

VS65

Series

Power Electronics' VS65 medium voltage soft starter is the most reliable and safe solution, fully flexible and customised line-up of MV cells. Rated for applications from 2.3kV to 13.8kV, combines outstanding design and hardware under the most stringent IEC regulations, with advanced technology motor control and safety, that allows a smooth motor starting and stopping under any circumstance.

The VS65 series have been designed and tested under the most demanding environments, together with an easy and rugged user interface allows the user to configure the ultimate motor control and safety protections that will take care of your valuable rotating assets. The VS65 is compartmentalised in 4 independent sections that smartly isolate the medium voltage parts from the low voltage control sections. Fibre optics communicates between the control board and the power stage offering the maximum safety and immunity levels.

Our vertical integration of production and a dedicated project department allow us to offer customised equipment such as input MV protection cells, user terminal strips, communications protocols, ... the VS65 by Power Electronics is your fully integrated tailor made solution, manufactured and factory tested, with the most reliable warranty with unique on-site technical service.



- **Highest operator safety**
- **Built-in motor protection functionalities**
- **High reliability and availability**
- **Highest break away torque**
- **Easy operation with intuitive control**
- **Fully customisable to your requirements**



LV USER INTERCONNECTION AND INTERFACE

The user has easy frontal and safe access to the terminal strip (I/O signals) where the centralised control signals will be connected.

The front panel integrates built-in as standard: 3 push buttons (start, stop, E-stop), 1 start mode selector (LOC, REM, STOP), 5 status pilots lamps (running, stop, ready, power supply, warning). Additionally the user can easily configure the soft starter due to its intuitive backlit display and comprehensive documentation.

SCR POWER STAGE

The power stage consists of high voltage anti-parallel pairs of SCR, which are connected in series depending on the rated voltage. Available from 2,3kV to 13,8kV. Our heavy duty design has a maximum overload capacity of 500% In.

The VS65 takes care of its thyristors at any load and temperature condition by means of its built-in SCR snubber circuit and hardware protections. The Snubber circuit balances and protects the SCR stacks to enable a safe start and stop under any circumstance.

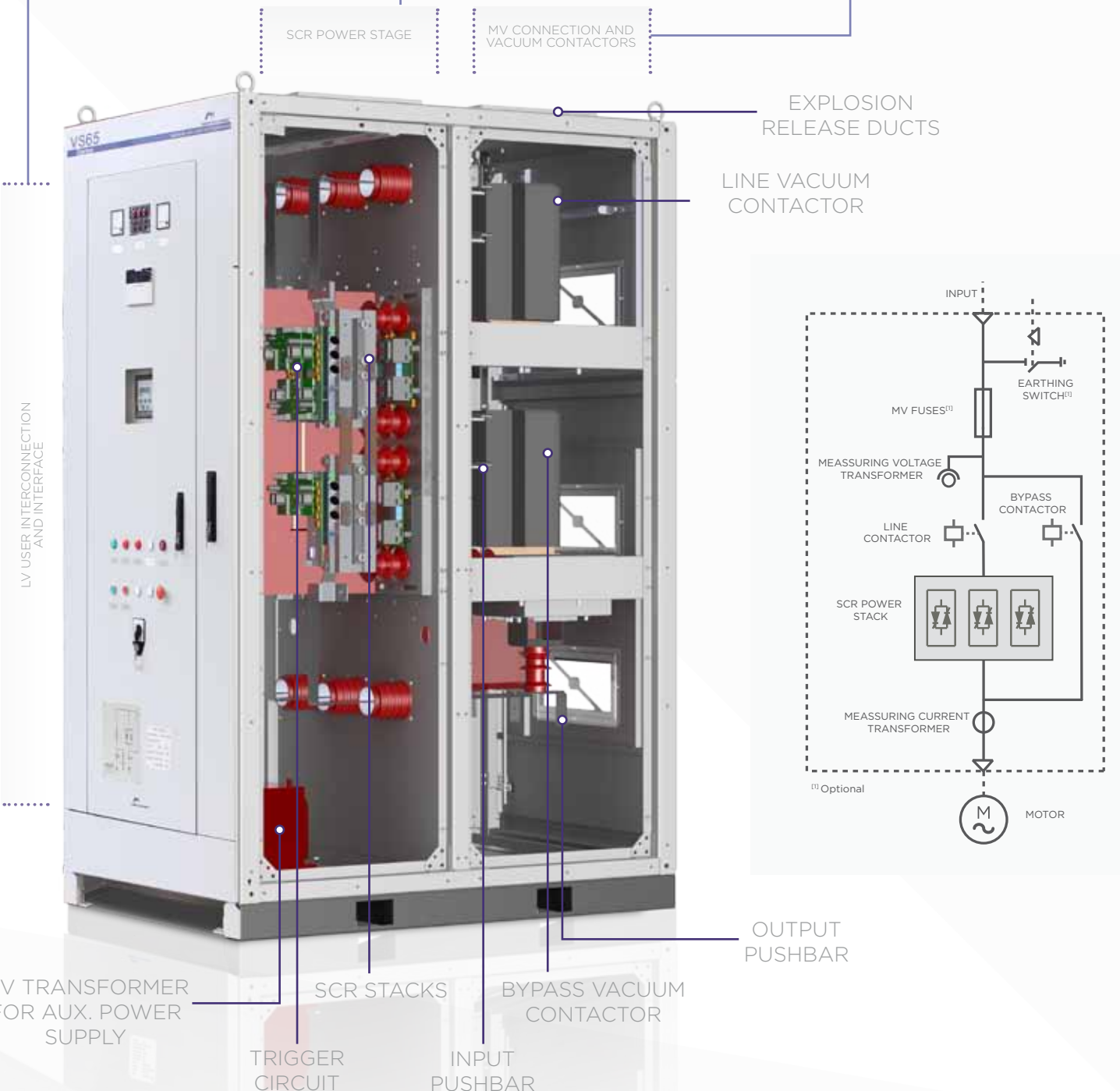
Located above the power stage is the trigger circuit. This board communicated through fibre optic to the main control board that precisely sends the triggering pulses to perform a soft start. A fibre optic communication offers maximum safety, total immunity to noise and fast communication rates.

MV CONNECTION AND VACUUM CONTACTORS

The input and output bus bars are tailor made to be ready to plug in to your mains. Top and bottom and either cable or copper bus bar connection options are available.

The VS65 integrates built-in as standard two MV vacuum contactors (line and bypass). The START command initialises the starting sequence by enabling the line contactor, and then the pre-configured soft start is performed. Once the motor reaches the designated point, the bypass contactor is enabled and the line contactor is opened.

This topology isolates the thyristors from the mains at rated speed, hence the VS65 offers 100% efficiency with maximum reliability and protection.





- Independent sections isolate terminal strip and interface, from medium voltage equipment.
- Mechanic interlock or by procedure that avoid unexpected door opening that give access to live parts of the equipment.
- Optional input grounding switch that connects to ground each phase avoiding unexpected reconnections during maintenance.
- Pre start low voltage test by using a LV motor or a set of lamps, allows a safely fully functional performance test including: plant control integration, enabling bypass and line contactors, I/O settings and thyristor firing.
- Explosion proof cabinet resistant to internal shortcircuit. The energy generated is released through a dedicated duct on the top, therefore avoiding any personal injury.
- BIL rating up to 50kV for safety and reliability. Clearance and creepage distances oversizing offers maximum safety.
- Factory tested at full current and optionally specific witness testing available.
- Power Electronics personnel is present in every commissioning to get the most to your application.



- Electronics conformally coated with military and aerospace technology (IEC61086-1:2004, -3-1) and totally sealed, allow to be installed in harsh environments.
- Heavy duty SCR design (125% continuous, 500% 5s and 50°C) and high inverse peak voltage without reactors (chokes).
- IP44 degree of protection. No dust filters that is suitable for humid and polluted environments.
- EMC cabinet design to offer maximum immunity and minimum emissions.
- Line and bypass vacuum contactors isolate the power stage in running mode against mains disturbances.
- Copper or aluminum busbars.

Rated voltage	SCR pairs in series	SCRs Inverse Peak Voltage (V)
2.3kV	1	6.500V
3.3kV/4.16kV	2	13.000V
5kV/5.5kV/6kV/6.6kV	3	18.000V
10kV	4	26.000V
11kV	5	32.500V
13.8kV	6	39.000V

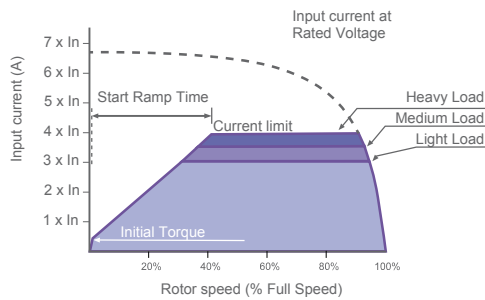
TOTALLY SEALED
AND CONFORMALLY
COATED ELECTRONICS



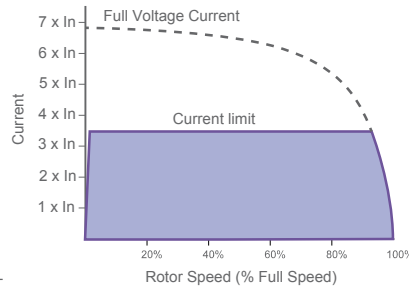


The VS65 soft starter gets the most from your facilities, by implementing the unique dynamic torque control algorithm (CDP) that offers an ultimate break away torque and starts the most demanding applications. Some of the starting and stopping extended settings are:

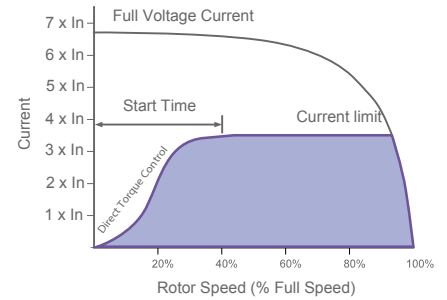
STARTING MODES



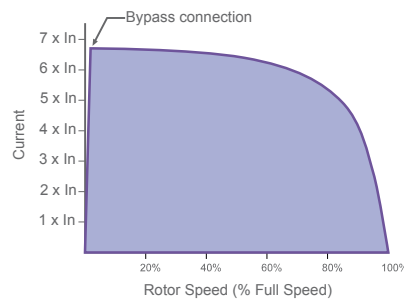
VOLTAGE RAMP



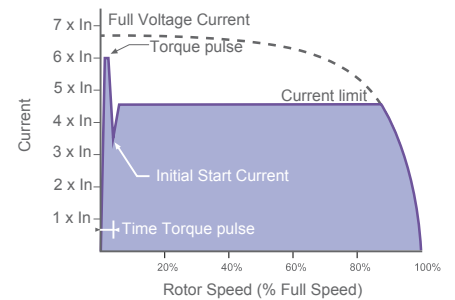
CURRENT LIMIT STARTING



DYNAMIC TORQUE CONTROL

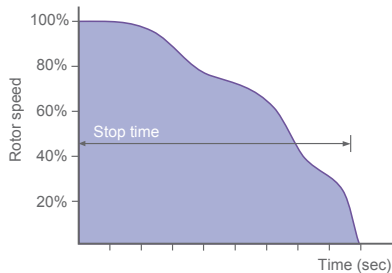


DIRECT STARTING

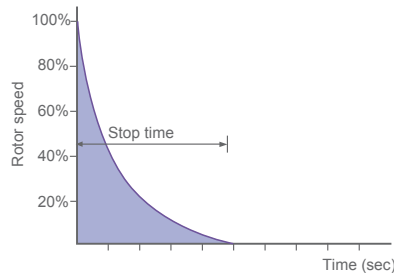


ROTOR LOCKED

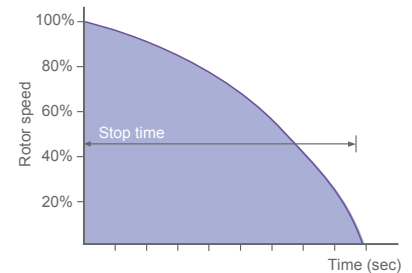
STOP MODES



WATER HAMMER CONTROL



SPIN STOP



STOP WITH VOLTAGE RAMP



The VS65 soft starter includes built-in as standard the ultimate motor and soft starter protections, features that allow it to act as a motor protection relay.

- Motor start delay
- Door open sensor
- Accelerating and decelerating control
- Starting to running transition
- SCRs over temperature
- Low input voltage
- Under-load protection
- Local and remote control selector
- Current imbalance
- Phase rotation
- Locked rotor / incomplete sequence
- i^2t Electronic motor over load
- Instantaneous electronic over current trip / Shearpin
- Motor overcurrent
- Over voltage protection
- Input phase loss
- Controlled stopping ramp
- Starts per hour - Notching and jogging
- Communication loss
- Local emergency stop
- Line contactor
- Remote emergency stop
- Excessive start time (max. 120s)
- **Other protection relays can be optionally ordered**



CUSTOMISED SOLUTIONS

Experienced medium voltage engineers and backed by our R&D and Production departments, can modify standard equipment to comply with your specific requirements and support you during the plant lay-out. Factory tested solutions that provide flexibility and reliability.



Customised control and pushbuttons:

- Selectors and pushbuttons
- Digital and analogue I/O pre-configuration
- Customised user terminal strip
- PTC and PT100 relays
- Instantaneous ground fault protection relay.
- Specific external Power Supply (UPS, 110Vac,...)
- Optional communication protocols (Profibus-DP, Dvicenet, Modbus TCP,...)
- Soft starter's and motor's heating resistor control.

Input protection module:

- Automatic Circuit Breaker (VCB)
- Medium Voltage Fuses
- Withdraw-able vacuum contactors
- Earthing switch
- Input and Output MV cabin with commutation vacuum contactors and fuses.
- Input MV cabin to connect different fixed power factor correction solutions
- Surge arresters

Cabinet features:

- Degree of protection IP54, stainless steel enclosure, special RAL, special labelling and warning labels.
- Incoming MV cable or busbar connection from top, right or backside.
- Lined up soft starters with common main input busbar and protection "Run busbar".

Documentation:

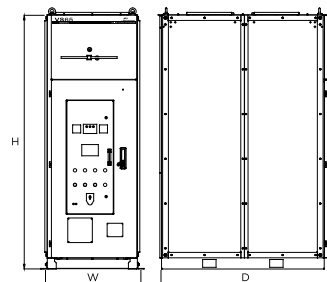
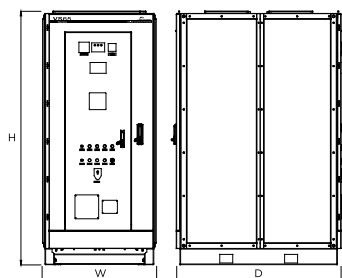
- Electrical and dimensional drawings.
- ITP reports
- Witness factory Acceptance test (FAT)
-

VS65 SOFT STARTER MODULE - TECHNICAL CHARACTERISTICS

INPUT	Input voltage ^[1]	2,3kVca - 13.8kVca		
	Input frequency	47 - 62Hz		
	Control voltage ^[1]	230Vac ±10%, 50Hz		
	Phase sequence	Compatible with any phase sequence		
	Transitory over voltage protection	Snubber network / Optional Surge arresters		
OUTPUT	Efficiency (full load)	> 99.6%, 100% Bypass activated		
	Overload	125% of the continuous rated value 100% to 500% (during 1 - 60s configurable)		
	Bypass contactor	Powerful enough to start the motor in direct start mode		
ENVIRONMENTAL CONDITIONS	Protection degree	IP44		
	Cooling system	Natural		
	Work temperature	0°C to +50°C		
	Storage temperature	-25°C to +55°C		
	Humidity	5% - 95%, non condensing		
	Height ^[1]	1000m, no power derating		
INTERCONNECTION	Painting ^[1]	RAL 7035, C3 corrosion (ISO 12944-2)		
	Digital inputs	5 configurable input		
	Analogue inputs	2 analogue inputs of 0-20mA or 4-20mA, 0-10V		
	Output relays	3 switched relays (non-inductive 10A 250Vac)		
KEYPAD AND CONTROL PUSHBUTTONS	Analogue outputs	1 configurable output 0-20mA or 4-20mA		
	Display	Backlit, alphanumeric 2x16 characters		
		5 keys: start, stop, access and scroll menu		
	Door mounted indicators and buttons (soft starter)	Status leds: ON: Green. Turned on indicates there is voltage in the control boards. RUN: Orange. Flashing shows when the motor accelerates or decelerates. When turned on indicates the motor is working. FAULT: Red. Indicates fault.		
		3 push buttons: Start, Stop and emergency stop		
		1 starting mode selector		
	Door mounted indicators (Optional input module)	5 status pilots (running, stopped, ready, power supply, alarm)		
		7 status pilots (Power supply L1/L2/L3, MV switches status on/off/loaded control voltage supply)		
	Display information	3 push buttons: switch status, connection and disconnection		
		Current of the three phases	Line average voltage	
Digital inputs and relays status		Analogue inputs and outputs status		
Power supply and motor frequency		Power factor		
Motor torque and power		Fault history (5 last faults)		
Total and partial starts number		Total and partial operation hours		
Partial motor consumption (kWh)				
COMMUNICATIONS	Standard Hardware	RS232 / RS485		
	Optional Hardware	Ethernet, Profibus DB9		
	Standard Protocol	Modbus-RTU		
	Optional Protocol	Profibus DP, Devicenet, Ethernet, N2 Metasys		
	Control modes	Local: from keyboard and pushbuttons Remote: from the digital and analogic inputs.		
SOFT STARTER SETTINGS	Torque pulse	Initial torque		
	Initial torque time	Acceleration time		
	Current limit: 1to 5•In	Overload: 0.8 to 1.2•In, Overload curve: 0 to 10		
	Deceleration time / Spin stop	Number of Starts/hour allowed		
	Dual setting	Water hammer control		
	Torque control			
REGULATIONS	Certification	CE		
	Designed as	EMC Directive (2004/108/CE)		
	Design and construction	EN61000-6-2, -4		
		EN62271-1,-200		
	EN60071-1,-2			

NOTE [1] Other configurations, consult with Power Electronics.

DIMENSIONS



		VS65		
VOLTAGE	CONFIGURATION	DIMENSIONS		
		WIDTH W (mm)	DEPTH D (mm)	HEIGHT H (mm)
<4.16kV	CL, CL_E, CL_F, CL_S	1050	1550	2300
	CL_FS, CL_FE	1050	1820	2300
5kV-6.6kV	CL, CL_F	1050	1550	2300
	CL_E, CL_S	1050	1820	2300

		VS65AR		
VOLTAGE	CONFIGURATION	DIMENSIONS		
		WIDTH W (mm)	DEPTH D (mm)	HEIGHT H (mm)
<400A	CL_FS, SF_E, IA_FS	715	1550	2300
630A-2500A	IA_FS, IX_FS	900	1550	2300

[1] Valid dimensions for units I_n < 300A. Other voltages and configurations, consult with Power Electronics.

VS65 SOFT STARTER MODULE - CONFIGURATION TABLE

VS65 Series	200		4		4		CL		O		-		-	
	Rated output current ^[1]		Rated input voltage		Degree of protection		Configuration		Power cable access		Fuses		Earth switch	
	200	200A	2	2300V	4	IP44	CL	Fixed line contactor / Fixed bypass contactor	O	Bottom input and output connection	-	Not included	-	No Earth switch
	400	400A	3	3000V 3300V			CX	Withdrawable line contactor/ Fixed bypass contactor	T	Top input and bottom output connection	F	With general input fuse protection	E	With Earth switch
	4	4160V			XX	Withdrawable line contactor/ Withdrawable bypass contactor	U	Top input and output connection			S	ON/OFF/Earth switch
	600	600A	6	6000V 6600V										
			8	10000V 11000V										
			9	13200V 13800V										
			-	Under request										

NOTES [1] Check the rated current of the motor nameplate and indicate the short circuit current to guarantee the compatibility with the selected soft starter.
[2] Consult availability with Power Electronics.
Request your quote by filling the ordering info template; please consult Power Electronics with your additional demands.

PROTECTION MODULE VS65AR - CONFIGURATION TABLE

VS65AR Protection Module	1250		6		4		IA		T		-		-	
	Rated current		Rated voltage		Degree of protection		Configuration		Power cable access		Fuse protection		Earthing Switch	
	0400	400A	2	2300V	4	IP44	SF	Disconnecter with fuses	-	Bottom input and output	-	Not included	-	Not included
	0630	630A	3	3000V 3300V			IA	Automatic Circuit Breaker (VCB)	T	Top input and bottom output	F	Included	E	Earth switch
	1250	1250A	4	4160V			IX	Withdrawable Automatic Circuit Breaker (VCB)	U	Top input and output			S	ON/OFF/Earth switch
	6	6000V 6600V			CL	Fixed Line contactor					I	ON/OFF/Earth switch INPUT and OUTPUT
			8	10000V 11000V ^[2]			CX	Withdrawable Line contactor					M	ON/OFF/Earth switch input and Earth switch output
			9	13200V 13800V										
			-	Bajo pedido										

NOTES [1] Check the rated current of the motor nameplate and indicate the short circuit current to guarantee the compatibility with the selected protection module.
[2] Consult availability with Power Electronics.
Please consult Power Electronics with your demands.

STANDARD RATINGS - VS65 SOFT STARTER MODULE

VS65 4.16kV				
CODE	NOMINAL CURRENT (A)	MOTOR POWER		
		(kW)	(HP) ^[1]	
VS65050 4	50	298	400	
VS65055 4	55	336	450	
VS65060 4	60	373	500	
VS65070 4	70	447	600	
VS65080 4	80	522	700	
VS65095 4	95	597	800	
VS65110 4	110	671	900	
VS65120 4	120	746	1000	
VS65150 4	150	932	1250	
VS65180 4	180	1119	1500	
VS65210 4	210	1305	1750	
VS65240 4	240	1491	2000	
VS65270 4	270	1678	2250	
VS65300 4	300	1864	2500	

VS65 6kV - 6.6kV				
CODE	NOMINAL CURRENT (A)	MOTOR POWER		
		(kW) ^[2]	(HP)	
VS65040 6	40	400	536	
VS65045 6	45	450	603	
VS65050 6	50	500	671	
VS65055 6	55	560	751	
VS65060 6	60	630	845	
VS65070 6	70	710	952	
VS65080 6	80	800	1073	
VS65090 6	90	900	1207	
VS65100 6	100	1000	1341	
VS65125 6	125	1250	1676	
VS65140 6	140	1400	1877	
VS65160 6	160	1600	2146	
VS65180 6	180	1800	2414	
VS65200 6	200	2000	2682	
VS65220 6	220	2240	3004	
VS65250 6	250	2500	3353	
VS65280 6	280	2800	3755	
VS65300 6	300	3150	4224	

NOTES [1] HP standard motor rated power ($\cos \phi = 0.88$, 4.16kV).
[2] kW standard motor rated power ($\cos \phi = 0.88$, 6.6kV).
Request your quote by filling the Ordering info template; please consult Power Electronics with your additional demands.
Soft starters over 400A and 7.2kV will be equipped with automatic circuit breaker instead of vacuum contactors and engineered under request, consult availability.

24H/7D TECHNICAL ASSISTANCE	HEADQUARTERS - VALENCIA - SPAIN
	C/ Leonardo da Vinci, 24 - 26 - Parque Tecnológico - 46980 - PATERNA - VALENCIA - SPAIN Tel. 902 40 20 70 - Tel. (+34) 96 136 65 57 - Fax (+34) 96 131 82 01
	INTERNATIONAL SUBSIDIARIES
GERMANY	Power Electronics Solar GmbH - Dieselstrasse, 77 - D-90441 - NÜRNBERG - GERMANY Tel. (+49) 911 99 43 99 0 - Fax (+49) 911 99 43 99 8 • Email: info@ped-deutschland.de
AUSTRALIA	Power Electronics Australia Pty Ltd - U6, 30-34 Octal St, Yatala, - BRISBANE, QUEENSLAND 4207 • P.O. Box 6022, Yatala DC, Yatala Qld 4207 - AUSTRALIA Tel. (+61) 7 3386 1993 - Fax (+61) 7 3386 1993 • Email: sales@power-electronics.com.au
BRAZIL	Power Electronics Brazil Ltda - Rua Odeon, 102 - Centro - CEP 09720-290 SÃO BERNARDO DO CAMPO - SP - BRASIL - Tel. (+55) 11 5891 9612 - Tel. (+55) 11 5891 9762 Email: comercialbrasil@power-electronics.com
KOREA	Power Electronics Asia HQ Co - Room #305, SK Hub Primo Building - 953-1 Dokok-dong, Gangnam-gu - 135-270 - SEOUL - KOREA Tel. (+82) 2 3462 4656 - Fax (+82) 2 3462 4657 • Email: sales@power-electronics.kr
CHILE	Power Electronics Chile Ltda - Los Productores # 4439 - Huechuraba - SANTIAGO - CHILE Tel. (+56) (2) 244 0308 - 0327 - 0335 - Fax (+56) (2) 244 0395 • Email: ventas@pech.cl • Oficina Petronila # 246, Casa 19 - ANTOFAGASTA - CHILE - Tel. (+56) (55) 793 965
CHINA	Power Electronics Beijing - Room 606, Yiheng Building - No 28 East Road, Beisanhuan - 100013, Chaoyang District, BEIJING - R.P. CHINA - Tel. (+86 10) 6437 9197 - Fax (+86 10) 6437 9181 • Power Electronics Asia Ltd - 20/F Winbase Centre - 208 Queen's Road Central - HONG KONG - R.P. CHINA Email: sales@power-electronics.com.cn
UNITED STATES	Power Electronics USA Inc. • 505 Montgomery Street, 11th Floor San Francisco • CA 94111 • USA Tel.: (415) 874-3668 • Fax: (415) 874-3001 • Mob: (415) 376-1471 • Email: sales@power-electronics.us
INDIA	Power Electronics India - N°5, Cunningham Crescent, 1st floor. Bangalore- 560052 - INDIA Tel./Fax : +91 80 6569 0489 • Email: salesindia@power-electronics.com
ITALY	Power Electronics Italia Srl - Piazzale Cadorna, 6 - 20123 - MILANO - ITALIA Tel. (+39) 342 50 73 691 • Email: infoitalia@power-electronics.com
JAPAN	Power Electronics Japan KK - Nishi-Shinbashi 2-17-2 - HF Toranomon Bldg. 5F 105-0003 • Minato-Ku - TOKYO Tel. (+81) 03 6355 8911 - Fax (+81) 03 3436 5465 • Email: salesjapan@power-electronics.com
MEXICO	P.E. Internacional Mexico S de RL - Avda. Tejocotes lote 76 A S/N • San Martín Obispo Tepetlixpa • CP 54763 • CUAUTITLAN IZCALLI • MEXICO Tel. (+52) 55 5390 8818 • Tel. (+52) 55 5390 8363 • Email: ventasmexico@power-electronics.com
MOROCCO	Power Electronics - Ekoakua • Geea sarl , N°184 Bloc Hay EL.Massira Aït Melloul •CP 80150 • Agadir • MAROC Tel. + 212 5 28 24 04 57 • Mob: (+34) 628 11 76 72 • Email: ventesmaroc@power-electronics.com
NEW ZEALAND	Power Electronics New Zealand Ltd - 12A Opawa Road, Waltham - CHRISTCHURCH 8023 P.O. Box 1269 CHRISTCHURCH 8140 • NEW ZEALAND Tel. (+64 3) 379 98 26 - Fax.(+64 3) 379 98 27 • Email: sales@power-electronics.co.nz
TURKEY	Perpa Ticaret Merkezi A Blok Kat:2 No:9/0034 - 34384 Okmeydanı Şişli • İstanbul • TURKEY Tel: 0 212 221 48 48 (124) - F: 0 212 221 17 00 Email: turkiyesatis@power-electronics.com
UNITED KINGDOM	Power Electronics UK Pty Ltd· Wells House, 80 Upper Street, Islington · London, N1 ONU · 147080 Islington 5 Tel. (+44) 149 437 00 29 • Email: uksales@power-electronics.com
SOUTH AFRICA	Power Electronics South Africa Pty Ltd · Central Office Park Unit 5 · 257 Jean Avenue · Centurion 0157 Tel. (+34) 96 136 65 57 · Fax (+34) 96 131 82 01 • Email: salesza@power-electronics.com