IEC Technical data
Contactor electrical durability and Utilization categories

General

Utilization categories determine the current making and breaking conditions relating to the characteristics of the loads to be controlled by the contactors. International standard IEC 60947-4-1 and European standard EN 60947-4-1 are the standards to be referred to.

If I_c is the current to be broken by the contactor and I_e the rated operational current normally drawn by the load, then:

- Categories AC-1 and AC-3: $I_c = I_e$
- Category AC-2: $I_c = 2.5 \times I_e$
- Category AC-4: $I_c = 6 \times I_e$

Generally speaking $I_c = m \times I_e$ where m is a multiple of the load operational current.
On pages 1.66 - 1.71, the curves corresponding to categories AC-1, AC-2, AC-3 and AC-4 represent the electrical durability variation of standard contactors in relation to the breaking current I_c.
Electrical durability is expressed in millions of operating cycles.
These curves have been plotted for 400 V - 50 Hz 3-phase currents but remain valid up to 690 V - 40 ... 60 Hz provided that a check is carried out to make sure that at the operational voltage U_e, the current I_e normally drawn by the load does not exceed the value of the contactor rated operational current: I_e / AC-1 for category AC-1 and I_e / AC-3 for categories AC-3 and AC-4. The values are given for each type of contactor in pages 1.44, 1.45, 1.54, and 1.61 (Technical Data).

Curve Utilization Mode

Electrical durability forecast and contactor selection for categories AC-1, AC-2, AC-3 or AC-4

- Note the characteristics of the load to be controlled:
  - Operational voltage ..... U_e
  - Current normally drawn ..... I_e (U_e / I_e / kW relation for motors, + page 0/0).
  - Utilization category ..... AC-1, AC-2, AC-3 or AC-4
  - Breaking current ..... $I_c = I_e$ for AC-1 and for AC-3 ; $I_c = 2.5 \times I_e$ for AC-2 ; $I_c = 6 \times I_e$ for AC-4
- Define the number of operating cycles N required.
- On the diagram corresponding to the operational category, select the contactor with the curve immediately above the intersection point (I_c ; N).

Electrical durability forecast and contactor selection for mixed duty motor control: AC-3 ($I_c = I_e$) type switching off while "motor running" and, occasionally, AC-4 ($I_c = 6 \times I_e$) type switching off while "motor accelerating".

- Note the characteristics of the motor to be controlled:
  - Operational voltage ..... U_e
  - Current normally drawn while "motor running" ..... I_e (U_e / I_e / kW relation for motors, + 0/0).
  - Breaking current for AC-3 ..... $I_c = I_e$
  - Breaking current for AC-4 while "motor accelerating" ..... $I_c = 6 \times I_e$
  - Percentage of AC-4 operations ..... K (on the basis of the total number of operating cycles)
- Define the total number of operating cycles N required.
- Note the smallest contactor rating compatible for AC-3 (U_e / I_e) on pages 2/62, 2/63, 2/73, and 2/79.
- For the selected contactor make a note of the following in relation to the voltage using diagram AC-3 page 2/85 and AC-4 page 2/86 or 2/87:
  - The number of operating cycles A for $I_c = I_e$ (AC-3)
  - The number of operating cycles B for $I_c = 6 \times I_e$ (AC-4)
- Calculate the estimated number of cycles N' (N' is always below A)

$$N' = \frac{A}{1 + 0.01\ K\ (A/B - 1)}$$

- If N' is too low in relation to the target N, calculate the estimated number of cycles for a higher contactor rating.

Case of uninterrupted duty.
Among the different utilization categories, the uninterrupted duty implies the following remark. The combinated effect of environmental conditions and the proper temperature of the product may require some disposals. As a matter of fact, for this duty, the use duration prevails over the number of operating cycles.
For long term service, some verifications of preventing maintenance are needed to check the functionality of the concerned product (consult us).
Over a duration of five years, in these conditions the contactor might present high internal resistance. We recommend to change the contactor or change the contacts.