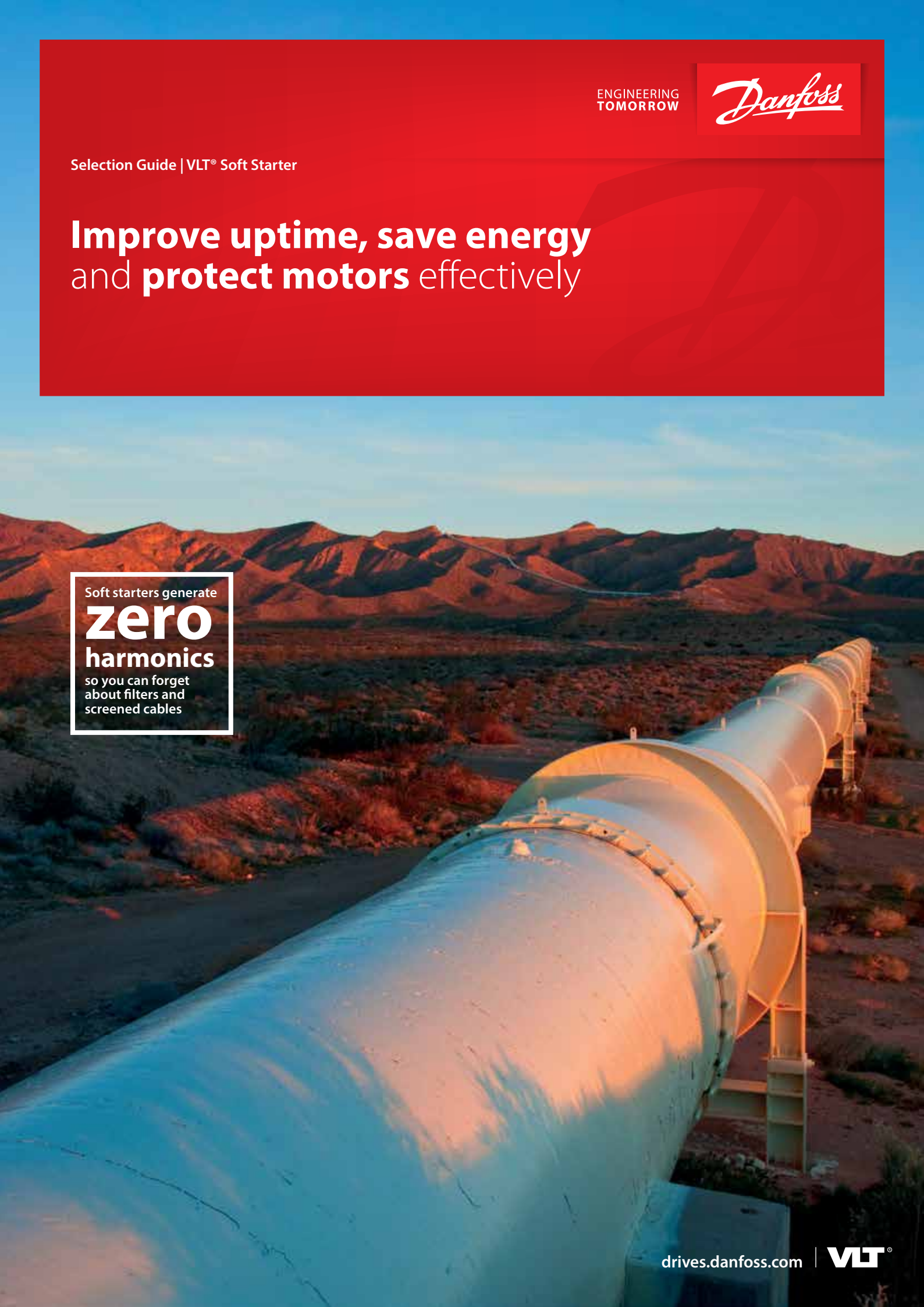
ENGINEERING
TOMORROW

Selection Guide | VLT® Soft Starter

Improve uptime, save energy and protect motors effectively



drives.danfoss.com | VLT®

When to use a soft starter

Need more uptime and less maintenance? Then install a soft starter on your direct-on-line (DOL) or start-delta installation.
Payback is fast and you get these additional benefits:

- Lower inrush current reduces mechanical stress – and minimizes penalty from the utility company
- Extended system lifetime due to reduced wear on
  - Motor
  - Power cables
  - Electrical distribution system
- Reduced water hammer in pump applications. For more application benefits, see pages 4 and 5.
- After start-up, you can bypass the soft starter, switching over to run direct-on-line.

After initial start-up, running DOL saves energy, by reducing losses and thus reducing cooling requirements. Danfoss provides an easy solution for switching back and forth to DOL – the VLT® Soft Starter MCD 500 with integrated bypass.

More protection, less space

Select a Danfoss soft starter to win unique benefits:

- Care for your motor and soft starter – get good motor and soft starter protection value, with more protection features in the soft starter.
- Save panel space with a very compact footprint
- Integrate the soft starter with VLT® drives
- Programme the soft starter via your PC using the VLT® Motion Control Tool MCT 10 set-up software*
- Enjoy the integrated bypass as standard for VLT® Soft Starter MCD 500 ratings up to 961 A

**Requires optional USB module*

Why use a soft starter for speed control?

Forget harmonics

AC drives, also known as variable speed drives (VSD) work by changing the frequency input to the motor – and this causes harmonics on the supply network. Harmonics do not affect the AC drive itself. However, if not kept under control, harmonics can reduce performance and reliability of other equipment connected to the grid, such as generators and circuit breakers. The solution is to install filters and screened cables but even then the harmonic effect is not completely removed.

Therefore it's reassuring to know that a soft starter already fulfils all emission and immunity requirements laid out by the EMC directive. The soft starter does not change the frequency and therefore does not generate harmful harmonics. So when using a soft starter there is no need to consider harmonics at all.

Reduce torque and current

Using a soft starter you can adjust torque to the exact level required, whether or not the application is loaded. By reducing the starting torque, mechanical stress on equipment is alleviated, saving on service and maintenance costs.

The soft starter also reduces starting current which means you can avoid voltage drops in the network.

Save cost

Soft starters cost up to one-tenth the price of high-power drives. So if your control requirements are covered by limiting current only at start and stop, with no need for constant acceleration and torque control, then there are significant savings to be won.

Save space

Soft starters are smaller than AC drives and the difference becomes more significant the higher the amp rating gets. You can save on panel space.

Integrated bypass – for all-round savings

The VLT® Soft Starter MCD 500 provides an integrated bypass to allow direct-on-line operation as an alternative. The integrated bypass offers multiple cost-saving benefits.

Reduce heat loss

Integrated bypass provides the opportunity to switch over to direct-on-line operation, after initial start-up via the soft starter. By running partially direct-on-line, you win the advantages of reduced losses and need for heat dissipation, thus saving energy due to decreased cooling requirements.

Save space

The MCD 500 with integrated bypass takes up less panel space than a soft starter with an external contactor.

Save time

With only six terminals instead of twelve, it is much faster to wire an MCD 500 with integrated bypass, than an alternative soft starter with external contactor. Less cable is required, which additionally reduces cost. Save even more time, by using the handy set-up software tool VLT® Motion Control Tool MCT 10 to configure the MCD 500 via PC. You can use the same set-up tool with VLT® drives.

Save energy – fast payback

The soft starter with integrated bypass contactor saves space by comparison to an external contactor connected to a non-bypassed unit.

Select a soft starter with integrated bypass when you want to save costs. The payback time is just months, using the MCD 500 with integrated bypass. See how in this example:

Example

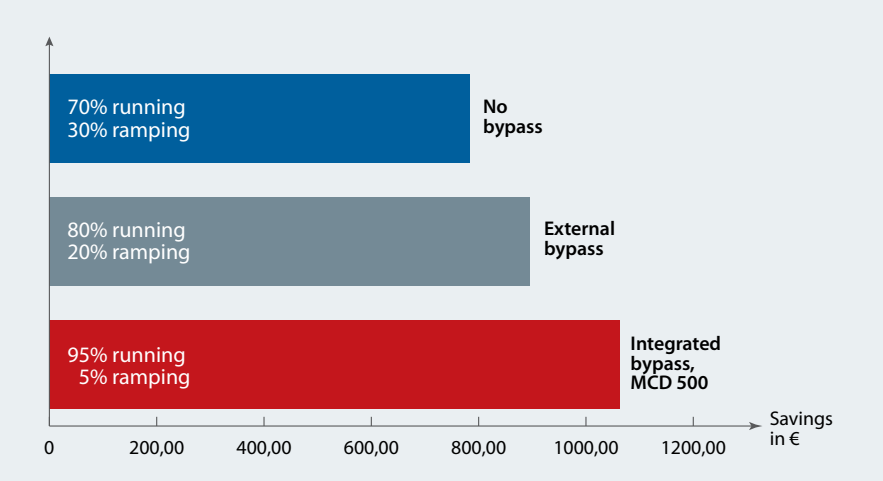
In the example, a soft starter regulates a water pump, with motor specifications as follows:

Motor

Supply.....400 V AC
Rating.....132 kW
FLC.....245 A
Start duty.....300% for 30 seconds
Electricity prices.....(industry – EU)

Estimated savings, non-bypassed versus bypassed

Save more with bypass, compared to no bypass.
The energy saved depends on the relationship between ramping and running.
The more the application is running the more the bypass will save – *see illustration.*



Cost saving using a bypass, showing the beneficial savings effect of increased running time and reduced ramping time.

Integrated bypass versus external bypass

Win back your investment faster with integrated bypass, compared to external bypass. The payback period is only a few months.

Investment (indexed values)	No bypass, Direct-on-line	Soft starter with external bypass	Soft starter with integrated bypass VLT® Soft Starter MCD 500
Soft starter	100	100	137
Bypass contactor + wiring + mounting	0	58	0
Extra panel space, parts, and labour	0	3	0
Total	**100**	**161**	**137**
Extra cost compared to no bypass	-	61	37
Simple payback period [months]	–	3.3	2

Applications

Centrifugal pump – Water

Need to reduce water pressure surges and mains supply disturbance at start-up? Then a gentle start using a soft starter is a good idea. It also provides a soft stop to control the effects of fluid hammer often associated with uncontrolled pump stop – ultimately extending pump life and reducing running costs. For new projects, build these savings in at design phase – there is no need to specify pressure surge tanks and motorized valves to cater for repetitive high-pressure surges. The minimum start current function reduces electrical disturbance on mains supply and limits demand on supply as well – reducing reticulation costs for example in farmland irrigation projects.

The soft starter

- Prevents motor overheating via integrated protection
- Ensures that pump does not run in reverse, via start-up protection
- Detects blocked pipes or lack of fluid via undercurrent protection, thus preventing unnecessary pump damage

Centrifugal fan – HVAC

Extend the life of centrifugal fans by adding a soft starter – to ensure gentle acceleration and deceleration, minimizing wear on coupling, belts, and bearings.

The soft starter

- Reduces electrical disturbance on the supply via a minimal start current
- Prevents overheating of motor windings and body
- Prevents starting when fan direction is reversed, avoiding damage
- Trips in the event of excess start time, indicating a jammed or stalled fan, also providing early indication of bearing failure
- Detects broken couplings and belts or clogged fan filter, via and optional trip or flag for motor undercurrent

To integrate the soft starter directly with a BMS, the VLT® Soft Starter MCD 500 supports monitoring fan loading, without the need for extra equipment an analog output.

Compressor – Protect your motor

Has the compressor ever locked up, for instance due to entry of liquid ammonia? Using a soft starter, ongoing monitoring prevents damage to motor, compressor, and couplings in a lock up situation. Soft starters provide instant protection against motor overload, by tripping the motor immediately.

The soft starter

- Enables load shedding before the soft starter trips, for compressor overload or motor overtemperature
- Trips to prevent motor damage when start-up time exceeds a preprogrammed limit, for example due to a jammed or stalled compressor
- Monitors the compressor load using a 0-20 mA/4-20 mA analog output
- Enables optimized compressor performance with dual speed dahlander motor control
- Avoids short cycling via restart delay, promoting longer life of motor, compressor, and coupling
- Is an easy retrofit for start/delta starters

Conveyor belt – Food and beverage industries

Extend the life of your conveyor belt, and gain the benefit of consistent start-up regardless of whether the belt is loaded or not. The soft starter ensures gentle acceleration and deceleration, reducing risk of product damage due to jerky starts and sudden stops. It also protects the couplings, belts, and bearings against mechanical wear.

The soft starter

- Prevents conveyor belt slap during start
- Reduces stress on counter-balances and weights
- Reduces electrical disturbance on the supply, via a minimum start current function
- Provides protection against accidental running in reverse
- Detects broken couplings or broken belts, and trips the motor immediately
- Detects overload, or a jammed or stalled conveyor, and protects equipment by tripping the motor immediately

Crusher and mill – Mining

Maximise your crusher or mill throughput by installing a soft starter at the motor input. The soft starter allows the motor to operate at its upper thermal limit, while carefully monitoring thermal capacity to ensure motor protection. The crusher can then safely ride through temporary product overload situations

The soft starter

- Eliminates the need for special control equipment, by connecting motor thermistors directly into the VLT® Soft Starter MCD 500 thermistor input
- Extends the life of couplings, belts, and bearings by gentle start-up, minimizing torque transients
- Reduces electrical disturbance on the supply
- Limits the demand on the supply, especially critical on remote sites supplied by generator sets
- Prevents damage due to unintentional running in reverse, by preventing start when rotation of the 3-phase incoming supply changes
- Detects broken couplings and broken crusher belts via undercurrent protection, and trips to prevent further damage

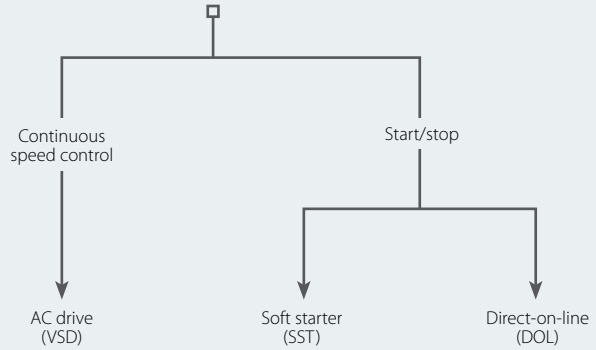
Soft starter guide:
Find the right product for your application

	Application	Inertia	MCD 100	MCD 201	MCD 202	MCD 500
Water	Agitator	High				■
	Centrifugal pump		■	■	■	■
	Compressor (Screw, unloaded)		■	■	■	■
	Compressor (Reciprocating, unloaded)	High				■
	Conveyor	High				■
	Fan (damped)		■	■	■	■
	Fan (undamped)	High				■
	Mixer	High				■
	Positive displacement pump	High				■
	Submersible pump		■	■	■	■
Metals & mining	Belt conveyor	High				■
	Dust collector		■	■	■	■
	Grinder		■	■	■	■
	Hammer mill	High				■
	Rock crusher	High				■
	Roller conveyor		■	■	■	■
	Roller mill	High				■
	Tumbler	High				■
	Wire draw machine	High				■
Food processing	Bottle washer		■	■	■	■
	Centrifuge	High				■
	Dryer	High				■
	Mill	High				■
	Palletizer	High				■
	Separator	High				■
	Slicer		■	■	■	■
Pulp & paper	Dryer	High				■
	Re-pulper	High				■
	Shredder	High				■
Petro-chemical	Ball mill	High				■
	Centrifuge	High				■
	Extruder	High				■
	Screw conveyor	High				■
Transport & machine tool	Ball mill	High				■
	Grinder		■	■	■	■
	Material conveyor	High				■
	Palletizer	High				■
	Press		■	■	■	■
	Roller mill	High				■
	Rotary table	High				■
Lumber & wood products	Bandsaw	High				■
	Chipper	High				■
	Circular saw		■	■	■	■
	Debarker		■	■	■	■
	Edger		■	■	■	■
	Hydraulic power pack		■	■	■	■
	Planer		■	■	■	■
	Sander	High				■

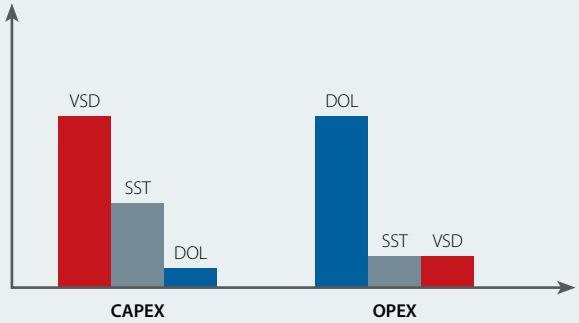
Step 1. Determine what kind of speed control you need

Consider first, whether start/stop control or continuous speed control is required.
Then consider the scale of both initial investment and running costs.

Speed control



Initial cost



If you selected an AC drive (VSD), read more about Danfoss VLT® and VACON® drives on **drives.danfoss.com**.
If you selected a soft starter, then read on.

Direct-on-line (DOL) drawbacks

- Wear on motor bearings
- Wear and tear on gearbox
- Water hammer

Step 2. Match your application

Determine the size of the soft starter based on inertia level.
Refer to the Soft Starter guide on page 6.

Step 3. Match your needs

Find the right match between your application and the soft starter features you need.
The guide recommends which model of Danfoss VLT® soft starter is best for the job:

- VLT® Soft Start Controller MCD 100
- VLT® Compact Starter MCD 201 or 202
- VLT® Soft Starter MCD 500

	MCD 100	MCD 201	MCD 202	MCD 500
Power size	0.1-11 kW	7.5-110 kW	7.5-110 kW	7.5-850 kW
Start/stop	Timed voltage ramp	Timed voltage ramp	Current limited started	Adaptive Acc. Cont. (AAC)
Protection	None	None	7 features	19 features
Outputs	None	1 output relay	2 output relay	3 programmable outputs
Control	2 wire control / 3 rotary switches	2-3 wire control / 3 rotary switches	2-3 wire control / 8 rotary switches	8 language graphical display
Options	None	Fieldbus / remote display and PC software		
Initial cost, indexed	1	1.8	2.2	3.1

VLT® Soft Starter MCD 500

VLT® Soft Starter MCD 500 is a total motor starting solution. Current transformers measure motor current and provide feedback for controlled motor ramp profiles.

AAC, the Adaptive Acceleration Control, automatically employs the best starting and stopping profile for the application. Adaptive Acceleration Control means that for each start and stop, the soft starter compares and adapts the process to the chosen profile best suited to the application.

The VLT® Soft Starter MCD 500 has a four-line graphical display and a logic keypad making programming easy. Use the advanced setup to view operational status.

Three menu systems: Quick Menu, Application Setup and Main Menu provide the optimum programming approach.

Power range

21-1600 A, 7.5-850 kW
(1.2 MW inside Delta Connection)
Versions for 200-690 V AC

Feature	Benefit
User friendly	
AAC Adaptive Acceleration Control	– Automatically adapts to the chosen starting and stopping profile
Adjustable bus bars allow for both top and bottom entry (360 – 1600 A, 160 – 850 kW)	– Space saving, less cable cost and easy retrofitting
DC injection braking distributed evenly over three phases	– Less installation cost and less stress on the motor
Inside Delta (6-wire connection)	– Smaller soft starter can be selected for the application
Log menus, 99 events and trip log provide information on events, trips and performance	– Eases analysis of the application
Auto Reset	– Less down-time
Jog (slow-speed operation)	– Application flexibility
Second-order thermal model	– Allows motors to be used to their full potential without damage from overloading
Internal bypass contactors (21 – 215 A, 961 A)	– Save space and wiring compared to external bypass – Very little heat dissipates when running. Eliminates costly external fans, wiring or bypass contactors
Auto-start/stop clock	– Application flexibility
Compact size – amongst the smallest in their class	– Saves space in cabinets and other application set-ups
4-line graphical display	– Optimum programming approach and setup for viewing operational status
Multiple programming setup (Standard Menu, Extended Menu, Quick Set)	– Simplifies the programming, but still holding to maximum flexibility
Multiple languages	– Serving the whole world

MCD 500 operation options

Starting
- AAC Adaptive Acceleration
- Control
- Current Ramp
- Constant Current
- Kickstart

Stopping
- Coast to stop
- TVR Soft Stop
- AAC Adaptive Deceleration Control
- Brake

VLT® Control Panel LCP 501

Everything you can do with the VLT® Soft Starter MCD 500 controls is also possible via the VLT® Control Panel LCP 501.

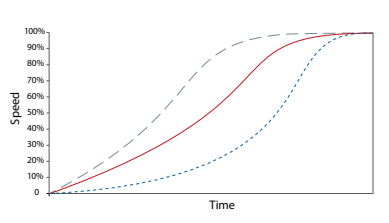
Select a screen view set-up from one user-programmable and 7 standard views.

Language selection
English, Chinese, German, Spanish, Portuguese, French, Italian, Russian.

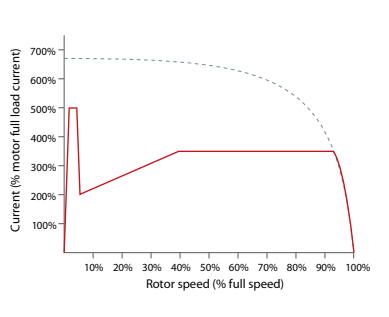
The LCP 501 is connected to the MCD 500 by using a 3 m cable using a 9-pin (D-sub) plug and 3 m cable provided with the IP65 (NEMA 12) door-mount kit.

Once connected, the soft starter asks whether you want to copy parameters from LCP to starter or starter to LCP (if different).

100% easy connection
- The Modbus, PROFIBUS, EtherNet/IP and DeviceNet modules use another port on the MCD 500, located at the side of the soft starter
- Separate LCP 501 output at the bottom for 9 pin plug and 3 m cable
- One ordering number (LCP with door-mount kit and cable)
- Plug & play connection, even when the soft starter is powered up
- One cable for power and communication
- Powered up by soft starter
- Copy of parameter set-up



Three Adaptive Acceleration Control (AAC) start profiles; early, constant and late acceleration



Constant current/ current ramp – here shown with kickstart

Dimensions

Current rating [A]	Weight [kg]	Height [mm]	Width [mm]	Depth [mm]	Enclosure size
21, 37, 43 and 53	4.2	295	150	183	G1
68	4.5			213	
84, 89 and 105	4.9				
131, 141, 195 and 215	14.9	438	275	250	G2
245	24	440	424	296	G3
331 and 396	30.2				
469, 525, 632, 744, 826 and 961	60	640	433	295	G4
1200, 1410 and 1600	120	856	585	364	G5

VLT® Compact Starter MCD 200

VLT® Compact Starter MCD 200 series from Danfoss includes two soft starters in the power range 7.5-110 kW.

The series offers easy DIN rail mounting for sizes up to 30 kW, 2-wire or 3-wire start/stop control and excellent starting duty (4 x Ie for 6 seconds).

Heavy starting ratings at 4x Ie for 20 seconds.

Compatible with grounded delta power systems.

Power range

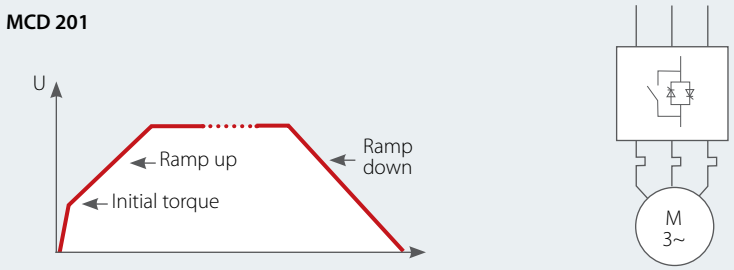
7.5 – 110 kW

Remote operation

The dedicated remote operator kit facilitates remote operation of VLT® Compact Starter MCD 201 and VLT® Compact Starter MCD 202 .

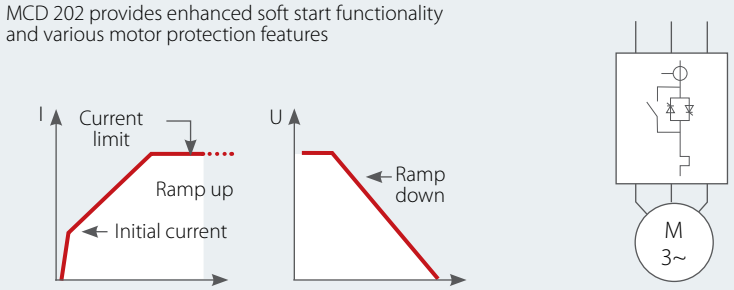
The operator (IP54/NEMA 12) is mounted on the cabinet front and allows remote control, status indication and motor monitoring of an individual VLT® Compact Starter using RS485 serial communication.

MCD 201



MCD 202

MCD 202 provides enhanced soft start functionality and various motor protection features



Feature	Benefit
Small footprint and compact size	– Saves panel space
Built-in bypass	– Minimizes installation cost and eliminates power loss – Reduces heat build up. Savings in components, cooling, wiring and labor
Advanced accessories	– Allows enhanced functionality
Advanced SCR control algorithms balance output waveform	– Allows more starts per hour, at higher load
Reliable	**Maximum up-time**
Essential motor protection (MCD 202)	– Reduces overall project investment
Max. ambient temperature 60 °C without derating	– No external cooling or oversizing necessary
User friendly	**Save commissioning**
Easy to install and use	
Easy DIN rail mounting for sizes up to 30 kW	– Saves time and space

Dimensions

Power range (400 V)	7-30 kW	37-55 kW	75-110 kW
Height [mm]	203	215	240
Width [mm]	98	145	202
Depth [mm]	165	193	214

VLT® Soft Start Controller MCD 100

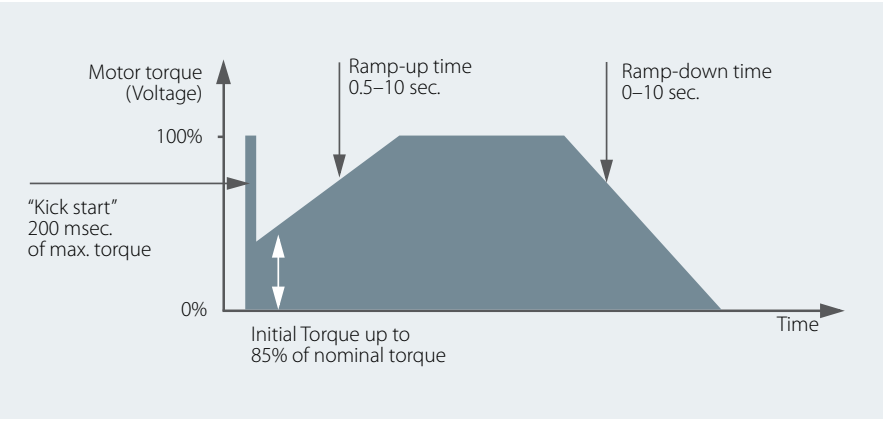
VLT® Soft Start Controller MCD 100 is a cost-effective and extremely compact soft starter for AC motors up to 11 kW, due to a unique semiconductor design.

VLT® Soft Start Controller MCD 100 is a true "fit and forget" product. Selection can be made on the basis of the motor power – exactly as with traditional contactors.

VLT® Soft Start Controller MCD 100 products provide timed voltage ramp up and down. Ramp time can be individually adjusted with rotary switches from 0.4 to 10 seconds.

The start torque can be adjusted from 0 to 85% of the direct on-line torque.

All sizes are rated for line voltage up to 600 V AC.



Feature	Benefit
Small footprint and compact size	– Saves panel space
Selection can be based on motor power	– Easy selection
Universal control voltage	– Simplifies selection – Keeps stock at a minimum
"Fit and forget" contactor design	– Simplifies installation – Reduces required panel space
Reliable	**Maximum up-time**
Robust semiconductor design	– Reliable operation
Almost unlimited number of starts per hour without derating	– Prevents unauthorized changes
Max. ambient temperature 50 °C without derating	– No external cooling or oversizing necessary
User friendly	**Save commissioning and operating cost**
Easy to install and use	– Saves times
Digitally controlled rotary switches	– Secures precise settings and simplifies installation
Easy DIN rail mounting for sizes up to 30 kW	– Saves time and space

Dimensions

Power range	1.5 kW	7.5 kW	11 kW
Height [mm]	102	110	110
Width [mm]	22.5	45	90
Depth [mm]	123.5	128.1	128

Serial communication

VLT® Compact Starter MCD 201 and 202, and VLT® Soft Starter MCD 500 come with optional plug-in modules for serial communication.

- DeviceNet
- EtherNet/IP
- PROFIBUS
- Modbus RTU
- USB

	MCD 100	MCD 201	MCD 202	MCD 500
Start/stop, reset	■	■	■	■
LED for start, run, trip	■	■	■	■
Trip codes	■	■	■	■
Current display			■	■
Motor temperature display			■	■
4 – 20 mA output			■	■
Programming keypad, graphical display				■

Ordering typecode

VLT® Soft Starter MCD 500

	[1]	[2]	[3]	[4]	[5]	[6]
MCD 5 –		–	– T	– G	X –	– C V

[1] FLC, [A]	
0021	FLC, [A]
0037	
0043	
0053	
0068	
0084	
0089	
0105	
0131	
0141	
0195	
0215	
0245	
0331	
0396	
0360	
0380	
0428	FLC, [A]
0469	
0525	
0595	
0619	
0632	
0744	
0790	
0826	
0927	
0961	
1200	
1410	
1600	

[2] Bypass indication	
B	With internal bypass contactor
C	Without internal bypass contactor (continuous)

[3] Supply voltage	
5	200-525 V AC
7	380-690 V AC
[4] Enclosure	
1	Enclosure size 1
2	Enclosure size 2
3	Enclosure size 3
4	Enclosure size 4
5	Enclosure size 5
[5] IP rating	
00	IP00
20	IP20
[6] Control voltage	
1	24 V AC or 24 V DC
2	110 or 220 V AC

VLT® Compact Starter MCD 200

	[1]	[2]	[3]	[4]
MCD 2 0		–	– T	– C V

[1] Series	
1	Soft start/stop
2	Soft start/stop + protection
[2] Nominal motor kW, 400 V	
055	E.g. 55 kW
110	110 kW

[3] Line supply voltage	
4	200-440 V
6	200-575 V
[4] Control supply voltage	
1	24 V AC/DC
3	110-240 V AC and 380-440 V AC

Size indications

VLT® Compact Starter MCD 201/MCD 202

Power size (kW)	Rated current AC-53b* (A)	Approvals
7.5	18 A: 4-6: 354	UL C – UL CE CCC C-tick Lloyds
15	34 A: 4-6: 354	
18	42 A: 4-6: 354	
22	48 A: 4-6: 354	
30	60 A: 4-6: 354	
37	75 A: 4-6: 594	
45	85 A: 4-6: 594	
55	100 A: 4-6: 594	
75	140 A: 4-6: 594	
90	170 A: 4-6: 594	
110	200 A: 4-6: 594	

** Example: AC 53b: 42 A: 4-6: 354 starting current max. 4 times FLC (42 A) in 6 seconds. 354 seconds minimum between starts.*

VLT® Soft Start Controller MCD 100

Power size (kW)	Rated current (A)	Approvals
1.5	3 A: 5-5:10 (AC 53b)	UL, CE
7.5	15 A: 8-3: 100-3000 (AC 53a)	
11	25 A: 6-5:100-480 (AC 53a)	

Size indication for VLT® Soft Starter MCD 500

Motor size (kW) @ 400 V	Enclosure type	Starts per hour	Max. FLC	Rated FLC (40° C, 1000 m), outside delta motor connection		
				Light 300%, 30s, Internal bypass	Medium 400%, 20s, Internal bypass	Heavy 450%, 30s, Internal bypass
11	G1 (no fan)	10	23	**21**	17	15
18.5		10	43	**37**	31	26
22		10	50	**43**	37	30
25		10	53	**53**	46	37
30	G1	6	76	**68**	55	47
37		6	97	**84**	69	58
45		6	100	**89**	74	61
55		6	105	**105**	95	78
60	G2	6	145	**131**	106	90
75		6	170	**141**	121	97
90		6	200	**195**	160	134
110		6	220	**215**	178	149
110	G2x	6	245	**245**	194	169
160		6	331	**331**	266	229
200		6	396	**396**	318	273
250	G4x	6	469	**469**	383	326
285		6	525	**525**	425	364
315		6	632	**632**	512	438
400		6	744	**744**	606	516
450		6	826	**826**	684	571
500		6	961	**961**	796	664

Motor size (kW) @ 400 V	Enclosure type	Starts per hour	Max. FLC	Not bypassed	External bypass	Not bypassed	External bypass	Not bypassed	External bypass
132	G3x	6	255	**245**	255	195	201	171	176
185	G4x	6	360	**360**	360	303	310	259	263
200		6	380	**380**	380	348	359	292	299
220		6	430	**428**	430	355	368	301	309
315		6	620	**595**	620	515	540	419	434
335		6	650	**619**	650	532	561	437	455
445		6	790	**790**	790	694	714	567	579
500		6	930	**927**	930	800	829	644	661
650	G5x	6	1200	**1200**	1200	1135	1200	983	1071
750		6	1410	**1410**	1410	1187	1319	1023	1114
850		6	1600	**1600**	1600	1433	1600	1227	1353

Note: Optimize your selection with WinStart Soft Starter PC tool.

Specifications

VLT® Soft Starter MCD 500	VLT® Soft Start Controller MCD 100
Type	
■ The total motor starter solution. ■ Provides advanced control methods for starting and stopping and protection of motor and application	■ A true "fit and forget" soft starter for DIN rail mount, MCD 100 provides basic soft start and stop function
Concept	
■ Enhanced soft start and soft stop ■ Motor and system protection ■ 7.5-850 kW @ 400 V (21-1600A) ■ 200-690 V mains voltage ■ 110-220 V AC or 24V AC/DC control supply ■ 3-phase SCR control	■ Soft start ■ Soft stop ■ 0.1-11 kW @ 400 V ■ 208-600 V mains voltage ■ 24-480 V AC/DC control voltage ■ 2-phase SCR control
Start/stop	
■ Adaptive Acceleration Control (AAC) ■ Current limit start ■ Current ramp start ■ Dual parameter function ■ Kick-start ■ Jog	■ Timed voltage ramp-up ■ Adjustable start torque ■ Selectable kick-start function
■ Adaptive Deceleration Control (AAC) ■ TVR soft stop (Timed Voltage Ramp) ■ Coast to stop ■ DC brake function – three phase ■ Soft brake function	■ Timed voltage ramp-down
Protection	
Same as MCD 202 and: ■ Under current ■ Current imbalance ■ Starter overtemperature ■ Restart delay ■ Warning before trips ■ Adjustable phase imbalance sensitivity – Programmable input trip – Individual phase loss trips – Individual shorted SCR trips – Int. bypass relay overload – Int. bypass relay fail ■ Fully adjustable protections ■ Network communication timeout ■ Heatsink overtemperature ■ Battery/clock failure ■ Supply frequency ■ External trip	
Output	
■ Three programmable output relays: Programmable analogue output ■ Motor thermistor	
Control	
■ 8 language graphical display and keypad ■ Quick menu and appplication menu ■ Buttons for start, stop, reset and remote control ■ Inputs for two- or three-wire control **Optional** ■ Modules for serial communication ■ VLT® Control Panel LCP 501 ■ PC software	■ Universal two-wire control ■ Programmable via 3 rotary switches
Other features	
■ Bypass up to 961A (500 kW) ■ Configurable bus bars from 360 A and up ■ Operation timers ■ Jog – slow speed operation ■ Auto reset of fault situations ■ Emergency run ■ 99 event log ■ Trip log ■ User programmable metering and monitoring ■ Simulation before connecting line voltage	■ Extremely robust SCR design for unlimited number of starts per hour, LED indication, IP20

VLT® Compact Starter MCD 201	VLT® Compact Starter MCD 202
Type	
■ A physically compact starter providing basic soft start and stop functionality	■ Physically similar to MCD 201 but providing enhanced soft start functionality and various motor protection functions
Concept	
■ Soft start ■ Soft stop ■ 7.5-110 kW @ 400 V ■ 200-575 V mains voltage ■ 110-440 V AC or 24 V AC/DC control supply ■ 2-phase SCR control	■ Current limit start ■ Soft stop ■ Motor protection ■ 7.5-110 kW @ 400 V ■ 200-575 V mains voltage ■ 110-440 V AC or 24 V AC/DC control supply ■ 2-phase SCR control
Start/stop	
■ Timed voltage ramp-up ■ Adjustable initial torque	■ Current limit start ■ Initial current ramp-up
■ Timed voltage ramp-down	■ Timed voltage ramp-down
Protection	
	■ Motor overload (adjustable trip class) ■ Excess start time ■ Reverse phase rotation ■ Motor thermistor input ■ Shorted SCR – no start ■ Supply fault – no start ■ Instantaneous overload
Output	
■ One output relay: Line contactor control	■ Two output relays: – Line contactor control – Run contactor or trip function
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
Other features	
■ Integral SCR bypass for minimum physical size and heat dissipation during nominal operation ■ LED status indication ■ IP20 (7.5 – 55 kW @ 400 V) ■ IP00 (75 – 110 kW @ 400 V) ■ Protection kit available	■ Integral SCR bypass for minimum physical size and heat dissipation during nominal operation ■ LED status indication ■ IP20 (7.5 – 55 kW @ 400 V) ■ IP00 (75 – 110 kW @ 400 V) ■ Protection kit available

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Danfoss Drives

Danfoss Drives is a world leader in variable speed control of electric motors. We aim to prove to you that a better tomorrow is driven by drives. It is as simple and as ambitious as that.

We offer you unparalleled competitive edge through quality, application-optimized products targeting your needs – and a comprehensive range of product lifecycle services.

You can rely on us to share your goals. Striving for the best possible performance in your applications is our focus. We achieve this by providing the innovative products and application know-how required to optimize efficiency, enhance usability, and reduce complexity.

From supplying individual drive components to planning and delivering complete drive systems; our experts are ready to support you all the way.

We draw on decades of experience within industries that include:

- Chemical
- Cranes and Hoists
- Food and Beverage
- HVAC
- Lifts and Escalators
- Marine and Offshore
- Material Handling
- Mining and Minerals
- Oil and Gas
- Packaging
- Pulp and Paper
- Refrigeration
- Water and Wastewater
- Wind

You will find it easy to do business with us. Online, and locally in more than 50 countries, our experts are never far away, reacting fast when you need them.

Since 1968, we have been pioneers in the drives business. In 2014, Vacon and Danfoss merged, forming one of the largest companies in the industry. Our AC drives can adapt to any motor technology and we supply products in a power range from 0.18 kW to 5.3 MW.

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