

# Automation

## Drives for Subsea Electrical Submersible Pumps (ESP)





# DRIVES FOR SUBSEA ELECTRICAL SUBMERSIBLE PUMPS (ESP)

## THE EFFICIENT AND SAFE CHOICE TO DRIVE SUBMERSIBLE PUMPS

State of the art in medium voltage frequency inverters, the MVW01 and MVW3000 models feature special functions, simplified programming and robust hardware. They are composed by multilevel inverting structure with medium voltage IGBTs (MVW01) or low voltage Cascaded H-Bridge (CHB) IGBT power cells - (MVW3000), plastic film capacitors and high-performance processors, **which ensure fast responses, extremely high efficiency and reliability for driving submersible pumps.**

The input stage is composed of a multi-pulse circuit with diodes fed by a phase-shifting transformer, in compliance with IEEE-519 standard.

### Main Characteristics

- Ready to drive synchronous machines (PMSM)
- Fast and easy multilingual programming
- Network communication via main industrial protocols (Modbus, Profibus-DP, DeviceNet and Ethernet)
- Low noise level (below 75 dB)
- Free SuperDrive programming software, for downloads, uploads and monitoring of parameters



## Main Benefits



High efficiency



Low operating cost



Quick and simple maintenance



Safe operation



Flexibility for input voltage

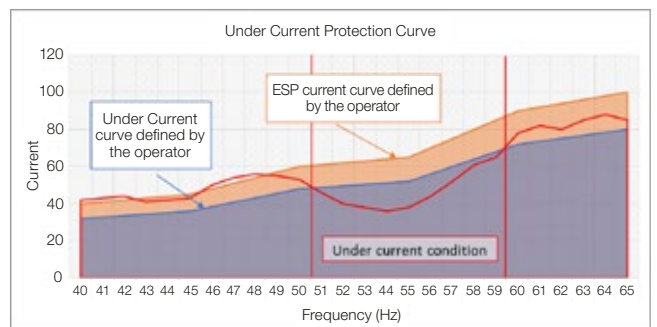
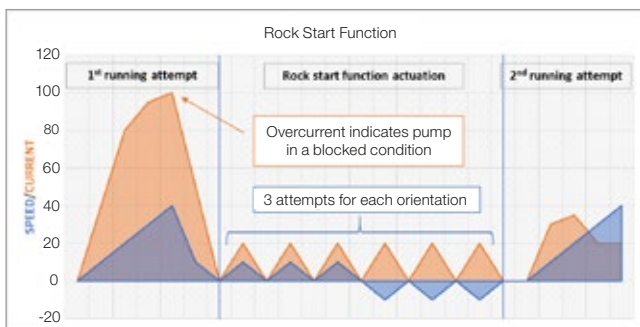
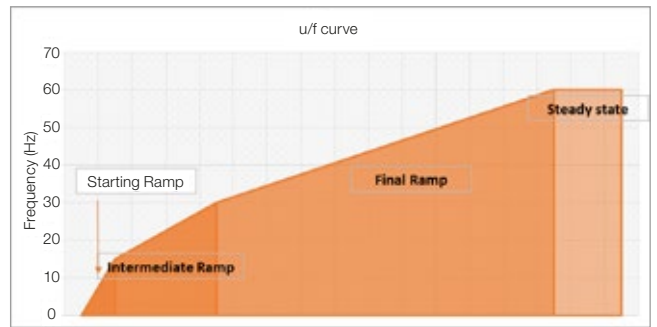
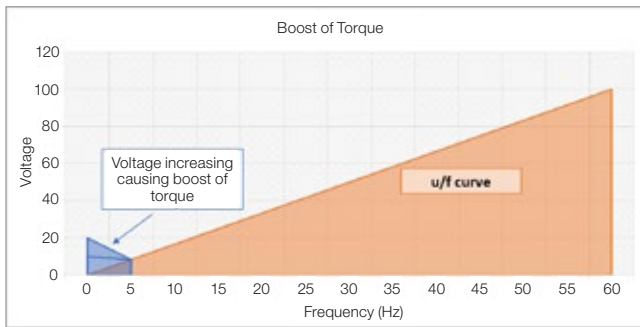


High input power factor



## Special Functions for ESP

- Long cable compensation, programmable according to the length and characteristics of the cable
- Rocking Start function with programmable cycles
- Undercurrent protection with customizable curve, alarm and trip. The pump is thus protected against low flows and overheating
- Acceleration and deceleration ramps with three programmable slopes, ensuring starts and stops with maximum efficiency without operating damages
- Adjustable V/f curve
- Pumping direction setting (clockwise/ counterclockwise)
- Operation compatible with bottom-hole monitoring equipment
- Built-in sinusoidal output filter, eliminating occasional wave reflections and stress to the insulation of the pump motor coils and power cables
- Operation under short-circuit to the ground in one of the pump motor phases, allowing the production to continue under such conditions  
Note that, when in this condition, the motor must be repaired as soon as possible
- Event Data Logger
- Trace function for fast troubleshooting



# MVW01

## Medium Voltage Frequency Inverter



### Neutral Point Clamped (NPC)

The MVW01 enables the variation and control of the pump flow through the setting of the motor speed, using the signal of the sensors (pressure or flow) or by means of a process controller. For being a medium voltage topology, it allows the input transformer to be mounted outside the panel, enabling the optimization of the thermal load or arrangements that fit the space limits in the electric room. Combined with the high reliability of the topology, the MVW01 is easy to maintain, allowing the quick change of the power arms (one per phase) by means of an easy-to-operate device especially designed for the extraction.

#### Main Characteristics



Optimized number of semiconductors, resulting in the most efficient and robust design on the market



Mechanical and electrical interlock - power cannot be accessed with the inverter energized



Use of plastic film capacitors - high reliability and long service life



Flexibility in the selection of the input voltage

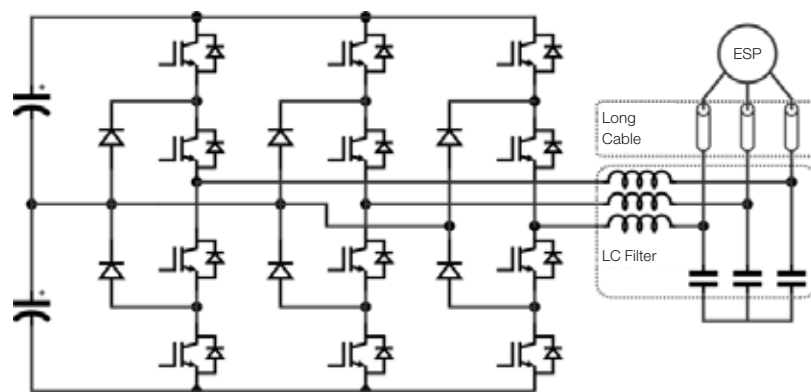
- Voltage Source Inverter (VSI) with NPC topology
- Use of high voltage (4.5 / 6.5 kV) IGBTs with 30-year lifespan
- Low harmonic distortion upstream of the converter

- Power: 500 to 22,500 HP (400 to 16,000 kW)
- Output voltage: 2.3 kV to 5.1 kV
- Output frequency: up to 120 Hz
- Air or water cooling

## Change of the Power Arms



Power arm quick change procedure



NPC topology for the output bridge



# MVW3000

## Medium Voltage Frequency Inverter



### Cascaded H-Bridge (CHB)

Multilevel medium voltage inverters in CHB topology are composed of multiple low-voltage single-phase inverters connected in series, which allows reaching medium-voltage output levels.

With efficiency above 96% (phase-shifting/isolation transformer + inverter), the solution provides complete motor protection, easy maintenance and high availability, guaranteed by the modular topology that allows operation with cells in failure.

### Main Characteristics



High power factor (>0.95)



Fully integrated solution, reducing the system commissioning and start-up time



High-efficiency air cooling

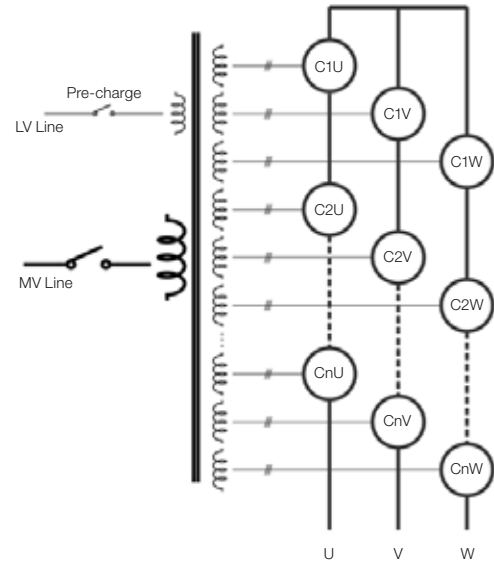


Use of plastic film capacitors - high reliability and long service life

- Voltage Source Inverter (VSI) with CHB topology
- Mechanical and electrical interlock – internal parts of power cabinet cannot be accessed with the inverter energized

- Motor current: up to 600 A (higher values on request)
- Voltage: 1.15 kV to 13.8 kV
- Output frequency: up to 120 Hz (higher values on request)

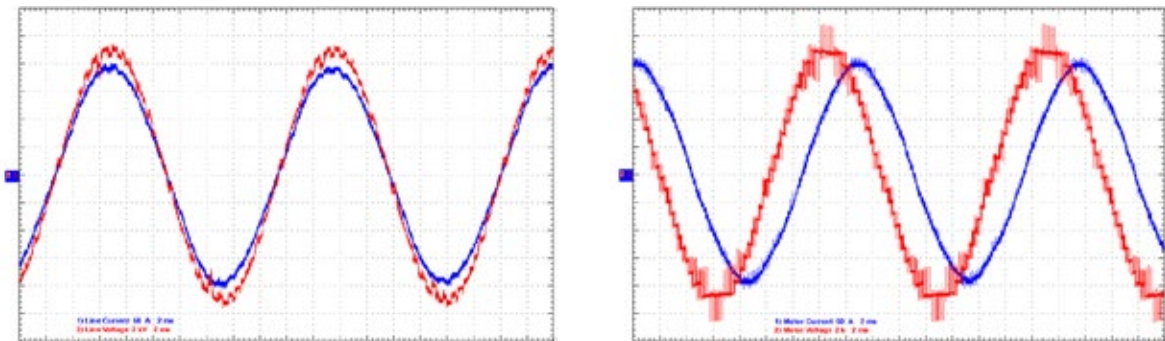




CHB topology for the output bridge

### Power Cells

- Automatic cell bypass with small reduction in the drive operating voltage (optional)
- Operating voltage of each cell: 690 V



Typical wave forms - Input/output

- The sinusoidal output voltage and current reduce the losses, vibration, torque pulsation and overheating of the motor
- Due to the transformer integrated to the panel and the topology, it produces very low levels of input and output harmonic distortion (36-pulse input configuration for the 6.9 kV voltage). It does not require the use of sinusoidal output filter for distances up to 500 meters

Power cells developed with WEG proven technology, with over thirty years of experience in frequency inverters.





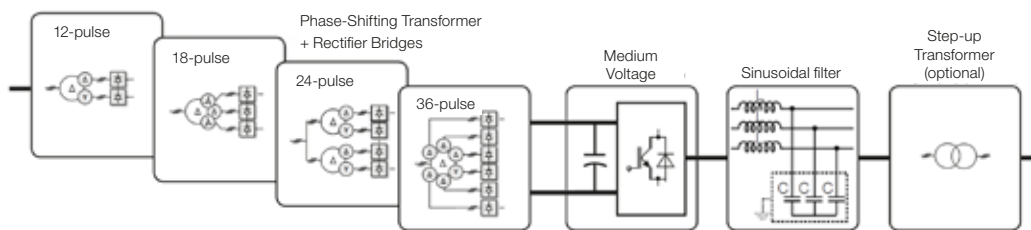
## Phase-shifting / Step-up Transformer



In addition to the input phase-shifting transformer suitable for the voltage level available on the platform, WEG medium voltage frequency inverters can be equipped with step-up transformers in the output to compensate the losses in the umbilical and adjust the level of the pump operating voltage, when necessary.

## Main Characteristics

- Resistant to the aggressive offshore environment, it can be manufactured in stainless steel and with protection rating IP54/55
- Electrostatic shield
- Tested and designed according to the standards: ABNT NBR 5356 / IEC 60076 / IEEE C57.12.00
- Custom design for each application (taps and pump operating frequency)



Complete solution to drive subsea electrical submersible pumps



**Global presence** is essential,  
as much as understanding your needs.

### Global Presence

With more than 30.000 employees worldwide, WEG is one of the largest electric motors, electronic equipments and systems manufacturers. We are constantly expanding our portfolio of products and services with expertise and market knowledge. We create integrated and customized solutions ranging from innovative products to complete after-sales service.

WEG's know-how guarantees our **Drives for Subsea Electrical Submersible Pumps (ESP)** are the right choice for your application and business, assuring safety, efficiency and reliability.



**Availability** is to have a global support network



**Partnership** is to create solutions that suit your needs



**Competitive edge** is to unite technology and innovation

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# WEG Worldwide Operations

## ARGENTINA

San Francisco - Cordoba  
Phone: +54 3564 421484  
[info-ar@weg.net](mailto:info-ar@weg.net)

Cordoba - Cordoba  
Phone: +54 3514 641366  
[weg-morbe@weg.com.ar](mailto:weg-morbe@weg.com.ar)

Buenos Aires  
Phone: +54 1142 998000  
[ventas@pulverlux.com.ar](mailto:ventas@pulverlux.com.ar)

## AUSTRALIA

Scoresby - Victoria  
Phone: +61 3 97654600  
[info-au@weg.net](mailto:info-au@weg.net)

## AUSTRIA

Markt Piesting - Wiener  
Neustadt-Land  
Phone: +43 2 633 4040  
[watt@wattdrive.com](mailto:watt@wattdrive.com)

Vienna  
Phone: +43 1 796 2048  
[wtr@weg.net](mailto:wtr@weg.net)

## BELGIUM

Nivelles - Belgium  
Phone: +32 67 888420  
[info-be@weg.net](mailto:info-be@weg.net)

## BRAZIL

Jaraguá do Sul - Santa Catarina  
Phone: +55 47 32764000  
[info-br@weg.net](mailto:info-br@weg.net)

## CHILE

La Reina - Santiago  
Phone: +56 2 27848900  
[info-cl@weg.net](mailto:info-cl@weg.net)

## CHINA

Nantong - Jiangsu  
Phone: +86 513 85989333  
[info-cn@weg.net](mailto:info-cn@weg.net)

Changzhou - Jiangsu  
Phone: +86 519 88067692  
[info-cn@weg.net](mailto:info-cn@weg.net)

Rugao - Jiangsu  
Phone: +86 513 80672011  
[zhuhua@weg.net](mailto:zhuhua@weg.net)

## COLOMBIA

San Cayetano - Bogota  
Phone: +57 1 4160166  
[info-co@weg.net](mailto:info-co@weg.net)

Sabaneta - Antioquia  
Phone: +57 4 4449277  
[info-co@weg.net](mailto:info-co@weg.net)

## ECUADOR

El Batan - Quito  
Phone: +593 2 5144339  
[wegecuador@weg.net](mailto:wegecuador@weg.net)

## FRANCE

Saint-Quentin-Fallavier - Isère  
Phone: +33 4 74991135  
[info-fr@weg.net](mailto:info-fr@weg.net)

## GERMANY

Türnich - Kerpen  
Phone: +49 2237 92910  
[info-de@weg.net](mailto:info-de@weg.net)

Balingen - Baden-Württemberg  
Phone: +49 7433 90410  
[info@weg-antriebe.de](mailto:info@weg-antriebe.de)

Nuremberg  
Phone: +49 911 239568 -700  
[info@tgmkanis.com](mailto:info@tgmkanis.com)

Homberg (Efze) - Hesse  
Phone: +49 5681 99520  
[info@akh-antriebstechnik.de](mailto:info@akh-antriebstechnik.de)

## GHANA

Accra  
Phone: +233 30 2766490  
[ghana@zestweg.com](mailto:ghana@zestweg.com)

## INDIA

Bangalore - Karnataka  
Phone: +91 080 46437450  
[info-in@weg.net](mailto:info-in@weg.net)

Hosur - Tamil Nadu  
Phone: +91 4344 301577  
[info-in@weg.net](mailto:info-in@weg.net)

## ITALY

Cinisello Balsamo - Milano  
Phone: +39 2 61293535  
[info-it@weg.net](mailto:info-it@weg.net)

## JAPAN

Yokohama - Kanagawa  
Phone: +81 45 5503030  
[info-jp@weg.net](mailto:info-jp@weg.net)

## MALAYSIA

Shah Alam - Selangor  
Phone: +60 3 78591626  
[info@wattdrive.com.my](mailto:info@wattdrive.com.my)

## MEXICO

Huehuetoca - Mexico  
Phone: +52 55 53214275  
[info-mx@weg.net](mailto:info-mx@weg.net)

Tizayuca - Hidalgo  
Phone: +52 77 97963790  
[info-mx@weg.net](mailto:info-mx@weg.net)

## NETHERLANDS

Oldenzaal - Overijssel  
Phone: +31 541 571080  
[info-nl@weg.net](mailto:info-nl@weg.net)

## PERU

La Victoria - Lima  
Phone: +51 1 2097600  
[info-pe@weg.net](mailto:info-pe@weg.net)

## PORTUGAL

Maia - Porto  
Phone: +351 22 9477700  
[info-pt@weg.net](mailto:info-pt@weg.net)

## RUSSIA and CIS

Saint Petersburg  
Phone: +7 812 363 2172  
[sales-wes@weg.net](mailto:sales-wes@weg.net)

## SOUTH AFRICA

Johannesburg  
Phone: +27 (0) 11 7236000  
[info@zestweg.com](mailto:info@zestweg.com)

Cape Town  
Phone: +27 (0) 21 507 7200  
[gentsets@zestweg.com](mailto:gentsets@zestweg.com)

Heidelberg  
Phone: +27 (0) 16 349 2683/4/5  
[wta@zestweg.com](mailto:wta@zestweg.com)

## SPAIN

Coslada - Madrid  
Phone: +34 91 6553008  
[info-es@weg.net](mailto:info-es@weg.net)

Valencia  
Phone: +34 96 1379296  
[info@autrial.es](mailto:info@autrial.es)

## SINGAPORE

Singapore  
Phone: +65 68589081  
[info-sg@weg.net](mailto:info-sg@weg.net)

Singapore  
Phone: +65 68622220  
[info-sg@weg.net](mailto:info-sg@weg.net)

## SCANDINAVIA

Mölnlycke - Sweden  
Phone: +46 31 888000  
[info-se@weg.net](mailto:info-se@weg.net)

## UK

Redditch - Worcestershire  
Phone: +44 1527 513800  
[info-uk@weg.net](mailto:info-uk@weg.net)

## UNITED ARAB EMIRATES

Jebel Ali - Dubai  
Phone: +971 4 8130800  
[info-ae@weg.net](mailto:info-ae@weg.net)

## USA

Duluth - Georgia  
Phone: +1 678 2492000  
[info-us@weg.net](mailto:info-us@weg.net)

Bluffton - Indiana  
Phone: +1 800 5798527  
[info-us@weg.net](mailto:info-us@weg.net)

Minneapolis - Minnesota  
Phone: +1 612 3788000  
[info-us@weg.net](mailto:info-us@weg.net)

Washington - Missouri  
Phone: +1 636-239-9300  
[wegwill@weg.net](mailto:wegwill@weg.net)

## VENEZUELA

Valencia - Carabobo  
Phone: +58 241 8210582  
[info-ve@weg.net](mailto:info-ve@weg.net)

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WEG Group - Automation Business Unit  
Jaraguá do Sul - SC - Brazil  
Phone: +55 47 3276 4000  
[automacao@weg.net](mailto:automacao@weg.net)  
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