SYNCHRO-SYM versus MAGNIX Magni250

[*Analysis: Retrofit MAGNIX "Passive Rotor" with an "Active Rotor" as only provided by the circuit and control architecture of SYNCHRO-SYM*]

	SYNCHRO-SYM	MAGNIX Magni250
	[INCLUDES BRTEC & Up to 8x PEAK TORQUE]	[DOES NOT INCLUDE Electronic Control - ***MOTOR ONLY***]
Continuous Power	**560 KW / 750 HP** **@ 3800 RPM, 800V** **@ 1407 Nm Torque** @ 94.4% Motor Efficiency @ **92.2% System Efficiency** # @ 1.25T Airgap Flux Density @ 7 pole-pairs No rare earth permanent magnets (**No RE-PM**)	**280 KW / 375 HP** **@ 1900 MAX Load RPM, 540 V** **@ 1407 Nm Torque** @ 93% Motor Efficiency @ Est. 89% System Efficiency with 96% Efficient Electronic Control # @ ? Airgap Flux Density @ ? pole-pairs RE-PM Amount: ? Kg @ ?T
Diameter	482.5 mm	559 mm ##
Length	169.7 mm	279 mm ##
Weight	99 Kg	MAGNIX Estimated to be 71Kg? ##
Volume	29,144 cm^3 (**W BRTEC & 560KW**)	68,438 cm^3 (**WO electronic control & 280KW**)
Power Density	19.2 KW/L (**W BRTEC & 560KW**)	4.1 KW/L (**WO electronic control & 280KW**)
Half Peak Power 2x	**1120 KW / 1500 HP** ### **@ 3800 RPM, 800V** **@ 2815 Nm Torque** ### @ 87.5.3% System Efficiency #	**N.A.**
Peak Power 4x	**2240 KW / 3001 HP** ### **@ 3800 RPM, 800V** **@ 5631 Nm Torque** ### @ 76.0% System Efficiency #	**N.A.**
Peak Power 8x	***Available w rated BRTEC & Robust Frame Assembly***	**N.A.**
The green design compares BEM-CAD designed SYNCHRO-SYM to the specifications of Magni 250, which clearly show SYNCHRO-SYM is up to half cost, half size, and half loss *for a given unit of power rating*, but *unlike the contestant, SYNCHRO-SYM specification includes the loss, cost, and size of the tightly integrated BRTEC.* With active winding sets on rotor and stator, SYNCHRO-SYM provides failsafe operation with continuous operation with catastrophic failure of the either the rotor or stator winding set. SYNCHRO-SYM has no delicate permanent magnets, back EMF safety, or Cogging issues. *If coaxially stacked (1120 KW), SYNCHRO-SYM can provide gearless axles that drive contra-rotating propellers with twice the redundancy.*		
	[INCLUDES BRTEC &	[INCLUDES Electronic Control]

	Up to 8x PEAK TORQUE]	
Continuous Power	**560 KW** / 750 HP @ **3800 RPM**, **800V** @ 1407 Nm Torque @ 94.4% Motor Efficiency @ **92.2% System Efficiency** [#] @ 1.25T Airgap Flux Density @ 7 pole-pairs **No RE-PM**	**280 KW** / 375 HP @ **1900 MAX Load RPM, 800 V** @ 1407 Nm Torque @ 94.4% Motor Efficiency @ **90.8% System Efficiency** [#] @ 1.25 Airgap Flux Density @ 7 pole-pairs RE-PM Amount: 19.8 Kg @ 1.25T
Diameter	482.5 mm	482.5 mm [##]
Length	169.7 mm	253.8 mm [##]
Weight	99.9 Kg	116.6 Kg [##]
Volume	31,029 cm^3 (**W BRTEC & 560KW**)	46,387 cm^3 (**W electronic control & 280KW**)
Power Density	18 KW/L (**W BRTEC & 560KW**)	6 KW/L (**W electronic control & 280KW**)

The yellow design compares SYNCHRO-SYM (with BRTEC) to Magni250 with integrated electronic control, both of which are designed with BEM-CAD and manufactured with MOTORPRINTER to the same optimizing material, winding, and packaging (including frame) techniques, which clearly show SYNCHRO-SYM is up to half cost, half size, and half loss for a given unit of power rating. Optimization was limited to less than 10 design iterations.

Note: SYNCHRO-SYM is non-optimized design: Only 10 design iterations.
Note: SYNCHRO-SYM is the only brushless, symmetric multiphase wound-rotor "synchronous" doubly-fed electric machine system, as only provided by Brushless Real Time Emulation Control (**BRTEC**).
Note: SYNCHRO-SYM requires the additional size cost and weight of a much more robust axle and frame assembly to meet the ultrahigh peak torque! Also, SYNCHRO-SYM electronic control (BRTEC) rating is designed to meet the indicated peak torque!
Note: [#] System efficiency is the compounded product of electric motor and electronic controller efficiency.
Note: [##] A lower flux density (< 1T) will significantly decrease the amount of RE-PM material from 0.1Kg/KW at 1.25T but with larger size and lower efficiency.
Note: [###] The symmetrical or dual ported transformer circuit topology of SYNCHRO_SYM provides eight times the torque potential as the asymmetric transformer circuit topology.

SYNCHRO-SYM versus MAGNIX Magni250

[*SYNCHRO-SYM Designed To Meet or Exceed MAGNIX Speed-Performance*]

	SYNCHRO-SYM	MAGNIX Magni250
	[INCLUDES BRTEC & Up to 8x PEAK TORQUE]	[DOES NOT INCLUDE Electronic Control - ***MOTOR ONLY***]
Continuous Power	**560 KW / 750 HP** **@ 1900 RPM, 800V** **@ 2816 Nm Torque** @ 94.1% Motor Efficiency @ **92.4% System Efficiency** # @ 1.25T Airgap Flux Density @ 7 pole-pairs **No RE-PM**	**280 KW / 375 HP** **@ 1900 MAX Load RPM, 540 V** **@ 1407 Nm Torque** @ 93% Motor Efficiency @ Est. 89% System Efficiency with 96% Efficient Electronic Control # @ ? Airgap Flux Density @ ? pole-pairs RE-PM Amount: ? Kg @ ?T
Diameter	539.1 mm ####	559 mm
Length	188.5 mm ####	279 mm
Weight	134.3 Kg ####	MAGNIX Estimated to be 71Kg?
Volume	42,993 cm^3 #### (**W BRTEC & 560KW**)	68,438 cm^3 (**WO electronic control & 280KW**)
Power Density	13.3 KW/L (**W BRTEC & 560KW**)	4.1 KW/L (**WO electronic control & 280KW**)
Half Peak Power 2x	**1120 KW / 1500 HP** ### **@ 1900 RPM, 800V** **@ 5631.9 Nm Torque** ### @ 85.8% System Efficiency #	**N.A.**
Peak Power 4x	**2240 KW / 3001 HP** ### **@ 1900 RPM, 800V** **@ 11263.8 Nm Torque** ### @ 72.5% System Efficiency #	**N.A.**
Peak Power 8x	***Available w rated BRTEC & Robust Frame Assembly***	**N.A.**

The green design compares the BEM-CAD designed SYNCHRO-SYM to the specifications of Magni250, which clearly show SYNCHRO-SYM is up to half cost, half size, and half loss *for a given unit of power rating*, but *unlike the contestant, SYNCHRO-SYM specification includes the loss, cost, and size of the tightly integrated BRTEC*. With active winding sets on rotor and stator, SYNCHRO-SYM provides failsafe operation with continuous operation with catastrophic failure of the either the rotor or stator winding set. SYNCHRO-SYM has no delicate permanent magnets, back EMF safety, or cogging issues. *If coaxially stacked (1120 KW), SYNCHRO-SYM can provide gearless axles that drive contra-rotating propellers with twice the redundancy.*

	[INCLUDES BRTEC & Up to 8x PEAK TORQUE]	[INCLUDES Electronic Control]
Continuous Power	**560 KW** / 750 HP	**280 KW** / 375 HP

	@ **1900** RPM, **800V** @ 2816 Nm Torque @ 94.1% Motor Efficiency @ **92.4% System Efficiency** # @ 1.25T Airgap Flux Density @ 7 pole-pairs **No RE-PM**	@ **850 MAX Load RPM, 800 V** @ 2816 Nm Torque @ 94.1% Motor Efficiency @ **90.6 System Efficiency** # @ 1.25 Airgap Flux Density @ 7 pole-pairs RE-PM Amount: 19.8 Kg @ 1.25T
Diameter	539.1 mm ####	539.1 mm ##
Length	188.5 mm ####	272.5 mm ##
Weight	134.3 Kg ####	143.2 Kg ##
Volume	42,993 cm^3 #### (**W BRTEC & 560KW**)	62,164 cm^3 (**W electronic control & 280KW**)
Power Density	13.3 KW/L (**W BRTEC & 560KW**)	4.5 KW/L (**W electronic control & 280KW**)

The yellow design compares SYNCHRO-SYM (with BRTEC) to Magni250 with integrated electronic control, both of which are designed with BEM-CAD and manufactured with MOTORPRINTER to the same optimizing material, winding, and packaging (including frame) techniques, which clearly show SYNCHRO-SYM is up to half cost, half size, and half loss for a given unit of power rating. Optimization was limited to less than 10 design iterations.

Note: SYNCHRO-SYM is non-optimized design: Only 10 design iterations.

Note: SYNCHRO-SYM is the only brushless, symmetric multiphase wound-rotor "synchronous" doubly-fed electric machine system, as only provided by Brushless Real Time Emulation Control (**BRTEC**).

Note: SYNCHRO-SYM requires the additional size cost and weight of a much more robust axle and frame assembly to meet the ultrahigh peak torque! Also, SYNCHRO-SYM electronic control (BRTEC) rating is designed to meet the indicated peak torque!

Note: # System efficiency is the compounded product of electric motor and electronic controller efficiency.

Note: ### The symmetrical or dual ported transformer circuit topology of SYNCHRO_SYM provides eight times the torque potential as the asymmetric transformer circuit topology. Electronic rating designed for indicated peak torque.

The size and weight of the axle and frame size and weight must meet the high peak torque demand

SYNCHRO-SYM versus MAGNIX Magni250

[*SYNCHRO-SYM Designed To Meet or Exceed MAGNIX Power-Performance*]

	SYNCHRO-SYM	MAGNIX Magni250
	[INCLUDES BRTEC & Up to 8x PEAK TORQUE]	[DOES NOT INCLUDE Electronic Control - ***MOTOR ONLY***]
Continuous Power	**280 KW / 375 HP** **@ 1900 RPM, 800V** **@ 1407 Nm Torque** @ 93.9% Motor Efficiency @ **92.9% System Efficiency** # @ 1.25T Airgap Flux Density @ 7 pole-pairs **No RE-PM**	**280 KW / 375 HP** **@ 1900 MAX Load RPM, 540 V** **@ 1407 Nm Torque** @ 93% Motor Efficiency @ Est. 89% System Efficiency with 96% Efficient Electronic Control # @ ? Airgap Flux Density @ ? pole-pairs RE-PM Amount: ? Kg @ ?T
Diameter	460.8 mm	559 mm
Length	149.8 mm	279 mm
Weight	93.8 Kg	MAGNIX Estimated to be 71Kg?
Volume	24,968 cm^3 (**W BRTEC & 280KW**)	68438 cm^3 (**WO electronic control & 280KW**)
Power Density	11.2 KW/L (**W BRTEC & 280KW**)	4.1 KW/L (**WO electronic control & 280KW**)
Half Peak Power 2x	**560 KW / 750 HP** ### **@ 1900 RPM, 800V** **@ 2816.1 Nm Torque** ### @ 86.8% System Efficiency #	**N.A.**
Peak Power 4x	**1120 KW / 3001 HP** ### **@ 1900 RPM, 800V** **@ 5631.9 Nm Torque** ### @ 74.6% System Efficiency #	**N.A.**
Peak Power 8x	***Available w rated BRTEC & Robust Frame Assembly***	**N.A.**

The green design compares the BEM-CAD designed SYNCHRO-SYM to the specifications of Magni250, which clearly show SYNCHRO-SYM is up to half cost, half size, and half loss *for a given unit of power rating*, but *unlike the contestant, SYNCHRO-SYM specification includes the loss, cost, and size of the tightly integrated BRTEC*. With active winding sets on rotor and stator, SYNCHRO-SYM provides failsafe operation with continuous operation with catastrophic failure of the either the rotor or stator winding set. SYNCHRO-SYM has no delicate permanent magnets, back EMF safety, or Cogging issues. *If coaxially stacked (560 KW), SYNCHRO-SYM can provide gearless axles that drive contra-rotating propellers with twice the redundancy.*

	[INCLUDES BRTEC & Up to 8x PEAK TORQUE]	[INCLUDES Electronic Control]
Continuous Power	**280 KW / 375 HP**	**140 KW** / 375 HP

	@ 1900 RPM, 800V **@ 1407 Nm Torque** @ 93.9% Motor Efficiency @ **92.9% System Efficiency** [#] @ 1.25T Airgap Flux Density @ 7 pole-pairs **No RE-PM**	**@ 950 MAX Load RPM, 800 V** @ 1407 Nm Torque @ 93.9% Motor Efficiency @ **90.5% System Efficiency** [#] @ 1.25 Airgap Flux Density @ 7 pole-pairs RE-PM Amount: 9.9 Kg @ 1.25T
Diameter	460.8 mm	460.8 mm [##]
Length	149.8 mm	232.7 mm [##]
Weight	93.8 Kg	91.3 Kg [##]
Volume	24,968 cm^3 (**W BRTEC & 280KW**)	38,778 cm^3 (**W electronic control & 280KW**)
Power Density	11.2 KW/L (**W BRTEC & 280KW**)	3.6 KW/L (**W electronic control & 280KW**)

The yellow design compares SYNCHRO-SYM (with BRTEC) to Magni250 with integrated electronic control, both of which are ***designed with BEM-CAD and manufactured with MOTORPRINTER to the same optimizing material, winding, and packaging (including frame) techniques****, which clearly show SYNCHRO-SYM is up to half cost, half size, and half loss for a given unit of power rating. Optimization was limited to less than 10 design iterations.*

Note: SYNCHRO-SYM is non-optimized design: Only 10 design iterations.
Note: SYNCHRO-SYM is the only brushless, symmetric multiphase wound-rotor "synchronous" doubly-fed electric machine system, as only provided by Brushless Real Time Emulation Control (**BRTEC**).
Note: SYNCHRO-SYM requires the additional size cost and weight of a much more robust axle and frame assembly to meet the ultrahigh peak torque! Also, SYNCHRO-SYM electronic control (BRTEC) rating is designed to meet the indicated peak torque!
Note: [#] System efficiency is the compounded product of electric motor and electronic controller efficiency.
Note: [###] The symmetrical or dual ported transformer circuit topology of SYNCHRO_SYM provides eight times the torque potential as the asymmetric transformer circuit topology. Electronic rating designed for indicated peak torque.