

VARIABLE SPEED DRIVE

# XMV660

## Series

XMV660 MV drive goes one step further in achieving high performance by implementing proven low voltage technology within a modular and reliable configuration. An input phase shift transformer powers low voltage cells that are combined in series producing a quasi-sinusoidal current and voltage output wave with a reduced  $dV/dt$  and THDi level. It is designed under the strictest safety regulations and complies with the most demanding industrial requirements. The XMV660 is available in a wide voltage and power range, offering the best power quality, maximum motor care, uncompromising safety and reliability with reduced maintenance across the whole range.



- Multi-level, pulse-width modulation with phase shift transformer
- High efficiency and Power factor at partial loads
- Low harmonics - IEEE 519 compliance
- Low HVF - No motor derating or motor cable length restriction
- Output voltage boosting
- Redundancy with cell bypass
- Rugged and maintenance friendly design

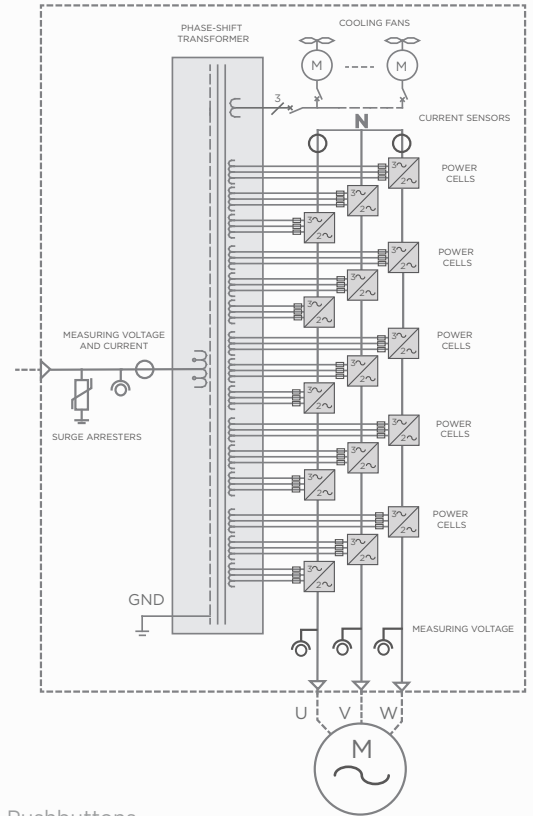


# XMV660 Series

The XMV660 is based on a multi-step pulse width modulation (PWM). Low voltage power cells are connected in series producing a quasi-sinusoidal voltage and current motor wave. This topology offers a low  $dV/dt$ , THDi and HVF without output  $dV/dt$  or sinusoidal filters. This leads to reduce: peak voltages at the motor terminals, motor vibrations and overheating.

Power cells are connected to dedicated output terminals of the phase-shift transformer that can be configured from 18 to 36 pulses. This transformer offers a low THDi, high electric protection, and high power factor at low loads.

The control panel monitors the transformer status and communicates with power cells through fiber optics. At the same time, interacts with the user and DCS (Distributed Control system) through the local display, serial communication ports, I/O signals or the ultimate new wifi web display.





### MAXIMUM MOTOR CARE

700V power cells combined in series generate a quasi sinusoidal voltage and current output waveform therefore achieving a low dV/dt, HVF and THDi.

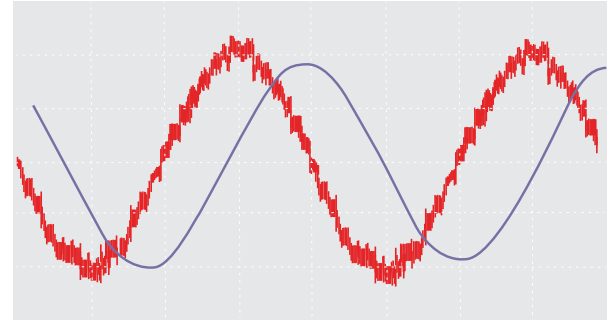
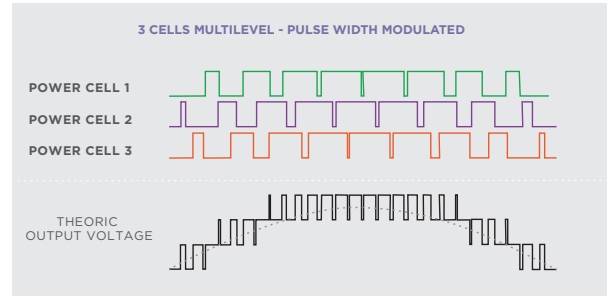
The XMV660 eliminates installation restrictions and additional expense that reduce profitably.

A low dV/dt reduces the voltage peaks at the motor winding and the common mode voltage (CMV) on the motor stator. Therefore, the XMV660 can be installed with new and existing motors with standard insulation and motor cables.

Negligible common mode currents (CMC) through motor bearings allow the use of standard bearings and lubrication.

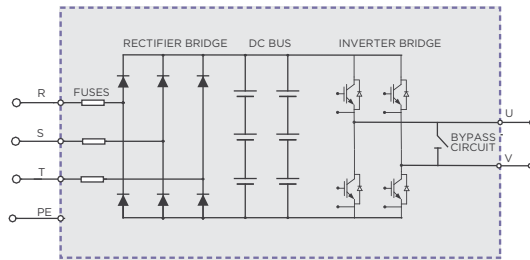
Reduced motor losses caused by non sinusoidal waveforms (high THDi). There is no need to apply a power derating in medium voltage motors.

Reduced induced vibrations and torque pulses on the motor shaft by implementing a multi-step pulse width modulation (PWM) with low voltage power cells.

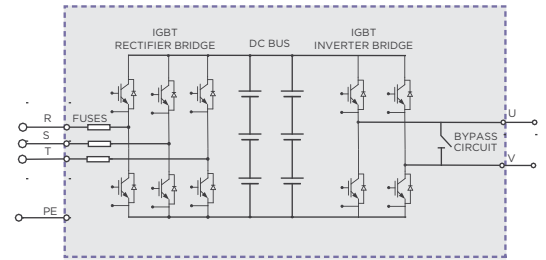


■ Motor Voltage Wave Form  
■ Motor Current Wave Form

### CELL TOPOLOGY A



### CELL TOPOLOGY B

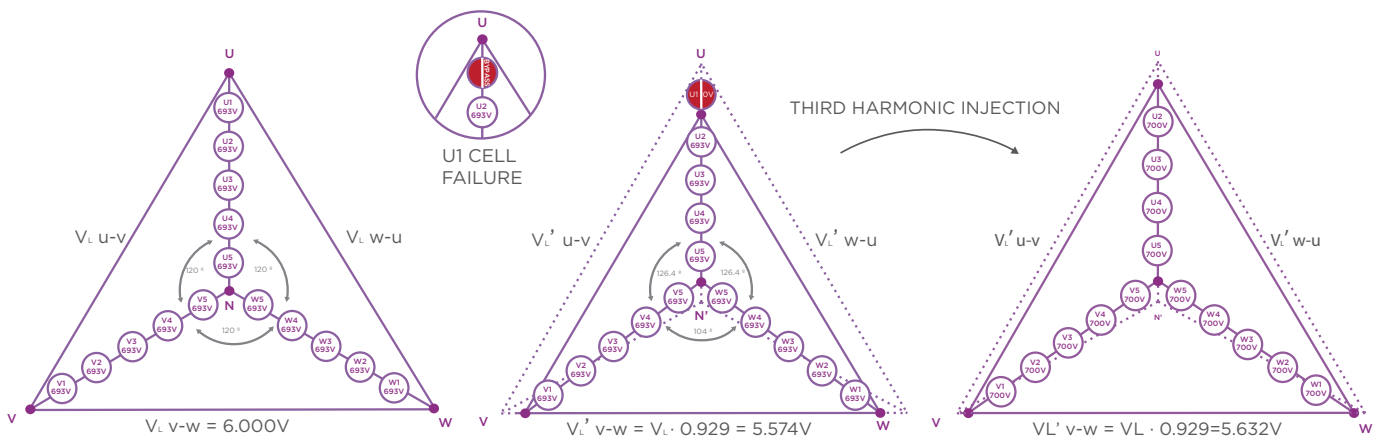


### MAXIMUM RELIABILITY AND AVAILABILITY

The XMV660 is delivered fully factory tested to ensure the best performance under any load condition.

Transformer's and cell's temperature are permanently monitored to detect fan clogging or failure. Additionally the drive is available with a redundant cooling system that maximises the availability rate.

The XMV660 is delivered with a bypass in each cell and a centralised algorithm that permits the drive to keep running even when one or more cells fail, and at maximized output voltage.







## MAINTENANCE FRIENDLY

The XMV660 is delivered with three independent compartments: power transformer cabinet, power cells cabinet and control cabinet.

All of the cabinets are designed to provide an easy front access that simplifies maintenance and supervision. The transformer cabinet can be installed out of the plant room in order to reduce indoor heat loads.

Low voltage test allow a safely fully functional performance before commissioning.

An accessible front connection together with a guide frame permits power cells to be manually changed by an operator with the aid of a trolley.

A redundant design of the power conversion stage and cooling system increases availability rates with a reduced stock of spare parts.

Electronics conformally coated with military and aerospace technology (IEC61086-1:2004, -3-1) and totally sealed, allow to be installed in harsh environments.



## ACCURATE, POWERFUL AND FLEXIBLE MOTOR CONTROL

Power Electronics' success is measured by our customer's satisfaction so the motor control systems developed by Power Electronics have been designed to meet the most demanding features. It integrates the V/f control and two vector controls: the Power Motor Control (PMC) and the Advanced Vector Control (AVC) as standard.

**QUICK AND POWERFUL RESPONSE.** PMC and AVC allow its application in high starting torque, dynamic or precise applications. The XMV660 is suitable for all existing applications.

**START AND STOP MAXIMUM CONTROL.** Thanks to the MBC (Mechanical Brake Control), the Pre-Magnetisation and Delay off IGBT, the loaded process will have a smooth start and stop.

**MULTIPLE DRIVE'S SYNCHRONIZATION.** PMC-OLTC is the unique master-slave motor control that allows the synchronisation of multiple drives and motors without encoder. The result is a smooth, powerful and fast response with the least maintenance and supervision. Every motor will provide the same torque under any circumstance, therefore ageing all the motors homogeneously. Moreover, its reduced starting in-rush current peaks allow the reduction of the drive and motor oversizing in demanding conveyors and mills.

**NON-STOP POWER CELL BYPASS.** When one or more power cells fail, the drive depending on the fault severity, automatically cuts off the power to the motor and bypasses the damaged cells. Then without losing the motor synchronisation, recalculates phase to phase angles to maximise output voltage (neutral-shift algorithm) and re-connects in a few milliseconds.

**SOFT LOAD (Optional).** A Low Voltage VSD magnetizes the transformer and charges each cell DC bus, once complete it synchronizes to the supply voltage and transfers the XMV660 to the line. The soft load limits from 10 to 1xIn the inrush current at the drive's connection.

**SYNCHRONOUS BIDIRECTIONAL BYPASS (Optional).** A set of contactors/VCBs and grounding switches allow the XMV660 to transfer the motor to the line and take-over the motor from the line. A precise synchronization (phase rotation, frequency and amplitude) of the motor with the supply voltage will allow a bumpless transfer and will enable the O&M to safely service the drive.

**ADDITIONAL FUNCTIONALITIES.** Thermal motor protection, motor overload prediction, motor stall, fly start, automatic restart, etc... complete the wide control features.





## CUSTOMISED SOLUTIONS

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

### CABINET FEATURES:

- IP4X protection degree, specific RAL, tailor made labelling.
- Incoming MV cable or busbar connection from top, right or backside.
- Lined up VSD with common main input busbar and protection.
- Cooling redundancy.

### CONTROL, USER TERMINAL STRIP AND PUSHBUTTONS:

- Pushbuttons, selectors and pilots.
- Digital and analogue I/O pre-configuration.
- Customised user terminal strip.
- PTC and PT100 relays.
- Process and motor encoder boards.
- Optional communication protocols (Profibus-DP, Dvicenet, N2 Metasys, CAN Open...).
- Power PLC dedicated applications.



### INPUT AND OUTPUT PROTECTION CELLS

- Synchronous or Asynchronous bypass cell with fully controlled contactors, VCBs and earthing switches.
- Input protection cell featured with Automatic circuit breaker, fuses, withdraw-able contactor, on-load disconnector with or without fuses, Earthing switch, Motor protection relay.
- Commutation cells.
- Cell with Soft-load system.

### DOCUMENTATION

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

## TECHNICAL CHARACTERISTICS

<b>INPUT</b>	Input voltage (kV) <sup>[1]</sup>	2.3kV to 15kV (±10%), (Voltage/Power Ride Through -35%)
	Frequency	50/60Hz (±10%)
	Power factor	> 0.95 (over 20% load)
	THDi (%) current	< 5% <sup>[2]</sup>
	Power transformer	Phase-shift transformer, dry type (Copper or aluminum)
	Overvoltage protection	Surge Arresters
<b>OUTPUT</b>	Technology	Multi-level, pulse-width modulation, low voltage power cells connected in series.
	Pulses / power cells in series	18p/3, 24p/4, 30p/5, 36p/6
	Power cells (A) / (V)	100A, 200A, 300A, 400A, 630A / 600V-700V
	Current harmonic distortion (THDi)	< 5%
	Harmonic voltage factor (HVF)	< 0.019 ( No motor derating required)
	Efficiency	≥96% (including transformer) @Pn
	Power cell bypass	Built-in as standard
	Output voltage balance	Neutral phase shift
	Output voltage boosting	Space vector modulation
<b>ENVIRONMENTAL RATINGS</b>	Operation conditions	Indoor, No caustic and volatile air, no dust
	Degree of protection	IP41 (IEC60529)
	Operation temperature <sup>[3]</sup>	0°C to +50°C
	Storage temperature	-25°C to +55°C
	Humidity	< 90%, non condensing
	Altitude	<1000m; >1000m power derating 1%/100m. Max. 3000m
	Cooling	Forced air cooling. Optional redundant
<b>CONTROL</b>	Control mode	Local control (Display and push-buttons) Remote control (I/O and communications), Web display (wifi)
	Control method	V/Hz VECTOR CONTROL Open Loop: PWM speed / torque control, AVC: speed / torque control Close Loop (Encoder): PWM speed / torque control, AVC: speed / torque control
	Carrier frequency	1kHz
	Control power supply	Redundant 2x230Vac II P+N (1kVA), UPS integrated
	Other characteristics	Voltage/Power ride through, quick setting and commissioning, master-slave synchronization, skip critical frequencies, delay-off IGBT, motor pre-magnetization, flux reduction at low load (energy saver), electric DC brake, multi-reference and speed ramp, Power PLC programming, Other consult Power Electronics.
<b>USER INTERCONNECTION <sup>[1]</sup></b>	Digital inputs	5 programmable, Active high (24Vdc), Isolated power supply 5 pre-configured (Start/Stop ; Reset, control mode, reference) 1 PTC input
	Analogue inputs	3 programmable differential inputs. 0 - 20mA, 4 - 20mA, 0 - 10Vdc and ±10Vdc. (Optically isolated)
	Digital outputs	2 programmable changeover relays (250Vac, 8A or 30Vdc, 8A) 3 programmables NO contacts (250Vac, 8A or 30Vdc, 8A) 3 pre-configured contacts (Start/Stop, Warning, Failure)
	Analogue outputs	3 isolated programmable outputs: 0 - 20mA, 4 - 20mA, 0 - 10Vdc and ±10Vdc
	Encoder (optional)	2 differential encoders input (process y vector control).Input signal from 5 to 24Vdc
	<b>COMMUNICATIONS</b>	Standard Hardware
Optional Hardware		Fiber optics, 9 Pin D-SUB, CAN
Standard Protocol		Modbus-RTU, Modbus TCP, Ethernet IP
Optional Protocol		Profibus-DP, Devicenet, CAN Open, N2 Metasys
<b>REGULATION</b>	Electromagnetic compatibility	Directiva EMC 2004/108/EC, IEC/EN 61800-3, IEEE 519-1992
	VSD design and construction	IEC/EN 61800-4 General requirements, IEC/EN 61800-5-1 Safety, IEC/EN 60146-1-1 Semiconductor converters
	MV transformer	IEC/EN 60076 -1, -11, IEC/EN 60146-1-3, IEC/EN 61378-1

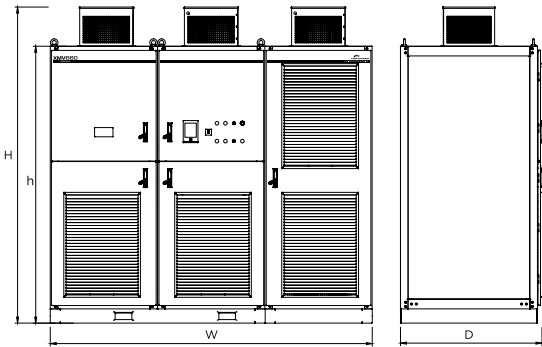
NOTES [1] Other configurations, consult Power Electronics.  
[2] Harmonics are below the limits defined in IEEE519 for all  $I_{sc}/I_L$ .  
[3]  $T_{amb}>40^{\circ}C$  requires special transformer design,  $<0^{\circ}C$  will be equipped with heating.

## CONFIGURATION TABLE - XMV660

XMV660 Series	100		66		X		Y		Z		-		-		-		Nominal Input Voltage <sup>[2]</sup>	
	Rated Output Current <sup>[1]</sup>		Rated Motor Voltage		Overload %		Degree of Protection		Model <sup>[2]</sup>		Cable access		Soft Load System		Cooling Redundancy		Nominal Output Voltage	
	100	100A	23	2.3kV (9 cells)	1	110% Light Duty	4	IP41	-	Asynchronous motor	-	Bottom input and output	-	Not included	-	Not included	-	Nominal Output Voltage
	200	200A	30	3kV (9 cells)	2	120% Normal Duty			S	Synchronous motor	T	Top input and bottom output	C	Included	V	Included	A	2.3kV
	300	300A	33	3.3kV (9 cells)	5	150% Heavy Duty			R	Asynchronous motor 4Q Regenerative	U	Top input and output					B	3kV
	400	400A	41	4.16kV (12 cells)	...	Under request			W <sup>[3]</sup>	Synchronous motor 4Q							C	3.3kV
	630	630A	60	6kV (18 cells)					M	Asynchronous motor 4Q Regenerative Monophase Bridge rectifier							D	4.16kV
	...	Under request	66	6.6kV (18 cells)													E	6kV
			10 <sup>[2]</sup>	10kV (27 cells)													F	6.6kV
			11 <sup>[2]</sup>	11kV (27 cells)													...	Under request
																	M	15kV

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

## DIMENSIONS - XMV660



	Rated current	Width W (mm)	Depth D (mm)	Height h (mm)	Height H (mm)	Height RC <sup>[1]</sup> H (mm)
4.16kV	< 100A	2700	1200	2320	2650	2800
	101A - 200A	4020	1425	2320	2650	2800
	201A - 300A	4390	1425	2370	2790	2930
	> 300A	Under request				
6.6kV	< 100A	3420	1200	2320	2650	2800
	101A - 200A	4580	1425	2320	2650	2800
	201A - 300A	5685	1425	2370	2790	2900
	> 300A	Under request				

NOTES [1] Total height with redundant cooling option (RC).  
 Dimensions valid for aluminum transformer, A power cell type and 120% overload.

## STANDARD RATINGS - XMV660

CODE	XMV660 4.16kV		
	NOMINAL CURRENT (A)	MOTOR POWER	
		(kW)	(HP) <sup>[1]</sup>
XMV66050 416	50	298	400
XMV66060 416	60	336	450
XMV66070 416	70	373	500
XMV66080 416	80	447	600
XMV66090 416	90	522	700
XMV66100 416	100	597	800
XMV66120 416	120	671	900
XMV66130 416	130	746	1000
XMV66160 416	160	932	1250
XMV66200 416	200	1119	1500
XMV66230 416	230	1305	1750
XMV66260 416	260	1491	2000
XMV66290 416	290	1678	2250
XMV66300 416	300	1752	2350
XMV66320 416	320	1864	2500
XMV66360 416	360	2051	2750
XMV66390 416	390	2237	3000
XMV66450 416	450	2610	3500
XMV66520 416	520	2983	4000
XMV66580 416	580	3356	4500
	Other under request		

CODE	XMV660 6.6kV		
	NOMINAL CURRENT (A)	MOTOR POWER	
		(kW) <sup>[2]</sup>	(HP)
XMV66045 066	45	400	536
XMV66050 066	50	450	603
XMV66055 066	55	500	671
XMV66060 066	60	560	751
XMV66070 066	70	630	845
XMV66080 066	80	710	952
XMV66090 066	90	800	1073
XMV66100 066	100	900	1207
XMV66110 066	110	1000	1341
XMV66140 066	140	1250	1676
XMV66150 066	150	1400	1877
XMV66180 066	180	1600	2146
XMV66200 066	200	1800	2414
XMV66220 066	220	2000	2682
XMV66250 066	250	2240	3004
XMV66270 066	270	2500	3353
XMV66300 066	300	2800	3755
XMV66350 066	350	3150	4224
XMV66390 066	390	3550	4761
XMV66440 066	440	4000	5364
XMV66500 066	500	4500	6035
XMV66550 066	550	5000	6705
	Other under request		

NOTES [1] HP standard motor rated power (cos φ • Eff = 0.8, 4.16kV)  
 [2] kW standard motor rated power (cos φ • Eff = 0.8, 6.6kV)  
 [3] 2.3kV, 3kV, 3.3kV, 6kV, 10kV, 11kV, and 12kV Standard Ratings available under request.

<b>24H/7D TECHNICAL ASSISTANCE</b>	<b>HEADQUARTERS - VALENCIA - SPAIN</b>
	<b>C/ Leonardo da Vinci, 24 - 26 - Parque Tecnológico - 46980 - PATERNA - VALENCIA - SPAIN</b> <b>Tel. 902 40 20 70 - Tel. (+34) 96 136 65 57 - Fax (+34) 96 131 82 01</b>
	<b>INTERNATIONAL SUBSIDIARIES</b>
<b>GERMANY</b>	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
<b>AUSTRALIA</b>	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
<b>BRAZIL</b>	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
<b>KOREA</b>	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
<b>CHILE</b>	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
<b>CHINA</b>	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
<b>UNITED STATES</b>	Power Electronics USA Inc. • 4777 N. 44th Ave - Phoenix, AZ 85031 • CA 94111 • USA Tel. (415) 874-3668 • Fax (415) 874-3001 • Mob. (415) 376-1471 • Email: sales@power-electronics.us
<b>INDIA</b>	Power Electronics India - N°5, Cunningham Crescent, 1st floor. Bangalore- 560052 - INDIA Tel./Fax +91 80 6569 0489 • Email: salesindia@power-electronics.com
<b>ITALY</b>	Power Electronics Italia Srl - Piazzale Cadorna, 6 - 20123 - MILANO - ITALIA Tel. (+39) 342 50 73 691 • Email: infoitalia@power-electronics.com
<b>JAPAN</b>	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
<b>MEXICO</b>	P.E. Internacional Mexico S de RL - Avda. Tejocotes lote 76 A S/N • San Martín Obispo Tepetlaxpa • CP 54763 • CUAUTITLAN IZCALLI • MEXICO Tel. (+52) 55 5390 8818 • Tel. (+52) 55 5390 8363 • Email: ventasmexico@power-electronics.com
<b>MOROCCO</b>	Power Electronics - Ekoakua • Geea sarl , N°184 Bloc Hay EL.Massira Aït Melloul •CP 80150 • Agadir • MAROC Tel. + 212 5 28 24 04 57 • Fax (+81) 03 3436 5465 • Email: ventesmaroc@power-electronics.com
<b>NEW ZEALAND</b>	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
<b>TURKEY</b>	Perpa Ticaret Merkezi A Blok Kat:2 No:9/0034 - 34384 Okmeydanı Şişli • İstanbul • TURKEY Tel. 0 212 221 48 48 (124) - Fax 0 212 221 17 00 Email: turkiyesatis@power-electronics.com
<b>UNITED KINGDOM</b>	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
<b>SOUTH AFRICA</b>	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