

STAMFORD®

SOL2M-M Wdg.711 - Technical Data Sheet

Standards

STAMFORD industrial alternators meet the requirements of the relevant parts of the IEC 60034 and the relevant sections of other international standards such as BS5000-3, ISO 8528-3, VDE 0530, NEMA MG1-32, CSA C22.2-100 and AS 60034. Other standards and certifications can be considered on request.

Quality Assurance

Alternators are manufactured using production procedures having a quality assurance level to BS EN ISO 9001.



Excitation and Voltage Regulators

Excitation System					
AVR Type	AS540				
Voltage Regulation	± 1%				with 4% Engine Governing
AVR Power	Aux Winding				

No Load Excitation Voltage (V)	13
No Load Excitation Current (A)	0.8
Full Load Excitation Voltage (V)	51
Full Load Excitation Current (A)	3.3
Exciter Time Constant (seconds)	-

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Electrical Data								
Insulation System	H							
Stator Winding	Double Layer Concentric							
Winding Pitch	2/3							
Winding Leads	12							
Winding Number	711							
Number of Poles	4							
IP Rating	IP23							
RFI Suppression	BS EN 61000-6-2 & BS EN 61000-6-4, VDE 0875G, VDE 0875N. Refer to factory for others							
Waveform Distortion	NO LOAD < 1.5% NON-DISTORTING BALANCED LINEAR LOAD < 5.0%							
Short Circuit Ratio	1/Xd							
Steady State X/R Ratio	6.08							
50 Hz					60 Hz			
Telephone Interference	THF<2%				TIF<50			
Cooling Air Flow	0.105 m³/sec				0.126 m³/sec			
Voltage Star (V)	380	400	415	-	416	440	480	-
Voltage Parallel Star (V)	190	200	208	-	208	220	240	-
Voltage Series Delta (V)	220	230	240	-	240	254	277	-
kVA Base Rating (Class H) for Reactance Values (kVA)	18.47	20.2	20.2	-	23.3	24.6	26.4	-
Saturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	1.870	1.846	1.715	-	2.362	2.229	2.010	-
X'd Dir. Axis Transient	0.124	0.123	0.114	-	0.157	0.148	0.134	-
X''d Dir. Axis Subtransient	0.104	0.103	0.095	-	0.131	0.124	0.112	-
Xq Quad. Axis Reactance	1.160	1.145	1.064	-	1.466	1.383	1.248	-
X''q Quad. Axis Subtransient	0.130	0.129	0.120	-	0.165	0.155	0.140	-
XL Stator Leakage Reactance	0.067	0.066	0.061	-	0.085	0.080	0.072	-
X2 Negative Sequence Reactance	0.190	0.188	0.175	-	0.240	0.227	0.205	-
X0 Zero Sequence Reactance	0.041	0.040	0.037	-	0.051	0.048	0.044	-
Unsaturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	2.244	2.215	2.057	-	2.834	2.675	2.412	-
X'd Dir. Axis Transient	0.143	0.141	0.131	-	0.180	0.170	0.154	-
X''d Dir. Axis Subtransient	0.122	0.120	0.112	-	0.154	0.145	0.131	-
Xq Quad. Axis Reactance	1.195	1.180	1.096	-	1.510	1.425	1.285	-
X''q Quad. Axis Subtransient	0.156	0.154	0.144	-	0.198	0.187	0.168	-
XL Stator Leakage Reactance	0.076	0.075	0.069	-	0.096	0.090	0.081	-
Xlr Rotor Leakage Reactance	-	-	-	-	-	-	-	-
X2 Negative Sequence Reactance	0.228	0.225	0.209	-	0.288	0.272	0.246	-
X0 Zero Sequence Reactance	0.047	0.047	0.043	-	0.060	0.057	0.051	-

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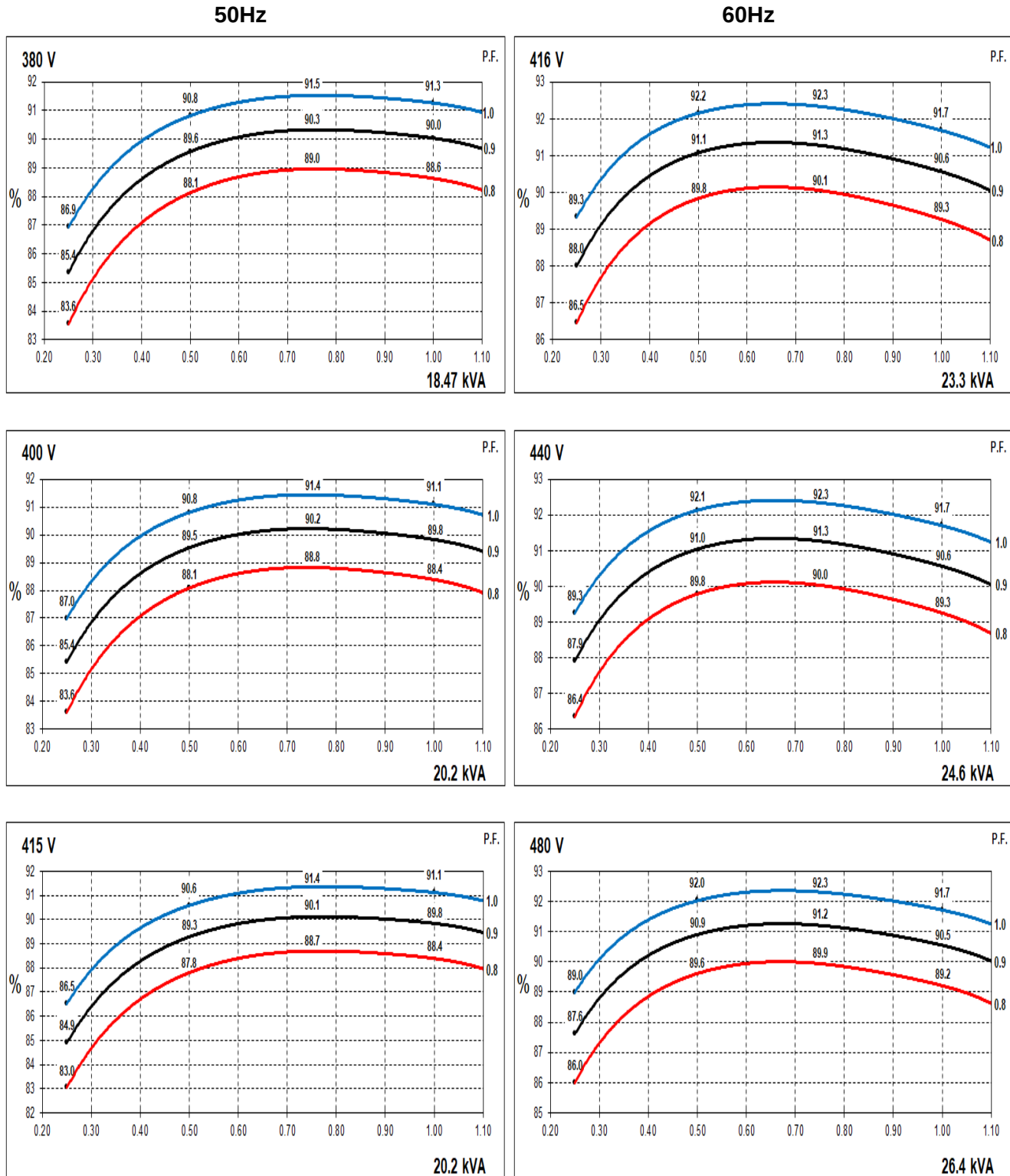
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Time Constants (Seconds)		
T'd Transient Time Const.	0.021	
T''d Sub-Transient Time Const.	0.002	
T'do O.C. Field Time Const.	0.55	
Ta Armature Time Const.	0.006	
T''q Sub-Transient Time Const.	0.003	
Resistances in Ohms (Ω) at 22 ⁰ C		
Stator Winding Resistance (Ra), per phase for series connected	0.29000	
Rotor Winding Resistance (Rf)	0.747	
Exciter Stator Winding Resistance	15.42	
Exciter Rotor Winding Resistance per phase	0.106	
Aux Winding Resistance	5.16	
Positive Sequence Resistance (R1)	0.36250	
Negative Sequence Resistance (R2)	0.41760	
Zero Sequence Resistance (R0)	0.36250	
Saturation Factors	400V	480V
SG1.0	-	-
SG1.2	-	-
Mechanical Data		
Shaft and Keys	All alternator rotors are dynamically balanced to better than ISO 21940-11 Grade 2.5 for minimum vibration in operation. Two bearing generators are balanced with a half key.	
	1 Bearing	2 Bearing
SAE Adaptor	3, 4, 5	3, 4, 5, None
Moment of Inertia	0.1588 kgm²	0.1591 kgm²
Weight Wound Stator	49kg	49kg
Weight Wound Rotor	42.947kg	43.945kg
Weight Complete Alternator	124kg	135kg
Shipping weight in a Crate	164kg	175kg
Packing Crate Size	93 x 59 x 76(cm)	93 x 59 x 76(cm)
Maximum Over Speed	2250 RPM for two minutes	
Bearing Drive End	-	BALL. 6309-2RS (ISO)
Bearing Non-Drive End	Ball Bearing, 6305-2RS1	Ball Bearing, 6305-2RS1

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THREE PHASE EFFICIENCY CURVES

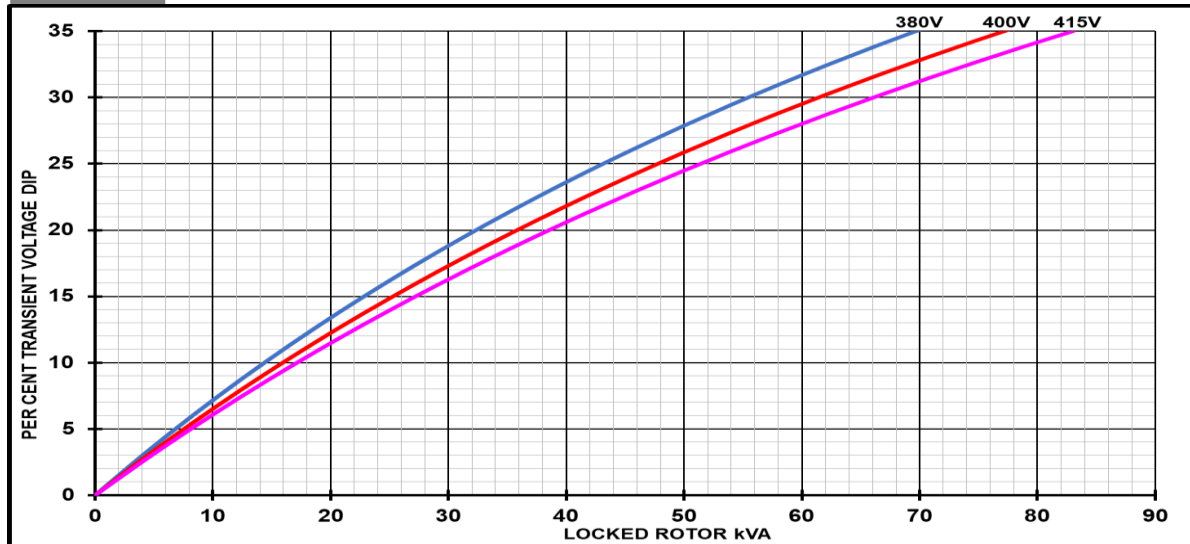


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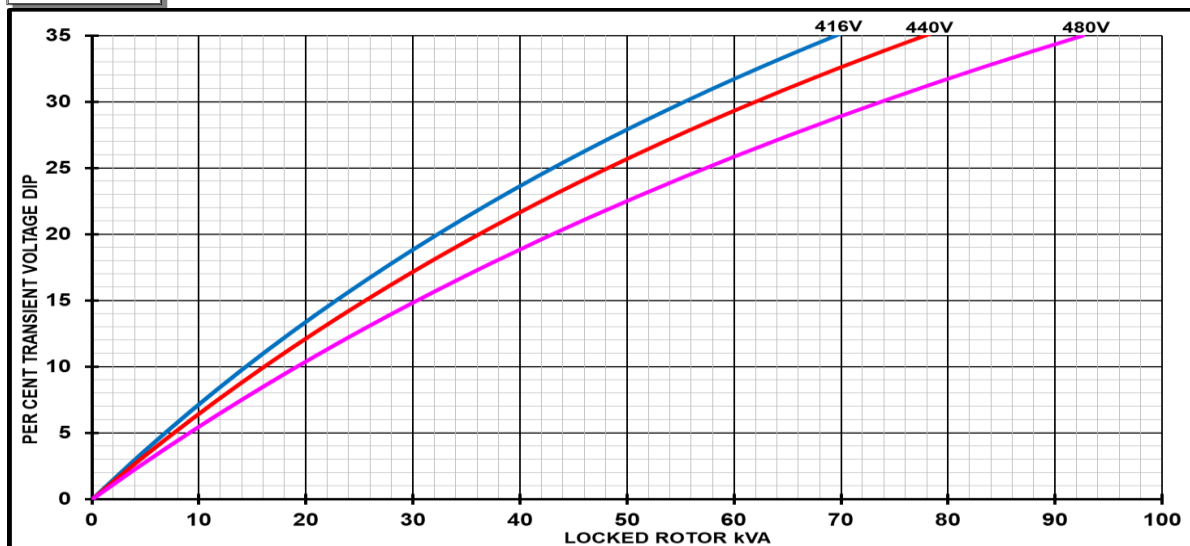
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Locked Rotor Motor Starting Curves - Separately Excited

50Hz



60Hz



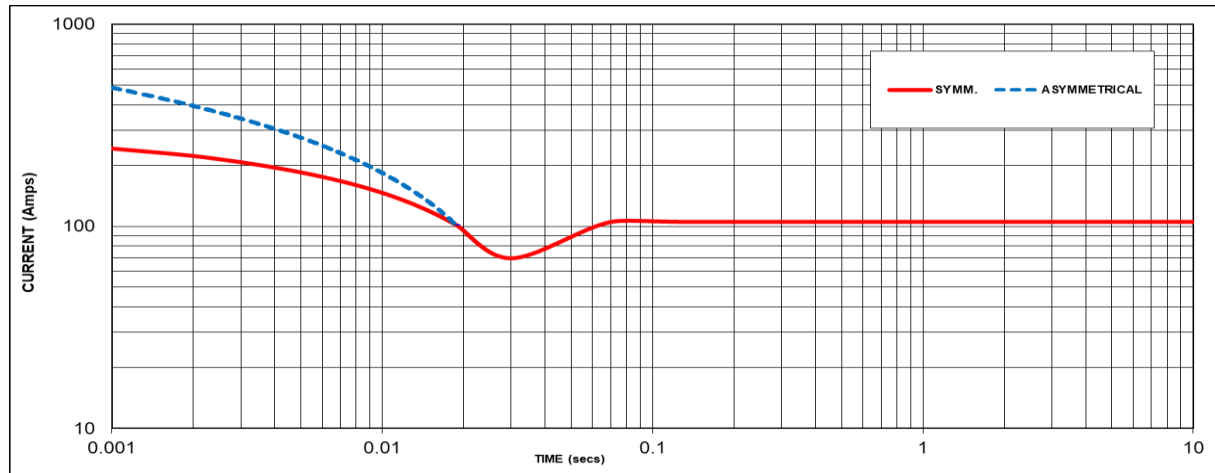
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor	
Lagging PF	Scaling Factor	Lagging PF	Scaling Factor
<= 0.4	1.00	<= 0.4	1.25
0.5	0.95	0.5	1.20
0.6	0.90	0.6	1.15
0.7	0.86	0.7	1.10
0.8	0.83	> 0.7	1.00
0.9	0.75		
0.95	0.70		
1	0.65		

Note: To determine % Transient Voltage Dip or Voltage Rise at various PF, multiply the % Voltage Dip from the curve directly by the Scaling Factor.

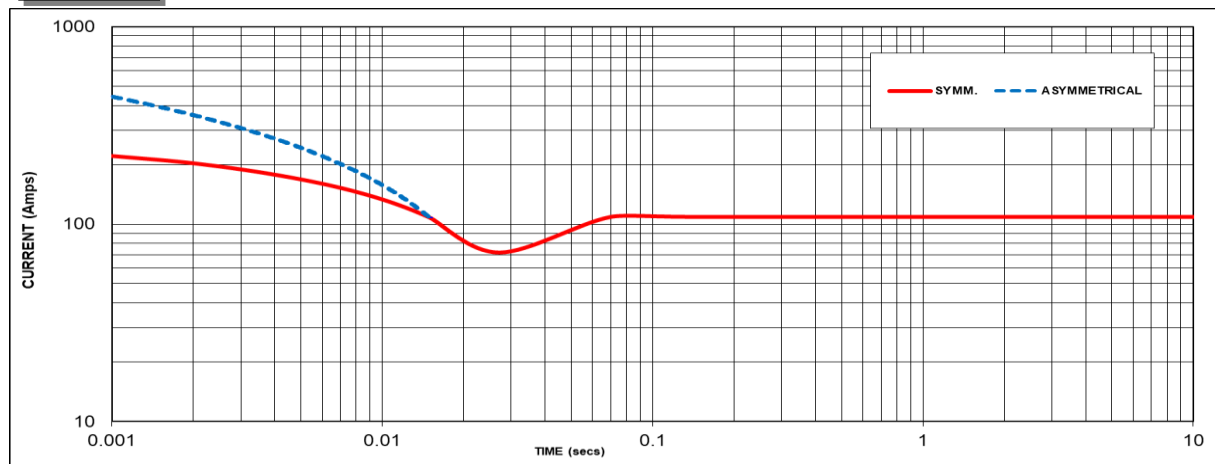
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Three-phase Short Circuit Decrement Curve - Separately Excited

50Hz


Sustained Short Circuit = 105 Amps

60Hz


Sustained Short Circuit = 109 Amps

Note 1

The following multiplication factors should be used to adjust the values from curve between time 0.001 seconds and the minimum current point in respect of nominal operating voltage :

50Hz		60Hz	
Voltage	Factor	Voltage	Factor
380V	X 1.00	416V	X 1.00
400V	X 1.05	440V	X 1.06
415V	X 1.09	480V	X 1.15
-	-	-	-

The sustained current value is constant irrespective of voltage level

The alternator is capable of delivering 300% balanced 3-phase short-circuit current for 10 seconds as per requirements specified by marine agencies

Note 2

The following multiplication factor should be used to convert the values calculated in accordance with NOTE 1 to those applicable to the various types of short circuit :

	3-phase	2-phase L-L	1-phase L-N
Instantaneous	x 1.00	x 0.87	x 1.30
Minimum	x 1.00	x 1.80	x 3.20
Sustained	x 1.00	x 1.50	x 2.50
Max. sustained duration	10 sec.	5 sec.	2 sec.

Note 3

All other times are unchanged

Curves are drawn for Star connections under no-load excitation at rated speeds. For other connection (where applicable) the following multipliers should be applied to current values as shown :

Parallel Star = Curve current value X 2

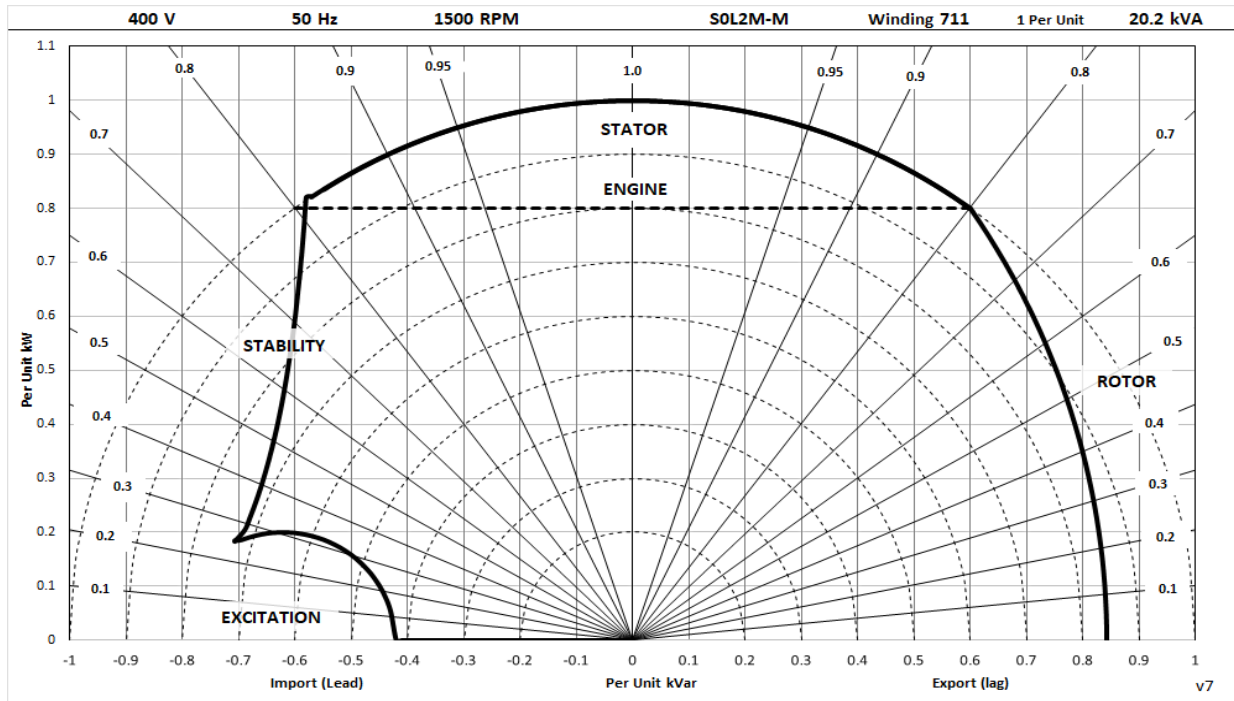
Series Delta = Curve current value X 1.732

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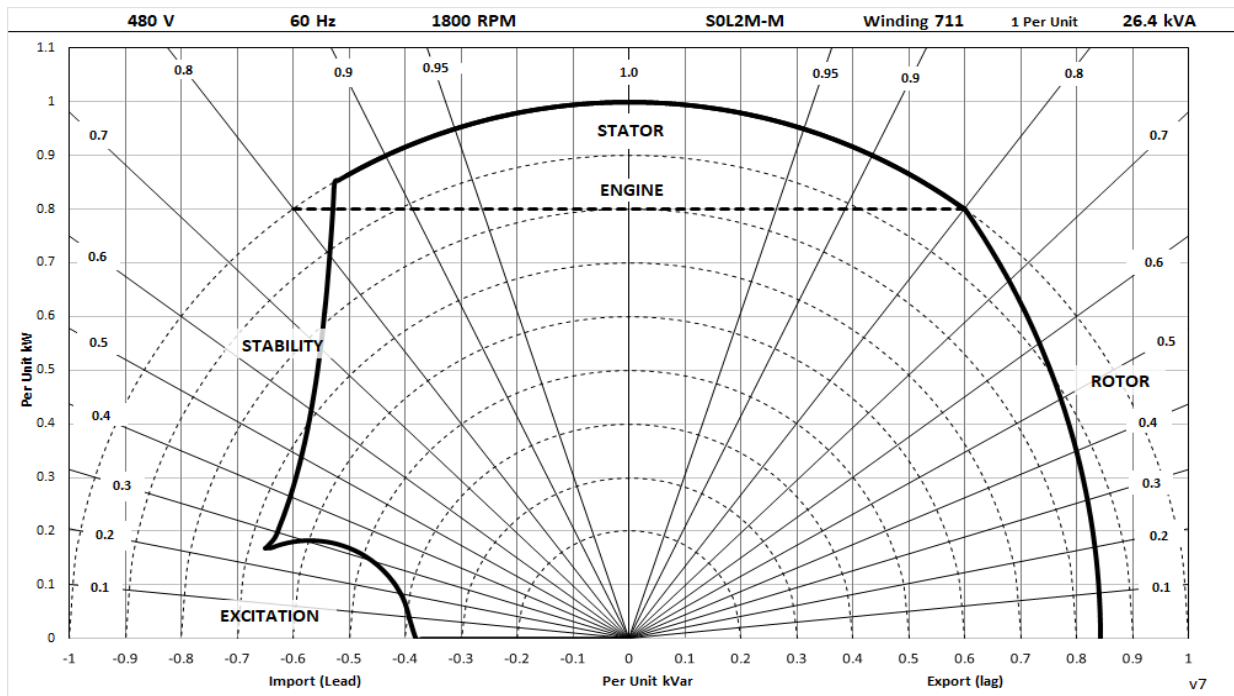
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Typical Alternator Operating Charts

400V/50Hz



480V/60Hz



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RATINGS AT 0.8 POWER FACTOR

Class - Temp Rise		Standby				Cont. H - 110/50°C				Cont. F - 90/50°C				Cont. B - 70/50°C			
50 Hz	Series Star (V)	380	400	415	N/A	380	400	415	N/A	380	400	415	N/A	380	400	415	N/A
	Parallel Star (V)	190	200	208	N/A	190	200	208	N/A	190	200	208	N/A	190	200	208	N/A
	Series Delta (V)	220	230	240	N/A	220	230	240	N/A	220	230	240	N/A	220	230	240	N/A
	kVA	N/A	N/A	N/A	N/A	18.5	20.2	20.2	N/A	16.7	18.3	18.3	N/A	14.7	16.1	16.1	N/A
	kW	N/A	N/A	N/A	N/A	14.8	16.2	16.2	N/A	13.4	14.6	14.6	N/A	11.8	12.9	12.9	N/A
	Efficiency (%)	N/A	N/A	N/A	N/A	88.6	88.4	88.4	N/A	88.9	88.7	88.6	N/A	89.0	88.8	88.7	N/A
	kW Input	N/A	N/A	N/A	N/A	16.7	18.3	18.3	N/A	15.0	16.5	16.5	N/A	13.2	14.5	14.5	N/A

60 Hz	Series Star (V)	416	440	480	N/A	416	440	480	N/A	416	440	480	N/A	416	440	480	N/A
	Parallel Star (V)	208	220	240	N/A	208	220	240	N/A	208	220	240	N/A	208	220	240	N/A
	Series Delta (V)	240	254	277	N/A	240	254	277	N/A	240	254	277	N/A	240	254	277	N/A
	kVA	N/A	N/A	N/A	N/A	23.3	24.6	26.4	N/A	21.0	22.3	23.9	N/A	18.6	19.7	21.1	N/A
	kW	N/A	N/A	N/A	N/A	18.6	19.7	21.1	N/A	16.8	17.8	19.1	N/A	14.9	15.8	16.9	N/A
	Efficiency (%)	N/A	N/A	N/A	N/A	89.3	89.3	89.2	N/A	89.7	89.6	89.6	N/A	90.0	89.9	89.9	N/A
	kW Input	N/A	N/A	N/A	N/A	20.9	22.0	23.7	N/A	18.7	19.9	21.3	N/A	16.5	17.5	18.8	N/A

De-rates

All values tabulated above are subject to the following reductions:

- 5% when air inlet filters are fitted
- 3% for every 500 meters by which the operating altitude exceeds 1000 meters above mean sea level
- 3% for every 5°C by which the operational ambient temperature exceeds 40°C @ Class H temperature rise (please refer to applications for ambient temperature de-rates at other temperature rise classes)
- For marine alternators, 3% for every 5°C by which the operational ambient temperature exceeds 50°C
- For any other operating conditions impacting the cooling circuit please refer to applications

Note: Requirement for operating in an ambient exceeding 60°C and altitude exceeding 4000 meters (for <690V) or 1500 meters (for >690V) must be referred to applications.

Dimensional and Torsional Drawing

For dimensional and torsional information please refer to the alternator General Arrangement and rotor drawings available on our website (<http://stamford-avk.com/>)

Note: Continuous development of our products means that the information contained in our data sheets can change without notice, and specifications should always be confirmed with Cummins Generator Technologies prior to purchase.



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