

A7L1M-K6 & A7L1W-K6 (Marine) Wdg.412 - Technical Data Sheet

Standards

STAMFORD | AvK 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	DECS150	DECS100	DM110		
Voltage Regulation	± 0.25%	± 0.25%	± 0.25%		with 4% Engine Governing
AVR Power	PMG	PMG	PMG		

No Load Excitation Voltage (V)	28.70 - 27.30
No Load Excitation Current (A)	1.33 - 1.27
Full Load Excitation Voltage (V)	95
Full Load Excitation Current (A)	3.7
Exciter Time Constant (seconds)	0.251

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Electrical Data								
Insulation System	H							
Stator Winding	Double Layer Concentric							
Winding Pitch	5/6							
Winding Leads	6							
Winding Number	412							
Number of Poles	6							
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	27.45							
50 Hz					60 Hz			
Telephone Interference	THF<2%				TIF<50			
Cooling Air Flow	2.07 m³/sec				2.48 m³/sec			
Voltage Star (V)	380	400	415	N/A	416	440	460	480
Voltage Parallel Star (V)	-	-	-	N/A	-	-	-	-
Voltage Delta (V)	-	-	-	-	-	-	-	-
kVA Base Rating (Class F) for Reactance Values (kVA)	1575	1625	1625	N/A	1738	1837	1919	2000
Saturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	1.28	1.19	1.11	N/A	1.41	1.34	1.28	1.22
X'd Dir. Axis Transient	0.11	0.10	0.10	N/A	0.12	0.12	0.11	0.11
X" d Dir. Axis Subtransient	0.08	0.08	0.07	N/A	0.09	0.09	0.08	0.08
Xq Quad. Axis Reactance	1.18	1.10	1.02	N/A	1.30	1.23	1.18	1.13
X"q Quad. Axis Subtransient	0.14	0.13	0.12	N/A	0.16	0.15	0.14	0.14
XL Stator Leakage Reactance	0.16	0.15	0.14	N/A	0.17	0.16	0.16	0.15
X2 Negative Sequence Reactance	0.11	0.10	0.09	N/A	0.12	0.11	0.11	0.10
X0 Zero Sequence Reactance	0.08	0.08	0.07	N/A	0.09	0.09	0.08	0.08
Unsaturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	1.54	1.43	1.33	N/A	1.70	1.60	1.53	1.47
X'd Dir. Axis Transient	0.13	0.12	0.11	N/A	0.14	0.13	0.13	0.12
X" d Dir. Axis Subtransient	0.10	0.09	0.08	N/A	0.11	0.10	0.10	0.09
Xq Quad. Axis Reactance	1.22	1.13	1.05	N/A	1.34	1.27	1.21	1.16
X"q Quad. Axis Subtransient	0.17	0.16	0.15	N/A	0.19	0.18	0.17	0.16
XL Stator Leakage Reactance	0.18	0.16	0.15	N/A	0.19	0.18	0.18	0.17
Xlr Rotor Leakage Reactance	0.12	0.11	0.10	N/A	0.13	0.12	0.12	0.11
X2 Negative Sequence Reactance	0.13	0.12	0.11	N/A	0.14	0.14	0.13	0.12
X0 Zero Sequence Reactance	0.10	0.09	0.08	N/A	0.11	0.10	0.10	0.09

*Notes:

- 1) A7L1W: IP44 rating with IC81W cooling (watercooled) and 38° C water inlet temperature.
- 2) A7L1M: IP23 rating with IC01 cooling (open-circuit cooling) as standard.

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Time Constants (Seconds)		
T'd Transient Time Const.	0.119	
T''d Sub-Transient Time Const.	0.014	
T'do O.C. Field Time Const.	3.020	
Ta Armature Time Const.	0.021	
T''q Sub-Transient Time Const.	0.0268	
Resistances in Ohms (Ω) at 22°C		
Stator Winding Resistance (Ra), per phase for series connected	0.00077	
Rotor Winding Resistance (Rf)	3.997	
Exciter Stator Winding Resistance	21	
Exciter Rotor Winding Resistance per phase	0.156	
PMG Phase Resistance (Rpmg) per phase	4.11	
Positive Sequence Resistance (R1)	0.0010	
Negative Sequence Resistance (R2)	0.0011	
Zero Sequence Resistance (R0)	0.0010	
Saturation Factors	400V	480V
SG1.0	0.389	0.439
SG1.2	1.713	1.838
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	-	SAE0,00
Moment of Inertia	-	86 kgm ²
Weight Wound Stator	-	1418kg
Weight Wound Rotor	-	1585kg
Weight Complete Alternator	-	4721kg
Shipping weight in a Crate	-	4971kg
Packing Crate Size	-	230*115*155(cm)
Maximum Over Speed	1500 RPM for two minutes	
Bearing Drive End	-	BALL 6232
Bearing Non-Drive End	-	BALL 6324

Notes:

- 1) Mechanical data are applicable for A7L1M with anti-friction bearing. Refer the GA and rotor drawings for A7L1W and sleeve bearing.
- 2) A7L1W and sleeve bearings are available for 2-bearing alternators only.
- 3) SAE adaptor options are not applicable for sleeve bearing.

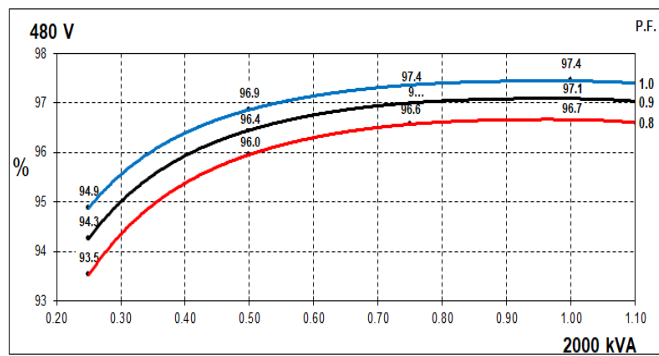
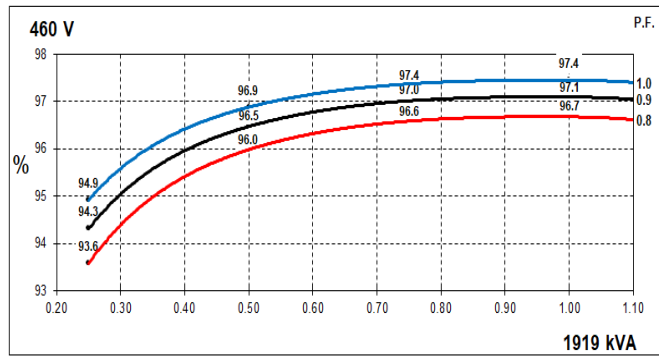
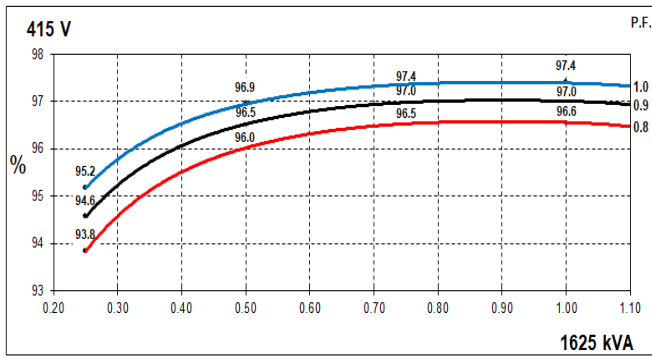
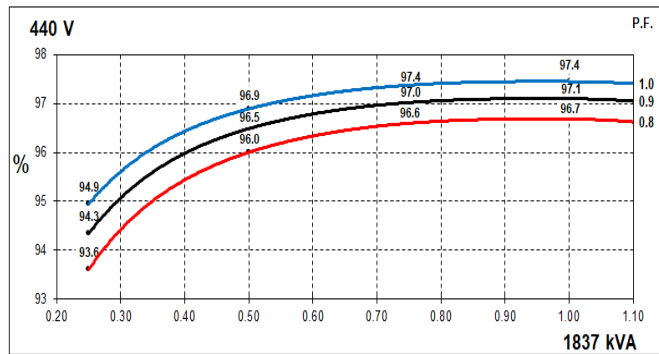
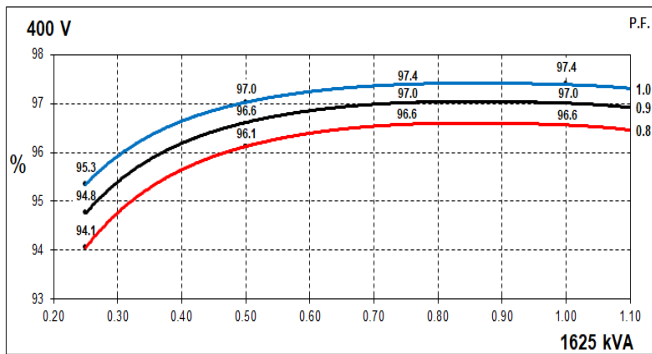
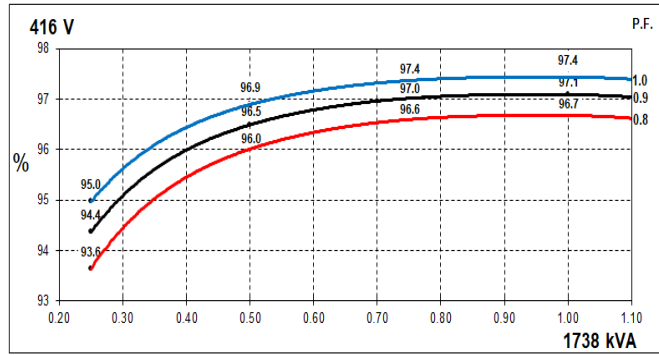
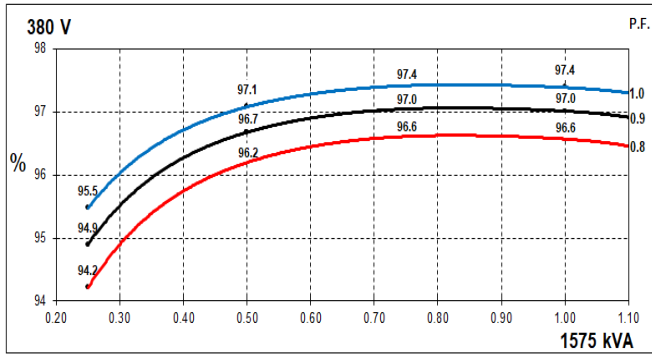
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THREE PHASE EFFICIENCY CURVES

50Hz

60Hz

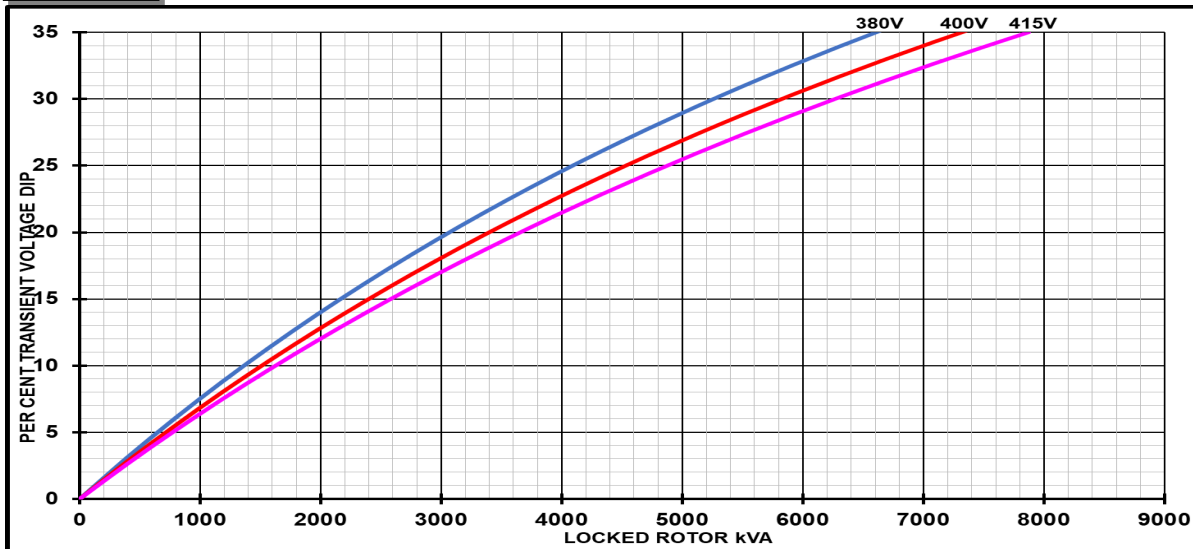


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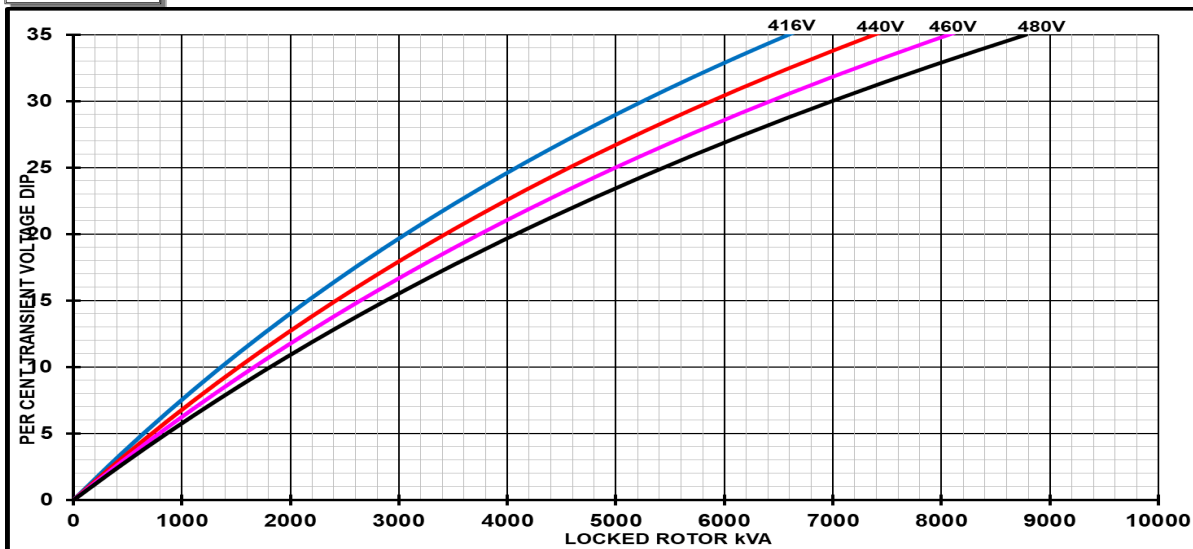
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Locked Rotor Motor Starting Curves - Separately Excited

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		

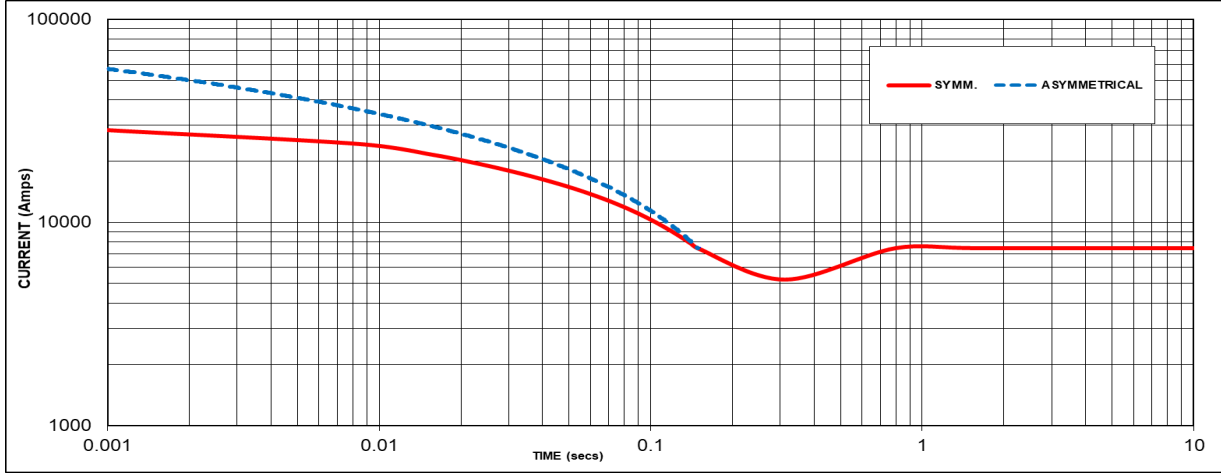
Note: To determine % Transient Voltage Dip or Voltage Rise at various PF, multiply the % Voltage Dip from the curve directly by the Scaling Factor.

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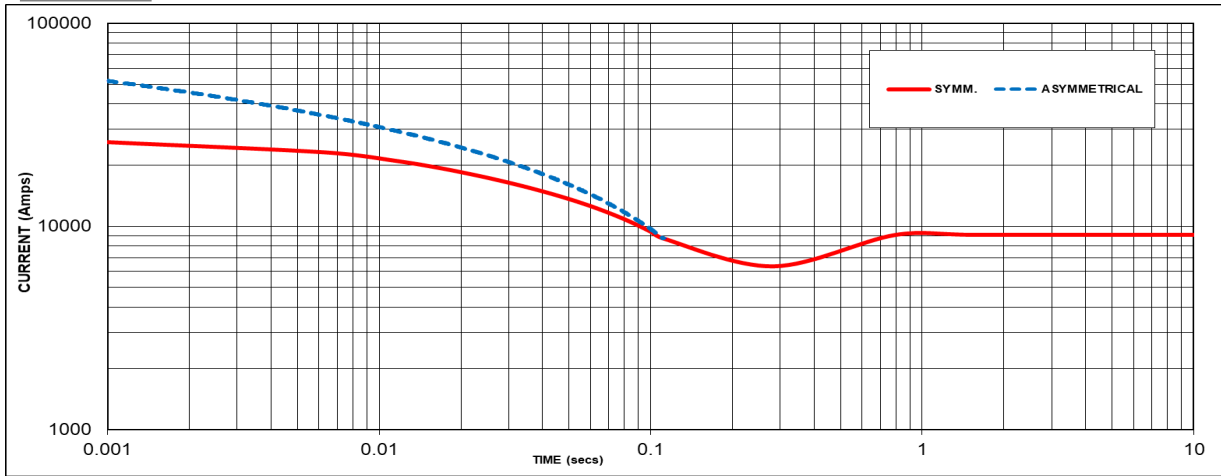
Three-phase Short Circuit Decrement Curve - Separately Excited

50Hz



Sustained Short Circuit = 7470 Amps

60Hz



Sustained Short Circuit = 9080 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 1.07	440V	X 1.06
415V	X 1.12	460V	X 1.12
N/AV	X 1.18	480V	X 1.17

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 :

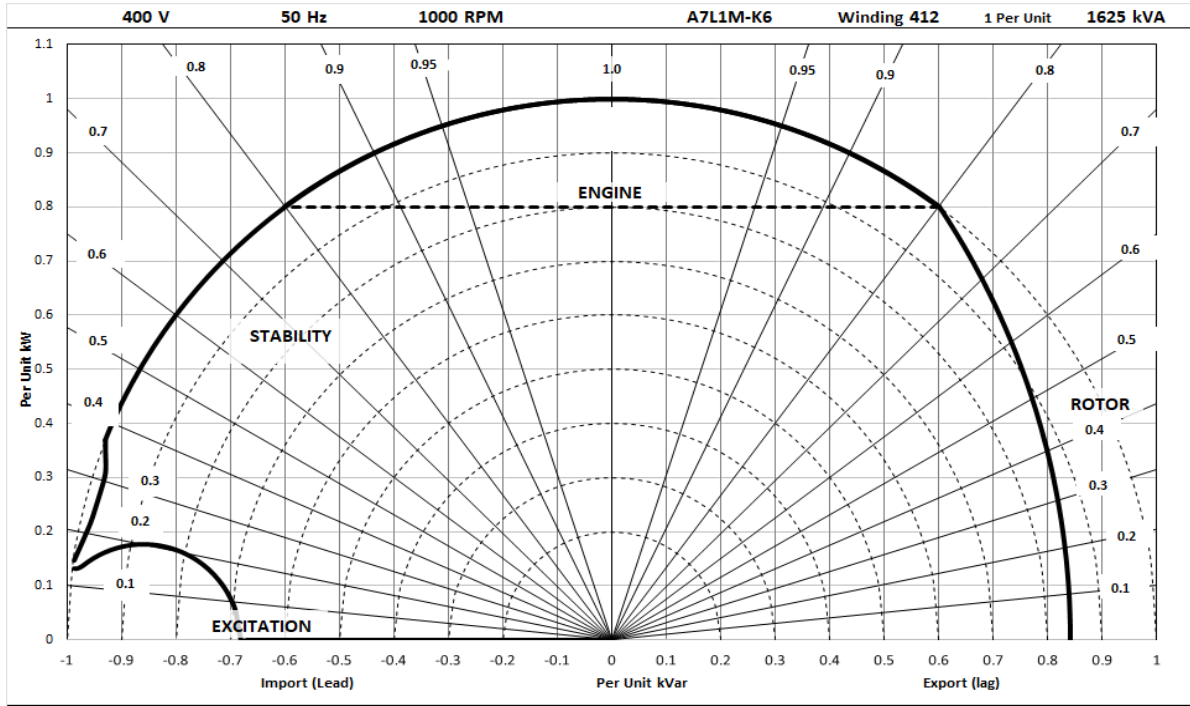
- Parallel Star = Curve current value X 2
- Series Delta = Curve current value X 1.732

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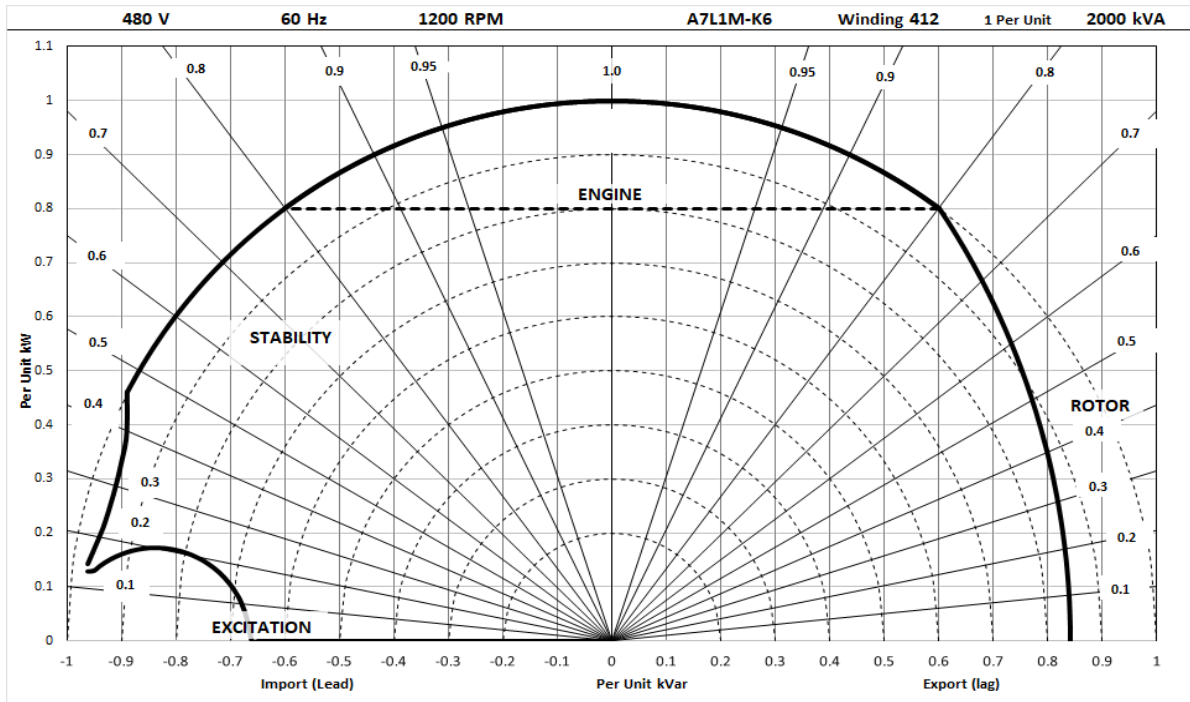
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Typical Alternator Operating Charts

400V/50Hz



480V/60Hz



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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	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	N/A	N/A	N/A	N/A	1575	1625	1625	N/A	1420	1465	1465	N/A
	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1260	1300	1300	N/A	1136	1172	1172	N/A
	Efficiency (%)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	96.6	96.6	96.6	N/A	96.6	96.6	96.6	N/A
	kW Input	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1305	1346	1346	N/A	1176	1213	1213	N/A

60 Hz	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	N/A	N/A	N/A	N/A	1738	1837	1919	2000	1563	1650	1725	1800
	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1390	1470	1535	1600	1250	1320	1380	1440
	Efficiency (%)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	96.7	96.7	96.7	96.7	96.7	96.7	96.7	96.7
	kW Input	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1438	1520	1588	1655	1293	1365	1427	1490

Note:

For A7L1W 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 (not applicable to S7L1W)
- For marine alternators (IP23), 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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