VLT® Soft Starters

MCD 201, MCD 202 and MCD 3000

VLT® Soft Starter family (MCD 201, 202, 3000)

VLT® Compact Starter MCD 201

VLT® Compact Starter MCD 202

Soft starts

Protect Gear, Goods, Equipment and Enviroment

An AC motor switched directly on the mains power supply will struggle to reach its nominal speed as quickly as possible, drawing maximum current from the power supply and applying maximum torque to the application. Depending on the application, this can cause significant problems. Applications like pumps, conveyers, centrifuges and bandsaws must be started slowly, and sometimes also stopped slowly, to prevent mechanical shocks such as water hammer and strains on bands, couplings and shafts. Such applications often involve a great deal of inertia, and sudden starts can damage the motor and other equipment as well as diminish system performance.

Principle of Phase Angle Control

A soft starter is an electronic device that regulates the voltage to the motor, which provides a smooth transition from standstill to full speed operation of the application. VLT® Soft Starters all use the principle of phase angle control. Back-to-back coupled thyristors ramp up the motor voltage. In some VLT® Soft Starters, current transformers measure the motor current, providing feedback for starting current control as well as numerous motor and application protection functions.

VLT® Soft Starters cover a comprehensive range

Soft starting and stopping can be controlled in a number of ways, depending on the application. Some applications require non-linear acceleration, and the voltage ramp is therefore related to the actual current drawn. Conversely, a bandsaw usually requires a quick stop function provided by a DC brake. A number of applications require a kick-start torque for a brief period of time followed by a soft ramp-up acceleration. VLT® Soft Starters cover all of these applications and much more.

Advantages of Soft starting over Star/ Delta and Auto transformer starting

Soft Starters are a far better alternative than star/delta and auto transformer starters. The star/delta starter reduces start current but introduces a damaging torque transient when switching from star to delta connection. Furthermore, star/delta starting does not always allow selection of the best start current level. This sometimes means the load cannot accelerate to full speed in star configuration, thereby making the star/delta starter completely ineffective. A star/delta starter does not impact the way the motor stops, thus leaving the voltage ramp down with no control.
The auto transformer reduces start current but also allows some control over the level of start current. Auto transformer starters do not, however, eliminate the risk of a jump in torque when shifting voltage.

Type	VLT® Compact Starter MCD 201	VLT® Compact Starter MCD 202	VLT® Soft Starter MCD 3000
	- a physically compact starter providing basic soft start and stop functionality	- physically similar to MCD 201, but provides enhanced soft start and motor protection functionality	- the total motor starter solution, providing control of starting and stopping as well as protection of both motor and application
Concept	Soft start Soft stop 10 - 150HP @ 480V 15 - 200HP @ 575V 200 - 575V mains voltage 110 - 400V AC or 24V AC/DC control supply	Current limit start Soft stop Motor protection 10 - 150HP @ 480V 15 - 200HP @ 575V 200 - 575V mains voltage 110 - 400V AC or 24V AC/DC control supply	Enhanced soft start and soft stop Motor and system protection 10 - 1267HP @ 480V 10 - 1667HP @ 575V 200 - 690V mains voltage 110 - 400V AC control supply
Start/stop	Timed voltage ramp-up Adjustable initial torque	Current limit start Initial current ramp-up	Current limit start Initial current ramp-up Kick start Torque boost Dual parameter function
	Timed voltage ramp-down	Timed voltage ramp-down	Linear voltage ramp-down Three auto-adjustable voltage ramps DC brake function Soft brake function
Protection		Motor overload (adjustable trip class) Excess start time Reverse phase rotation Motor thermistor input Shorted SCR - no start Supply fault - no start	As MCD 202 + Under current Shearpin Starter overtemperature Restart delay Warning before trips Adjustable phase Imbalance sensitivity
Outputs	One output relay: Line contactor control	Two output relays: Line contactor control Run contactor or trip function	Three output relays: Line contactor control Run contactor or trip function DC brake contactor
Control	Two or three wire control Programmable via 3 rotary switches Reset push button Optional: Modules for serial communication Remote operator kit PC software	Two or three wire control Programmable via 8 rotary switches Reset push button Optional: Modules for serial communication Remote operator kit PC software	Local key pad Buttons for start, stop, reset and remote control Inputs for two or three wire control Optional: Modules for serial communication Remote operator kit PC software
Other features	Integral SCR bypass for minimum physical size and heat dissipation during nominal operation LED status indication IP 20 (Up to 100 Amps) IP 00 (Above 100 Amps)	Integral SCR bypass for minimum physical size and heat dissipation during nominal operation LED status indication IP 20 (Up to 100 Amps) IP 00 (Above 100 Amps)	Built in bars for easy connection of bypass contactor. All motor protection functions are retained in bypass mode Inside delta wiring kit (175 - 1000HP @ 480V) Automatic reset function Password parameter protection Trip log function LED status indication IP 21 (Up to 250 Amps) IP 20 (Above 250 Amps)

Benefits:

Pumps

- Reduced hydraulic shocks in pipelines during start and stop
- Minimized mechanical stress on motor shaft
- Reduced starting current
- Undercurrent protection preventing damage from blocked pipe or low water situations (MCD3000)
- Automatic reset functionality ensures continued operation of unmanned pump stations (MCD3000)
- Phase rotation protection prevents damage from reverse pump rotation (MCD202 and MCD3000)
- Instantaneous overload protection prevents damage from debris drawn into the pump (MCD202 and MCD3000)

Conveyors

- Controlled start and stop functionality eliminates damage to application and product from mechanical shocks
- Minimized belt stretch and reduced counter balance stress
- Optimum soft start despite varying starting loads, e.g. coal conveyors starting loaded or unloaded (MCD202 and MCD3000)
- Extended mechanical lifetime

Compressors

- Reduced mechanical shocks extend the life of the compressor, couplings and motor
- Limited starting current enables large compressors to be started even when maximum power capacity is limited
- Phase rotation protection prevents operation in reverse direction (MCD202 and MCD3000)
- Instantaneous overload protection prevents possible damage from liquid ammonia entering the compressor screw (MCD202 and MCD3000)

Fans

- Smooth application of torque prevents mechanical stress
- Reduced starting times over star/delta starting

Centrifuges

- Smooth application of torque prevents mechanical stress
- Reduced starting times over star/delta starting
- Reduced stopping times thanks to DC brake and soft braking (MCD3000)

Bandsaws

- Soft braking function stops the motor quickly for faster saw band replacements (MCD 3000)
- Soft start eliminates torque shocks during start, extending saw band life
- Slow acceleration allows saw bands to be ”tracked” without jogging, making alignment easier
- Maximum overload capability available for ride-through of operating overloads (MCD3000)
- The motor thermal model (MCD202 and MCD3000) accounts for the actual overload capability of the connected motors and will trip only if absolutely necessary.

MCD200 (Amps shown at 40deg C, bypassed,4 x FLC)

Model No.	Amps
MCD20*-007-T6	18
MCD20*-015-T6	34
MCD20*-018-T6	42
MCD20*-022-T6	48
MCD20*-030-T6	60
MCD20*-037-T6	75
MCD20*-045-T6	85
MCD20*-055-T6	100
MCD20*-075-T6	140
MCD20*-090-T6	170
MCD20*-110-T6	200

*= 1 OR 2

Add CV1 for 24V AC/DC control

Add CV3 for 110 - 240V AC control

Add CV3 for 380 - 440V AC control

MCD3000 (Amps shown at 40deg C, bypassed, 4 x FLC)

Model No.	Amps
MCD3007	18A
MCD3015	32A
MCD3018	39A
MCD3022	49A
MCD3030	57A
MCD3037	73A
MCD3045	81A
MCD3055	107A
MCD3075	115A
MCD3090	168A
MCD3110	199A
MCD3132	206A
MCD3185	307A
MCD3220	362A
MCD3300	470A
MCD3315	551A
MCD3400	702A
MCD3500	833A
MCD3600	1049A
MCD3700	1328A
MCD3800	1534A

Approvals:

CE, UL, CUL, CCC, C-tick

Remote operation

Remote operation of VLT® Soft Starters is facilitated by the dedicated remote operator kit. The operator (IP54/NEMA12) is mounted on the cabinet front and allows remote control, status indication and motor monitoring of an individual VLT® Soft Starter using RS485 serial communication. It incorporates the following features:

	MCD 201	MCD 202	MCD 3000
Start/stop/quick stop, reset	•	•	•
LED for start, run, trip	•	•	•
Trip codes	•	•	•
Current display		•	•
Motor temp. display		•	•
4 – 20 mA output		•	•

IP54/NEMA12

Serial communication

MCD 201 and MCD 202 come with optional plug-in modules for serial communication.

- DeviceNet*
- Profibus*
- Modbus RTU
- AS-i*

Optional modules are available for serial communication with MCD 3000:

- DeviceNet
- Profibus
- Modbus RTU

(*as of May 2004)

Constant effort to improve

The focus is clear at Danfoss: as a leading supplier of drives solutions throughout the world, we have spent years evolving our technological and application know-how.
Danfoss drives have been produced since 1968 and Danfoss Bauer geared motors since 1927.

Today, a long list of references indicates that the name of Danfoss is widely regarded as being synonymous with excellent quality and operational security.
We have focused our professional resources on just one technological area for years: drives solutions. Years of applying these resources to industrial production lines have given us a wealth of experience and expertise. The results speak for themselves. Danfoss has enjoyed great success, and we are proud of what we do.

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