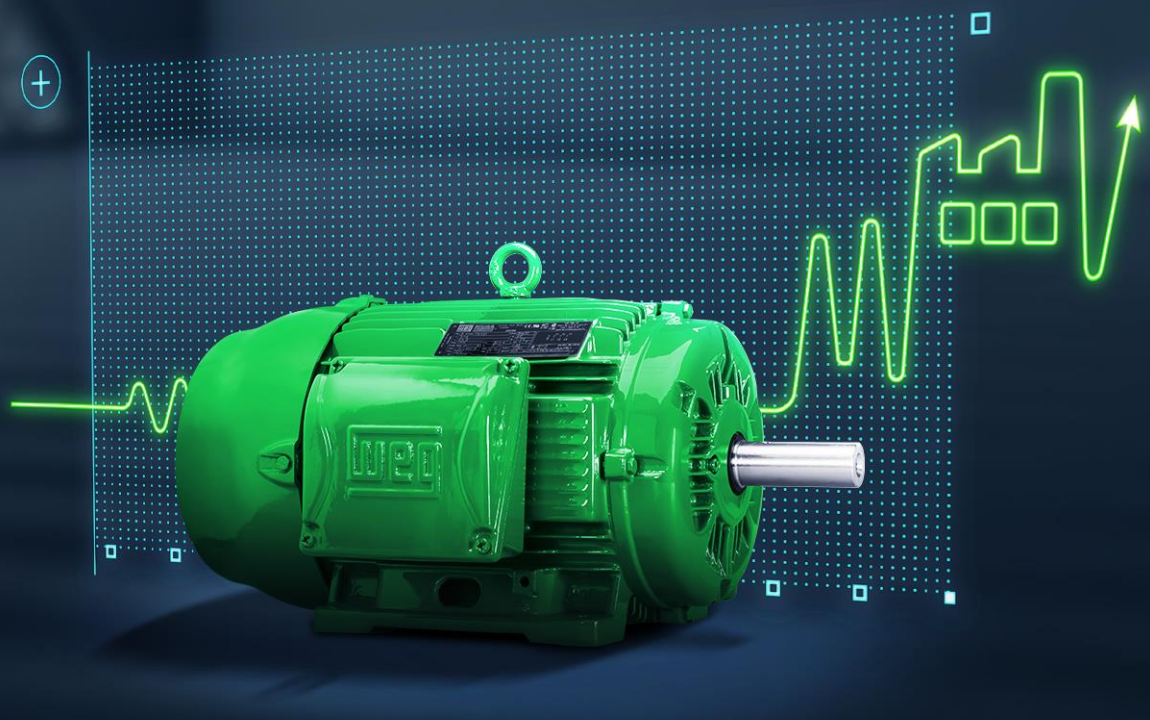
W22 IE4 SUPER PREMIUM

EFFICIENCY THAT TURNS INTO GREAT SAVINGS



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WEG Head Office in Jaraguá do Sul, SC, Brazil

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Zest WEG Electrical South Africa

- Founded as Zest Electric Motors in 1980 By James Blakemore.
- Head Office based in Johannesburg.
- ZEST Cape Town branch was established in 1994.
- WEG acquired majority equity stake in Zest WEG Group in 2010.
- 910 Employees.
- 8 Branches across South Africa.
- Largest Electric Motor and Variable Speed Drive stockist and supplier in Africa.

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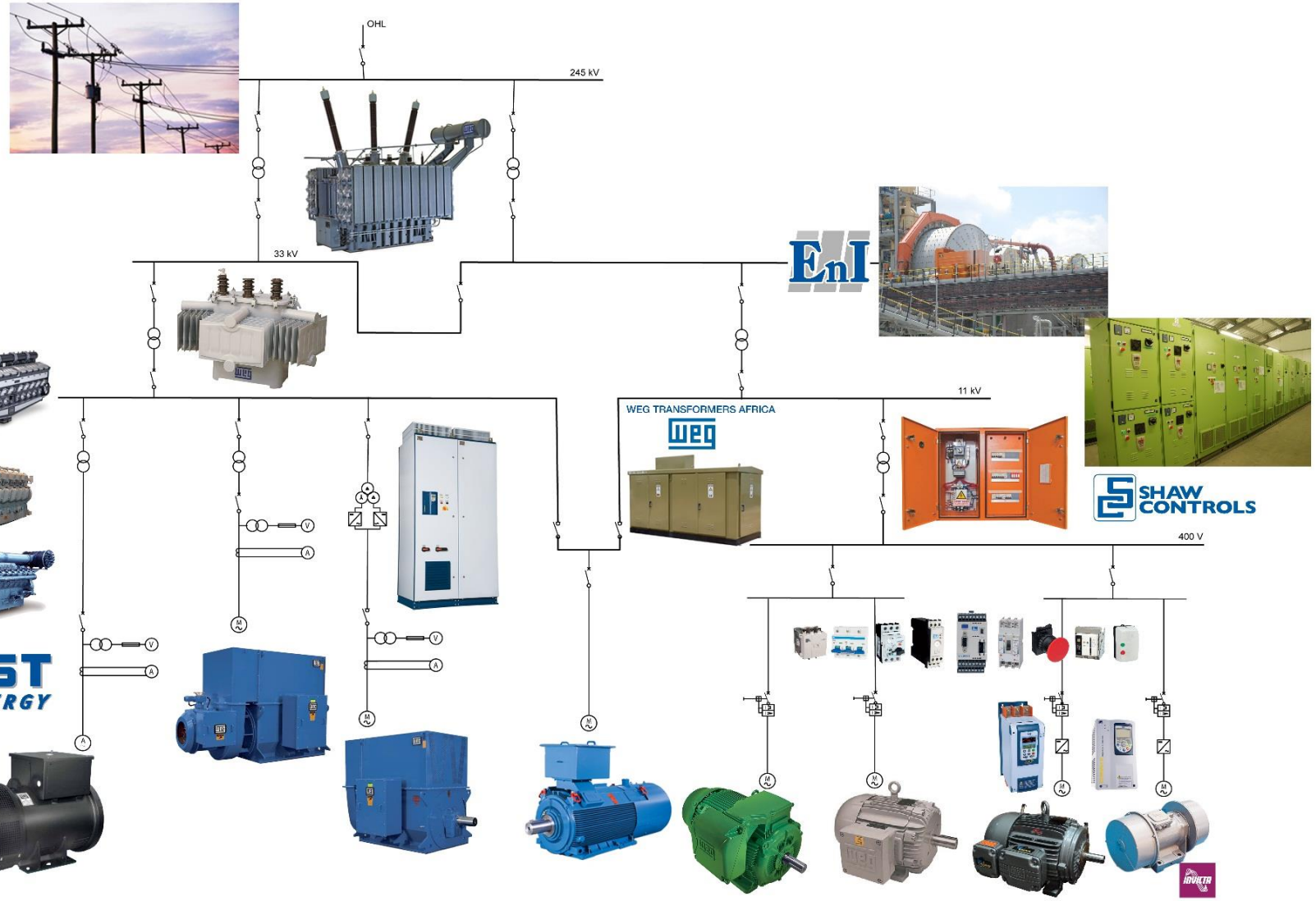
Zest WEG Electrical South Africa



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Energy efficiency
The issue…

Today industry are facing an energy challenge.

In the last two decades, global energy consumption has increased by 50%.

The forecast is that world energy consumption will double from current levels by 2050, according to the International Energy Agency (IEA), reflecting global economic growth and rising living standards.

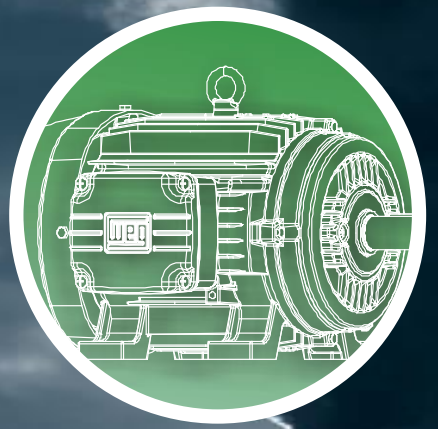
Pressures to reduce energy consumption, lower carbon dioxide (CO2) emissions.

All of these pressures are against a background of ever-rising energy prices and the dramatic effects climate change is having on the environment.

Global Electrical Energy Consumption

Electrical energy used by various Industry segments

~60%



Energy consumption by electric motors in industry represents

>65%

Globally, Motors Systems account for up to

~40%

of ALL Electricity Consumption

Source: European Energy Agency.

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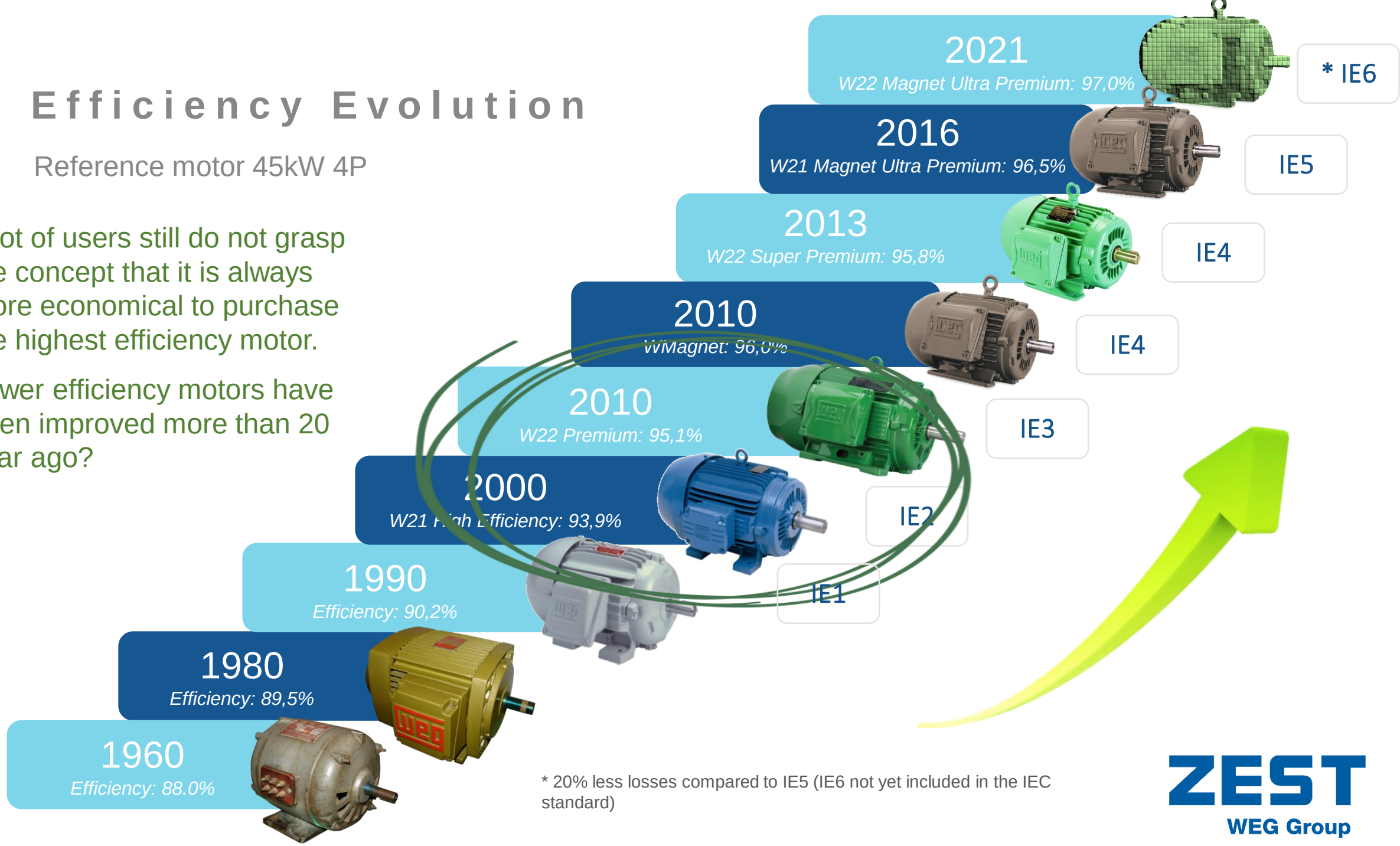
Efficiency Evolution

Reference motor 45kW 4P

A lot of users still do not grasp the concept that it is always more economical to purchase the highest efficiency motor.

Lower efficiency motors have been improved more than 20 year ago?



* 20% less losses compared to IE5 (IE6 not yet included in the IEC standard)

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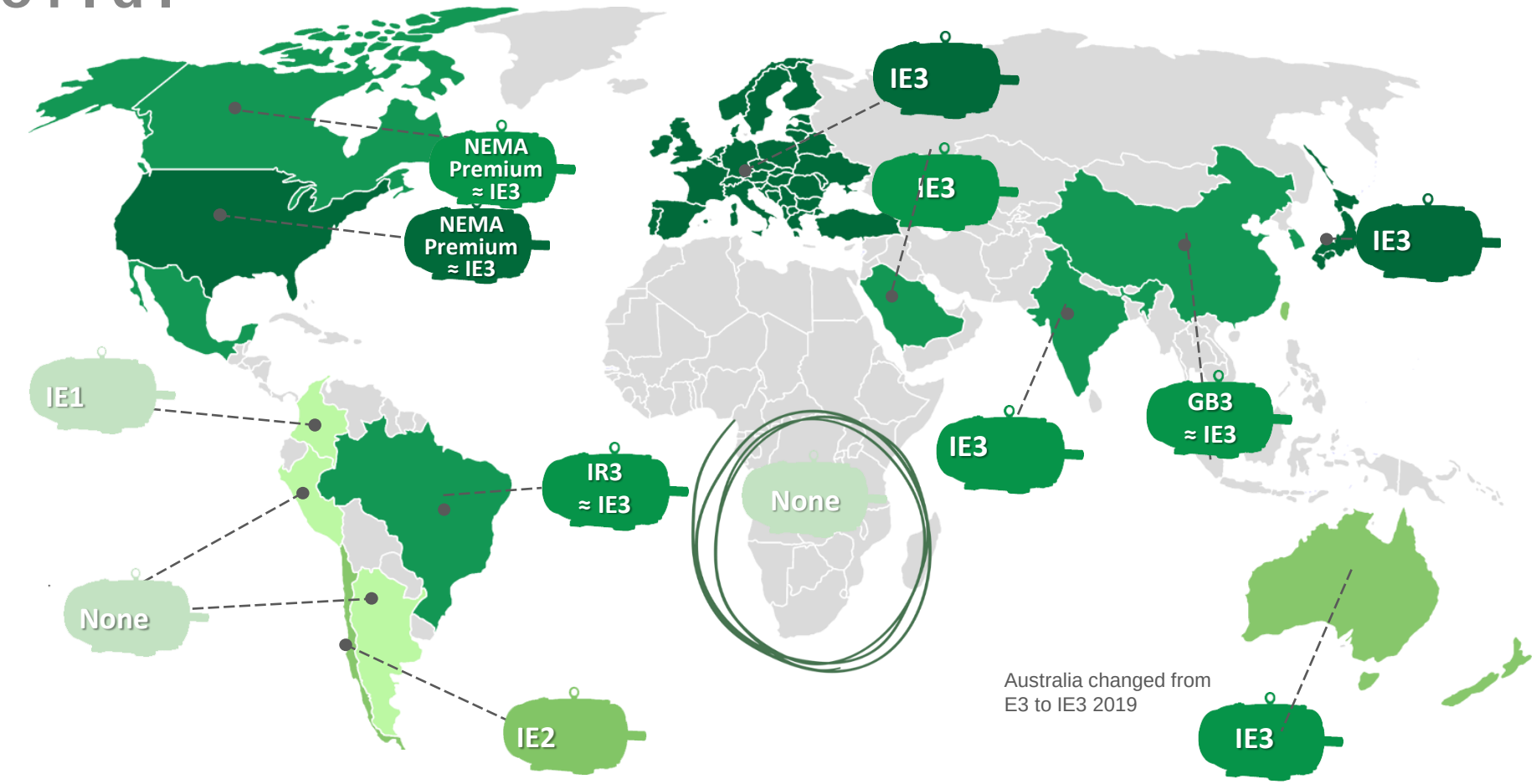
Current and future minimum mandatory efficiency grades for electric motors around world.



It's expected that the USA, Europe (EU) and Japan will adopt IE4 efficiency standard in 2022+

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Electric motor efficiency

Input = 100kW

Losses = 5kW

Output = 95kW

$\eta = 95\%$

Motor efficiency is the ratio between the output power available at the motor shaft, and the electrical input power or absorbed power.

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Motor Efficiency Classes (IEC Standard)

IEC 60034-30-1:2014 DOL operated (stops at IE4)

IEC 60034-30-2:2016 VSD operated (IE5 included)

Efficiency classes for Low Voltage motors 2-8 Pole and up to 1000kW.

IE1	IE2	IE3	IE4	IE5
Standard Efficiency	High Efficiency	Premium Efficiency	Super Premium Efficiency	Ultra Premium Efficiency





IEC 60034-2-1:2014

Efficiency measuring methods for motors.

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Motor Efficiency Classes (IEC Standard) Important Aspects

IEC 60034-2-1:2014

- Defines standard methods for testing efficiency, manufacturers are obligated to make their method known
- It is required for manufacturers to provide the rated efficiency, the IE standard and the standard of compliance on an OEM standard rating plate fixed to the motor
- Efficiency levels and standards are not subject to subjective comment or change by any local supplier, agent or distributor
- Examples and details are on the following slides.

IE1	IE2	IE3	IE4
Standard Efficiency	High Efficiency	Premium Efficiency	Super Premium Efficiency

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Motor Efficiency Testing Methods

IEC 60034-2-1:2014

Standard methods for determining losses and efficiency from tests

Two testing Methods:

1. Direct method

Input and output – measured

2. Indirect method

Joule losses - measured

Iron losses - measured

Mechanical losses - measured

Stray load losses -
- a) Measured
- b) Regression analysis
- c) Assigned allowance
- d) Eh-start test.

WEG uses indirect method, with stray load losses determined by measurement.

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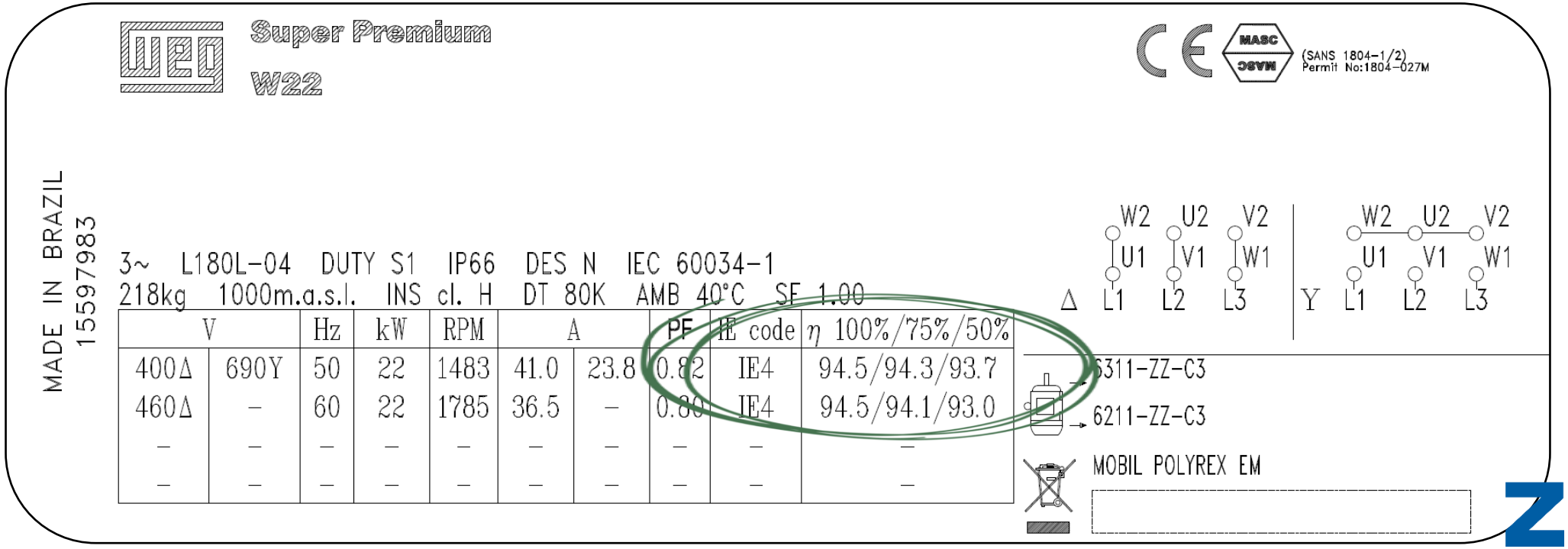
Motor Efficiency Marking

IEC 60034-2-1:2014

The rated efficiency and the IE code shall be durably marked on the rating plate, for example **“IE3 & 94.1%”**

It is also recommended to report efficiencies at full load, 75% and 50% in the product documentation and rating plate.



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Motor Efficiency Marking

Questionable marking out in the field

Is you motor efficiency real?

Example 37kW 4P IE3 motor, IEC is dictating efficiency to be at least 93.9%

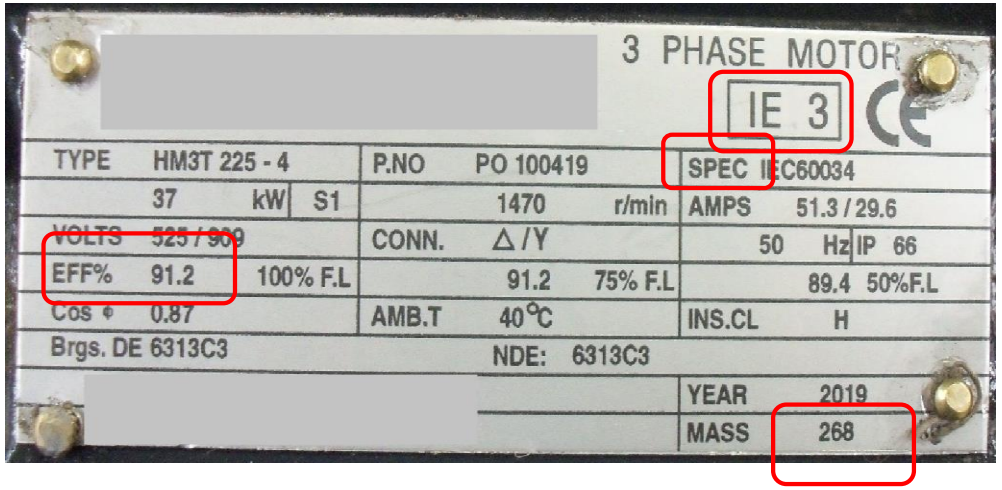

Plate A

- The way “IE3” is printed
- Referring to a spec and not a standard
- Efficiency 91.2%? This is IE1??

Plate B

- Cleary not stamped at factory, miss prints
- Efficiency 93.9%? This is exactly the standard??

WEG IE3 weight

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W22 IE4

SUPER PREMIUMEFFICIENCY MOTORS FROM WEG

Meet our W22 IE4 Super Premium motor.

The revolutionary new W22 platform developed by WEG has allowed us to manufacture motors with higher efficiency levels.

The W22 IE4 Super Premium Efficiency motor will be supplied in place of the W22 IE3 Top Premium Efficiency motor line, some of the IE3 motors will remain available for the ratings not covered by the IE4.

The initial launch of the IE4 motor will cover frames sizes 225 to 355 and for 2,4 and 6 Pole motors only.

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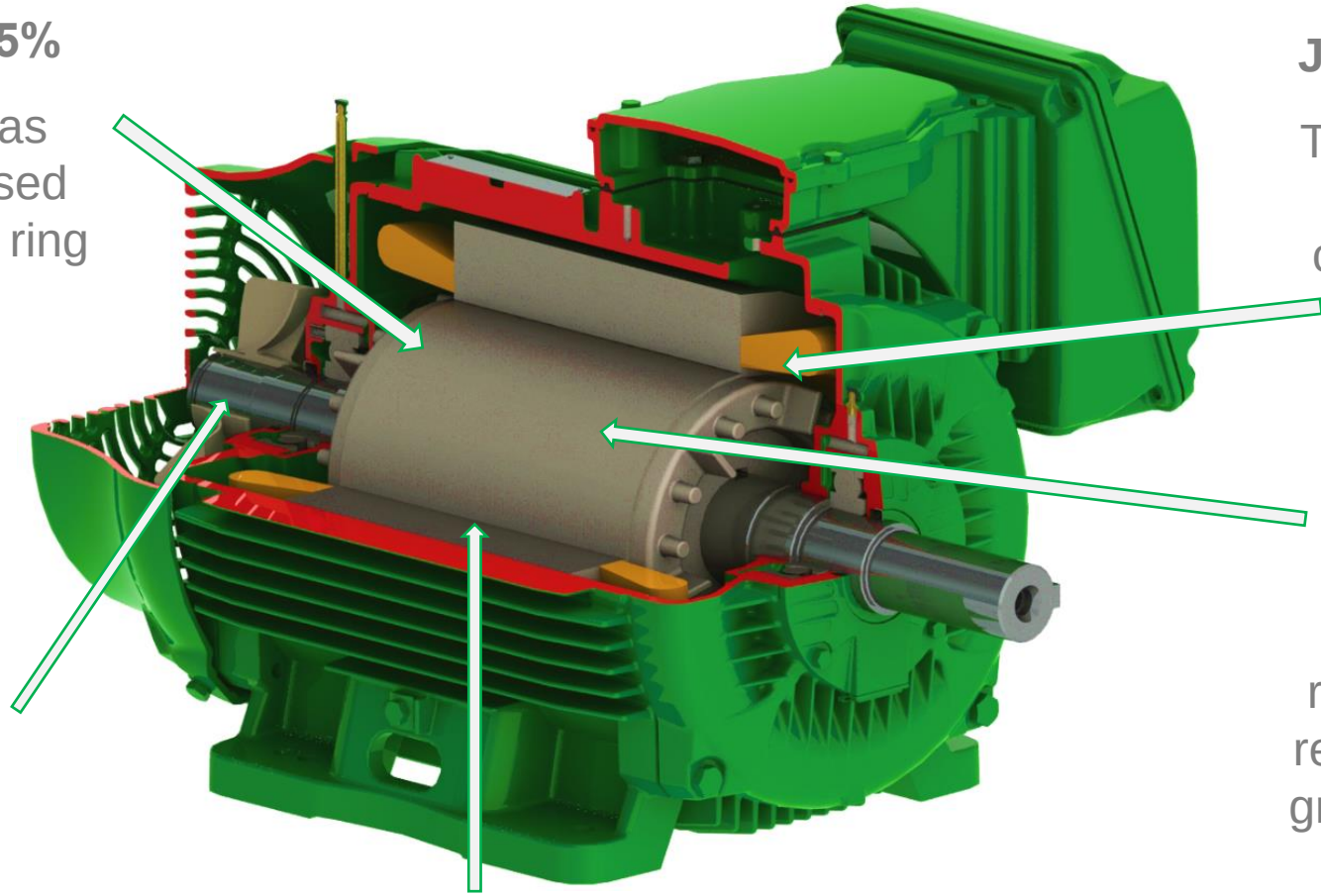
How did we improved the motor efficiency

Joule Losses (Pj2) ≈ 25%

The rotor(resistance) was reduced by using optimised rotor bar and short circuit ring designs.



Joule Losses (Pj1) ≈ 40%

The stator(resistance) was reduced by using more copper in the windings by means of double layer windings.

Iron lossses (Pfe) ≈ 20%

The quality of the magnetic properties of the stator and rotor are improved in order to reduce Iron Losses with a high grade silicone steel design and thermally treated rotor.

Mechanical Losses (Pmec) ≈ 5%

The design of the motor cooling was improved resulting in a smaller fan with new geometry and with lower losses.

Stray Load losses (SLL) ≈ 10%

Presision airgap techniques are used to reduce stray load losses.

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W22 IE4 Super Premium motor, features

Removable gland plate

From frames 280 to 355.

Extended grease pipe

Easy maintenance for re-greasing and automatic grease relief.

IP66 Degree of protection

Totally protected against dust and water jets.

VSD Suitability

Totally suitable for VSD applications up to **690V** as standard. With a **class H** insulation and insulated NDE bearing.

WISE® insulation system

(WEG Insulation System Evolution) Designed from enhanced insulation materials for VSD applications. This is an important consideration to be made when selecting a motor to be controlled by a VSD.

Rubber drains

Allows for easy motor drainage during maintenance procedures.

WSeal® Sealing System

The WSeal® sealing system have been developed by WEG to protect the motor against the accumulation of solid and liquid impurities present in the environment, that consists of a V'Ring with double lips and metal cap mounted on this ring.

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W22 IE4 Super Premium motor, benefits

Industry Standard

WEG W22 motor range.

Efficiency

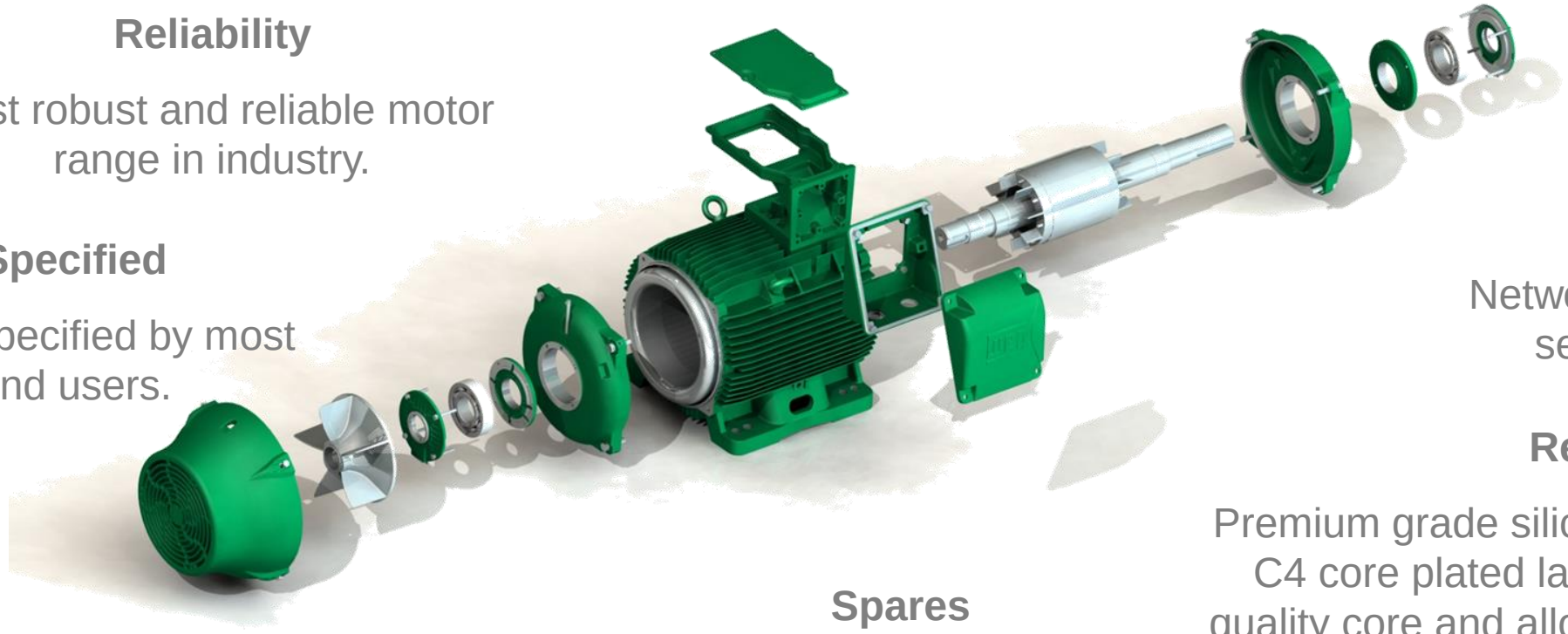
Highest efficiency levels in the field.

Savings on

Energy, TCO and CO_2.

Reliability

Most robust and reliable motor range in industry.



Guarantees

5 Year.

Specified

WEG Specified by most end users.

Service

Network of pre-approved service providers.

Repair

Premium grade silicon steel laminations - C4 core plated laminations to ensure quality core and allow rewinds back to full efficiency

Spares

Spare parts remain interchangeable.

From stock

The largest stock holding in South Africa and Sub-Saharan Africa.

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Question?

What is the annual running cost of continuously running a 100kW load?

$$\frac{8760h \times 100kW \times *R0.98/kWh}{96{,}3\% \text{ Efficiency}}$$

~ R891 400

What is the cost of a new 110kW motor

~ R86 000

Running cost, even of a partly loaded motor far exceed capital purchase price. It is always more economical to purchase the highest efficiency of motor that is practically possible.

*Industry Megaflex Tariff (R0.98/kW/h) (2020/2021)

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Question?

What is the running cost of continuously running a 100kW load?

Annual running cost ~ R891 400

Cost of a new motor ~ R86 000

5 weeks running cost ~ R85 500

10 year running cost ~ R12 300 000

Industry Megaflex Tariff (R0.98/kW/h) (2020/2021)
10 years at 7% energy increase

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10 year running cost vs. capital cost?

What is the annual running cost of continuously running a 100kW load?

Would you like to save on running cost or capital cost when buying an electric motor?

	IE1	IE4	Saving
Efficiency	94.1%	96.3%	2.2%
Running cost	R 12,604,829	R 12,316,868	R 287,961
Capital cost	R 74,861	R 86,105	R 11,244

Super Premium Motors can help you save money!

Saving money that you do not need to spend is not only a wise idea but it also is a “green” idea to support the conservation or our environment.

Industry Megaflex Tariff (R0.98/kW/h) (2020/2021)
10 years at 7% energy increase

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Consumption Comparison

Installed old motor. Rewound in the past 110 kW 4	*Hours / Day	20
	*Days / Year	365
	Loading (%)	75%
	**Tariff RkWh	R 0.98

110 kW 4P 2002	Installed motor	IE1	IE2	IE3	IE4
Efficiency η (%)	92.0%	94.1%	95.0%	95.6%	96.3%
Hours per Year	7300	7300	7300	7300	7300
Annual consumption (kWh)	654,620	640,011	633,947	629,969	625,389
Annual cost (ZAR)	R 641,527	R 627,210	R 621,268	R 617,369	R 612,882
Annual saving (ZAR)	NA	R 14,317	R 20,259	R 24,158	R 28,646
Price of new motor (ZAR)	NA	R 74,861	R 86,105	R 86,105	R 86,105
Payback in years, compared to IE1	NA	NA	0.6	0.5	0.4
10 Year running cost (ZAR)	R 8,863,627	R 8,665,820	R 8,583,723	R 8,529,850	R 8,467,847
10 Year saving (ZAR)	NA	R 197,807	R 279,904	R 333,777	R 395,780

*Industry average running hours is approximately 7300hrs per year
**Industry Megaflex (R0.98/kW/h) (2020/2021)
10 years at 7% energy increase

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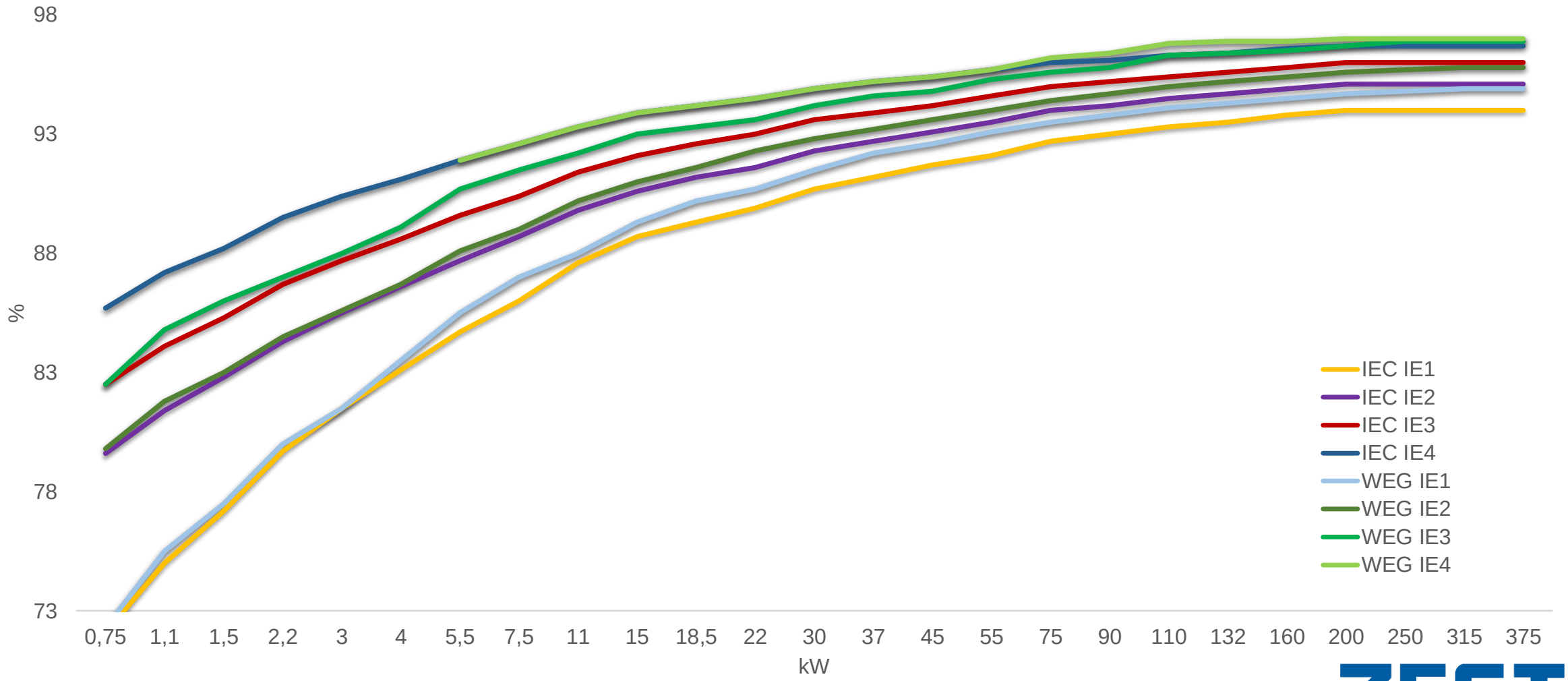
IEC vs. WEG Efficiency values



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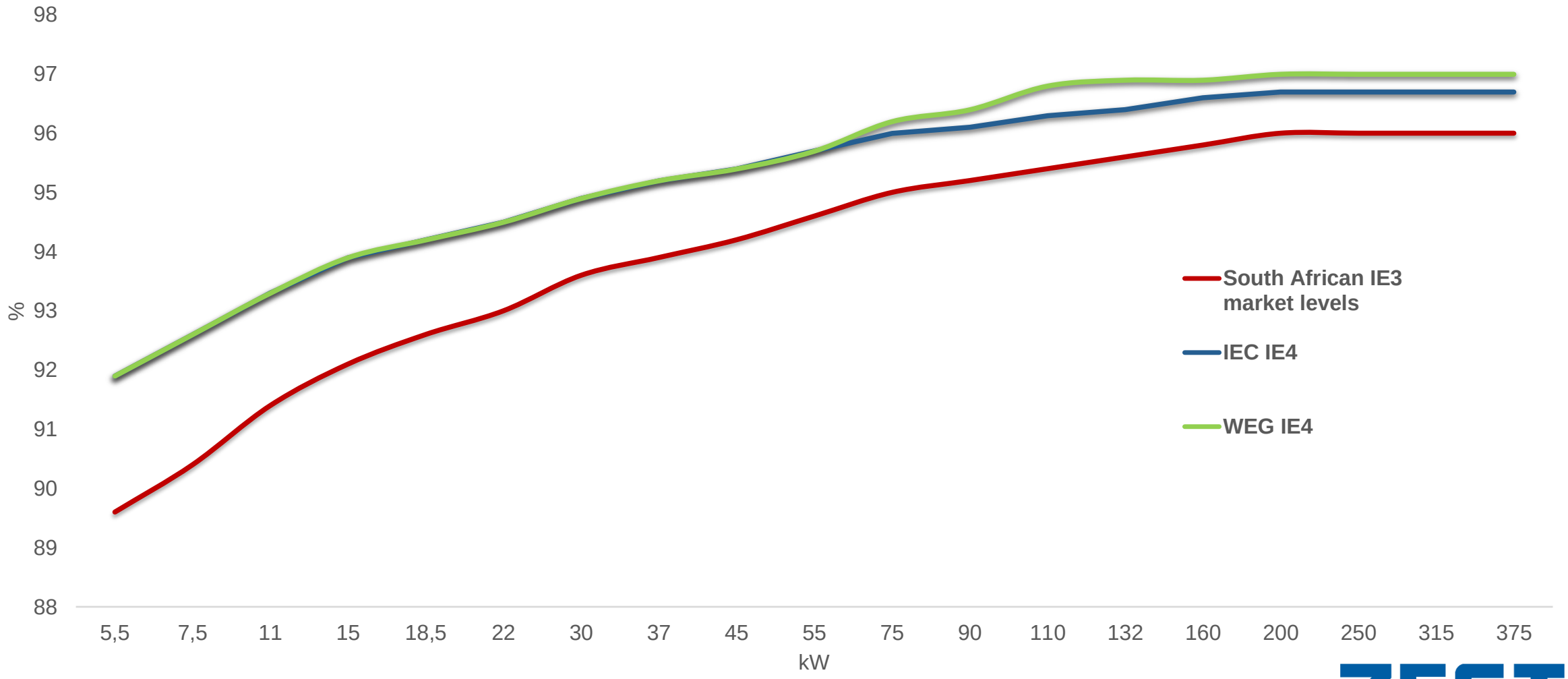
IE3 market levels vs. WEG IE4 levels



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The differences IE3 vs. IE4

	Speed r/min			EFF @100%			PF @100%			In (A)			Il/In LRC			Inrush (A)		
kW	IE3	IE4	Diff	IE3	IE4	Diff	IE3	IE4	Diff	IE3	IE4	Diff	IE3	IE4	Diff	IE3	IE4	Diff
11	1475	1475	0%	91.6	93.3	1.7%	0.83	0.81	-2%	20.9	21	0%	7.5	8.2	9%	350	387	11%
15	1475	1475	0%	92.3	93.9	1.6%	0.84	0.81	-4%	27.9	28.5	2%	7.2	7.2	0%	448	474	6%
18.5	1479	1479	0%	92.8	94.2	1.4%	0.82	0.83	1%	35.1	34.2	-3%	7.4	8.7	18%	589	706	20%
22	1483	1483	0%	93.2	94.5	1.3%	0.83	0.82	-1%	41.0	41	0%	7.3	9.5	30%	679	924	36%
30	1485	1485	0%	93.7	94.9	1.2%	0.81	0.81	0%	57.1	56.3	-1%	7.5	8.6	15%	1000	1140	14%
37	1485	1485	0%	94.1	95.2	1.1%	0.85	0.84	-1%	66.8	66.8	0%	7.7	8.6	12%	1220	1370	12%
55	1485	1485	0%	94.7	95.7	1.0%	0.85	0.83	-2%	98.6	100	1%	7.5	8.3	11%	1740	1950	12%
75	1488	1488	0%	95.2	96	0.8%	0.85	0.84	-1%	134	134	0%	7.5	8.5	13%	2530	2900	15%
90	1488	1488	0%	95.4	96.1	0.7%	0.86	0.86	0%	158	157	-1%	7.0	7.9	13%	2790	3150	13%
110	1491	1491	0%	95.6	96.3	0.7%	0.86	0.86	0%	193	192	-1%	7.7	8.1	5%	3750	3820	2%
132	1490	1490	0%	95.8	96.4	0.6%	0.86	0.86	0%	231	230	0%	7.5	7.5	0%	4290	4210	-2%
160	1490	1490	0%	96.0	96.6	0.6%	0.86	0.86	0%	280	278	-1%	7.7	7.7	0%	5300	5180	-2%
185	1492	1492	0%	96.0	96.7	0.7%	0.85	0.85	0%	327	325	-1%	7.8	7.7	-1%	6220	6010	-3%
200	1490	1490	0%	96.0	96.7	0.7%	0.87	0.86	-1%	346	347	0%	7.1	7.9	11%	5950	6580	11%
250	1490	1490	0%	96.2	96.9	0.7%	0.86	0.86	0%	436	433	-1%	7.9	8	1%	8680	8580	-1%
300	1491	1491	0%	96.2	96.7	0.5%	0.85	0.85	0%	530	527	-1%	7.6	7.8	3%	10100	10200	1%
355	1493	1493	0%	96.5	96.7	0.2%	0.86	0.82	-5%	617	646	5%	7.2	7.9	10%	11400	12500	10%

Starting currents and other related performance data is very similar to the IE3 designs, with no significant increases in Inrush currents, making the IE3 Switchgear compatible.

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Payback Times IE4 vs. IE1

Rating	Efficiency %	Efficiency %	Payback time in years against IE1 running hours per year, 75% duty point								
kW	WEG IE1	WEG IE4	1000	2000	3000	4000	5000	6000	7000	8000	8760
55	93.1	95.7	5.6	2.8	1.9	1.4	1.1	0.9	0.8	0.7	0.6
75	93.5	96	4.8	2.4	1.6	1.2	1.0	0.8	0.7	0.6	0.5
90	93.8	96.1	5.4	2.7	1.8	1.3	1.1	0.9	0.8	0.7	0.6
110	94.1	96.3	5.5	2.8	1.8	1.4	1.1	0.9	0.8	0.7	0.6
132	94.3	96.4	5.6	2.8	1.9	1.4	1.1	0.9	0.8	0.7	0.6
160	94.5	96.6	5.2	2.6	1.7	1.3	1.0	0.9	0.7	0.6	0.6
200	94.7	96.7	5.4	2.7	1.8	1.4	1.1	0.9	0.8	0.7	0.6
250	94.8	96.9	6.2	3.1	2.1	1.6	1.2	1.0	0.9	0.8	0.7
300	94.8	96.7	6.5	3.2	2.2	1.6	1.3	1.1	0.9	0.8	0.7
355	94.8	96.7	7.9	4.0	2.6	2.0	1.6	1.3	1.1	1.0	0.9

Payback periods are greatly reduced when comparing IE4 motors with IE1 motors, with an Industry payback average of approximately 9 months. The payback between IE4 and IE3 is irrelevant as there is no premium in cost to our customers, therefore one starts saving immediately.

Industry Megaflex Tariff (R0.98/kW/h) (2020/2021)
Industry average running hours is approximately 7300hrs per year

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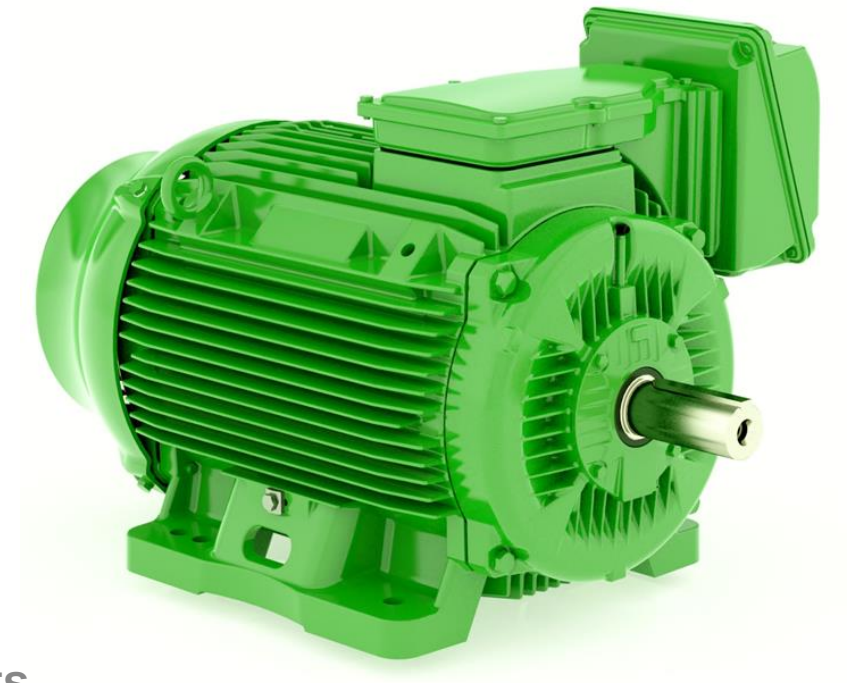
Summary



Benefits

- **Same price as IE3**
- From frames ≥225: 2,4 and 6 Poles (~37 to 355kW)
- Suitable for VSD applications up to **690V**
- Spare parts remain interchangeable
- Reduced **T**otal **C**ost of **O**wnership
- Reduced paybacks, below 1 year
- Most robust and reliable motor range in industry
- Network of pre-approved service providers.

Features

- Efficiency values above IEC IE4 levels
- The most efficient motor in Africa
- Removable gland plates for (frames ≥280)
- Extended grease pipe on DE bearing
- IP66 degree of protection
- WISE® insulation system for VSDs
- Insulated NDE bearing for (frames ≥315)
- Ready to be controlled by VSDs without alterations
- Class H, Trickle Impregnation System
- Premium grade C4 silicon steel laminations to ensure quality core and allow rewinds back to full efficiency
- Versatile split level terminal box
- WSeal® sealing system
- Rubber drains for easy maintenance
- Solid and integrated feet for low vibration levels.

5 Year Guarantee on W22 Range

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Conclusion

- Replacement is relatively simple.
- Trough exchanging existing motors into energy-saving motors, the energy-costs will decrease.
- Current kWh cost in South Africa will increase.
- Premium LV Motor are designed to run for 20 years plus.
- This means that even if the saving is not significant today it will be in some years to come.
- Possible problem is not the price of energy but the lack of energy and energy saving can avoid future load shedding.

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The World's Most
Energy Efficient Induction Motor
Range!
From Africa's best motor supplier!
Stock, service and support….

THANK YOU!

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