QUICK REFERENCE GUIDE

Motors and Starters

AUSTRALIA

		Main Featur
W21 General Purpose		• 0.18 to 250kW 415V/690V • Frames 63 to 355M/L • IP55 MEPS 2 compliant • High torque, low starting curre • Rated for continuous duty S1 ambient • Rugged cast iron or light weig construction (to frame 132) • Cast iron fan cowl from frame • Thermally protected (PTC) fra • 1 year warranty
W22 Industrial		• 0.18 to 330kW 415V/690V • Frames 63 to 355M/L • **IP66 high efficient E3 comp** • High starting torque • **Low noise level** • Rated for continuous duty S1 ambient • **Overload factor (SF) of 1.15** • **WISE® insulation system fo** • High grade FC-200 cast iron • Cast iron fan cowl from frame • **3 years warranty**
W22 Mining		• 0.18 to 330kW 415V/690V • Frames 63 to 355M/L • **IP66 high efficient E3 comp** • High starting torque • **Low noise level** • **Rated for continuous duty S ambient** • **Overload factor (SF) of 1.25** • **WISE® insulation system for** • High grade FC-200 cast iron c • Cast iron fan cowl from frame • **High tensile steel shaft and frames 225 to 355** • **Thermally protected (PTC) f 2 x PTCs and heaters frame** • **Accessories terminal box fr** • **Cast iron fans and W3Seal®** • **SPM mounting studs, frame** • **3 years warranty**
HGF Line		• 200 to 3,000kW 415V to 11,00 • Frames 315 to 630 • Low noise level • IP55 energy efficient (IP56 and • Rated for continuous duty S1 a ambient • Overload factor (SF) of 1.15 at • WISE® insulation system for sup • High grade FC-200 cast iron co • High tensile steel shaft • Ball or roller bearings, grease o • Thermally protected with 2 x w bearing RTD and heaters in all f • SPM mounting studs and 2 acc terminal boxes

es	Application & Environment	Start & Protect
ent at -20 to 45°C ght aluminium 160 me 160 and above	The W21 range is suitable for all general purpose applications, vertically or horizontally mounted, efficiently driving any type of load, direct coupled (standard) or pulley driven (on request).	DLW DOL Starters Start and protect your electric motor with WEG DLWs. Ranging from 0.37 to 18.5kW with built-in thermal overload, this is assurance that overloads and phase faults will not damage your investment on a motor. ESDW Star-Delta Starters Start and protect your electric motor with WEG ESDWs. Ranging from7.5 to 75kW with built-in thermal overload, the star-delta starters reduce starting current in light load applications. In addition, its thermal overload protects your motor against overload and phase failure.
oliant at -20 to 45°C **5 at 40°C ambient** **r superior life** construction 160	The W22 industrial range of high efficiency motors will drive down your energy bill and maintenance costs, providing reliable long life operation. It is suitable for all industrial applications, vertically or horizontally mounted, for DOL or VSD use*, where noise levels need to be reduced and superior performance is required.	 DLW Starter  ESDW Starter CFW08 VSD The CFW08 series of 240V single-phase input (to 2.2kW) or 415V three-phase input (to 15kW) provides starting, speed control and protection for your motor. V/Hz or open loop vector control ensures flexibility and ease of use.
liant **S1 at -20 to 55°C** **at 40°C ambient** **r superior life** onstruction 160 and above **roller bearings** **rame 160 to 200,** **225 to 355** **ame 160 and above** **es 225 to 355**	The W22 Mining is the ultimate electric motor. It's high efficiency will reduce electricity costs, it's high torque will keep your equipment running even with weak power supplies and high inertia loads, the WISE® insulation withstands voltage spikes and fast VSD surges extending motor life. It is suitable for all industrial, mining and the harshest environments, vertically or horizontally mounted, for DOL or VSD use*. Roller bearings provided for pulley type couplings and frames up to 355. Where performance and reliability are paramount, the W22M is indisputably the best motor on the market.	CFW11 VSD The CFW11 series is a high-tech, easy to use, energy-smart VSD. Versatile and user-friendly it is a full vector drive, open or closed-loop, capable of high torque starting for the most arduous loads. The patented Optimal Flux® function will save you thousands on energy costs, by eliminating forced cooling or motor oversizing. Controlled dV/dt design ensures motor insulation is not unduly stressed, resulting in longer motor life. This is the ultimate VSD, packed with high-tech functions including a 'soft PLC', but easy to use via a plain text HMI. Optimal FLUX
00V IP66 on request) t -20 to 45°C 40°C ambient perior life onstruction r oil lubricated inding RTDs, 1 rames cessories	The HGF line of high performance motors are compact TEFC electric motors which save real estate space and eliminate the higher on-going costs of CACA designs. Their internal fan distributes the inner air temperature, minimising temperature gradients and hot spots which, might otherwise decrease insulation life. A reliable and robust design concept, providing high output per frame and years of superior performance.	AFW11 IP54 VSD • 55 to 3,000kW • 415V & 690V • Vector and V/Hz control • Profibus, Devicenet, Canopen, Modbus • Built-in motor protection features • Delivered ready to install and operate 

		Main Feature
MGF Line		• 300 to 50,000kW 415V to 13 • Frames 315 to 1800 • IP55 energy efficient (IP56 an • Rated for continuous duty S1 ambient • Overload factor (SF) of 1.10 at • Ball, roller bearings or sleeve b • Thermally protected with 2 x 1 bearing RTD and heaters in • 2 accessories terminal boxes • Air-cooled, forced-cooled or c
MAF Line		• 300 to 50,000kW 415V to 13,8 • Frames 315 to 1800 • IP55 energy efficient (IP56 and • Rated for continuous duty S1 a ambient • Overload factor (SF) of 1.10 at • Ball, roller bearings or sleeve be • Thermally protected with 2 x w 1 bearing RTD and heaters in a • 2 accessories terminal boxes • Air-cooled, forced-cooled or du • Wound rotor motor with brush
Ex-d Flameproof		• 0.37 to 1,500kW • 415V/690V/1000V/3.3kV/6.6kV • Frames 90 to 560 • IP55 MEPS 2 Compliant (IP56 a • ANZEx or IECEx certified for Zo Group IIB • Rated for continuous duty S1 a ambient • T3 rating for ambient of 60°C • High-grade FC-200 cast iron co • Thermally protected (PTC) all fra
Ex-nA Non Sparking		• 0.37 to 10,000kW • Frames 63 to 1,000 • 415V/690V/1,000V/3.3kV/6.6 • IP55 MEPS 2 compliant (IP56, IP65 or IP66 on request • ANZEx or IECEx certified for Z Group IIC • Rated for continuous duty S1 40°C ambient • T3 rating for ambient of 80°C -55°C on request
Ex-t Dust Ignition Proof		• 0.37 to 300kW • 415V/690V/1,100V • Frames 63 to 355 • IP65 (Ex-tb) or IP55 (Ex-tc) MI E3 compliant • IECEx certified for Zone 21 Db Zone 22 Dc (Ex-tc) T125 Grou • Rated for continuous duty S1 ambient • T3 rating for ambient of 80°C ambient of -55°C on request

es	Application & Environment	Start & Protect
,800V d IP65 on request) at -20 to 45°C 40°C ambient bearings winding RTDs, all frames luct-cooled	The M line of induction motors extend the power rating to 50,000kW. The flexible design allows for air-air (IC611), air-water (IC81W7), self-ventilated or forced-cooling heat-exchanger or piped cooling system. The insulation system is made with state-of-the-art materials from first class suppliers, and tested under the most rigorous conditions. The fabricated steel frame allows for drop-in solutions, thus minimising costs of replacing older style designs.	MVW01 VSD • 400 to 6,000kW • 2.3/3.3/4.16/6.6kV • The most efficient MV drive on the market >99% • Low voltage harmonics with OPP® modulation • IGBTs with 30 year design life • Extractable power stacks with 5min replacement time 
300V IP65 on request) -20 to 45°C 40°C ambient arings inding RTDs, ll frames ct-cooled ifting gear	When high starting torque, low starting current or high inertia loads are involved (e.g. grinding mills and crushers), a WRIM design is generally the best solution. The MAF line has an automatic brush lifting system, which eliminates the onerous maintenance requirement of fixed brush motors with the added benefit of extending brush life 60 fold or more. This ingenious system increases plant up-time and reliability, resulting in higher production output and profits.	SSW7000 Soft Starter • 560 to 3,600kW • 2.3/3.3/4.16/6.6kV • IP41 • FTC-Flexible torque control technology • Main and by-pass contactor • Medium voltage fuses • Soft PLC function • USB connectivity 
/11kV and IP65 on request) ne 1, T4, -20 to 40°C nstruction ames	Chemical, gas and other combustible substances constitute a hazardous area, which require special electric motor designs. The area is classified by competent experts into either gas (G) or dust (D), depending on the type of combustible substance, zones or EPLs, gas groups and temperature class.	CFW11 VSD • 1.1 to 550kW • 415V and 690V • IP20 or IP54 (110kW) • Optimal Flux® • Optimal Breaking® • Profibus, Devicenet, Canopen, Modbus 
kV/11kV) one 1, T4, at -20 to or ambient of	• Zone 1 or Zone 21 = presence of gas (1) or dust (21) under normal operating conditions • Zone 2 or 22 = presence of gas (2) or dust (22) under abnormal operating conditions Zone 1 requires the use of Ex-d or Ex-e motors, whilst Zone 21 requires Ex-tb motors. Ex-nA may be used in Zone 2, and Ex-tc in Zone 22.	CFW08 VSD • 0.18 to 15kW at 415V 3ø • 0.18 to 2.2kW at 240V 1ø • IP20 or IP66 • V/Hz or open loop vector • Profibus, Devicenet, Canopen, Modbus 
EPS 2 or (Ex-tb) or p III at -20 to 40°C or	WEG's range of specially built and certified W21, W22, HGF and MGF motors offer a complete solution to modern hazardous area requirements. In addition, M Line is certified as Ex-p, providing a complete solution to hazardous area applications.	SSW06 Soft Starter • 22 to 2,000kW • 415V & 690V • Torque control • Internal by-pass contactor (to 820A) • Innovative contactor type connection terminals 

Energy savings

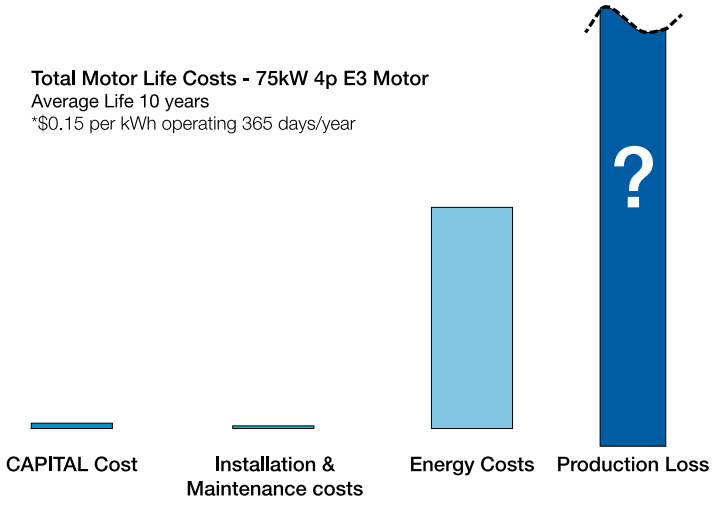
Based on an average kWh cost of $0.15/kWh, 24 hour/day operation 360 days per year, the W22 and W22M ranges of motors will deliver the following typical annual cost savings in energy use:

Output kW	W22 Annual Savings $ against MEPS 2 motors	W22 Annual Savings $ against MEPS 1 motors
0.75	$32	$156
1.1	$47	$217
1.5	$55	$245
2.2	$86	$306
3	$90	$348
4	$130	$416
5.5	$158	$484
7.5	$200	$584
11	$290	$681
15	$459	$842
18.5	$447	$970
22	$463	$1,043
30	$713	$1,264
37	$815	$1,486
45	$789	$1,530
55	$1,194	$1,928
75	$1,617	$2,279
90	$1,541	$2,591
110	$1,718	$2,671
132	$2,048	$3,186
150	$1,900	$2,972
160	$2,019	$3,615
185	$2,077	$3,923

Note: MEPS 1 motors were sold in Australia between April 2001 and April 2006.

The capital outlay costs of acquiring an electric motor generally only represents 1 to 2% of its total cost of ownership.

Energy, maintenance and reliability represent up to 99% of the total cost of ownership of an electric motor. The key to lowering total cost of ownership is to select E3 motors, with lower maintenance requirements and high reliability. Features such as WISE insulation, low vibration and noise, long lubrication intervals, service factors of 1.15 or higher, high instantaneous overload factors and torque are direct indicators of a reliable, robust and technologically advanced design.



Drive and motor innovation from WEG

What is **Optimal Flux®** ?

Combining a WEG Variable Frequency Drive (VFD) with a WEG Motor results in Optimal Flux®. How? The design characteristics of a WEG motor are pre-loaded into the WEG VFD. The Optimal Flux® control algorithm increases motor flux at low speeds, thereby allowing the same torque to be developed with lower current. The results are optimal motor flux at low speeds to produce full torque while minimising motor losses.

Why **Optimal Flux®** was developed.

Historically, variable speed, constant torque applications were driven by DC motors fed from DC variable speed drives. The DC motors were typically cooled by a separately driven blower, allowing full load operation to very low speeds. However, design factors typically limited the speed range to 20:1.

In the 1990's, consumers migrated to AC motors powered by VFDs. However, AC powered applications were limited to variable torque applications due to cooling limitations on the available AC motors. The air flow (cooling) from the shaft mounted fan is dramatically reduced as speed decreases. If the load were not also reduced as speed decreased, the reduced cooling would result in motor overheating.

As demand for VFD technology grew, motor designs were modified to provide adequate cooling at low speeds. This was accomplished by up-sizing motors or by fitting a separately driven forced ventilation in place of the shaft mounted fan.

WEG developed Optimal Flux (patented) to specifically address the needs of constant torque VSD market. Specifically, those applications with +/-0.5% speed regulation without an encoder and a speed range of 10:1. ***Optimal Flux® allows the operation of WEG motors*** from a speed range approaching ***5Hz upwards, without thermal damage, without*** the need for a speed feedback from a shaft mounted encoder, ***the fitting of forced ventilation to the motor or derating.***

How does **Optimal Flux®** achieve lower motor losses ?

Most of the heat in motors is the result I^2 losses. If motor current can be reduced even slightly, the resultant losses are significantly reduced. Variable torque loads inherently accomplish this since they require less torque (less current demand) as their speed is reduced. Constant torque loads require full torque at low speeds. Merely reducing the current would reduce both losses and torque, which would be unacceptable. The design characteristics of WEG W22 motors are loaded into the CFW11 VFDs which allows the Optimal Flux® control algorithm to adjust motor flux at low speeds thereby allowing the same torque to be developed with lower current.

What are the advantages of WEG VSD's and **Optimal Flux®** ?

- ***Doubled motor insulation life*** as operating temperature is reduced by approximately 11% (vs. Non-Optimal Flux® Control VFD). Typically, for each 10 degrees C of temperature reduction, motor insulation life is doubled.
- ***Elimination of motor & drive incompatibility*** as WEG has tested the drive and motor combinations under full load conditions.
- Single source customer support for motor and drive.
- ***Less down time*** resulting in cost savings.
- ***Elimination of costs associated with a separately driven fan,*** including the forced ventilation motor and starter, additional cable run to the fan motor, installation costs and the energy to operate it.
- Elimination of Output reactor for motor cable runs to 100m.
- Reduced spares and inventory.
- ***Reduction in energy use for both MEPS and E3 designs.***

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WEG Worldwide

Founded in 1961 in the state of Santa Catarina, Brazil by Werner Ricardo Voigt, Eggon João da Silva and Geraldo Werninghaus, WEG has amassed great experience in research/development, design, manufacture, test and commissioning of motors, drives and transformers.

Our motor manufacturing capacity is one of the largest in the world, producing over 68,000 motors per day, equivalent to approximately 11.5 million per year. We employ over 25,000 people worldwide, with over 3,000 specialist engineers to support our customers from design, development, application, through to commissioning.

With factories, branches and technical services located around the world WEG offers a complete solution from small systems through to complex integrated projects. Offering over 20 state of the art testing laboratories, a large investment in research & development and a genuine focus on sustainability, WEG continually invests in the development of more efficient and environmentally friendly electrical solutions.

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