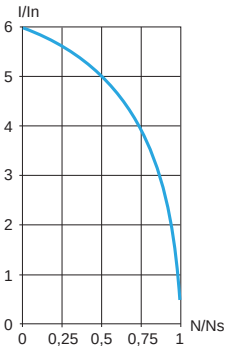
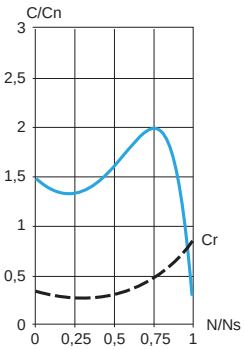
Soft starters
Conventional starting of three-phase asynchronous motors

Direct starting



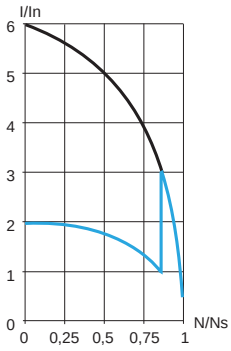
Starting current



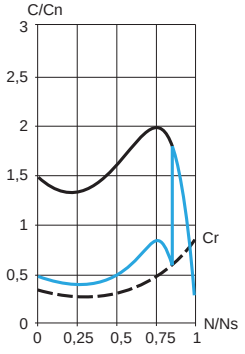
Starting torque

- Starting current: 4 to 8 times the nominal current
- Starting torque: 0.5 to 1.5 times the nominal torque
- Characteristics:
  - Motor with 3 terminals, low and medium power
  - On-load starting
  - High current peak and voltage drop
  - Simple device
  - Sudden starting for the mechanism
- No parameter adjustment

"Star-delta" starting



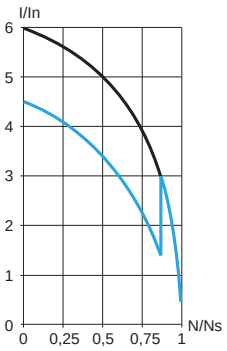
Starting current



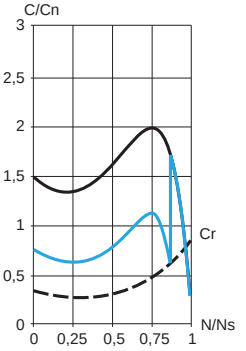
Starting torque

- Starting current: 1.8 to 2.6 times the nominal current
- Starting torque: 0.5 times the nominal torque
- Characteristics:
  - Motor with 6 terminals
  - No-load or low resistive torque starting
  - High current peaks and torque when changing to "star-delta" mode
  - A device requiring maintenance
  - Subject to mechanical stress when starting
- No parameter adjustment

Rheostatic stator starting



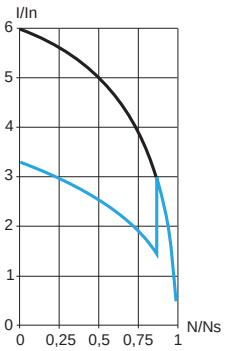
Starting current



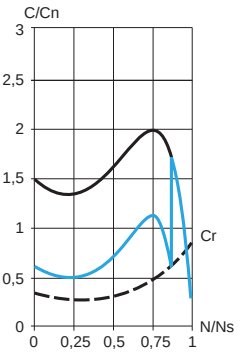
Starting torque

- Starting current: 4.5 times the nominal current
- Starting torque: 0.5 to 0.75 times the nominal torque
- Characteristics:
  - Motor with 3 terminals, high power
  - Starting with increasing resistive torque
  - High current peak
  - A large, bulky device requiring maintenance
  - Subject to mechanical stress when starting
- No parameter adjustment

Auto transformer starting



Starting current

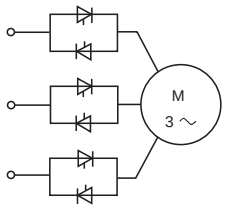


Starting torque

- Starting current: 1.7 to 4 times the nominal current
- Starting torque: 0.4 to 0.85 times the nominal torque
- Characteristics:
  - Motor with 3 terminals, high power
  - Large voltage drop and current peak when connected at full voltage
  - A complex, bulky device requiring maintenance
  - Subject to mechanical stress when starting
- No parameter adjustment

Soft starters
Progressive starting
of three-phase asynchronous motors

Conventional electronic starting with variable voltage and current limiting

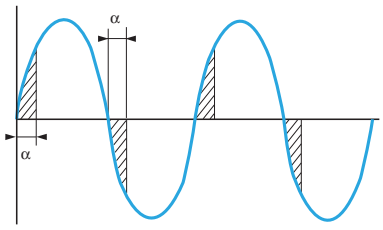


Schematic diagram

■ A controller with 6 thyristors connected head to tail in each line phase is used to power the three-phase asynchronous motor by gradually increasing the voltage on start-up.

□ Depending on the firing time and angle of the thyristors, it can be used to supply a voltage which will gradually increase at a fixed frequency.

□ The gradual increase in the output voltage can either be controlled by the acceleration ramp, or by the value of the limiting current, or linked to both parameters.



Firing angle

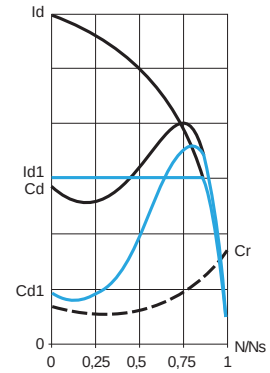


Figure 1

■ Figure 1 shows the behaviour of the torque in relation to the starting current.
Limiting the starting current Is to a preset value Is1 will reduce the starting torque Ts1 to a value which is almost equal to the ratio of the square of currents Is and Is1.
Example
On a motor with the following characteristics: Ts = 2 Tn for Is = 6In, current limiting at Is1= 3 In or 0.5 Is results in a starting torque: Ts1 = Ts x (0.5)2 = 2 Tn x 0.25 = 0.5 Tn.

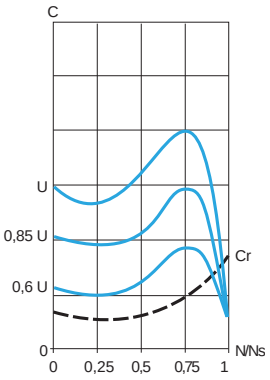


Figure 2

■ Figure 2 shows the torque/speed characteristic of a squirrel cage motor in relation to the supply voltage.
The torque varies like the square of the voltage at a fixed frequency. The gradual increase in the voltage prevents the instantaneous current peak on power-up.

Advantages of starting with the Altistart 48

■ Conventional electronic starting
To rectify problems caused by:
- mechanical stress when starting
- hydraulic transients during acceleration and deceleration in pump applications

Conventional electronic starting requires the use of several current limits or the switching of several voltage ramps.
The settings become complicated and must be modified every time the load changes.

■ Starting with the Altistart 48
The Altistart 48 torque control enables starting without mechanical stress and the smooth control of hydraulic transients with a single acceleration ramp.
The settings are simple and effective, whatever the load.