Technical Tip

SOFT-STARTERS: HOW TO CHOOSE THE IDEAL MODEL FOR AN APPLICATION?

In applications that require soft start, such as pumping systems, the use of drives like WEG Frequency Inverters and Soft-Starters helps to reduce the starting current and limit the torque, protecting and extending the service life of the motor and driven equipment.

Why Should I Choose a Soft-Starter?

The choice between an inverter or a soft-starter will depend on the type of application, on the requirements of the mechanical system and on the costs (of both installation and maintenance).

Soft-starters are generally the lowest-cost option for applications that need soft start. The main function of soft-starters is to protect the motor and the load against mechanical shocks (jolts) by controlling the voltage applied to the motor, thus reducing the starting current and allowing the gradual acceleration of the load up to the rated speed.

On the other hand Frequency Inverters control torque and speed.

Soft-Starter

- It controls the voltage and/or current during the start and/or stop
- It does not control the load speed (rotation) during the process

Frequency Inverter

- It controls the start and stop ramp
- It controls the speed/torque during the entire process

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Benefits of Using a Soft-Starter

For the Power Line

- Limitation of current peaks
- Limitation of voltage drops
- Optimization of the installation (contactors, cables, transformers, etc.)
- Greater demand control of the installation

For the Electric Motor

- Integral electronic protection (overload, undercurrent, overcurrent, phase loss, inverted phase sequence, etc.)
- Great protection
- Longer useful life
- Greater durability of the motor insulation
- Reduction of current peaks on the winding

For the Load/Machine

- It eliminates mechanical shocks
- Reduction of stress on couplings and transmission devices
- It mitigates possibilities for water hammer in pumping systems

Applications

Soft-starters can be used in applications where it is necessary:

- A soft ramp and torque control during start/stop
- Limit the motor starting current in order to prevent power supply problems, such as voltage drop
- Prevent mechanical shocks on the load
- Prevent pressure peaks or Water Hammer in the piping due to the fast change in the fluid speed

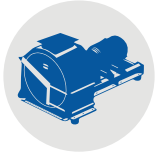

Fans


Centrifugal Pumps


Conveyors


Compressors


Mixers


Mills

Technical Tip

How Does a Soft-Starter Work?

WEG soft-starters use SCR (Silicon Controlled Rectifier/ Thyristor) in an antiparallel configuration in two or three phases (depending on the model) and control the voltage applied to the motor terminals by adjusting the firing angle of the thyristors. By properly setting the variables, the obtained torque is adjusted to the load requirement, thus ensuring the minimum necessary starting current.

WEG soft-starters have an internal bypass contactor that provides energy savings and longer life of equipments due to losses reduction on thyristors. That also allows the soft-starter to have a smaller size, thus contributing to reducing panel dimensions and installation costs.

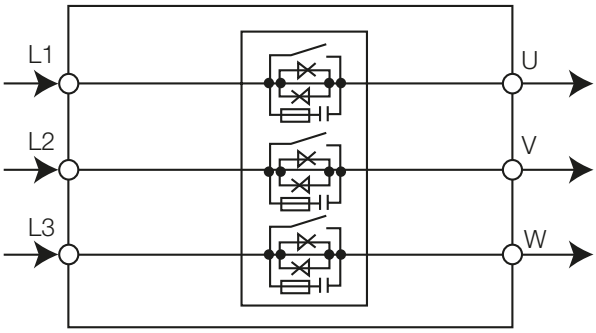


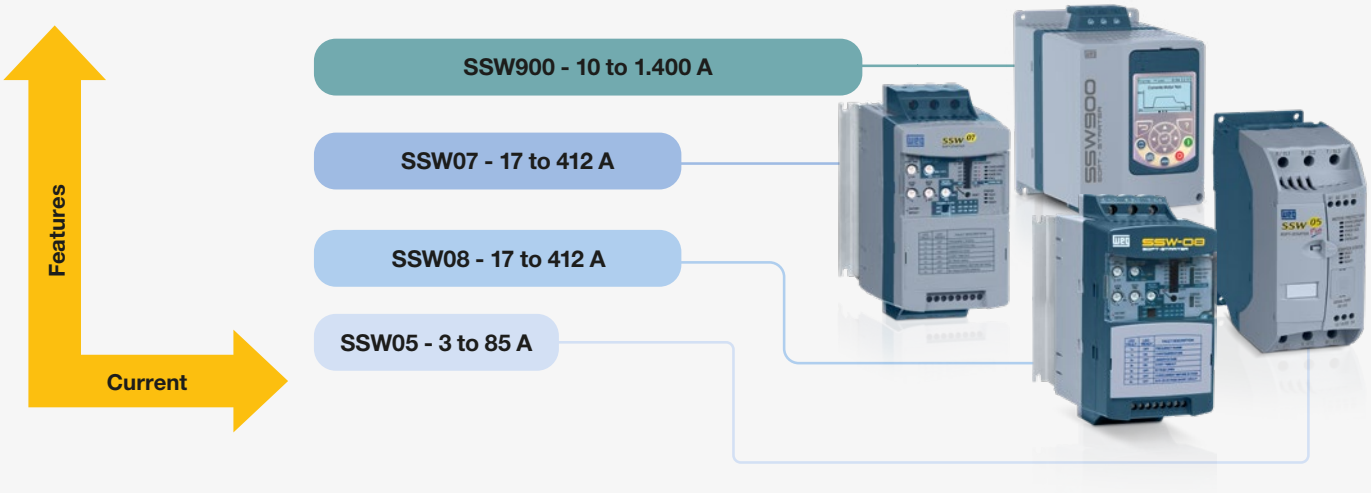
Figure 2 - Simplified diagram of a Soft-Starter with bypass

Overview of the Soft-Starter Line

The SSW05 is WEG's most compact solid state starter with motor two-phase control and built-in bypass. It is designed to drive light loads.

The SSW07 and SSW08 soft-starters have the same features. The SSW07 controls the three phases of the motor and is recommended to drive heavy loads, while the SSW08 controls two phases of the motor and is recommended to drive light to moderate loads. Both have built-in bypass.

The SSW900 line is the most complete and robust, used in applications requiring high overload capacity. It features three-phase control and internal bypass, in addition to motor torque control. It also allow customizing the application via the SoftPLC function, which replaces a small PLC.



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Practical Sizing Rules

Application		Load	Inertia	Multiplication factor[2]	Suggested soft-starter[2]
Centrifugal pump	Secondary pump (chiller)	Light	Low	1.0	SSW05 - SSW08[3]
	Building pumping (cisterns)	Light	Low	1.0	SSW05 - SSW08[3]
	Jacking or distribution pump	Light	Low	1.0	SSW07[3] - SSW900
	Big water columns or pipelines	Light	Low	1.0	SSW900
	Open system	Light	Low	1.0	SSW900
Reciprocating pump		Heavy	Medium	1.0	SSW07[3] - SSW900
Liquid dispenser	Helical pump	Light	Low	1.0	SSW08
Compressors (screw)	Start with relief	Light	Low	1.0	SSW05 - SSW08[3]
Compressor (reciprocating)	Start without relief	Moderate	Medium	1.0	SSW07[3] - SSW900
Mixers		Moderate	Medium	1.2 - 1.5	SSW07[3] - SSW900
Fans		Moderate/heavy	Medium/high	1.2 (<25 HP)	SSW07[3]
				1.5 (>25 HP)	SSW07[3] - SSW900
Exhaust fan		Heavy	Medium	1.5 - 1.8	SSW07[3] - SSW900
Mills		Heavy	Medium	1.5 - 1.8	SSW07[3] - SSW900
Conveyors		Heavy	High	1.5 - 1.8	SSW07[3] - SSW900
Centrifuges		Heavy	Very high	1.5 - 1.8	SSW07[3] - SSW900
Press	Inertia flywheel	Heavy	Very high	1.8 - 2.0	SSW900

1) The information of the table above is valid for normal duty starts, that is, maximum 10 starts per hour. The torque and inertia of the load referred to the motor shaft are also taken into account.

2) The proper way to use the table is to select a Soft-Starter that can supply at least the motor rated current multiplied by the service factor, that is:

ISoft_Starter > In_Motor x SF

3) Attention to the SSW08, SSW07 and SSW900 models (up to 412 A):

Without Ventilation Kit

- 10 starts per hour, that is every 6 minutes for the models from 17 A to 30 A and for the models from 255 A to 412 A
- 3 starts per hour, that is 20 minutes for the models from 45 A to 200 A

With Ventilation Kit

- 10 starts per hour, that is every 6 minutes for models from 45 A to 200 A

Notes

This document is to be used only as a guidance. As any practical rule, this carries an intrinsic risk in its attempt to generalize the behavior of a Soft-Starter, therefore, the person applying the rule must be capable to identify challenging situations that require a deeper analysis.


SSW05


SSW08


SSW07


SSW900

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