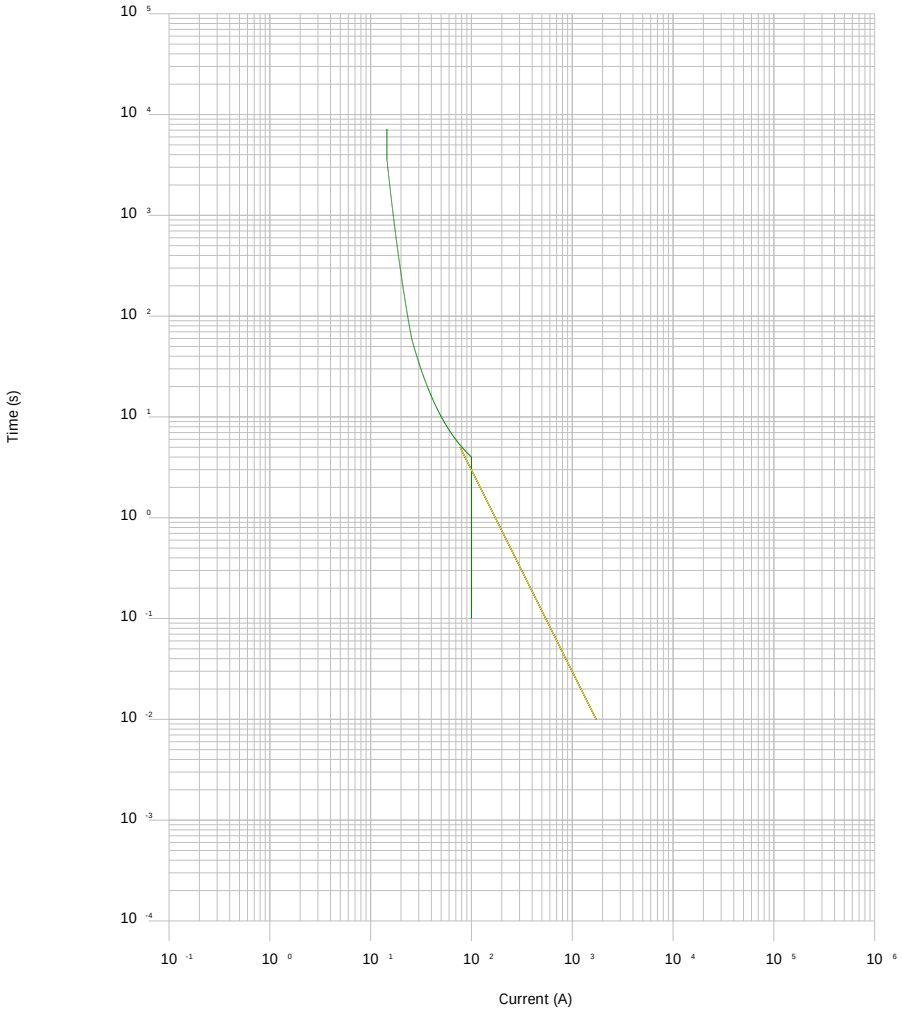
Properties of the short circuit protection devices (IEC 60364-4-43, section 434.5.2)

For cables and isolated conductors, all the current caused by the short circuit anywhere in the circuit must be interrupted in a period of time not exceeding that required for the insulation of the conductors to reach their permissible temperature limit.

For short circuits with a duration of up to 5 s, the time t, in which a specific short circuit current will increase the temperature of the insulation of the conductors from the maximum permissible temperature under normal operating conditions up to the limit temperature, can be calculated, approximately, using the following formula:

$$t = \left(k \cdot \frac{S}{I_{cc}} \right)^2 \qquad [3]$$



Normal supply						
I_{cc} (kA)	Type of short circuit	t_{cc} (s)	S (mm²)	k	t_{cable} (s)	Status
1.17	Ik1 max top	< 0.10	1.50 (F)	115	0.0218*	⚠
0.51	Ik1 min bottom	< 0.10	1.50 (F)	115	0.1165	✓

* For working times of the protection devices < 0.10 s for which there is a large asymmetry in the current and for current limiting devices k^2S^2, it must be greater than the value of the energy that is passed (I^2t), which is indicated by the manufacturer of the protection device. ⚠

Since no specific protection has been selected from a manufacturer's catalogue, a generic I^2t curve is assumed for the protection, which provides values that, in general, are sufficiently conservative. However, for greater security, this same check must be carried out with the specific curve of the protection that is going to be used, which must be provided by its manufacturer.

$$I^2t < k^2S^2$$

5245 < 29756.25

Complementary supply						
I_{cc} (kA)	Type of short circuit	t_{cc} (s)	S (mm²)	k	t_{cable} (s)	Status
0.82	Ik1 max top	< 0.10	1.50 (F)	115	0.0443*	
0.43	Ik1 min bottom	< 0.10	1.50 (F)	115	0.1578	

* For working times of the protection devices < 0.10 s for which there is a large asymmetry in the current and for current limiting devices k^2S^2, it must be greater than the value of the energy that is passed (I^2t), which is indicated by the manufacturer of the protection device.

Since no specific protection has been selected from a manufacturer's catalogue, a generic I^2t curve is assumed for the protection, which provides values that, in general, are sufficiently conservative. However, for greater security, this same check must be carried out with the specific curve of the protection that is going to be used, which must be provided by its manufacturer.

$$I^2t < k^2S^2$$

3976 < 29756.25

With:

- I_{cc} Short circuit current
- t_{cc} Short circuit duration period
- S Section of the cable
- k Factor that takes into account the resistivity, the temperature coefficient and the heat capacity of the conductor material, and the appropriate initial and final temperatures. For normal use conductor insulation, the values of k for line conductors are shown in table 43A
- t_{cable} Time taken by the conductor to reach its admissible temperature limit
- I^2t Specific pass-through energy of the circuit breaker