Geared motors help simulators take off

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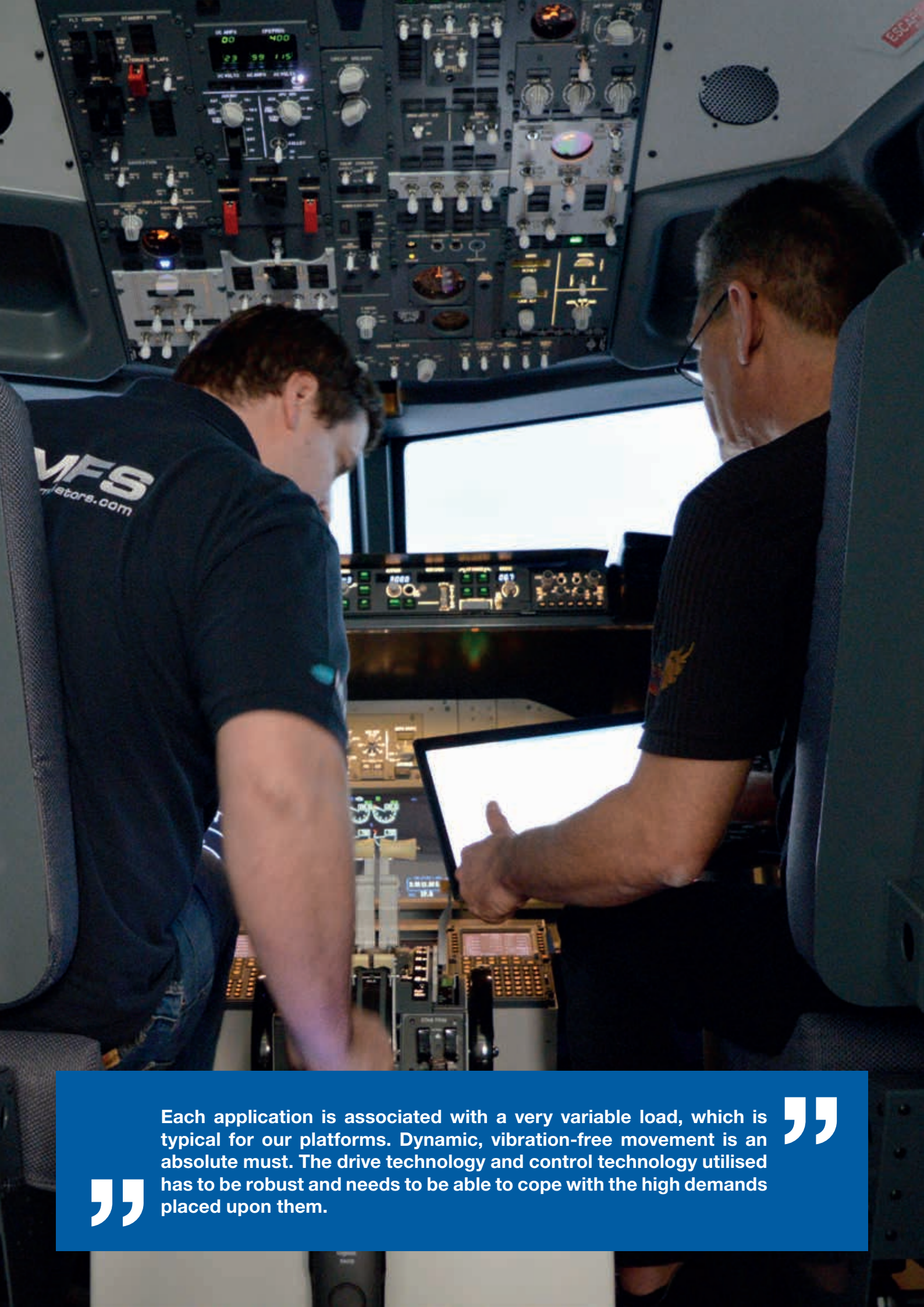
Belgian company Motion For Simulators (MFS) builds highly dynamic carrier platforms for a wide range of simulation applications. These include flight simulators, racing games and applications in the area of load behaviour. MFS has developed a new motion concept for its multi-axis platforms which allows aspiring hobby and professional pilots to take to the skies in flight simulators. The new concept combines dynamic servo drives with efficient helical bevel geared motors from Watt Drive, a subsidiary of the WEG group.

At the time of its foundation, some 20 years ago, MFS's original product range centred on the design and build of aircraft simulators. Eventually, the company wanted to complement its range of simulators with mobile carrier platforms. After a search for an adequate 'off the shelf' supplier proved to be unsuccessful, MFS took the decision to develop the mobile carrier platforms in house. Over time the original servo controlled two axis platform has evolved to a range of standard and personalised platforms that are powered by two, three and six axes.

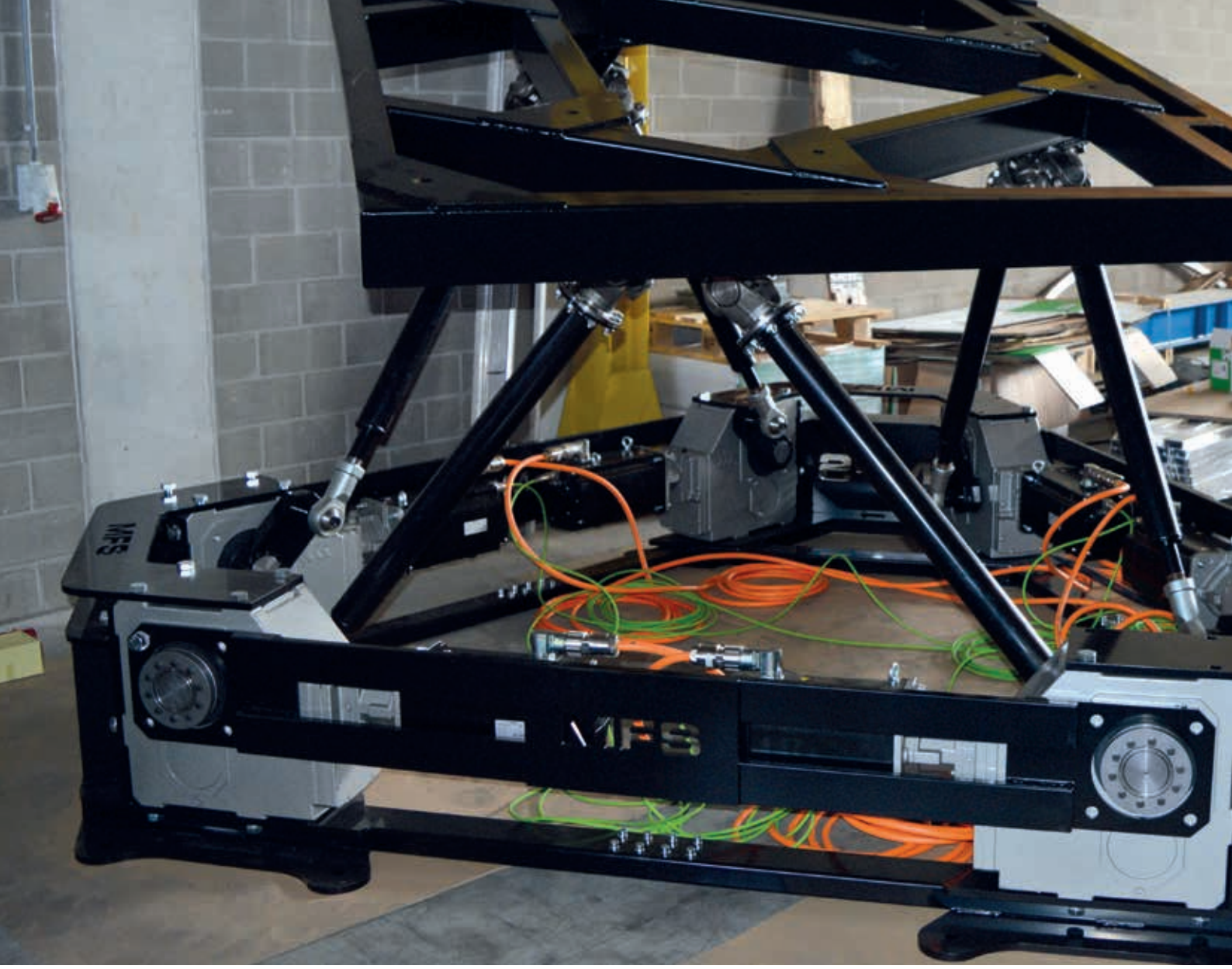
In collaboration with the Belgian company Automotion, the Schneider Electric Motion Centre in Belgium, MFS finally developed a market-ready system after a three-year period of intense research and development. The simulators on mobile platforms can be used for a wide range of applications, from professional users – e.g., for use in medical situations or pilot training – to enthusiasts who want to use a simulator at home.

New motion concept

In order to increase the performance and efficiency of its simulator platforms, MFS cooperated with Automotion and WEG to develop a new drive concept. Both the servo control, which performs all the calculations for the movements, as well as the



> Each application is associated with a very variable load, which is typical for our platforms. Dynamic, vibration-free movement is an absolute must. The drive technology and control technology utilised has to be robust and needs to be able to cope with the high demands placed upon them.



servo drives and the geared motors were newly implemented.

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Nearly every simulator application is different, and they all have very specific requirements in terms of speed, number of axis and acting forces. To implement the correct design for the geared motors, calculating the mechanical forces acting from different directions (radial and axial) posed a particular challenge. In a number of cases, WEG

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has developed special ratios for the geared motors with short lead times.

Complete electrical-mechanical solution

Previously the axis of the servo-controlled simulation platforms were controlled with a separate PCB electronic card in combination with a servo worm gear transmission. However, the system is now operational with a modern PacDrive motion controller in combination with the associated servomotors.
When it comes to the mechanical engineering needs, as part of the turnkey solution, the decision was made to use helical bevel gear units from Watt Drive, which in some cases had application-specific gear ratios due to the very special application areas of the simulators. In addition, they are equipped with suitable servo adapters, via which the servo motors are coupled to the geared motors. Depending on the application and the number of axes, two, three or six geared motors per platform are used.
The drive packages consisting of geared motor and servomotors are integrated into MFS's control software. All movements are controlled by the industrial motion controller and through the connection of the new servomotors with helical bevel gear units, the axial and radial stress limits were able to be increased, as was the energy efficiency. What's more when compared to hydraulically driven simulators, the electrodynamic platforms also produce considerably less noise.
„The use of the more efficient helical bevel gearbox reduces the power consumption and we can use smaller servo drives for the same performance requirements. At the same time, the new geared motors can withstand higher radial and axial forces at the same torque than previous models,

so that we can increase the dynamics and load on the platforms. Overall, the efficiency of the gearbox results in improved performance compared to the solution used to date," says Tahon.

Higher load capacity

The new motion concept allows the systems to react very quickly, it means that cycle times of 1 ms can be achieved. In addition to the higher speeds, the advanced mobile platforms feature very precise movement control and higher load capacity. For example, work is currently underway on a 10 x 15 m platform – gigantic dimensions for a motion simulator. Thanks to the new drive concept, MFS can now design systems that would not have been possible in the past, e.g. due to the weight that needs to be supported. Now, systems of 5-6 tonnes of load are possible.
„We're glad that we can rely on our partners. Automotion and WEG not only to supply components, they also apply their expertise in order to jointly develop solutions with us. They spare no effort, starting with support in the software area through to the materials to be delivered and all the way to brainstorming regarding the mechanical integration of their components into our systems. This flexibility is a fundamental requirement for us to be able to develop our application-specific simulators," says Tahon.

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Marnix Tahon
Company founder and CEO of MFS

WEG Worldwide Operations

ARGENTINA
San Francisco - Cordoba
Phone: +54 3564 421484
info-ar@weg.net

Cordoba - Cordoba
Phone: +54 3514 641366
weg-morbe@weg.com.ar

Buenos Aires
Phone: +54 1142 998000
ventas@pulverlux.com.ar

AUSTRALIA
Scoresby - Victoria
Phone: +61 3 97654600
info-au@weg.net

AUSTRIA
Markt Piesting - Niederoesterreich
Phone: +43 2 633 4040
watt@wattdrive.com

Vienna
Phone: +43 1 796 2048
wtr@weg.net

BELGIUM
Nivelles - Belgium
Phone: +32 67 888420
info-be@weg.net

BRAZIL
Jaraguá do Sul - Santa Catarina
Phone: +55 47 32764000
info-br@weg.net

CHILE
La Reina - Santiago
Phone: +56 2 27848900
info-cl@weg.net

CHINA
Nantong - Jiangsu
Phone: +86 513 85989333
info-cn@weg.net

Changzhou - Jiangsu
Phone: +86 519 88067692
info-cn@weg.net

Rugao - Jiangsu
Phone: +86 513 80672011
zhuhua@weg.net

COLOMBIA
San Cayetano - Bogota
Phone: +57 1 4160166
info-co@weg.net

Sabaneta - Antioquia
Phone: +57 4 4449277
info-co@weg.net

ECUADOR
El Batan - Quito
Phone: +593 2 5144339
wegecuador@weg.net

FRANCE
Saint-Quentin-Fallavier - Isère
Phone: +33 4 74991135
info-fr@weg.net

GERMANY
Türnich - Kerpen
Phone: +49 2237 92910
info-de@weg.net

Unna
Phone: +49 2303 986870
info@wattdrive.de

Balingen - Baden-Württemberg
Phone: +49 7433 90410
info@weg-antriebe.de

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

GHANA
Accra
Phone: +233 30 2766490
ghana@zestweg.com

INDIA
Bangalore - Karnataka
Phone: +91 080 46437450
info-in@weg.net

Hosur - Tamil Nadu
Phone: +91 4344 301577
info-in@weg.net

ITALY
Cinisello Balsamo - Milano
Phone: +39 2 61293535
info-it@weg.net

JAPAN
Yokohama - Kanagawa
Phone: +81 45 5503030
info-jp@weg.net

MALAYSIA
Shah Alam - Selangor
Phone: +60 3 78591626
info-wsea@weg.net

MEXICO
Huehuetoca - Mexico
Phone: +52 55 53214275
info-mx@weg.net

Tizayuca - Hidalgo
Phone: +52 77 97963790
info-mx@weg.net

NETHERLANDS
Oldenzaal - Overijssel
Phone: +31 541 571080
info-nl@weg.net

PERU
La Victoria - Lima
Phone: +51 1 2097600
info-pe@weg.net

PORTUGAL
Maia - Porto
Phone: +351 22 9477700
info-pt@weg.net

RUSSIA and CIS
Saint Petersburg
Phone: +7 812 363 2172
sales-wes@weg.net

SCANDINAVIA
Mölnlycke - Sweden
Phone: +46 31 888000
info-se@weg.net

SINGAPORE
Singapore
Phone: +65 68589081
info-sg@weg.net

Singapore
Phone: +65 68622220
info-sg@weg.net

SOUTH AFRICA
Johannesburg
Phone: +27 (0) 11 7236000
info@zestweg.com

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

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

SPAIN
Coslada - Madrid
Phone: +34 91 6553008
info-es@weg.net

Valencia
Phone: +34 96 1379296
info@autrial.es

UK
Redditch - Worcestershire
Phone: +44 1527 513800
info-uk@weg.net

UNITED ARAB EMIRATES
Jebel Ali - Dubai
Phone: +971 4 8130800
info-ae@weg.net

USA
Duluth - Georgia
Phone: +1 678 2492000
info-us@weg.net

Bluffton - Indiana
Phone: +1 800 5798527
info-us@weg.net

McHenry - Illinois
Phone: +1 815 3853500
sales@raemotors.com

Minneapolis - Minnesota
Phone: +1 612 3788000
info-us@weg.net

Washington - Missouri
Phone: +1 636-239-9300
wegwill@weg.net

VENEZUELA
Valencia - Carabobo
Phone: +58 241 8210582
info-ve@weg.net

For those countries where there is not a WEG own operation, find our local distributor at www.weg.net and www.wattdrive.com

WEG Group - Motors Business Unit
Jaraguá do Sul - SC - Brazil
Phone: +55 47 3276 4000
motores@weg.net
www.weg.net

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