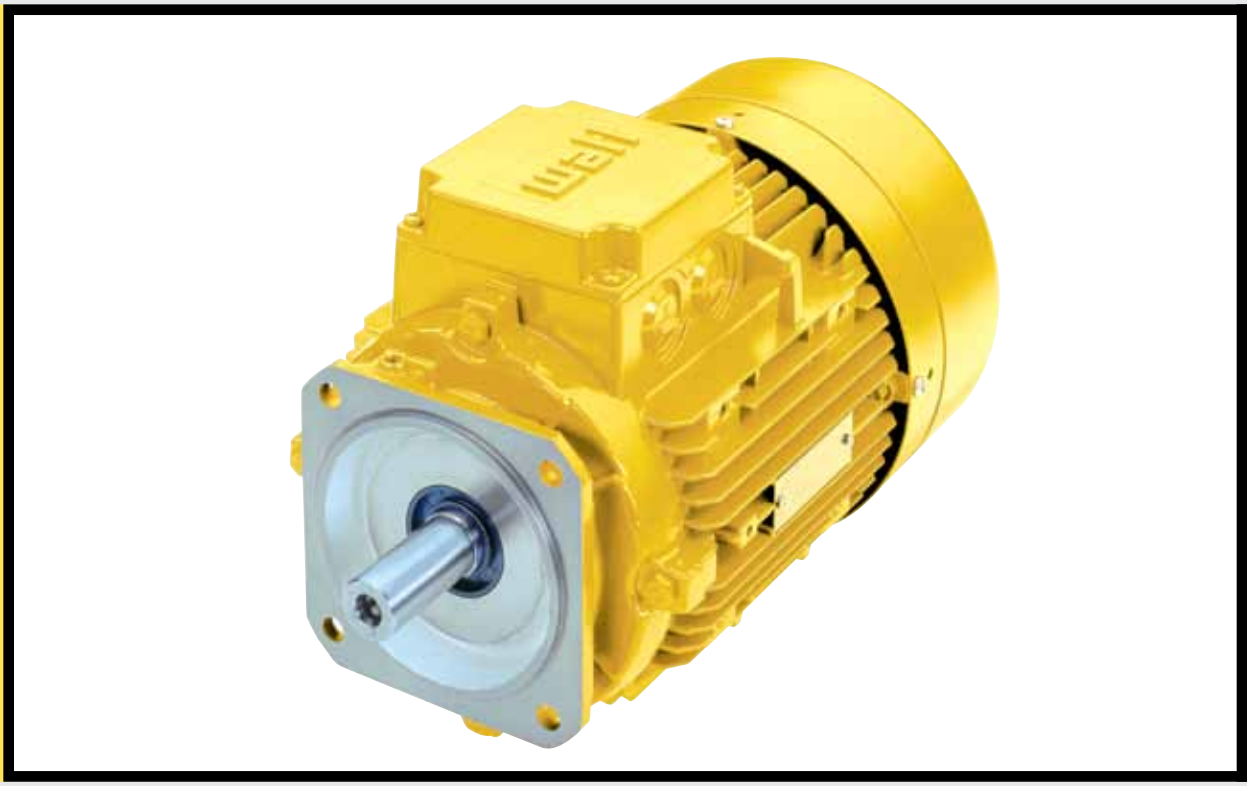
watt drive®

The Double Power Double Speed Story

How To Cut Your Motor Size In Half



EUSAS Worldwide Motors

Power Capacity 3/4 - 75 HP

DIEQUA Corporation

www.diequa.com
630-980-1133

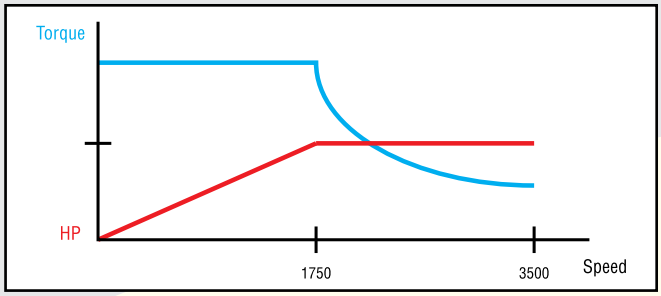
Reduce Your Motor Size While Maintaining Torque

Are you interested in a creative way to reduce gearmotor size and cost in your inverter driven applications? Then the EUSAS motor is what you've been looking for.

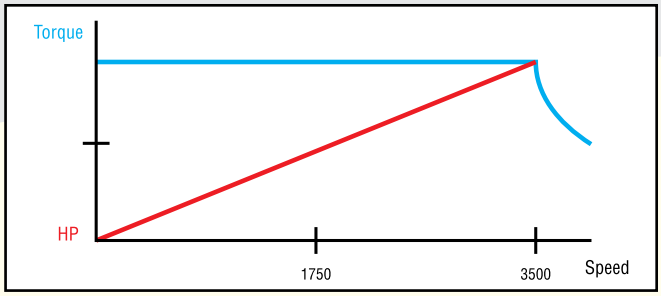
A unique winding with 12 leads, instead of the more typical 6 or 9, and a terminal box with 9 posts gives WATT Drive's EUSAS motor the ability to maintain constant torque throughout its speed range, up to 120 Hz. This effectively doubles the motor's power at top speed resulting in twice the power rating of a conventional motor while saving cost, space, and weight.

How and why does it work? Here's the short Double Power Double Speed story...

Typical Motor Curves

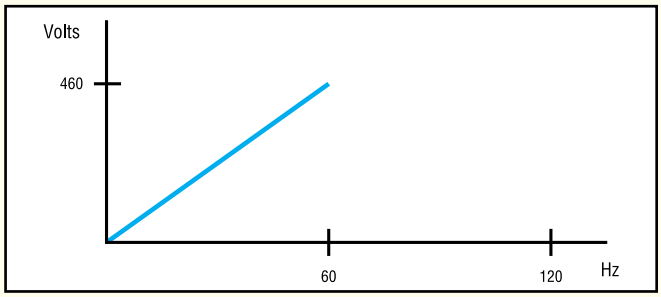


EUSAS Motor Curves

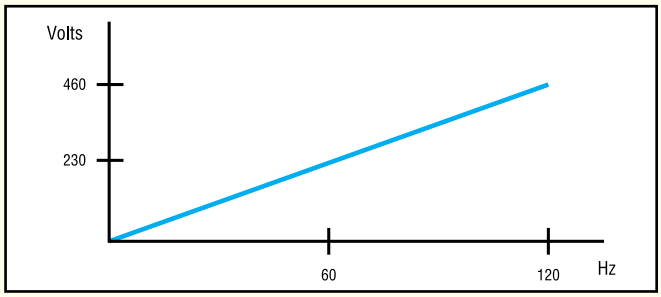


To achieve the EUSAS torque and horsepower curves, high voltage is required, and the inverter needs to be set to supply the ceiling voltage at 120 Hz instead of 60 Hz.

Typical Volts/Hz Inverter Setting

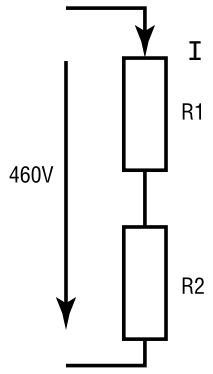


EUSAS Volts/Hz Inverter Setting



To get constant torque to 120 Hz with this new setting, it is required to supply double the current (A). This is possible by wiring the motor in parallel (ΔΔ or YY), instead of in series (Δ or Y), which is typical for 460V. The effective resistance (Rges) in connecting the windings in series is greater than connecting the windings in parallel. So, higher input current (I) is possible with parallel connection. The following example shows magnetic equivalence between the connections and therefore the same flux and torque at the higher current.

Series Connection - Δ



Resistance Assumption

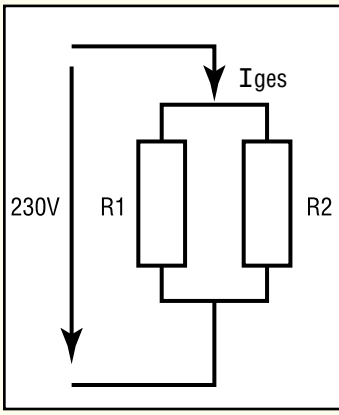
R1 = R2 = 100 Ohm

Rges = R1 + R2 = 200 Ohm

$I = \frac{460V}{200\ Ohm} = 2.3A$

A current of 2.3 amps flows through both windings.

Parallel Connection - ΔΔ



Resistance Assumption

R1 = R2 = 100 Ohm

$Rges = \frac{100 \times 100}{100 + 100} = 50\ Ohm$

$Iges = \frac{230V}{50\ Ohm} = 4.6A$

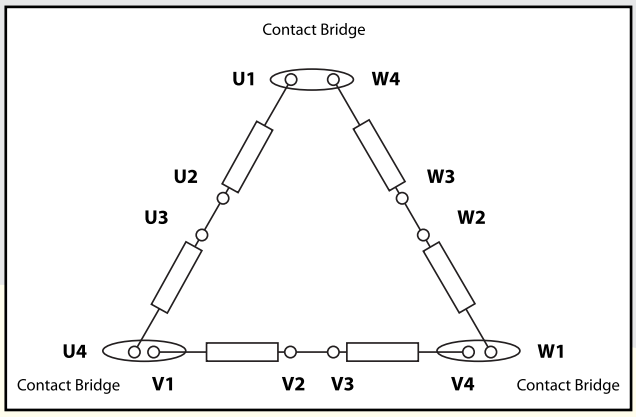
A current of 2.3 amps flows through each winding.

The result is that when wired in parallel and at the higher voltage and current, the inverter can control the Volts/Hz relationship as it is increased to 460V at 120 Hz, maintaining flux and therefore constant torque over the full speed range.

Series and Parallel Connections

Using the previous example, we see the effect of changing to a double delta connection and how it creates the same power at 60 Hz with half the voltage.

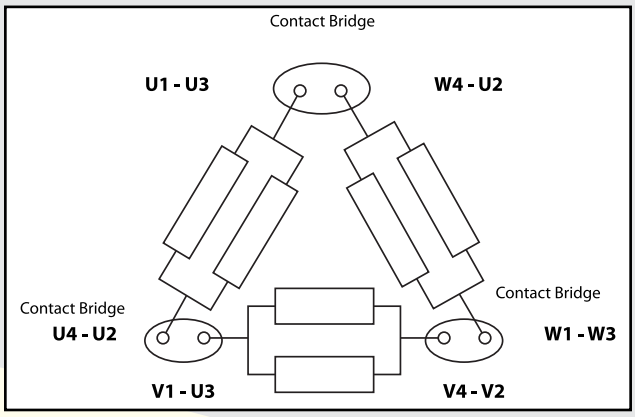
Series Connection - Δ



Current = 2.3 amps
Power = √3 x voltage x current x cosφ

P = √3 x 460 x 2.3 x 0.77 = 1411 WATTS
1411 WATTS = 1.9 HP

Parallel Connection - ΔΔ



Current = 4.6 amps
Power = √3 x voltage x current x cosφ

P = √3 x 230 x 4.6 x 0.77 = 1411 WATTS
1411 WATTS = 1.9 HP

Conclusion: By increasing the voltage to 460V in the parallel connection calculation, the result is double the power.

Application Example:

We need 1220 Nm output torque at 117 RPM using an inline gearmotor with brake.

	Standard Motor	EUSAS Motor
Input Speed	1750	3500
Motor Size	20 HP	10 HP
Gearbox Ratio	15:1	30:1
Torque	1220 Nm	1220 Nm
Gearmotor	HU85A161L4BR	HU85A134M4BR
Weight	385 lbs.	275 lbs.

Cost Savings Example (estimate):

With the smaller motor and brake, savings can be achieved. The same inverter is required for both.

	Standard Motor	EUSAS Motor
Gearbox	$1500	$1500
Motor	$1550	$900
Brake	$875	$600
Totals	$3925	$3000

Savings of more than 30%
(smaller motors may yield smaller savings)

What you need to make this work:

1. A high voltage main power source (460 - 480V).
2. An inverter that can provide the required current.
3. Set the ceiling voltage to be delivered at 120 Hz instead of 60 Hz.
4. Make appropriate terminal connections for wiring in parallel (ΔΔ) or (YY) depending on frame size.
5. Double the gearbox ratio to achieve the desired output.

What to watch out for:

1. Verify the gearbox has the higher speed capacity.
2. Higher ratios may add stages, reducing savings.
3. Higher speeds may result in more noise
4. Available in IEC frame sizes only.

Why "Double Power Double Speed"?

The basic torque, power & speed relationship is:

$$\text{Torque} = \frac{\text{Power x constant}}{\text{Speed}}$$

If constant torque is maintained as the speed is doubled...

$$\text{Torque} = \frac{\text{2 x Power x constant}}{\text{2 x Speed}}$$

...then power is also doubled, in the same motor size.

For motor specs, please visit

cat4CAD®

www.cat4cad.com

EUSAS Motors Provide Maximum Design Versatility

The EUSAS motor is best used with a gearbox. WATT Drive offers 4 options for complete integration of the motor and reducer.

Inline

An extremely compact design provides highly reliable, space-saving performance for the most demanding applications. Available in foot or flange mount designs.

Helical Bevel

A highly efficient, more compact, right angle design with higher capacities for heavier duty or low backlash applications. Available with hollow bores or output shafts.

Parallel Shaft

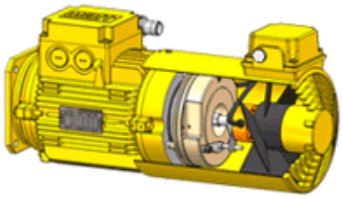
Compact design offer shrink disc or hollow bore options with torque arm and buffer kit support. Single and dual output shafts also available with bolt-on output flanges.

Helical Worm

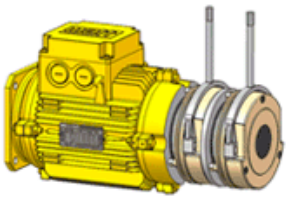
Ground worms and precision helical gears provide high efficiency and quiet operation, with Uniblock mount, shaft mount, and wash down options.

The EUSAS motor has a modular design with a long list of options, many of which are field retro-fittable.

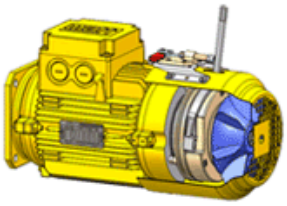
Forced Cooling Brake & Encoder



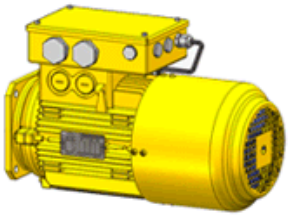
Double Brakes



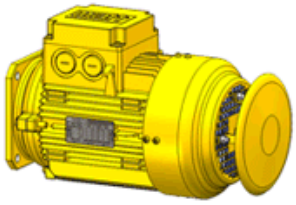
Single Brakes



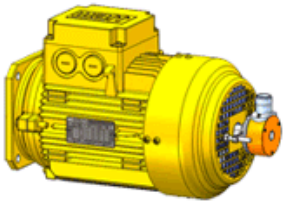
Special Connections



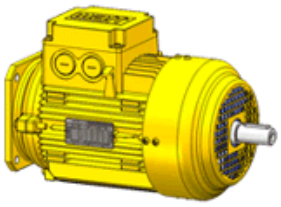
Endshield Covers



Internal/External Encoders



Auxiliary Shafts



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