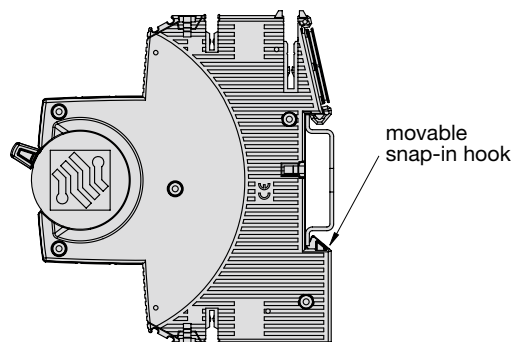
**Labels:**

- operating area (reinforced insulation)
- mounting area (standard insulation)
- auxiliary contact terminal M2 max. 1.5 mm<sup>2</sup>
- slot for signal busbar
- main contact terminal M4 max. 10 mm<sup>2</sup>

**Detail View:**

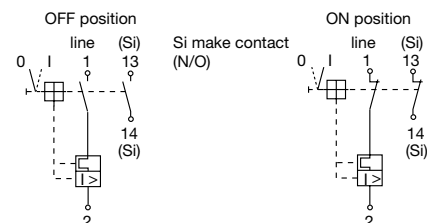
- unit I
- unit II
- unit III

## Installation drawing

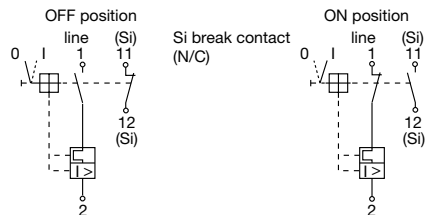
allowable mounting position: **vertical**

## Internal connection diagrams

...-H121-...



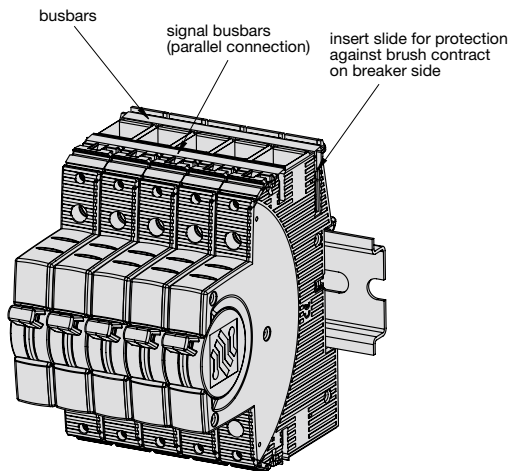
...-H131-...



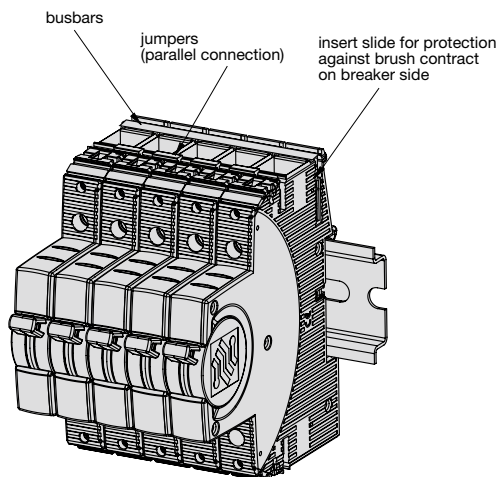
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## Termination examples

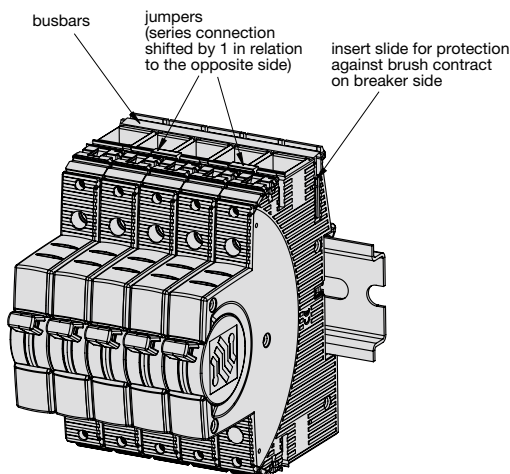
### 4220-T with busbars and signal busbars (auxiliary contacts connected in parallel)



### 4220-T with busbars and jumpers (auxiliary contacts connected in parallel)



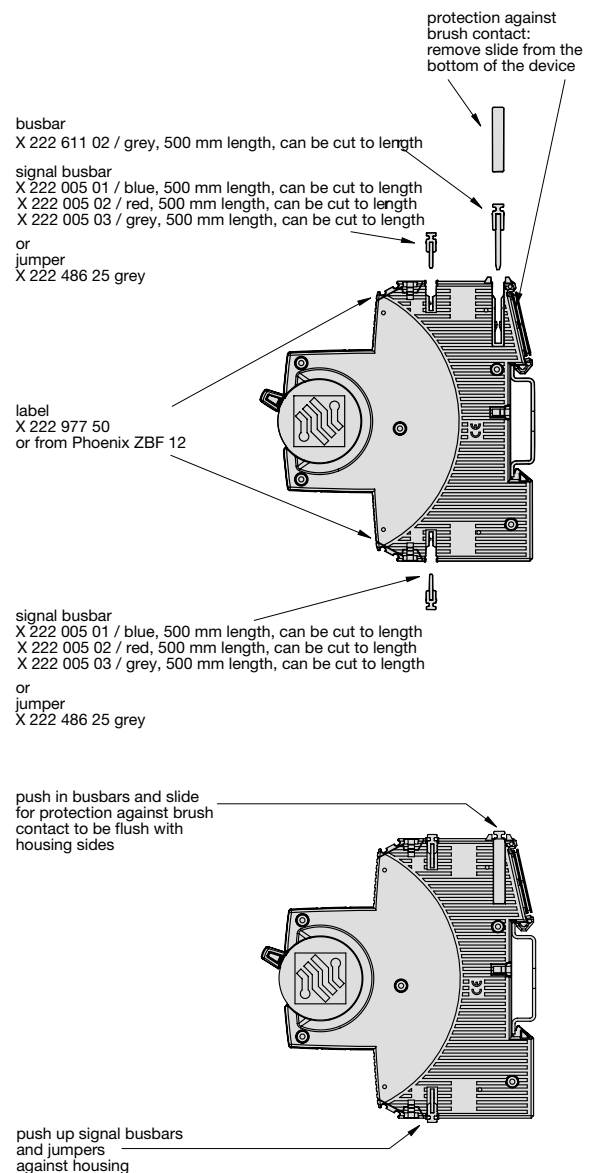
### 4220-T with busbars and signal busbars (auxiliary contacts connected in serie)



**Busbars, signal busbars and jumpers: see accessories**

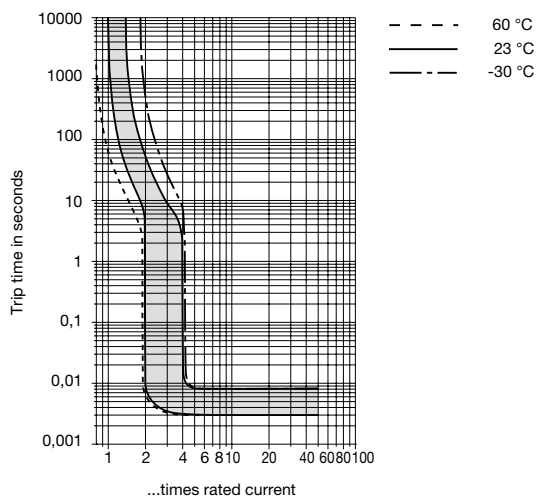
## Accessories

| Description                                                | Part number  |
|------------------------------------------------------------|--------------|
| busbar grey, 500 mm length,<br>can be cut to length        | X 222 611 02 |
| signal busbar blue, 500 mm length,<br>can be cut to length | X 222 005 01 |
| signal busbar red, 500 mm length,<br>can be cut to length  | X 222 005 02 |
| signal busbar grey, 500 mm length,<br>can be cut to length | X 222 005 03 |
| signal busbar grey<br>(packing unit 25 pcs)                | X 222 486 25 |
| Label (packing unit 50 pcs)<br>or from Phoenix ZBF 12      | X 222 977 50 |

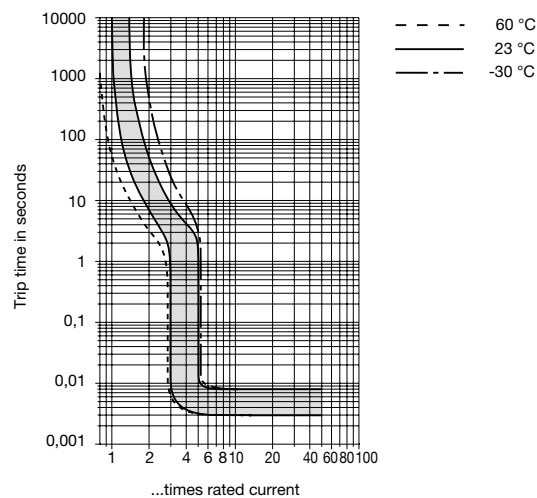


## Typical time/current characteristics

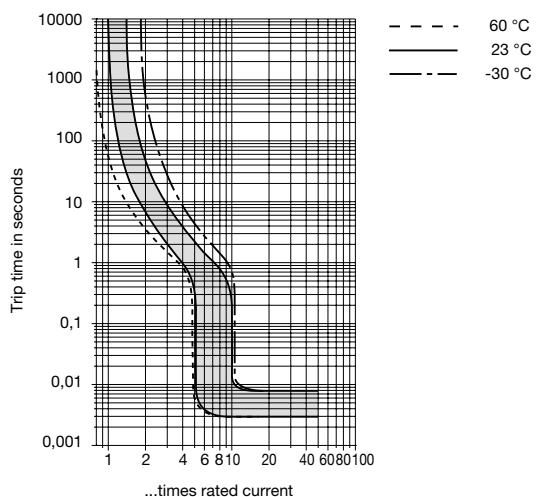
**F1 thermal, magnetic fast (DC)**



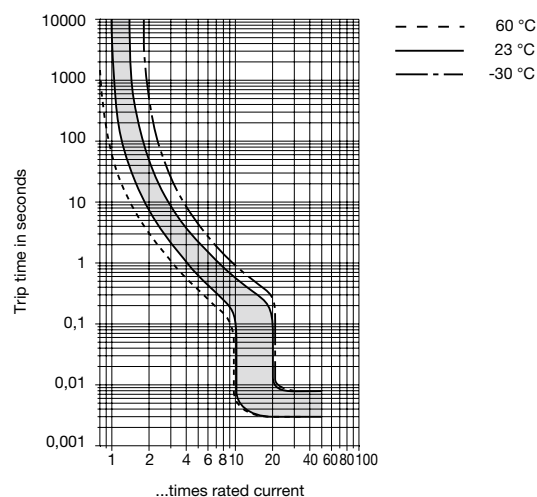
**F2 thermal, magnetic fast (AC/DC)**



**M1 thermal, magnetic medium delay (AC/DC)**



**T1 thermal, magnetic long delay (AC/DC)**



The time/current characteristic curve depends on the ambient temperature prevailing. In order to eliminate nuisance tripping, please multiply the circuit breaker current ratings by the derating factor shown below. See also section Technical information.

|                  |      |      |      |      |      |       |      |      |      |      |
|------------------|------|------|------|------|------|-------|------|------|------|------|
| Ambient temp. °F | -22  | -4   | +14  | +32  | +50  | +73.4 | +86  | +104 | +122 | +140 |
| °C               | -30  | -20  | -10  | 0    | +10  | +23   | +30  | +40  | +50  | +60  |
| Derating factor  | 0.76 | 0.79 | 0.83 | 0.88 | 0.93 | 1     | 1.04 | 1.12 | 1.22 | 1.35 |

**Magnetic tripping currents are increased by 30 % on DC supplies.**

**When several devices are mounted together, an air gap between each is recommended. If this is not possible, each device should carry only 80 % of its rating.**

## Approvals

| Authority | Standard             | Rated voltage                       | Current ratings                                          |
|-----------|----------------------|-------------------------------------|----------------------------------------------------------|
| VDE       | IEC/EN 60934         | AC 240/415 V<br>AC 240 V<br>DC 60 V | 0.1 A...32 A<br>0.1 A...32 A<br>0.1 A...32 A             |
| UL        | UL 1077 C22.2 No 235 | AC 277/480 V<br>AC 277 V<br>DC 60 V | 0.1 A...32 A<br>0.1 A...32 A<br>0.1 A...32 A             |
| UL        | UL 489               | AC 120 V<br>DC 60 V                 | 0.1 A...32 A (single pole)<br>0.1 A...32 A (single pole) |

All dimensions without tolerances are for reference only. In the interest of improved design, performance and cost effectiveness the right to make changes in these specifications without notice is reserved. Product markings may not be exactly as the ordering codes. Errors and omissions excepted.