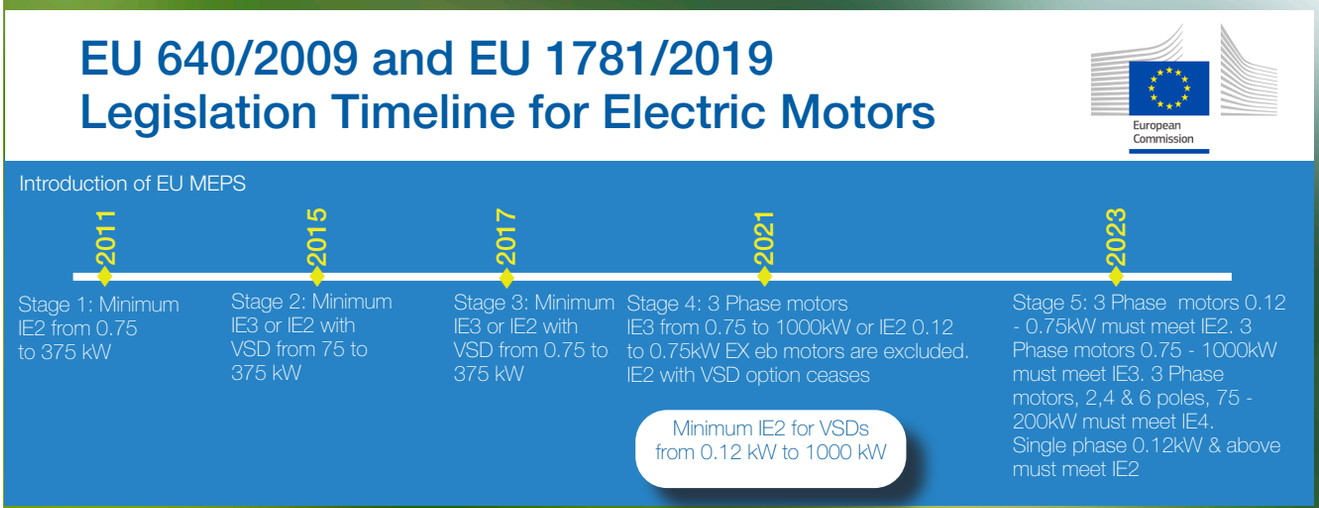
Motors | Automation | Energy | Transmission & Distribution | Coatings

EU Legislation Changes to Help Improve Efficiency



WEG Drives: Even More Efficiency to Your System.

Efficiency has become one of the key challenges facing many businesses, whether it's related to financial efficiency through supply chain management or human efficiency by getting the most productive workforce, making Efficiency the key to the health and growth of a business.

Global population growth and economic development has generated significant energy demand around the world, resulting in increased use of fossil fuels, causing greater levels of pollution within our atmosphere.

A review of the Regulation (EC) No. 640/2009, the regulation that governs the eco-design of electric motors and analysis of the technical, environmental and economic aspects of electric motors and drives, indicated that electric motor drive systems use about half of the electricity consumed in the European Union and United Kingdom.

The review showed that the use of variable speed drives to control motor speed for improved energy efficiency, converted 265TWh of electricity from the grid with a frequency suited for driven applications. It is anticipated that this consumption will increase by approximately 46% to 570 TWh by 2030.

Regulation (EC) No. 640/2009 was set to save 57 TWh annually by 2020 and 102 TWh annually by 2030. By including motors not covered by this regulation (i.e. smaller larger and hazardous area motors) it has been estimated that an additional 10 TWh of electricity could be saved annually Regulation (EU) 2019/1781 has been adopted by the European Commission, amending the regulations set out by (EC) No. 640/2009.

Starting from July 1st 2021, all electric motors which are to be operated from a variable speed drive now must adhere to a minimum of IE3 to be eligible for sale. The exception made in 2017 ceases.

For the first time, from July 1st 2021 the regulations for the eco-design of energy related products will include requirements for variable speed drives. VSDs with three-phase power supply, rated voltage from 100 to 1000 V AC, with only one AC output that drive motors with power ratings from 0.12 to 1000 kW are in the scope and shall not exceed the maximum power losses corresponding to the IE2 efficiency level. Regenerative drives, sinusoidal input current drives, nuclear safety drives and VSDs integrated in to a product of which the energy performance cannot be tested independently from the product are out of the scope. **

But the decision to invest in new equipment can be a minefield, with manufacturers all promoting the efficiency of their products with no easy means of comparing them.

With the introduction of EN 50598, that has now been superseded by the IEC61800-9, the European Commission has provided manufacturers a clear framework by which to grade a complete machine, this in turn allows the consumer to compare the overall efficiency of a product irrespective of their design and component selection, this is known as the "Extended Product Approach".

By harnessing the Extended Product Approach the European Commission expect the increased demand for more efficient systems to help achieve its targets for carbon dioxide (CO_2) reduction.

*** The information included in the new standards relate to stand-alone drives. For applications in panels please refer to the applicable standard.*

What is the Extended Product Approach?

The Extended Product (EP), according to ***IEC 61800-9***, is the combination of a motor system and a driven equipment, such as a fan, pump, compressor, conveyor or mixer.

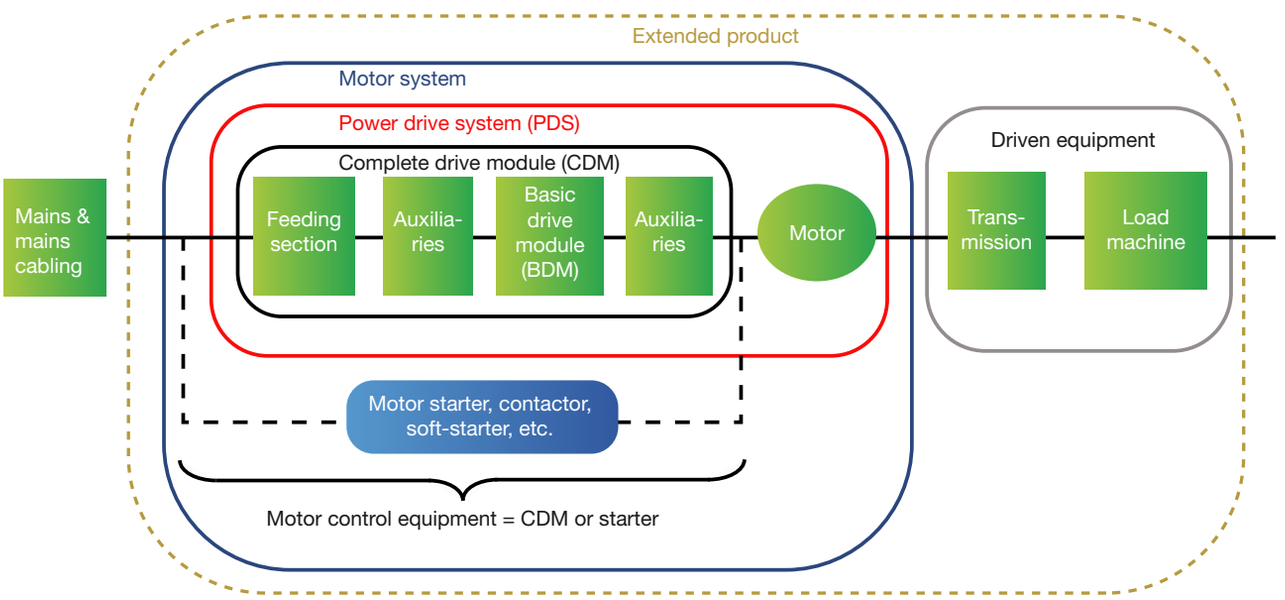


Figure 1 - Illustration of the extended product including a motor system *Source: IEC 61800-9-1*

The ***Motor System***, according to IEC 60947-4-1, comprises of all the equipment necessary to control and operate the system and can include the motor or geared motor, a variable speed drive, soft starter, servo controller and all the associated controls and switchgear. Within the Motor System the individual elements are:

- ***Basic Drive Module*** (BDM): the BDM is the inverter in its most simplistic form.
- ***Complete Drive Module*** (CDM): the Complete Drive Module, according to IEC 61800-2, consists of the electronic power converter connected between the electric supply and a motor as well as extension such as protection devices, transformers and auxiliaries. CDM takes the inverter and augments it with any filters, chokes, transformers or input switchgear required.
- ***Power Drive System*** (PDS): the Power Drive System, according to IEC 61800-2, consists of the Motor and the complete drive module.

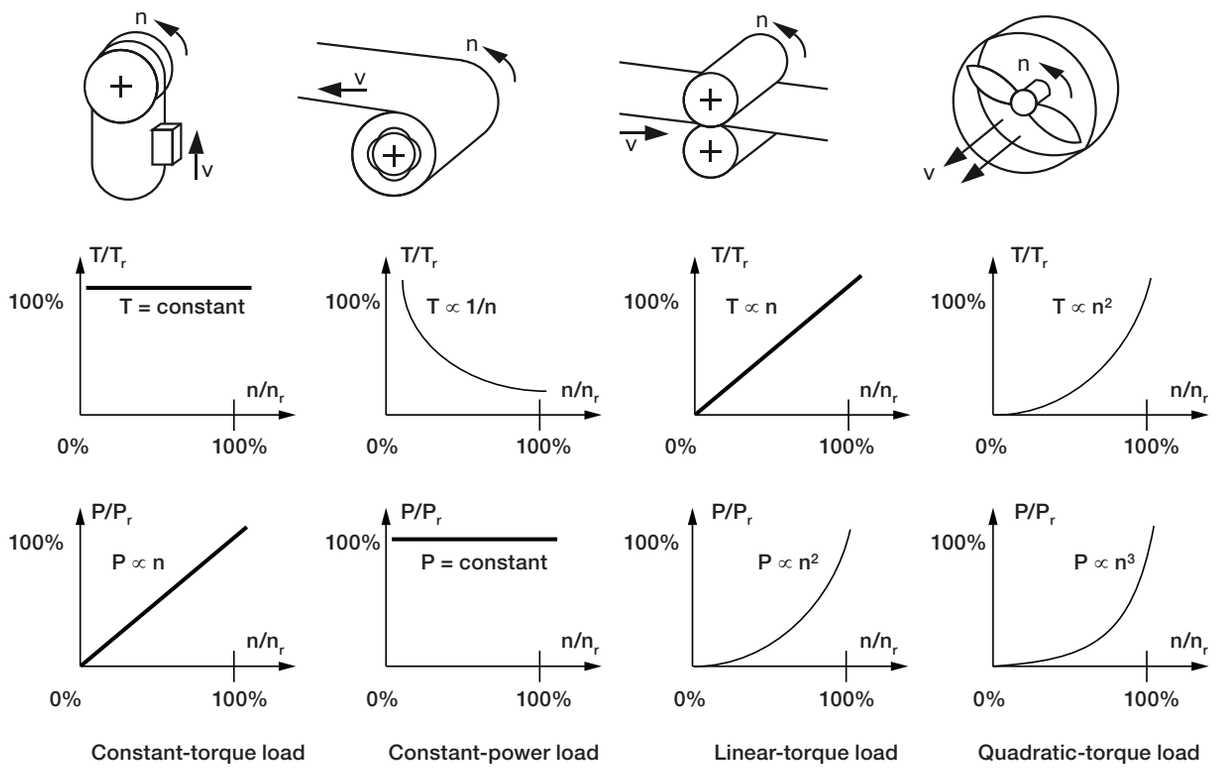
By combining the ***Driven Equipment*** requirements and the ***Motor System*** within our approach we can calculate the overall efficiency taking all of the elements into account. This results in an ***Energy Efficiency Index*** (EEI) which produces a value describing an energy efficiency aspect of an application, resulting from the extended product approach (EPA).
This methodology enables the determination of the energy efficiency index (EEI) of the extended product (EP) based on the speed torque profiles of the driven equipment, the relative power losses of the motor system and the duty profile of the application.

This results in the most efficient component selection for the application.

The Extended Product Approach employs a semi-analytical model (SAM) to calculate the efficiency of each of the components at the operating points of the driven equipment. This is achieved by first understanding the operating conditions of the driven equipment.

1 - The Torque or Power Versus Speed Profile

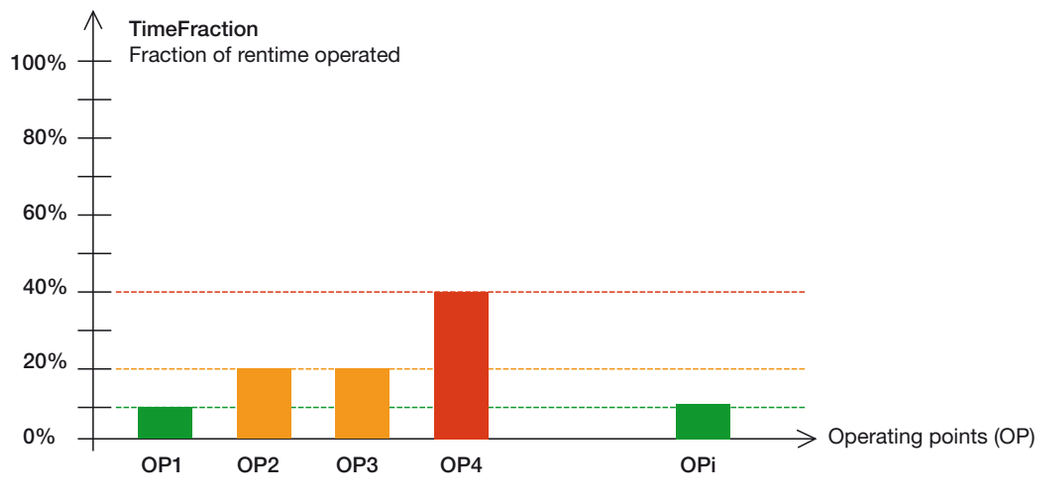
By understanding the torque/power demand at the desired speed we can begin to build a profile of the system.



Source: IEC 61800-9-1

2 - The Duty Profile

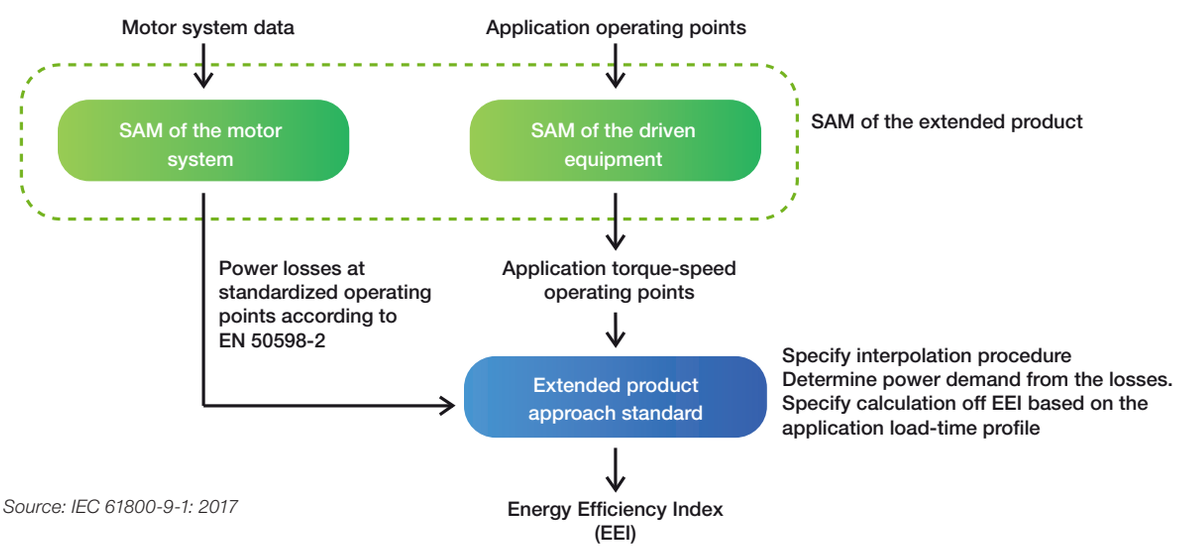
This graph illustrates the various power levels required by the application, including standby, and the fraction of time during which the machine is operated at these levels. The duty profile essentially depends on the sizing of the motor and on how the extended product is operated in practice. When mapped against the amount of time spent at each duty the profile of the driven equipment is clear.



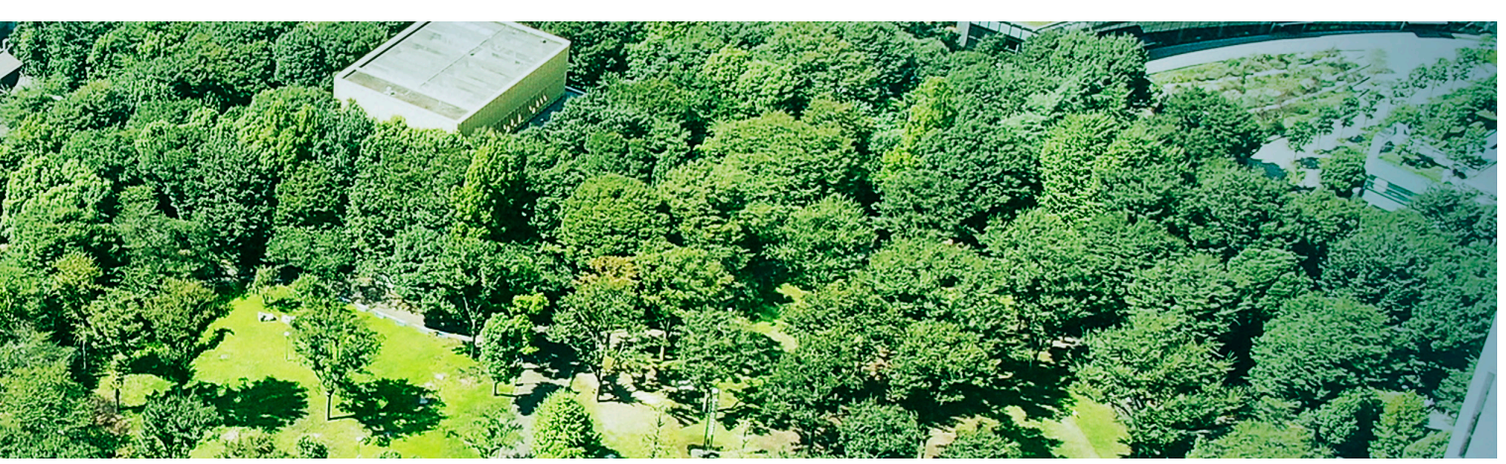
Source: IEC 61800-9-1

3 - The Energy Efficiency Index (EEI)

By analyzing the Motor System efficiency based on the Driven Equipment's profile this methodology enables the machine manufacture to determine their products overall Energy Efficiency Index.



Source: IEC 61800-9-1: 2017



Defining Efficiency – Complete Drive Module (CDM)

Manufacturers of Complete Drive Modules are must calculate and make available the efficiency of their products at 8 nominated points which can then be used within the semi-analytical method by the system manufacturer to determine their systems overall efficiency.

IEC 61800-9-2: Defining Efficiency - CDM

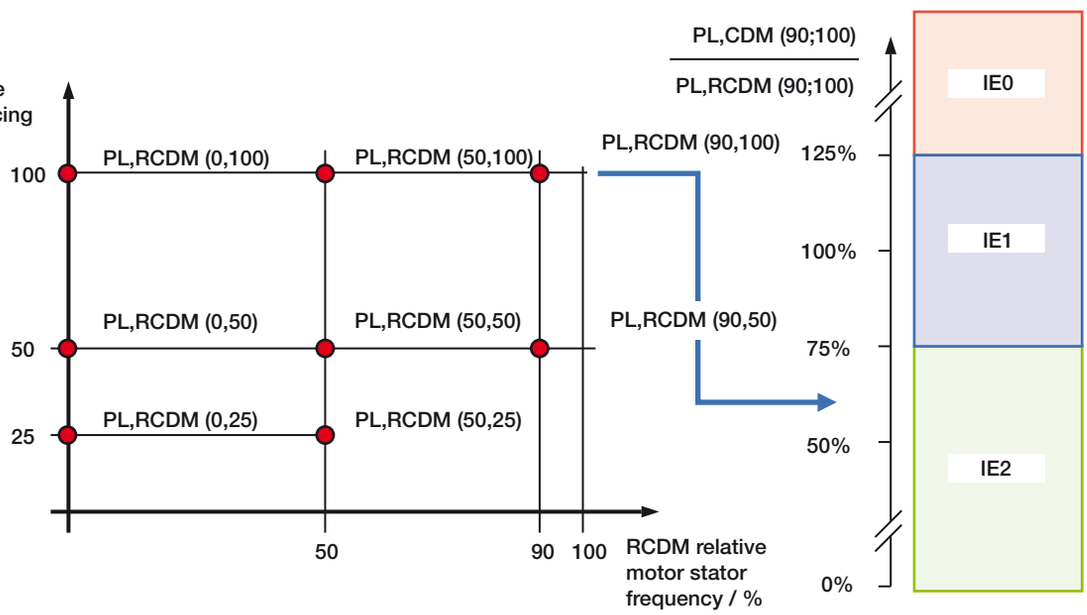
- IE1 reference values for CDM's
- Defines testing method for CDM's

Example

- CFW500C16P0T4 losses defined as 198 W
- 100% reference value = 581W
  - Therefore WEG 7.5 kW CFW500 = IE2

Where a CDM with 25% more losses than the reference value of IE1 is classified as IE0, whereas a CDM with 25% lower losses than the reference value of IE1 is classified as IE2.

is applicable to all CDM's with power ratings from 0.12 kW up to 1,000 kW, with a voltage range from 100 V to 1,000 V.



Source: IEC 61800-9-2: 2017

Defining Efficiency – Power Drive System (PDS)

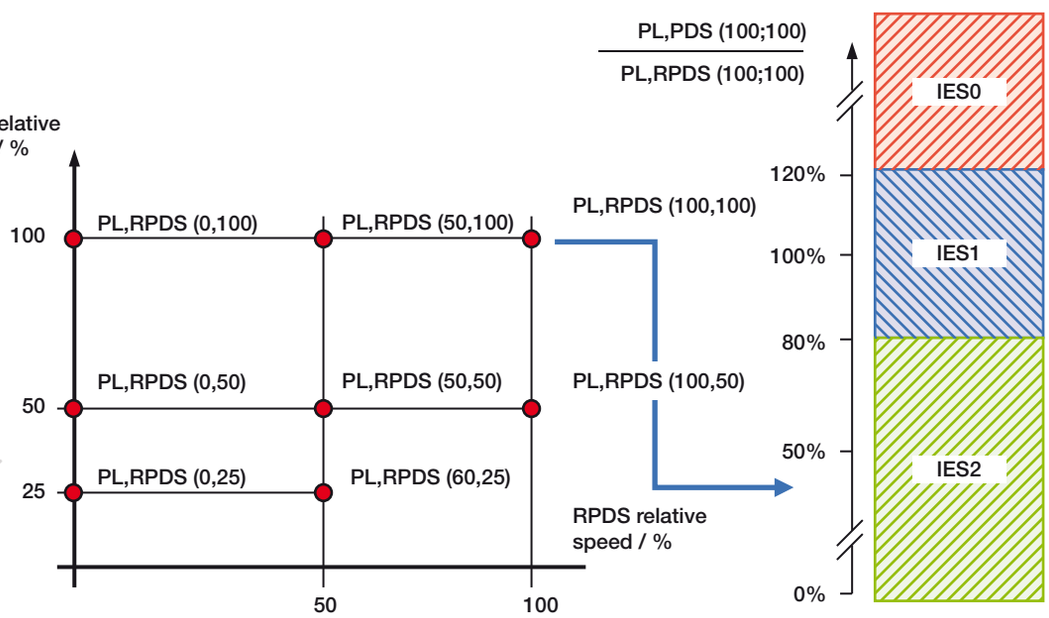
The classification of a Power Drive System, consisting of a CDM plus a motor, is similar to the method used for a CDM but using the new nomenclature IES0 - IES2, and unlike the +/-25% tolerance permitted for a CDM, a tighter tolerance of +/-20% is consider for the IES classification.

IEC61800-9-2: Defining Efficiency - PDS

- IES1 reference values for PDS's
- Defines testing method for PDS's

Example

- CFW500C16P0T4 losses defined as 198 W + W22 IE2 4p Motor Losses of 825 W = 1,023 W
- 100% reference value = 1,801 W
  - Therefore WEG 7.5 kW package is classified as IES2



Source: IEC 61800-9-2: 2017

WEG Achieves IE2 and IES2 Across the Range

Where an application does not require the motor to run at nominal speed all the time, the use of variable speed drive can lead to major enegy savings

WEG has a complete line of variable speed drives which exceed the IE2 requirements outlined in IEC61800-9 and when combined together with our robust and reliable motor line create a synergic and integrated solution for all applications.

A Power Driven System (PDS) that uses any WEG variable speed drive with WEG motors (efficiency level IE2 or higher) achieves IES2 efficiency level.

This makes WEG your ideal choice for all your variable speed drive and motors.

WEG Worldwide Operations

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

Cordoba - Cordoba
Phone: +54 351 4641366
weg-morbe@weg.com.ar

Buenos Aires
Phone: +54 11 42998000
ventas@pulverlux.com.ar

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

AUSTRIA
Markt Piesting - Wiener Neustadt-Land
Phone: +43 2633 4040
watt@wattdrive.com

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

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

ECUADOR
El Batan - Quito
Phone: +593 2 5144339
ceccato@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

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
info@zestghana.com.gh

INDIA
Bangalore - Karnataka
Phone: +91 80 41282007
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@wattdrive.com.my

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

Tizayuca - Hidalgo
Phone: +52 77 97963790

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

SOUTH AFRICA
Johannesburg
Phone: +27 11 7236000
info@zest.co.za

SPAIN
Coslada - Madrid
Phone: +34 91 6553008
wegiberia@wegiberia.es

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

Singapore
Phone: +65 68622220
watteuro@watteuro.com.sg

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

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

Minneapolis - Minnesota
Phone: +1 612 3788000

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.

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

Cod: 50065625 | Rev: 00 | Date (m/y): 04/2016