

Soft starters – December 2021

Guide

Soft starters for electric motors



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EXCEEDING EXPECTATIONS

Introduction

Getting the right start is the first step towards success. When designing an application, it is always worth considering precisely what happens when you start the electric motor. A soft starter provides a better start, thereby avoiding power surges and sudden motion. Soft starters also allow applications to have a soft stop.

Electrical soft starters function by sending voltage through a series of connected semi-conductors.

During a soft start, these components can be configured to gradually allow an increasing amount of current to pass through. By reversing the process, it is possible to gradually reduce the voltage, eventually bringing the motor to a soft stop.

A soft starter operates using two main parameters: limiting the voltage and controlling the starting time. Adjusting these factors according to your starting torque requirements allows you to avoid spikes of inrush current when starting the motor and reduce mechanical stress on the motor and connected application.

Advantages of using a soft starter

The main advantages of using a soft starter are:

Better application control

For many applications, sudden uncontrolled start and stop can cause problems. This is eg. the case for pumps, where abrupt stops result in water hammering, which causes wear and tear on the piping. Applications such as centrifugal fans and cooling compressors also benefit from a soft start, as it reduces the initial strain on the system and thereby extends the lifetime of the application.

Preventing power spikes

With both DOL and star delta starters, getting the motor to full speed and torque often generates a current peak that can be over 10 times the rated current of the motor. Many energy providers have requirements that limit such current peaks as it can cause a voltage drop on the supply grid and transformer. This also applies to marine applications powered by a generator, where unintentional current peaks increase the risk of malfunction.

Considerations when selecting a soft starter

Choosing a soft starter depends on the following criteria:

- Application type and use
- Nominal power and current of the motor
- The load factor of the application

It is important to find the right balance between voltage reduction and torque demand, as limiting the current too much prevents the motor from starting while not limiting it enough defeats the purpose of even using a soft starter.

The number of starts required within a given period is also relevant. A soft starter generates significant heat during use, so there is a natural limit to how many times the motor can be stopped and started during normal use. If frequent starts and stops per hour are needed, it may be necessary to increase the size and capacity of the soft starter relative to the rated motor power.

It is recommended to install bypass and line contactors. A bypass contactor is mounted in parallel to the soft starter to divert power when the motor has reached operating speed. This reduces energy loss and extends the lifetime of the soft starter. A line contactor is installed in serial to the soft starter, for safely disconnecting the power to the soft starter. When a soft starter has an embedded bypass switch, the external bypass contactor is not needed.

The application type and environment should always be taken into consideration e.g. selecting a soft starter rated for marine usage, high altitudes, or hazardous environments.

Soft starters for different applications

Using a soft starter can be relevant for many different types of applications across industries and markets.

Industrial applications

For centrifugal pumps and other industrial pump applications, a soft starter can be used to reduce motor torque during the start sequence. Performing a soft stop by slowly decreasing the current is an effective way of preventing water hammering.

Conveyor belts with light or fragile loads benefit from soft starts and stops, which both prevent jostling of the material and excessive wear and tear of gearboxes and couplings. Furthermore, it can prevent slipping belts on belt driven applications.

For compressors, a soft starter provides better starting performance, especially for screw compressor applications, where the load torque increases with the speed.

Marine applications

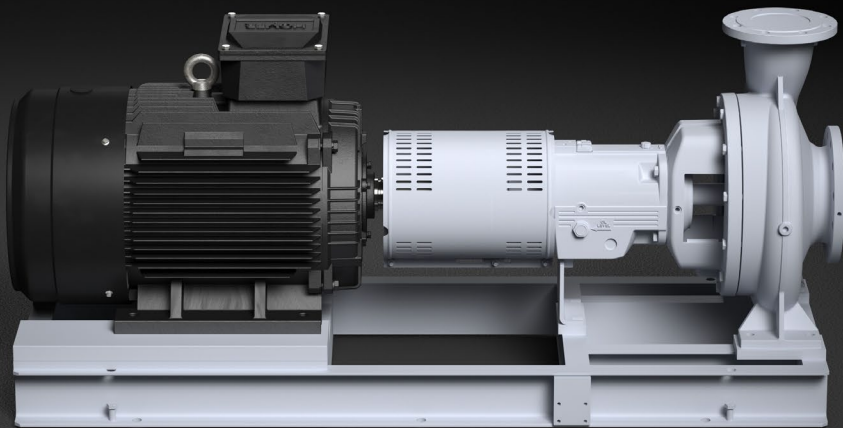
Soft starters are useful for a range of marine applications, including ballast water pumps, cargo pumps, and scrubber pumps. The ability to eliminate inrush current peaks is beneficial for generator use as it prevents the generator from overloading.

HVAC applications

For centrifugal fans, soft starters can help reduce starting torque to prevent belt slipping and prevent voltage drops due to high inrush currents. As many larger industrial fans are driven by relatively powerful motors mounted with a flywheel, they typically require a heavy duty start. To overcome the initial inertia, it is advisable to select a larger size of soft starter than the motor size.

Oil & Gas applications

In the oil & gas marine industry, soft starters are frequently used for cargo pumps and compressors, which require soft start and stop, but otherwise operate at full speed.



About Hoyer

Hoyer Motors is an international supplier of high-end electric motors, drives and controls. Headquartered in Denmark and China, we are represented through sales offices and distributors worldwide.

We pride ourselves on being an elite manufacturing enterprise with the highest attention to service and flexibility – a company where dedication, competitiveness and reliability are second to none.

We have a focus on selected industrial markets including Marine, HVAC, Industrial Pumps, Oil & Gas, Wind and HPU. Through strong partnerships with leading OEMs within these markets, we offer a unique set-up and industrial insight. We add supply chain value by understanding the business and markets of our customers.

Together with our business partners, we strive to improve industrial energy efficiency and thereby reduce emissions.

Contact us

We are ready to support you with more insight on cooling. Please contact us if you have further questions.

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