

# STAMFORD®

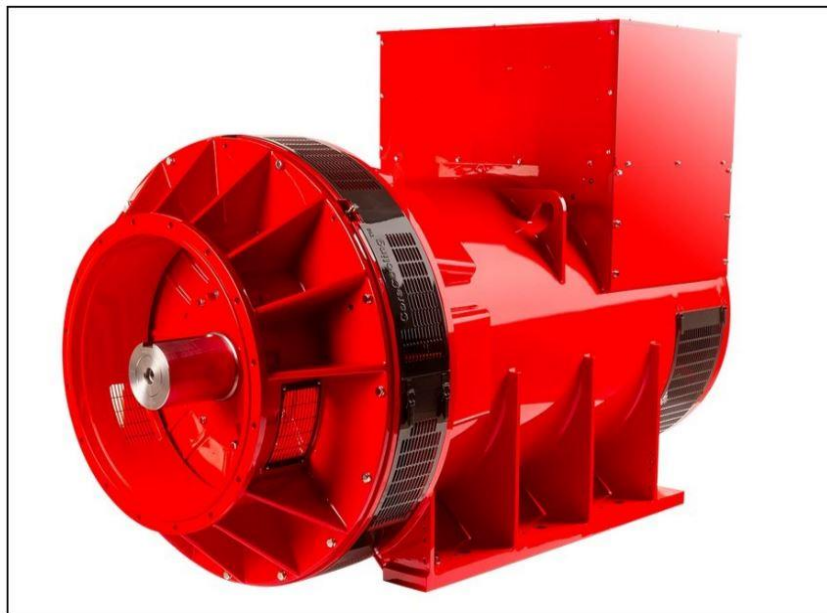
## S7L1M-K4 &S7L1W-K4 (Marine)Wdg.312 - Technical Data Sheet

### 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	MX322	DM110	DECS100	DECS150	
Voltage Regulation	± 0.5%	± 0.25%	± 0.25%	± 0.25%	with 4% Engine Governing
AVR Power	PMG	PMG	PMG	PMG	

No Load Excitation Voltage (V)	27.5
No Load Excitation Current (A)	1.3
Full Load Excitation Voltage (V)	76
Full Load Excitation Current (A)	3
Exciter Time Constant (seconds)	0.18

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## S7L1M-K4 & S7L1W-K4 (Marine)Wdg.312

Electrical Data								
Insulation System	H							
Stator Winding	Double Layer Concentric							
Winding Pitch	2/3							
Winding Leads	6							
Winding Number	312							
Number of Poles	4							
IP Rating	IP23,1P44* (see footnote)							
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	30.71							
50 Hz					60 Hz			
Telephone Interference	THF<2%				TIF<50			
Cooling Air Flow	3.1 m <sup>3</sup> /sec				3.72 m <sup>3</sup> /sec			
Voltage Star (V)	380	400	415	-	416	440	460	480
Voltage Parallel Star (V)	-	-	-	-	-	-	-	-
Voltage Delta (V)	-	-	-	-	-	-	-	-
kVA Base Rating (Class H) for Reactance Values (kVA)	2500	2500	2400	-	2500	2650	2750	2900
Saturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	1.55	1.40	1.25	-	1.56	1.47	1.40	1.36
X'd Dir. Axis Transient	0.14	0.13	0.11	-	0.14	0.13	0.13	0.12
X''d Dir. Axis Subtransient	0.11	0.10	0.09	-	0.11	0.10	0.10	0.09
Xq Quad. Axis Reactance	1.42	1.28	1.14	-	1.42	1.34	1.28	1.24
X''q Quad. Axis Subtransient	0.18	0.16	0.14	-	0.18	0.17	0.16	0.15
XL Stator Leakage Reactance	0.06	0.05	0.05	-	0.06	0.06	0.05	0.05
X2 Negative Sequence Reactance	0.15	0.13	0.12	-	0.15	0.14	0.13	0.13
X0 Zero Sequence Reactance	0.01	0.01	0.01	-	0.01	0.01	0.01	0.01
Unsaturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	1.86	1.68	1.50	-	1.87	1.77	1.68	1.63
X'd Dir. Axis Transient	0.16	0.14	0.13	-	0.16	0.15	0.14	0.14
X''d Dir. Axis Subtransient	0.13	0.11	0.10	-	0.13	0.12	0.11	0.11
Xq Quad. Axis Reactance	1.46	1.32	1.17	-	1.46	1.38	1.31	1.27
X''q Quad. Axis Subtransient	0.21	0.19	0.17	-	0.21	0.20	0.19	0.19
XL Stator Leakage Reactance	0.07	0.06	0.05	-	0.07	0.06	0.06	0.06
Xlr Rotor Leakage Reactance	0.13	0.12	0.11	-	0.13	0.12	0.12	0.11
X2 Negative Sequence Reactance	0.18	0.16	0.14	-	0.18	0.17	0.16	0.15
X0 Zero Sequence Reactance	0.02	0.02	0.01	-	0.02	0.02	0.02	0.02

\*Notes:

- 1) S7L1W: IP44 rating with IC81W cooling (watercooled) and 38° C water inlet temperature.
- 2) S7L1M: IP23 rating with IC01 cooling (open-circuit cooling) as standard.

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## S7L1M-K4 &S7L1W-K4 (Marine)Wdg.312

Time Constants (Seconds)		
T'd Transient Time Const.	0.179	
T''d Sub-Transient Time Const.	0.013	
T'do O.C. Field Time Const.	5.920	
Ta Armature Time Const.	0.060	
T''q Sub-Transient Time Const.	0.0117	
Resistances in Ohms ( $\Omega$ ) at 22°C		
Stator Winding Resistance (Ra), per phase for series connected	0.00043	
Rotor Winding Resistance (Rf)	2	
Exciter Stator Winding Resistance	21.78	
Exciter Rotor Winding Resistance per phase	0.0588	
PMG Phase Resistance (Rpmg) per phase	1.91	
Positive Sequence Resistance (R1)	0.0005	
Negative Sequence Resistance (R2)	0.0006	
Zero Sequence Resistance (R0)	0.0005	
Saturation Factors	400V	480V
SG1.0	0.624	0.655
SG1.2	3.022	3.238
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		SAE 0, 00, None
Moment of Inertia	-	60.24 kgm <sup>2</sup>
Weight Wound Stator	-	2365kg
Weight Wound Rotor	-	1862kg
Weight Complete Alternator	-	4980kg
Shipping weight in a Crate	-	5230kg
Packing Crate Size	-	230 x 115 x 155(cm)
Maximum Over Speed	2250 RPM for two minutes	
Bearing Drive End	-	BALL. 6232
Bearing Non-Drive End	-	BALL. 6319

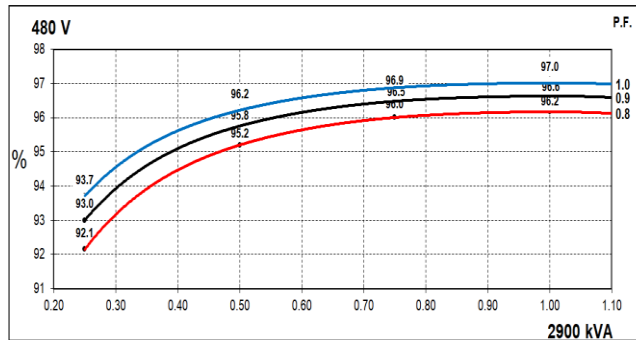
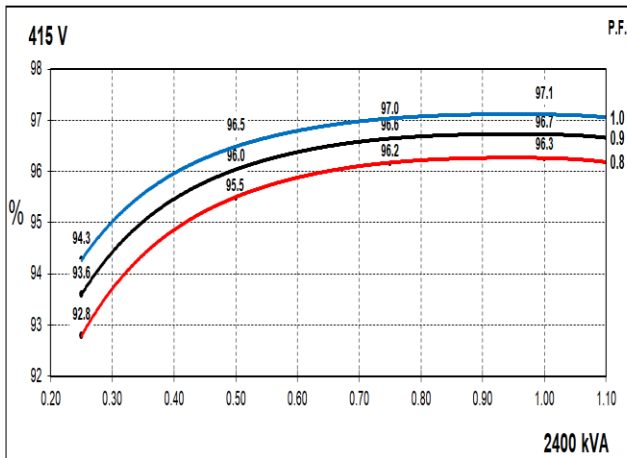
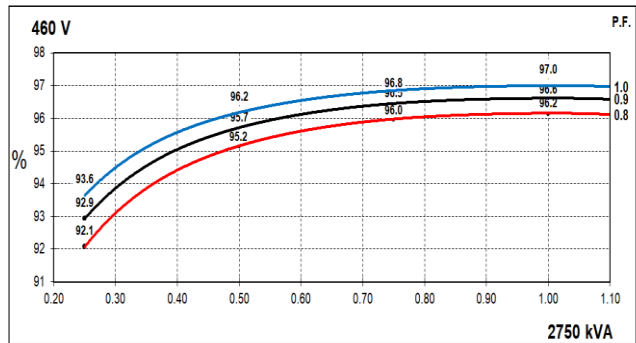
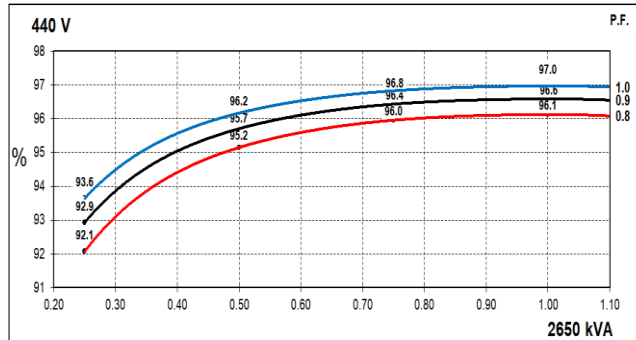
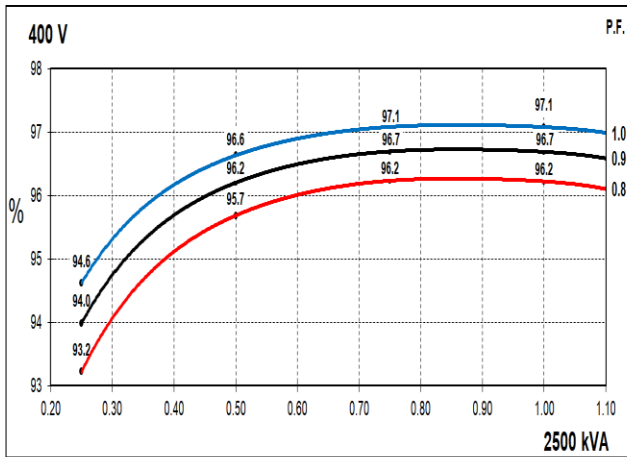
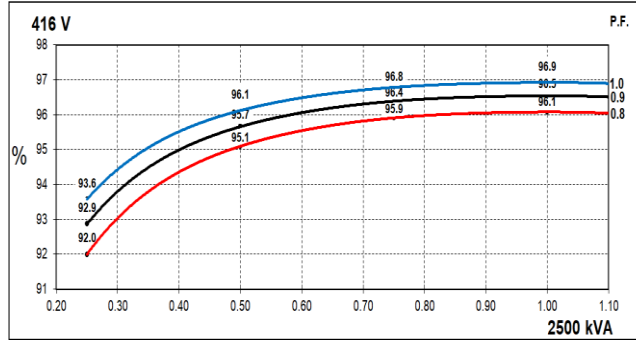
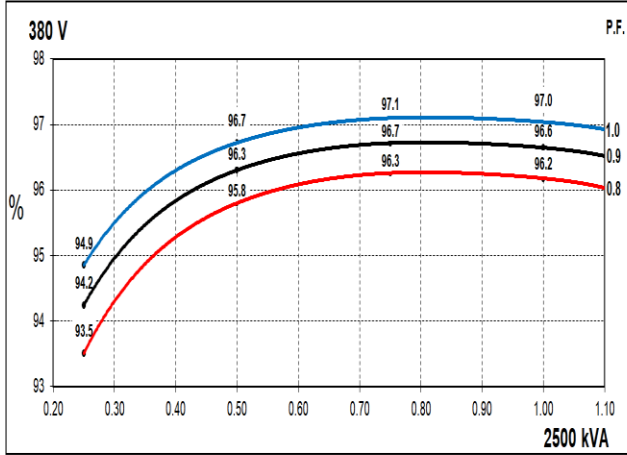
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### THREE PHASE EFFICIENCY CURVES

**50Hz**

**60Hz**

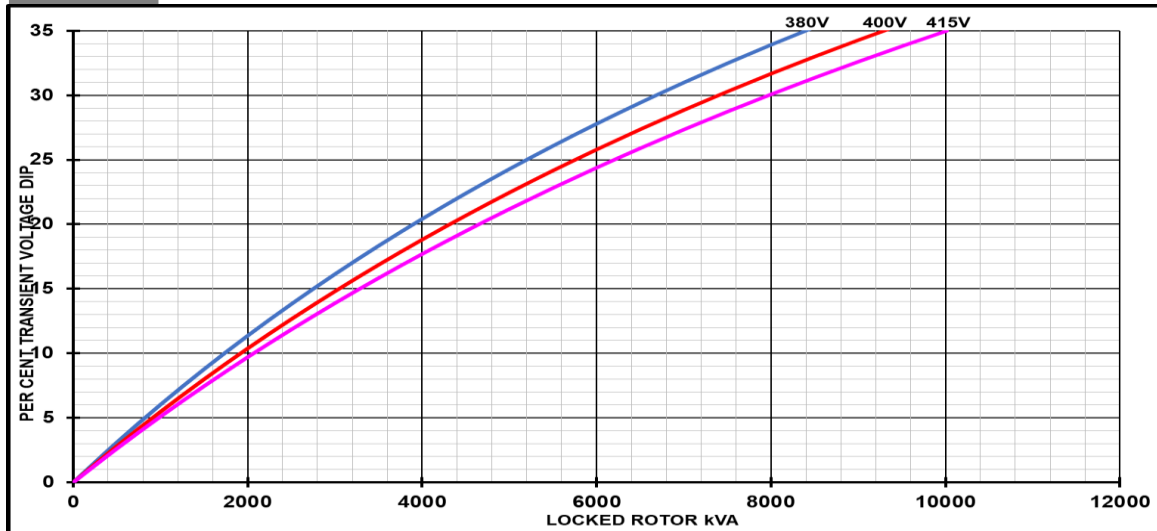


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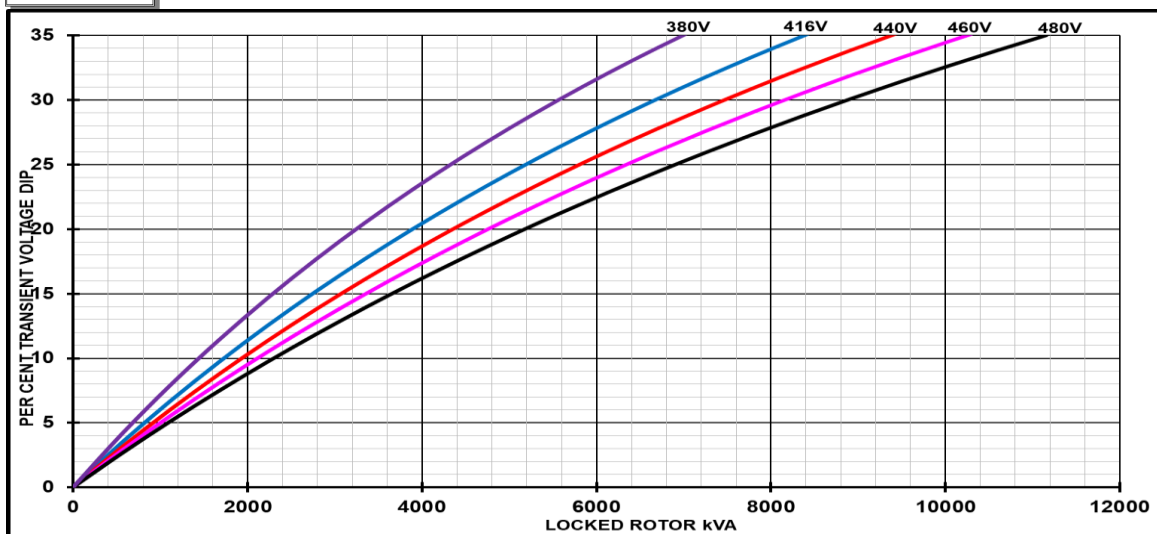
## S7L1M-K4 & S7L1W-K4 (Marine)Wdg.312

### 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		

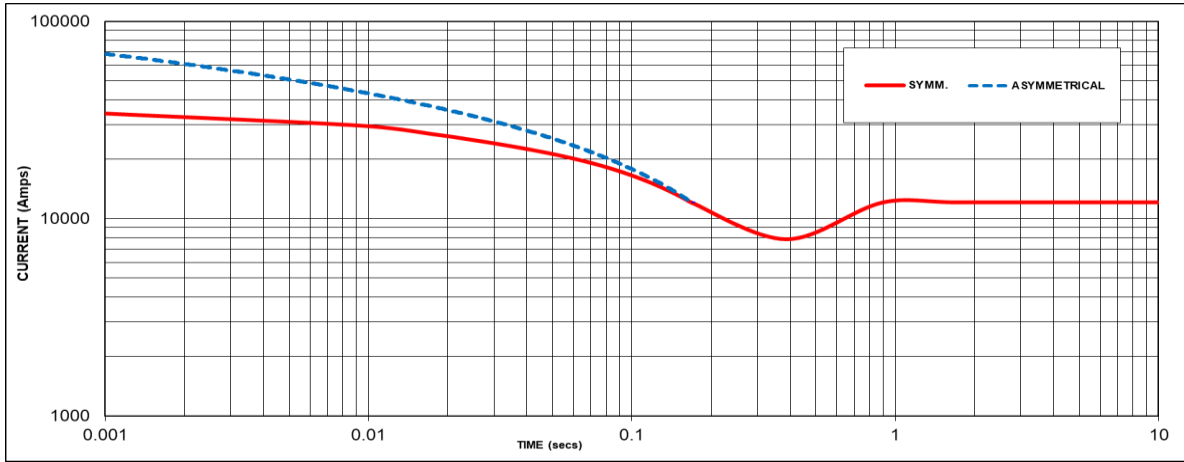
**Note:** To determine % Transient Voltage Dip or Voltage Rise at various PF, multiply the % Voltage Dip from the curve directly by the Scaling Factor.

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## S7L1M-K4 & S7L1W-K4 (Marine)Wdg.312

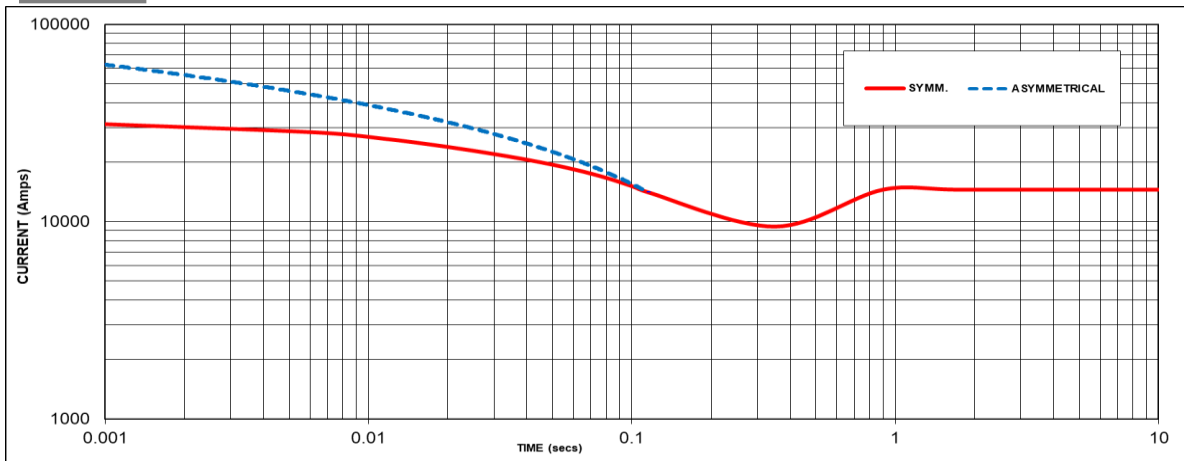
### Three-phase Short Circuit Decrement Curve - Separately Excited

**50Hz**



**60Hz**

Sustained Short Circuit = 12125 Amps



Sustained Short Circuit = 14550 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	460V	X 1.10
-	X 1.16	480V	X 1.15

The sustained current value is constant irrespective of voltage level

**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**

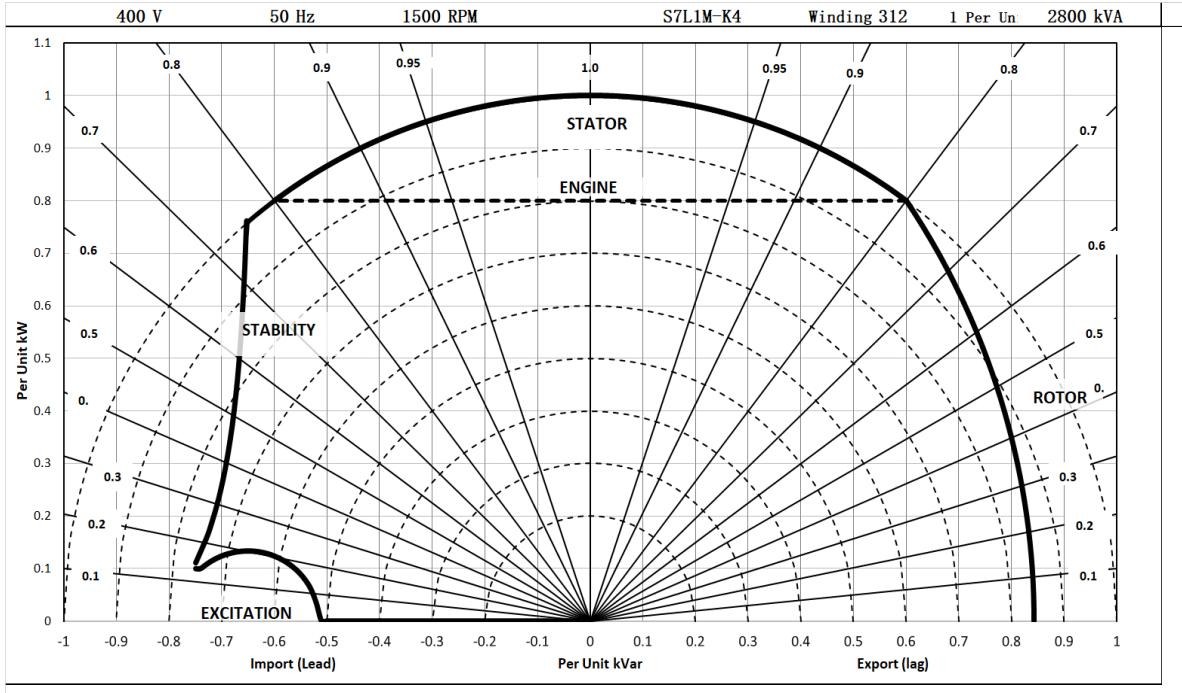
All other times are unchanged  
 Curves are drawn for Star connections under no-load excitation at rated speeds. For other connection (where applicable) the following multipliers should be applied to current values as shown :  
 Parallel Star = Curve current value X 2  
 Series Delta = Curve current value X 1.732

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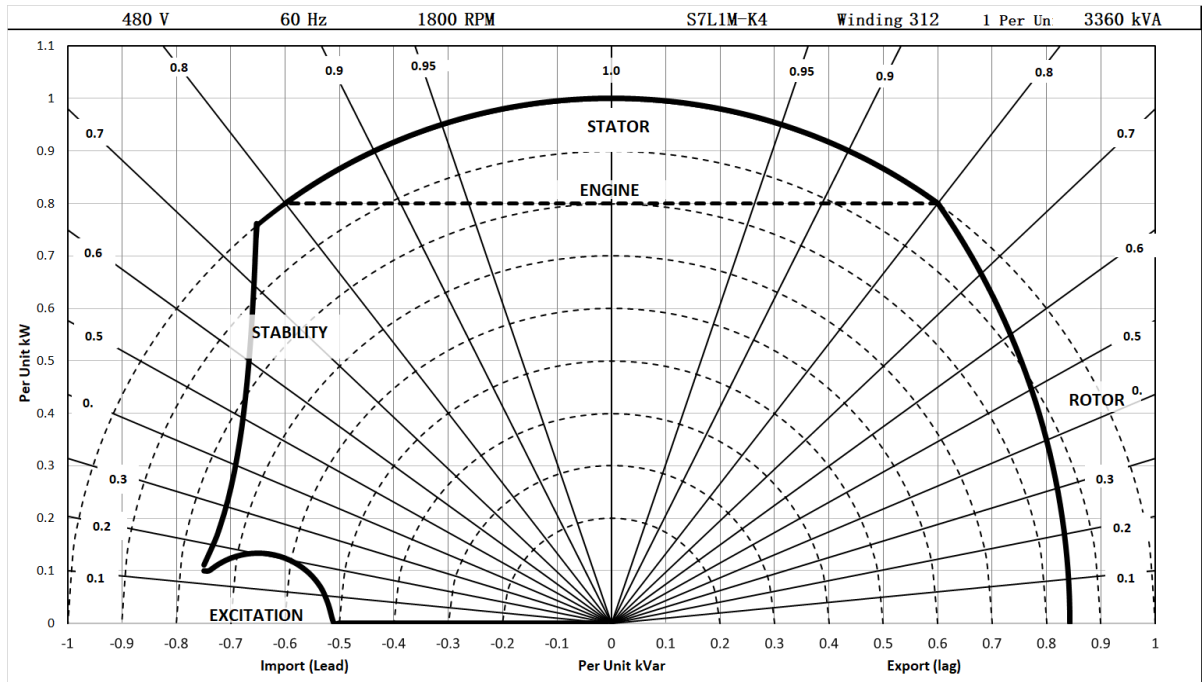
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### Typical Alternator Operating Charts

**400V/50Hz**



**480V/60Hz**



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## S7L1M-K4 & S7L1W-K4 (Marine)Wdg.312

### 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			
<b>50 Hz</b>	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Delta (V)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	kVA	N/A	N/A	N/A	N/A	2500	2500	2400	N/A	2250	2250	2150	N/A	2000	2000	1900	N/A
	kW	N/A	N/A	N/A	N/A	2000	2000	1920	N/A	1800	1800	1720	N/A	1600	1600	1520	N/A
	Efficiency (%)	N/A	N/A	N/A	N/A	96.2	96.2	96.3	N/A	96.3	96.3	96.3	N/A	96.3	96.3	96.2	N/A
	kW Input	N/A	N/A	N/A	N/A	2079	2078	1995	N/A	1870	1870	1787	N/A	1662	1662	1580	N/A

<b>60 Hz</b>	Star (V)	416	440	460	480	416	440	460	480	416	440	460	480	416	440	460	480
	Parallel Star (V)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Delta (V)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	kVA	N/A	N/A	N/A	N/A	2500	2650	2750	2900	2300	2450	2500	2700	2065	2150	2200	2350
	kW	N/A	N/A	N/A	N/A	2000	2120	2200	2320	1840	1960	2000	2160	1652	1720	1760	1880
	Efficiency (%)	N/A	N/A	N/A	N/A	96.1	96.1	96.2	96.2	96.1	96.1	96.1	96.2	96.0	96.0	96.0	96.1
	kW Input	N/A	N/A	N/A	N/A	2082	2205	2288	2412	1915	2039	2080	2246	1721	1791	1832	1957

**Note:**

For S7L1W marine application, ratings are applicable for water inlet temperature up to maximum 38° C

**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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