SIEMENS



Industrial Controls

Soft Starter

3RW44

Manual

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Disadvantages

This results in the following disadvantages

- A higher load is placed on the machine's mechanical components
- Higher costs for replacing worn parts and maintaining the application

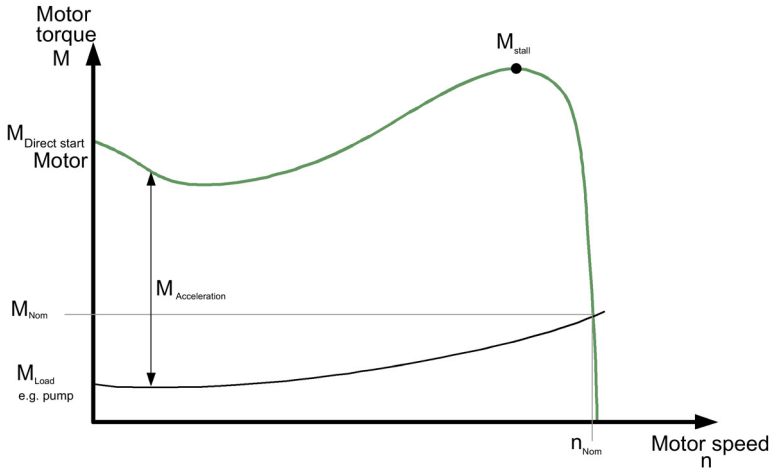


Figure 2-2 Typical starting torque characteristic of a three-phase asynchronous motor

Solution

The SIRIUS 3RW44 electronic soft starter allows the current and torque characteristics during startup to be optimally adapted to the requirements of each application.

2.1.2 Principle of operation of the 3RW44 electronic soft starter

The 3RW44 soft starter features two antiparallel thyristors in each of the phases. There is one thyristor for the positive and one thyristor for the negative half-wave.

The rms value of the motor voltage is increased (from an adjustable starting voltage or starting torque) to the rated motor voltage within a definable starting time by means of the leading-edge phase. This is achieved using various control methods.

The motor current changes in proportion to the voltage applied to the motor. The starting current is thus reduced by the factor of the voltage applied to the motor.

The torque changes in squared proportion to the voltage applied to the motor. The starting torque is thus reduced in squared proportion to the voltage applied to the motor.

Example

SIEMENS 1LG4253AA motor (55 kW)

Rated data at 400 V

P_e:	55 kW
I_e:	100 A
$I_{direct\ starting}$:	approx. 700 A
M_e:	355 Nm
	Example:

$$M_e = 9{,}55 \times 55\ kW \times \frac{1000}{1480\ min^{-1}}$$

n_e:	1480 rpm
$M_{direct\ starting}$:	approx. 700 Nm
Set starting voltage:	50 % (½ of line voltage)

=> $I_{starting}$ ½ of direct-on-line starting switch-on current (approx. 350 A)

=> $M_{starting}$ ¼ of direct-on-line starting torque (approx. 175 Nm)

The diagrams below show the starting current and torque characteristics for a three-phase asynchronous motor in combination with a soft starter:

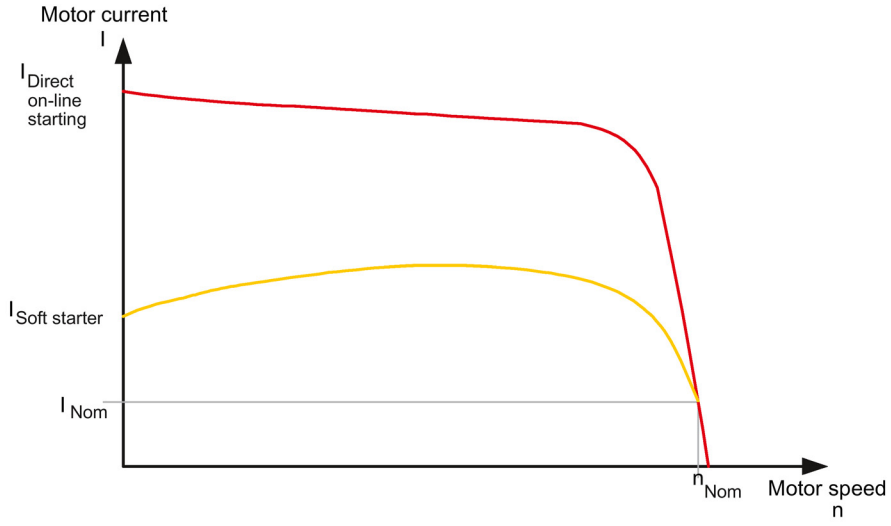


Figure 2-3 Reduced current characteristic of a three-phase asynchronous motor during startup with a SIRIUS 3RW44 soft starter

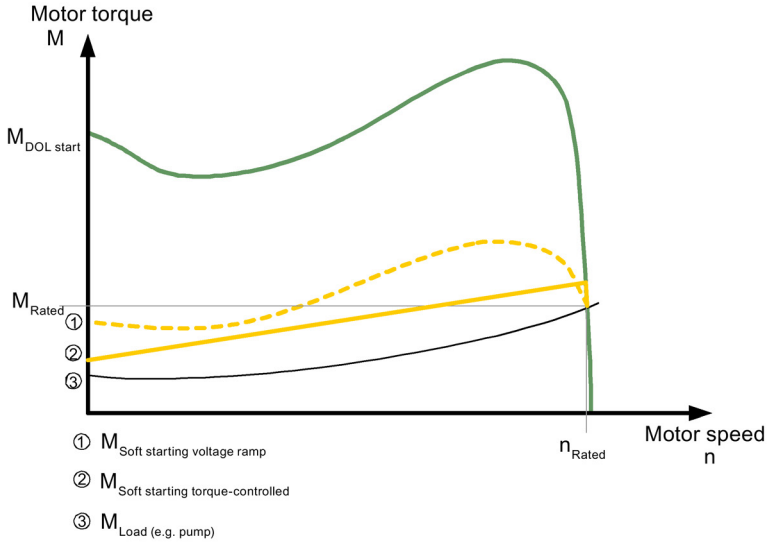


Figure 2-4 Reduced torque characteristic of a three-phase asynchronous motor during startup with a SIRIUS 3RW44 soft starter

Startup

This means that, since the motor voltage is controlled by the electronic soft starter during the startup process, the consumed starting current and the starting torque generated in the motor are also controlled.

The same principle is applied during the stopping process. This way the torque generated in the motor is slowly reduced, thus enabling a smooth ramp-down of the application.

The frequency remains constant during this process and corresponds to the line frequency, in contrast to frequency-controlled startup and stopping of a frequency converter.

Once the motor has started up correctly, the thyristors are fully utilized, meaning that the complete line voltage is applied to the motor terminals. As the motor voltage does not have to be controlled during operation, the thyristors are bridged by integrated bypass contacts. This minimizes the waste heat generated during continuous operation (which is caused by the thyristor's power loss). Therefore the area around the switching devices heats up less.

The diagram below shows the method of operation of the 3RW44 soft starter:

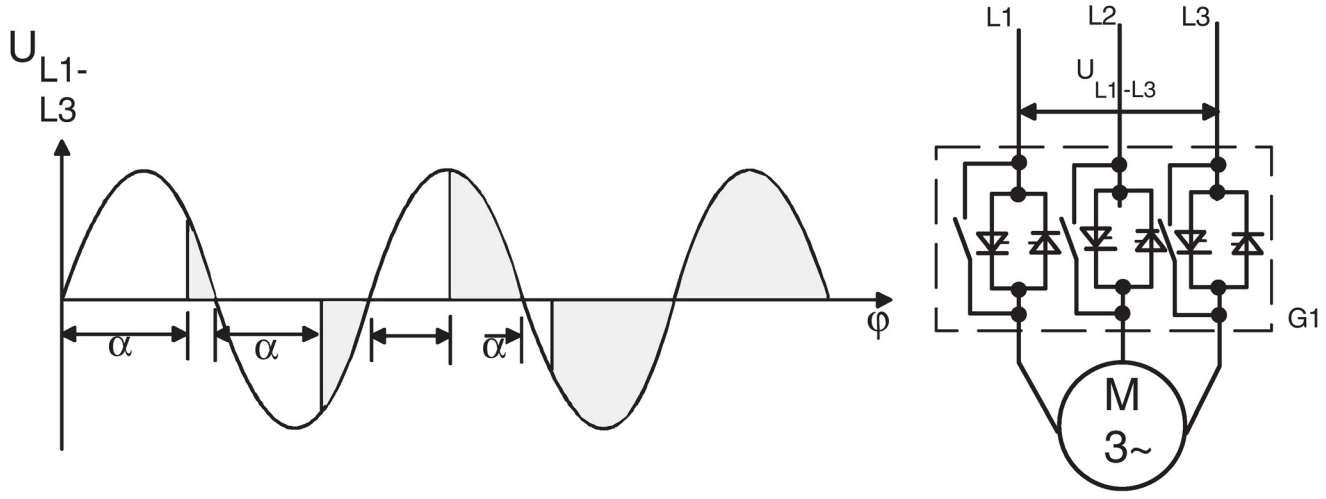


Figure 2-5 Phase angle control and schematic diagram of a soft starter with internal bypass contacts

4.1.3 Installation requirements

Degree of protection IP00

3RW44 soft starters conform to IP00 degree of protection.

The devices must be installed in control cabinets with IP54 degree of protection (pollution degree 2), taking account of the ambient conditions.

Make sure no liquids, dust or conductive objects can get inside the soft starter. The soft starter produces waste heat (power loss) while it is operating (refer to chapter General technical data (Page 253)).

NOTICE
Overheating of the switching device Provide adequate cooling at the place of installation to prevent the switching device from overheating.

Note

Coated circuit boards

All 3RW44 soft starters with a production date G/150206 onwards are equipped as standard with coated printed circuit boards to improve protection of the device against tough ambient conditions such as dust, moisture or other harmful influences.

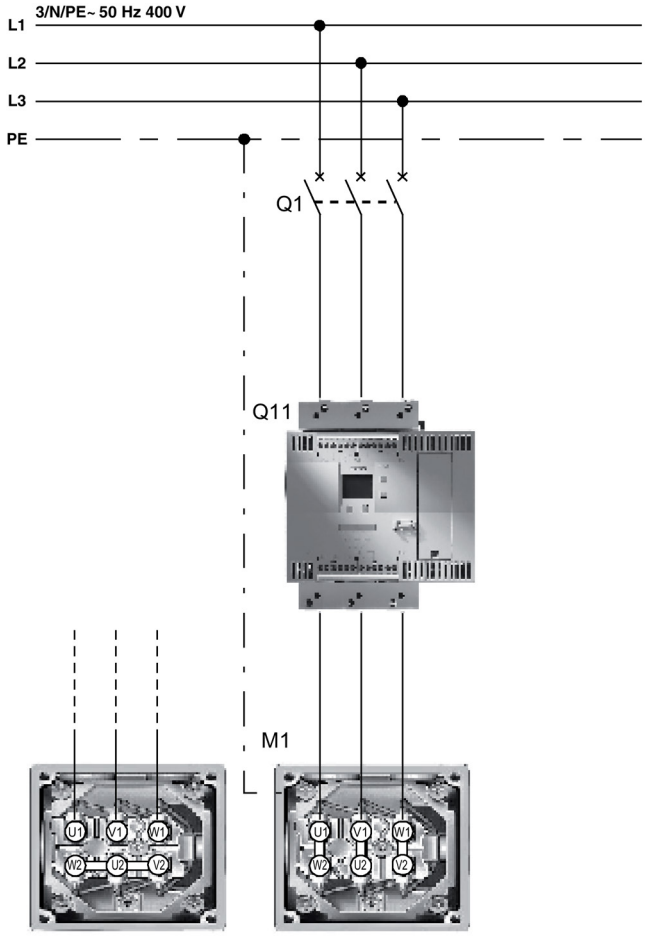


Figure 4-3 Block diagram of 3RW44 soft starters in standard circuits

NOTICE
Error message due to delayed switching of the contactor If a main or line contactor is connected between the soft starter and the motor or in the return line between the motor and the soft starter, steps must be taken to ensure that this contactor is connected within 100 ms of activation of the start command for the 3RW44. If the contactor is not connected within 100 ms of activation of the start command for the 3RW44, the soft starter no longer recognizes the current circuit variant (standard circuit or inside-delta circuit). A "Missing load phase 1-3" error message is generated.

4.6 Electrical connection

4.6.1 Control and auxiliary circuit connection

The SIRIUS 3RW44 soft starter is supplied with two different connection systems:

- Screw connections
- Spring-loaded connections

Two control voltage versions are available:

- 115 V AC
- 230 V AC

4.6.2 Main circuit connection

All soft starters have busbar connections for the main circuit connection.

Size 3RW44 2.

An additional box terminal for direct cable connection is supplied as standard with size 3RW44 2.

Sizes 3RW44 3. and 3RW44 4.

For size 3RW44 3. and 3RW44 4. devices, it is possible to retrofit box terminals as optional accessories (see chapter Accessories (Page 286)).

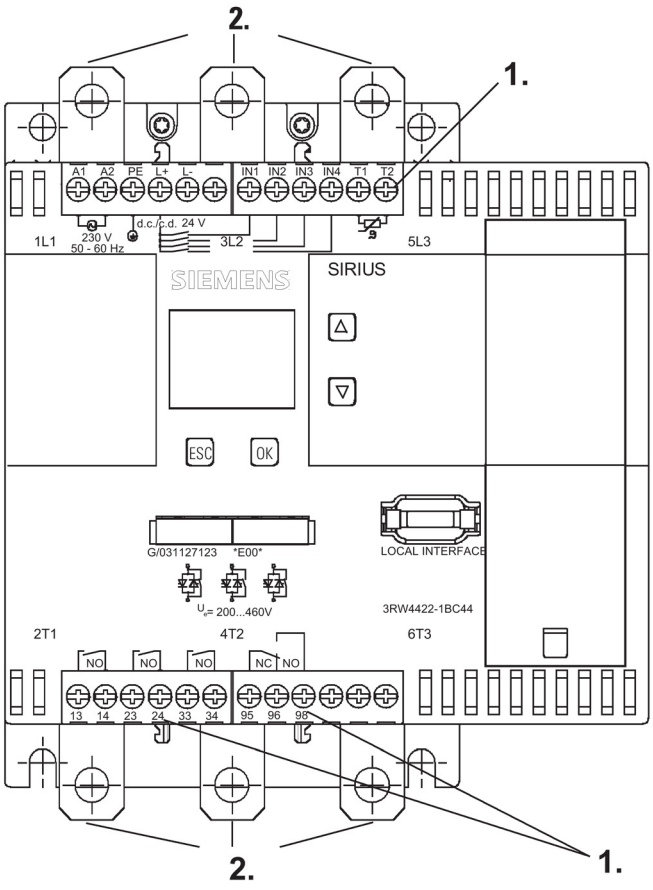


Figure 4-8 Connections

1.	A1, A2, PE, L+, L-, IN1, IN2, IN3, IN4, T1, T2, 13, 14, 23, 24, 33, 34, 95, 96, 98: Control/auxiliary circuit
2.	L1/L2/L3 Main circuit infeed
3.	T1/T2/T3 Main circuit outgoing feeder load

Figure 3-8: Connections

NOTICE
It is not permitted to connect the 3-phase line infeed to terminals T1/T2/T3.