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SEVERN
DRIVES & ENERGY

RELIABLE GREEN POWER SOLUTIONS

MV Green Power Series

Medium Voltage Starters, Drives & Energy Converters

THE QUEEN'S AWARDS
FOR ENTERPRISE:
INTERNATIONAL TRADE
2011

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Contents

The Green Power Series of Medium Voltage Starters, Drives and Energy Converters represent a step change in motor starting and control technology.

MFS Multiple Frequency Starters
Offer unique voltage and step frequency soft starting, allowing for the controlled start of motors under light, medium and heavy loading.

MVC Green Power Drives
Advanced low harmonic, asymmetric voltage configured medium voltage drives with modular design and simple configuration.

MVC Renewable Converters
Advanced features such as direct, medium or low voltage input options from tidal turbines or wave generators and direct output at up to 33kV, for connection to the grid without the need for additional step up transformers.

LVC Solar Converters
Offer 690V output as standard and are available configured with additional FACTS equipment to allow direct connection to grid level voltages.

High quality components, lower cost of ownership through easy to service modular design, simpler installation usually without the need for additional transformers and filters, are part of this green product's credentials.

MFS Multi Frequency Starters

MFS Multi Frequency Starters use advanced motor control technology to soft start and stop medium voltage motors under load. A provision for rotating larger motors on a timed basis to prevent the motor shaft distorting under the effects of gravity is also available.

The two stage starter offers 12.5Hz and 50Hz starting profile and the 3 stage version offers 12.5Hz, 25Hz, and 50Hz for starting motors with difficult starting torque requirements.

Featuring LCD Keypad and LED Mimic for easy identification of drive status, the starter features fully removable power stacks for ease of maintenance and 4 pump starting curves as standard.

Available with or without bypass contactor and with a variety of configuration options for multiple motor starting (up to 4), the MFS series of Medium Voltage Green Power Starters offers the only real alternative to MV VSD's for soft starting heavy loads to run at full speed.

The MFS reduces water hammer, site voltage fluctuations, and energy consumption. Because of its multiple frequency operation, applications which would normally have proved difficult with a soft starter can now be easily solved including motors with moderate or heavy loading at start.

MFS
Multi Frequency Starter

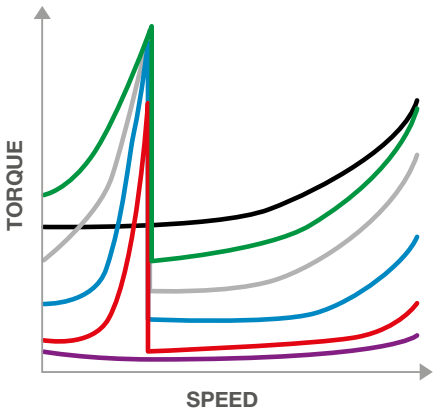
Performance comparison

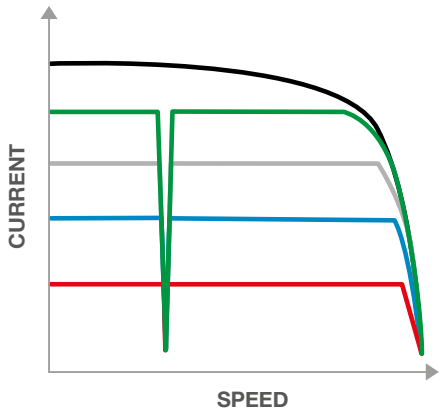
COMPARED CONTENT	STARTING METHOD			
	HYDRAULIC RESISTANCE STARTER	GENERAL SOLID STARTER	MAGNETIC SATURATION REACTOR	MFS Multi Frequency Starter
Starting performance	Using the plate electrodes to reduce the effective resistance to zero, open loop control, not adapted to low temperature.	Using microprocessor technology to realize soft start through thyrister voltage control, quick adjusting speed, various starting methods controlled through menu.	Using microprocessor technology to realize soft start through thyrister control quick adjusting speed, 01.sec close loop control, starting method controlled through menu.	Using micro electric technology to realize soft start through thyrister, quick adjusting speed, 10 MSEL close loop, starting method controlled through menu
Soft stop	No	Yes	Yes	Yes
Protection function	Bad	Good	Good	Good
Volume	Big	Small	Big	Small
Maintenance	Big	Small	Small	Free of maintenance
Starting current (Ie rated current)	5Ie	4Ie	4Ie	2Ie
Starting torque	40%Te	30%Te	30%Te	80%-90%Te
Starting time	Slow	Quick	Quick	Quick
Loading condition	Light or empty load	Light or empty load	Light or empty load	All loads
Starting noise	Big	Small	Big	Small
Starting control method	One	Many	One	Many
Starting repeatability	No	Yes	Yes	Yes

The starting current of the MFS can be set to a user defined limit. The first chart shows the MFS starting torque characteristics. The second chart shows the corresponding starting currents. The black graph shows the DOL start condition, the coloured graphs show different pre-set maximum currents. Extra breakaway torque is available due to the MFS frequency changes in the starting phase. Raising the current limitation results in decreased voltage drop in the supply.

Starting modes
Voltage ramp, current limit, voltage ramp with current limit, 2 or 3 stage frequency, 4 x pump control start curves.

Stopping modes
Voltage ramp, 2 or 3 stage frequency, quick stop.





MFS Multi Frequency Starters product range

MFS 1000
Multi Frequency Starter

TYPE
Stand Alone Starter

POWER RANGE
160kW to 4.6MW

VOLTAGE RANGE
2.3kV to 13.8kV

MFS 1100
Multi Frequency Starter

TYPE
Common Bus Starter

POWER RANGE
160kW to 4.6MW

VOLTAGE RANGE
2.3kV to 13.8kV

Max number of MFS starters 4

Max number of motors 4

MFS technology index

ITEM	PERFORMANCE INDEX
Range of power to be applied for	160kW – 50000kW
Rated voltage	2.3-13.8kV
Voltage drop of thyrister	Less than 1V with bypass
Triggering technology	Electro magnetic triggering or photo-electric triggering
Starting torque	80%-90% rated torque
Starting current	Controllable and can be less than 2 times
Protection & monitoring	With over current protection, starting overtime protection, valves triggering failure protection etc.
Stop mode	Free stop mode, soft stop mode and electric braking mode
Directions	Forward & reverse
Communication	Modbus, Profibus RS485, CAN

MFS 1200
Multi Frequency Starter

TYPE	Sequenced Starter
POWER RANGE	160kW to 4.6MW
VOLTAGE RANGE	2.3kV to 13.8kV
Max number of MFS starters 1	
Max number of motors 4	

MFS 2000
Multi Frequency Starter

TYPE	Stand Alone Starter
POWER RANGE	5.5MW to 50MW
VOLTAGE RANGE	2.3kV to 13.8kV

MFS operating condition

MAX. STARTING CURRENT	400% OF FLA (FULL LOAD CURRENT)
Max. starting time	60sec,@ 400% FLA
Max. starting times	1 4 times, (40°C, 30sec, 400%IR) 2 No time limit for continuous type
Ambient temperature	
1 During operation	1 0-40°C, max. 60°C, when above 40°C, capacity reducing 10% every 5°C
2 During transmission	2 –10°C to +50°C
3 Storage	3 –25°C to +70°C
Altitude	Max. 1000 m, when above 1000 m, VFS capacity reduction appears refer to curves below
Max. humidity	95%, no condensation

MVC Multi Level Green Power Drives

Working Principles

The RXPE MVC is a medium voltage multi-level converter constructed by the cascade connection of single phase H-bridged inverters in series to achieve the required medium voltage output.

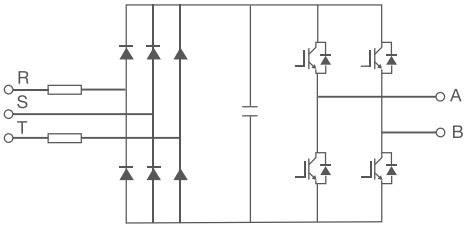
Each single phase inverter receives input DC power from its own isolated 3-phase rectifier, itself fed from a separate transformer secondary. Each rectifier and associated inverter is assembled into an identical power module.

The input transformer is an integral part of the MVC cabinet with multiple isolated secondary windings to supply the power modules.

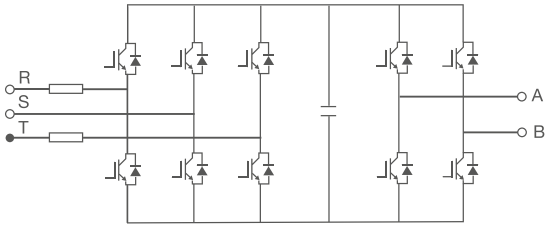
Each transformer secondary is wound with a different phase displacement angle in order to achieve an effective high pulse number rectifier resulting in a significant reduction of input current harmonic distortion.

Features

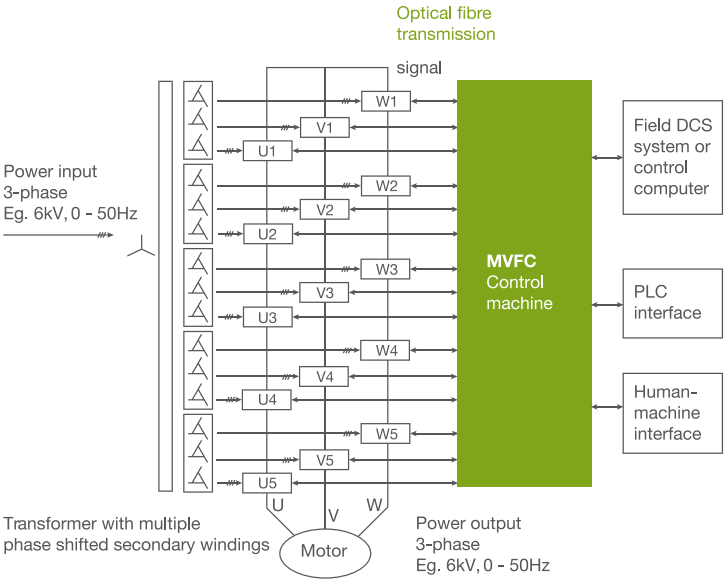
- Multi-level PWM voltage-source inverter
- Output voltage range 2.3 – 13.8kV achieved without output transformer
- Can be used with asynchronous / synchronous motors and generators
- Output filter not required – may be used as retrofit with old motors
- No additional motor heating caused by drive
- No significant induced motor torque pulsations
- Can be used with long motor cable lengths, usually without need for output filter
- Integrated isolation transformer – no common-mode voltage stress impressed on to motor
- Supply-side harmonic filters and power factor correction not required
- Uses flux vector control technology, open or closed loop
- Reduced stray bearing current helps prevent premature bearing failure



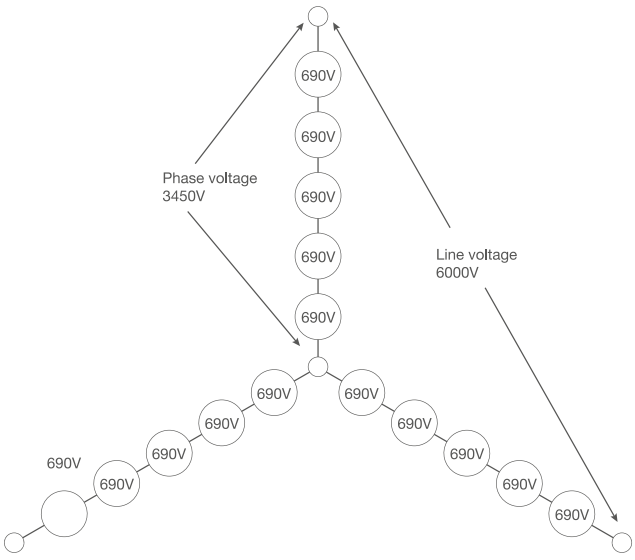
Power module - single quadrant



Power module - regenerative 4-quadrant



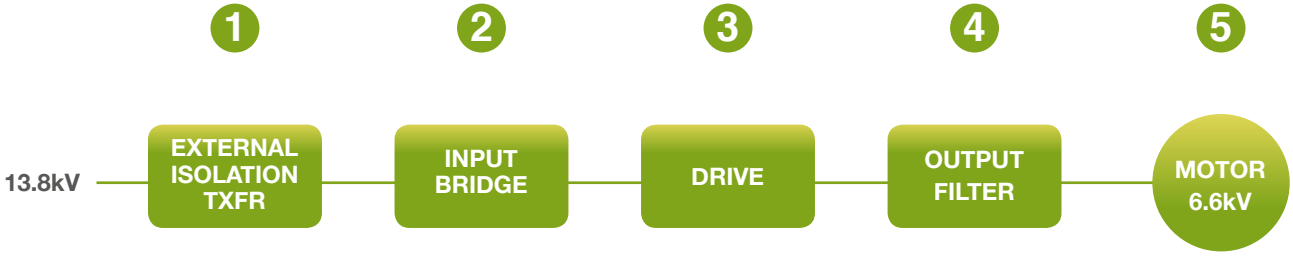
MVC schematic diagram of main circuit for serial multi-level technology



Each phase is made up of 5 series connected 690V power modules for 6kV output

Simple installation lower cost solution

Conventional method



Green Power Series method

1. External isolation / step down transformer required to reduce common mode voltage motor stress and reduction to motor voltage.
Not required for MVC Green Power Drives due to integrated phase shifting technology.

2. Input Bridge to reduce harmonic disturbances to factory supply.
Not required for MVC Green Power drives due to low harmonic topology
- **3.3kV motor output = 18 pulse**
- **6.6kV motor output = 36 pulse**

Higher voltages can give higher pulse equivalence.

3. Output filter to correct poor Voltage waveform and high dv/dt and long cable lengths.
Usually not required for MVC Green Power Drives due to multi level output (PWMS) 7 level for 3.3kV and 13 level for 6.6kV.

4. Output filter to correct poor current waveform and high dv/dt and long cable lengths.
Usually not required for MVC Green Power Drives due to multi level output (PWMS) 7 level for 3.3kV and 13 level for 6.6kV.

5. Motor
Due to the integrated phase shifting technology of MVC Green Power Drives the input voltage to the drive and the voltage to the motor can be different (asymmetrical) eliminating the need for step down transformers converter.

MVC 4000
Green Solutions MV Drive

The MVC 4000 Green Solutions MV Drive is available in voltages from 2.3kV up to 13.8kV. Has a power range up to 17.2MW and is available in both standard and regenerative formats.

Offering both fan / pump, sensor less vector and encoder feedback control options the MVC 4000 Green Solutions Drive delivers the best price performance ratio available from any MV drive.

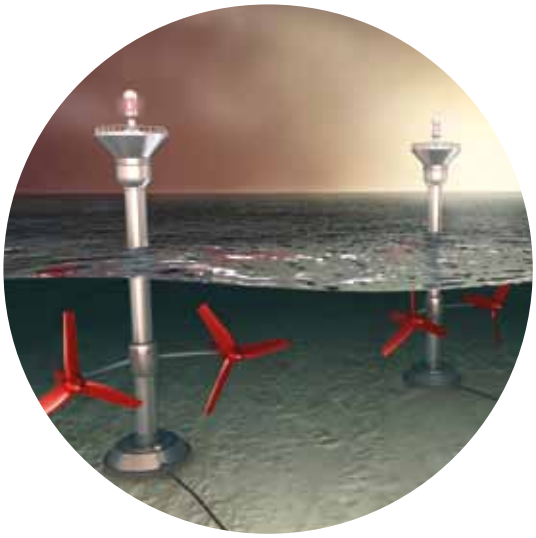
With our proven low harmonic multi level modular technology at its heart the MVC 4000 delivers low maintenance and assures low cost of ownership.

MVC 4500
Renewable Energy Converter

Available in a variety of power and voltage ranges the MVC 4500 Green Power Convertor is designed for clean power renewable energy solutions. Available in a variety of enclosure styles including containerised

Suitable for input from subsea or land based tidal generators the drive can output up to 33kV for connection to the local grid. Based on our MVC 4000 green power technology the MVC 4500 Renewable Energy Converter is the best and most efficient choice for energy companies looking for a simple and reliable solution.

The MVC 4500 can also be used as a drive – regeneration system for pumped storage hydro electricity.



LVC SOLAR
Renewable Energy Converter

Available in 250kW 500kW and 1MW the LVC Solar Energy Converter delivers green, renewable energy.

Utilising DSP control, high power IGBT modules, advanced MPPT technology based on instantaneous reactive power theory and harmonic current compensation the LVC Solar can to some extent, achieve grid reactive power and harmonic current compensation.

MVC 5000
Compact Green MV Drive

High power density

High power density and modular design has yielded significant improvements in space optimization and efficiency of heat dissipation.

Modular design

The modular design, using quick connect and disconnect power terminations, makes replacement of major components, easy for maintenance.

Vector control

When used to control dynamic loads, the MV variable frequency drive uses modern open or closed loop flux vector control to adjust its output frequency and voltage continuously. This achieves high dynamic performance, fast response, wide range of speed regulation, and fast acceleration and deceleration of MV motors.

- Display and recording of operating data
- Self-diagnosis
- Complete protection system
- Closed loop control
- Flying start
- Dual-route control power supply
- High power factor
- Sensorless vector control
- Vector control for synchronous motors
- Synchronized bypass grid connection
- Master-slave control
- Energy feedback
- Low noise
- Multi-language HMI

MVC 6000
Green High Power MV Drive

Utilising the latest generation of IEGT devices the MVC 6000 delivers refined and controlled power from 200MW to 60MW in a variety of voltages.

Delivering green multi level low harmonic power to applications is the MVC 6000 Green High Power MV Drive's core competence.

Designed with the Severn RXPE ethos of high reliability, low maintenance the true cost of ownership of this drive places it as the best price performance ratio drive in its class.

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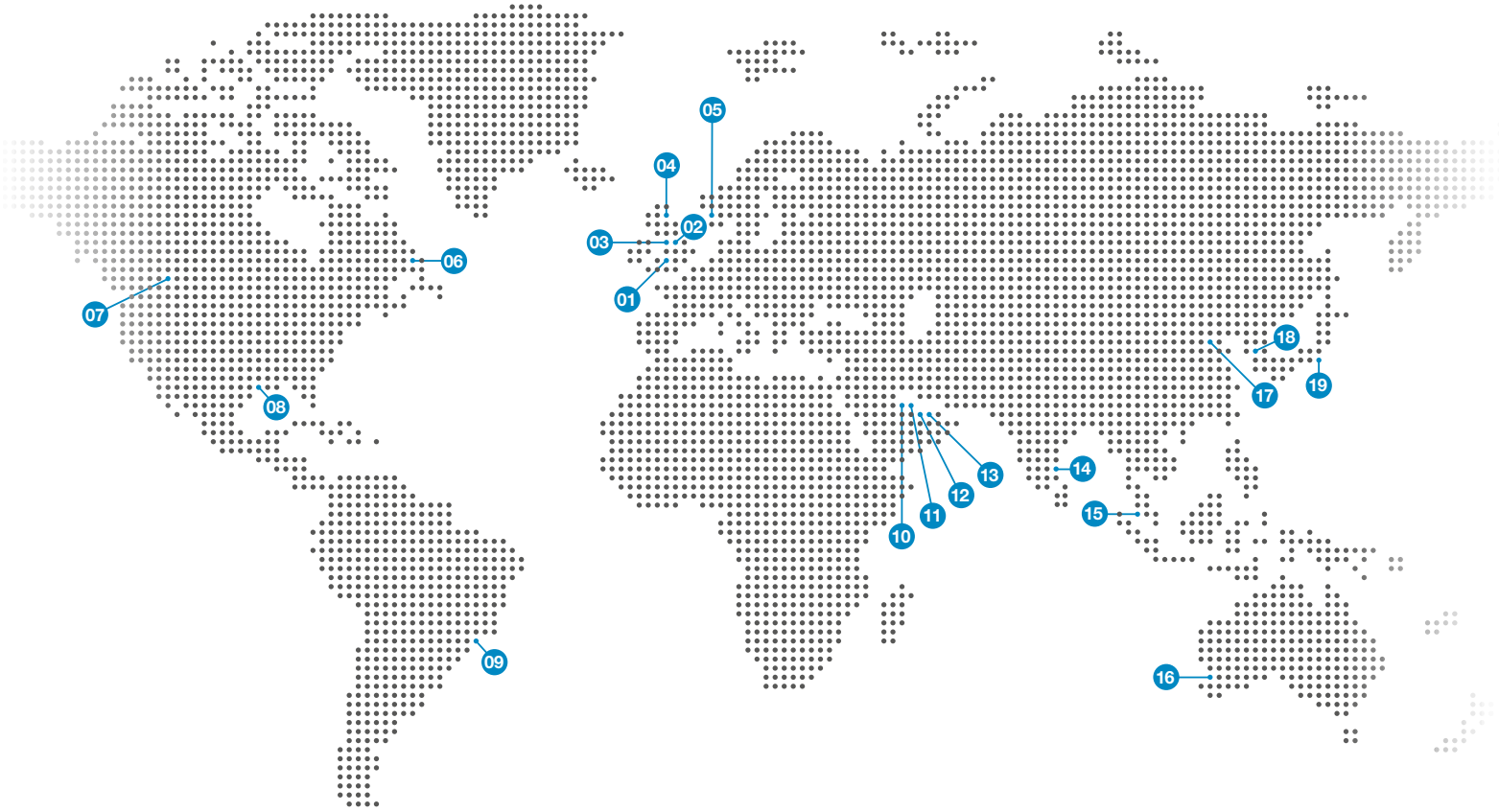

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L.B.Bentley
Stroud England UK

Ionex SG
Nailsworth England UK

02 Severn Unival
Brighouse England UK

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