Additional characteristics

Compact NSXm up to 160 A

TMD magnetic trip units, tripping curves

Protection of distribution systems

<table>
<thead>
<tr>
<th>TM16D</th>
<th>TM25D</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM16D : Im = 30 x In</td>
<td>TM25D : Im = 24 x In</td>
</tr>
<tr>
<td>T &lt; 10 ms</td>
<td>T &lt; 10 ms</td>
</tr>
</tbody>
</table>

Reflex tripping.

<table>
<thead>
<tr>
<th>TM32D / TM40D</th>
<th>TM50D / TM63D</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM32D : Im = 19 x In</td>
<td>TDM50D / TM63D : Im = 12 x In</td>
</tr>
<tr>
<td>T &lt; 10 ms</td>
<td>T &lt; 10 ms</td>
</tr>
</tbody>
</table>

Reflex tripping.
Compact NSXm up to 160 A
TMD magnetic trip units, tripping curves
Protection of distribution systems

Additional characteristics

For all TMD curves:
Values are given for 40 °C ambient, Ir = 1xIn, 3 poles loaded, cold start.
For Ir = k x In, read the time corresponding to 1/k times given current.
For 1 pole tripping, read the time corresponding to 0.85 times given current.
For hot start (0.9 x Ir), divide max. time by 2, min. time by 4.

Reflex tripping.
Additional characteristics

Compact NSXm up to 160 A
Micrologic Vigi 4.1, tripping curves
Protection of distribution systems

25 A

50 A

100 A

160 A

Reflex tripping.
Compact NSXm and NSX100 to 630 devices incorporate the exclusive reflex-tripping system. This system breaks very high fault currents. The device is mechanically tripped via a “piston” actuated directly by the pressure produced in the breaking units by the short-circuit. For high short-circuits, this system provides a faster break, thereby ensuring discrimination. Reflex-tripping curves are exclusively a function of the circuit-breaker rating.
Current and energy limiting curves

The limiting capacity of a circuit breaker is its aptitude to let through a current, during a short-circuit, that is less than the prospective short-circuit current.

Ics = 100 % Icu
The exceptional limiting capacity of the Compact NSX and NSXm ranges greatly reduces the forces created by fault currents in devices. The result is a major increase in breaking performance. In particular, the service breaking capacity Ics is equal to 100 % of Icu. The Ics value, defined by IEC standard 60947-2, is guaranteed by tests comprising the following steps:

- break three times consecutively a fault current equal to 100 % of Icu
- check that the device continues to function normally, that is:
  - it conducts the rated current without abnormal temperature rise
  - protection functions perform within the limits specified by the standard
  - suitability for isolation is not impaired.

Longer service life of electrical installations
Current-limiting circuit breakers greatly reduce the negative effects of short-circuits on installations.

Thermal effects
Less temperature rise in conductors, therefore longer service life for cables.

Mechanical effects
Reduced electrodynamic forces, therefore less risk of electrical contacts or busbars being deformed or broken.

Electromagnetic effects
Fewer disturbances for measuring devices located near electrical circuits.

Economy by means of cascading
Cascading is a technique directly derived from current limiting. Circuit breakers with breaking capacities less than the prospective short-circuit current may be installed downstream of a limiting circuit breaker. The breaking capacity is reinforced by the limiting capacity of the upstream device. It follows that substantial savings can be made on downstream equipment and enclosures.

Current and energy limiting curves
The limiting capacity of a circuit breaker is expressed by two curves which are a function of the prospective short-circuit current (the current which would flow if no protection devices were installed):

- the actual peak current (limited current)
- thermal stress (A²s), i.e. the energy dissipated by the short-circuit in a conductor with a resistance of 1 Ω.

Example
What is the real value of a 70 kA rms prospective short-circuit (i.e. 100 kA peak) limited by an NSX160F upstream?
The answer is 20 kA peak.

Maximum permissible cable stresses
The table below indicates the maximum permissible thermal stresses for cables depending on their insulation, conductor (Cu or Al) and their cross-sectional area (CSA). CSA values are given in mm² and thermal stresses in A²s.

<table>
<thead>
<tr>
<th>CSA</th>
<th>1.5 mm²</th>
<th>2.5 mm²</th>
<th>4 mm²</th>
<th>6 mm²</th>
<th>10 mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cu</td>
<td>2.97x10⁴</td>
<td>8.26x10⁴</td>
<td>2.12x10⁵</td>
<td>4.76x10⁵</td>
<td>1.32x10⁶</td>
</tr>
<tr>
<td>Al</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.41x10⁵</td>
</tr>
<tr>
<td>PRC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cu</td>
<td>4.10x10⁴</td>
<td>1.39x10⁵</td>
<td>2.92x10⁵</td>
<td>6.56x10⁵</td>
<td>1.82x10⁶</td>
</tr>
<tr>
<td>Al</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7.52x10⁵</td>
</tr>
<tr>
<td>CSA</td>
<td>16 mm²</td>
<td>25 mm²</td>
<td>35 mm²</td>
<td>50 mm²</td>
<td></td>
</tr>
<tr>
<td>PVC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cu</td>
<td>3.40x10⁵</td>
<td>8.26x10⁵</td>
<td>1.62x10⁷</td>
<td>3.31x10⁷</td>
<td></td>
</tr>
<tr>
<td>Al</td>
<td>1.39x10⁷</td>
<td>3.38x10⁷</td>
<td>6.64x10⁷</td>
<td>1.35x10⁸</td>
<td></td>
</tr>
<tr>
<td>PRC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cu</td>
<td>4.69x10⁸</td>
<td>1.39x10⁸</td>
<td>2.23x10⁸</td>
<td>4.56x10⁸</td>
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</tr>
<tr>
<td>Al</td>
<td>1.93x10⁸</td>
<td>4.70x10⁸</td>
<td>9.23x10⁸</td>
<td>1.88x10⁹</td>
<td></td>
</tr>
</tbody>
</table>

Example
Is a Cu/PVC cable with a CSA of 10 mm² adequately protected by an NSX160F? The table above indicates that the permissible stress is 1.32x10⁷ A²s. All short-circuit currents at the point where an NSX160F (Icu = 35 kA) is installed are limited with a thermal stress less than 6x10⁷ A²s. Cable protection is therefore ensured up to the limit of the breaking capacity of the circuit breaker.
Current and energy limiting curves
Compact NSXm

Current-limiting curves

Voltage 400/440 V AC
Limited short-circuit current (kA peak)

Voltage 660/690 V AC
Limited short-circuit current (kA peak)

Energy-limiting curves

Voltage 400/440 V AC
Limited energy

Voltage 660/690 V AC
Limited energy