STAMFORD

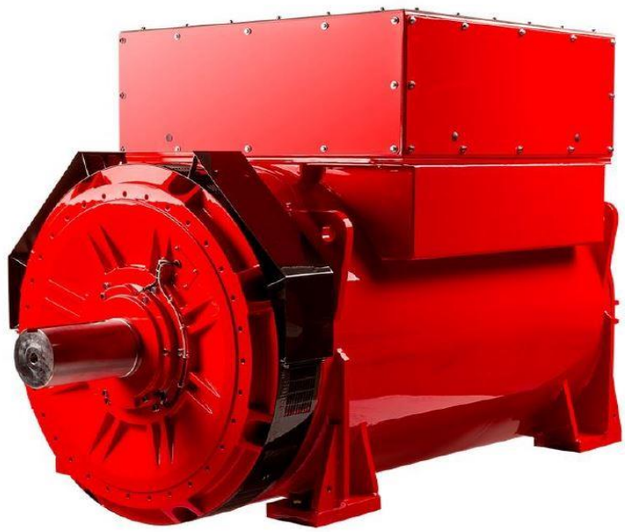
S9M1D-F4 Wdg.51 - Technical Data Sheet

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

No Load Excitation Voltage (V)	10.3 - 10.4
No Load Excitation Current (A)	0.83 - 0.84
Full Load Excitation Voltage (V)	44.7
Full Load Excitation Current (A)	3.62
Exciter Time Constant (seconds)	0.34

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Electrical Data		
Insulation System	H	
Stator Winding	Double Layer Lap	
Winding Pitch	5/6	
Winding Leads	6	
Winding Number	51	
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	49.80	
	50 Hz	**60 Hz**
Telephone Interference	THF<2%	TIF<50
Cooling Air Flow	2.78 m³/sec	3.33 m³/sec
Voltage Series Star (V)	3300	4160
Voltage Parallel Star (V)	-	-
Voltage Delta (V)	-	-
kVA Base Rating (Class H) for Reactance Values (kVA)	3488	4214
Saturated Values in Per Unit at Base Ratings and Voltages		
Xd Dir. Axis Synchronous	3.104	2.832
X'd Dir. Axis Transient	0.224	0.204
X"d Dir. Axis Subtransient	0.140	0.127
Xq Quad. Axis Reactance	1.391	1.269
X"q Quad. Axis Subtransient	0.287	0.262
XL Stator Leakage Reactance	0.165	0.151
X2 Negative Sequence Reactance	0.264	0.241
X0 Zero Sequence Reactance	0.115	0.105
Unsaturated Values in Per Unit at Base Ratings and Voltages		
Xd Dir. Axis Synchronous	3.725	3.398
X'd Dir. Axis Transient	0.258	0.235
X"d Dir. Axis Subtransient	0.163	0.149
Xq Quad. Axis Reactance	1.433	1.307
X"q Quad. Axis Subtransient	0.344	0.314
XL Stator Leakage Reactance	0.186	0.170
Xlr Rotor Leakage Reactance	0.263	0.240
X2 Negative Sequence Reactance	0.317	0.289
X0 Zero Sequence Reactance	0.135	0.123

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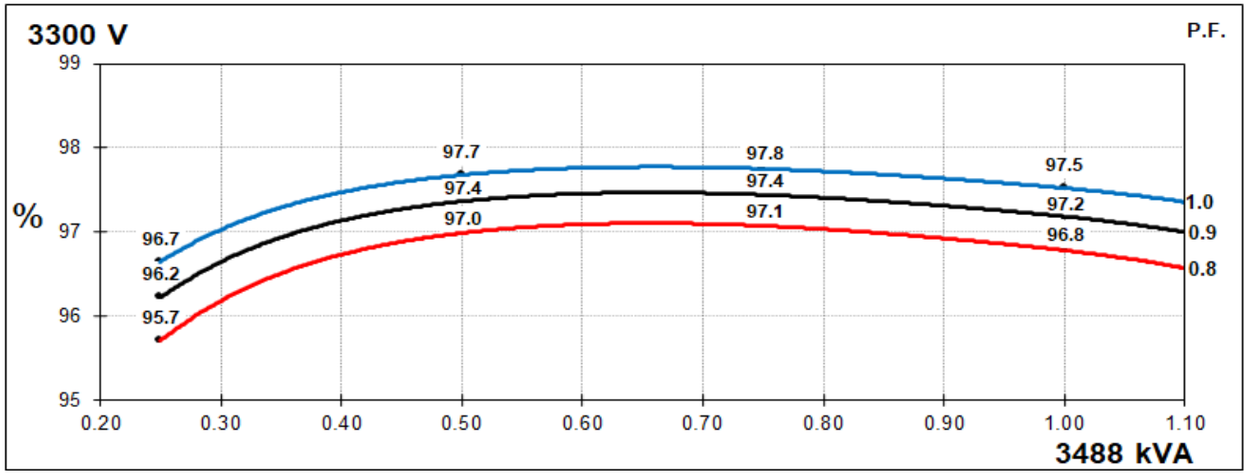
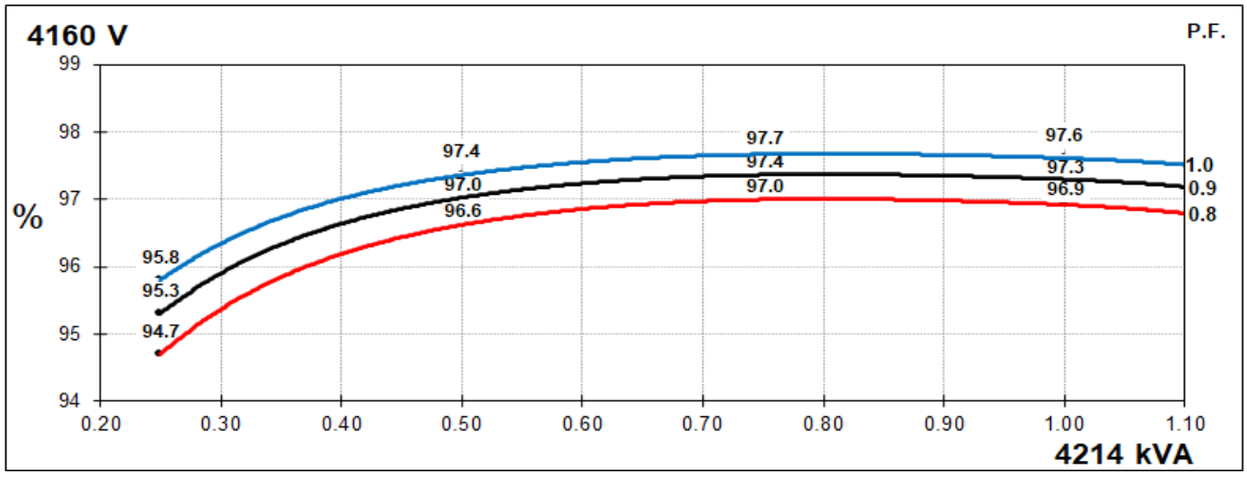
Time Constants (Seconds)		
T'd Transient Time Const.	0.226	
T''d Sub-Transient Time Const.	0.018	
T'do O.C. Field Time Const.	2.879	
Ta Armature Time Const.	0.098	
T''q Sub-Transient Time Const.	0.0200	
Resistances in Ohms (Ω) at 22^{0}C		
Stator Winding Resistance (Ra), per phase for series connected	0.0200	
Rotor Winding Resistance (Rf)	0.69	
Exciter Stator Winding Resistance	11.2	
Exciter Rotor Winding Resistance per phase	0.016	
PMG Phase Resistance (Rpmg) per phase	3.8	
Positive Sequence Resistance (R1)	0.0250	
Negative Sequence Resistance (R2)	0.0288	
Zero Sequence Resistance (R0)	0.0250	
Saturation Factors	3300V	4160V
SG1.0	0.15	0.11
SG1.2	0.63	0.614
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		0, 00, None
Moment of Inertia	-	102.6 kgm²
Weight Wound Stator	-	2487kg
Weight Wound Rotor	-	2381kg
Weight Complete Alternator	-	6650kg
Shipping weight in a Crate	-	7030kg
Packing Crate Size	-	280 x 200 x 220(cm)
Maximum Over Speed	2250 RPM for two minutes	
Bearing Drive End	-	6236
Bearing Non-Drive End	-	6324

THREE PHASE EFFICIENCY CURVES

50Hz

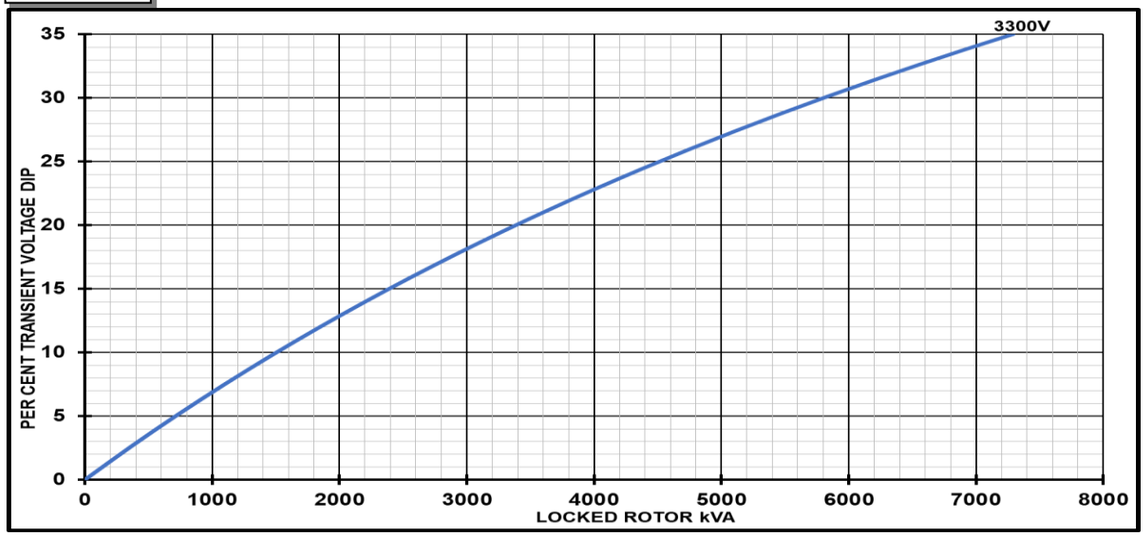


60Hz

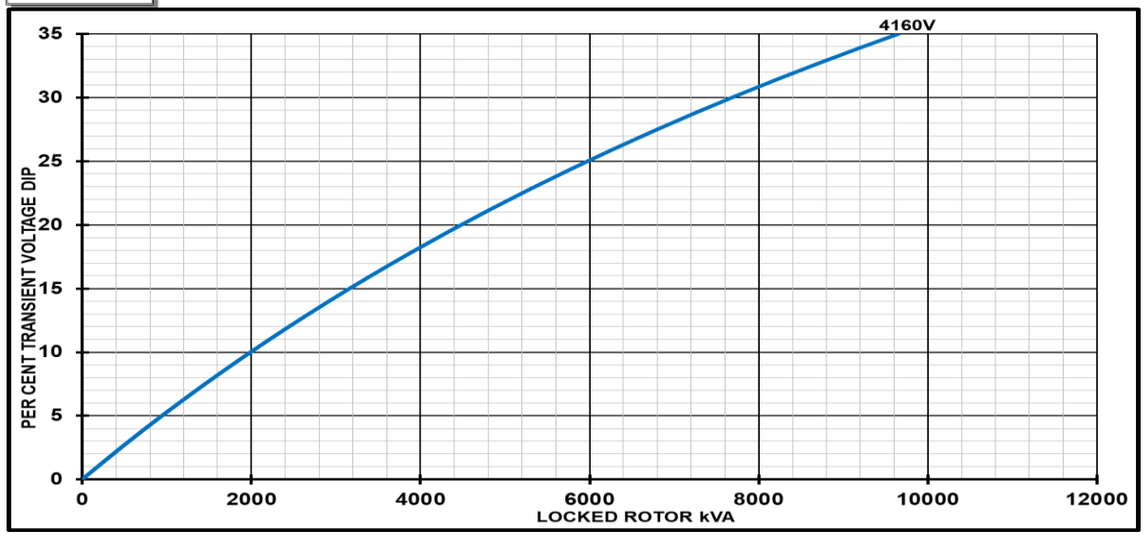


Locked Rotor Motor Starting Curves - Separately Excited

50Hz



60Hz



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

Transient Voltage Rise Scaling Factor	
Lagging PF	Scaling Factor
<= 0.4	1.25
0.5	1.20
0.6	1.15
0.7	1.10
> 0.7	1.00

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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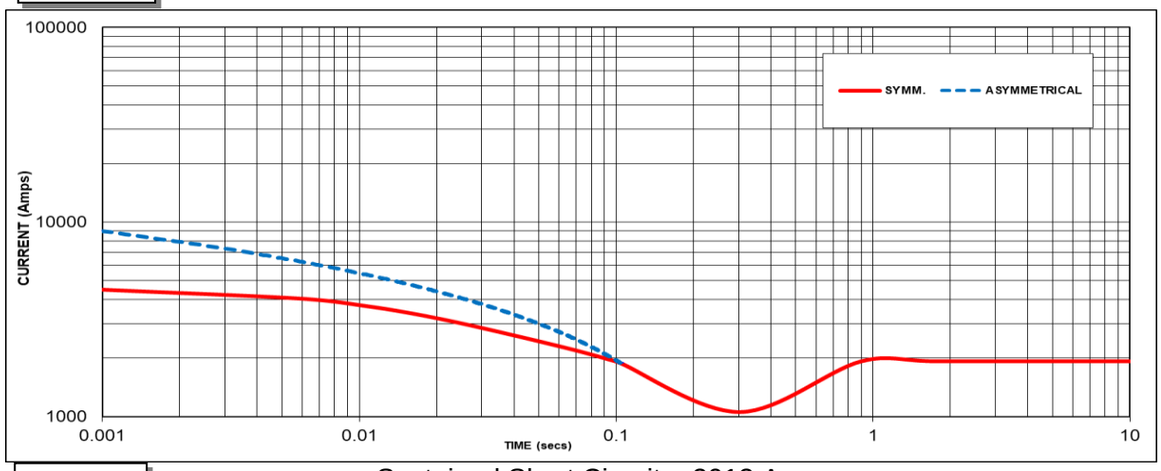
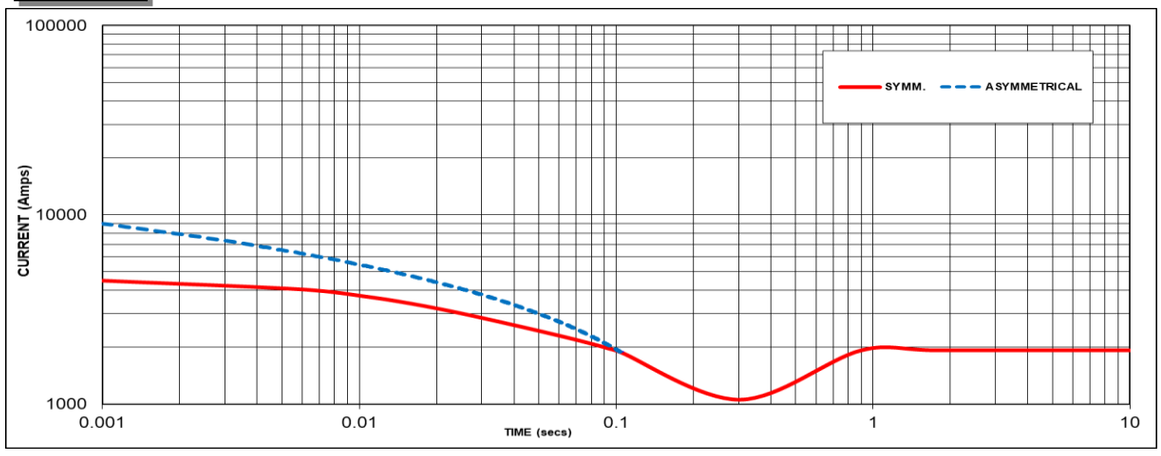
Three-phase Short Circuit Decrement Curve - Separately Excited

50Hz



Sustained Short Circuit = 2013 Amps

60Hz



Sustained Short Circuit = 1929 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
3300V	X 1.00	4160V	X 1.00
-	-	-	-
-	-	-	-
-	-	-	-

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 :

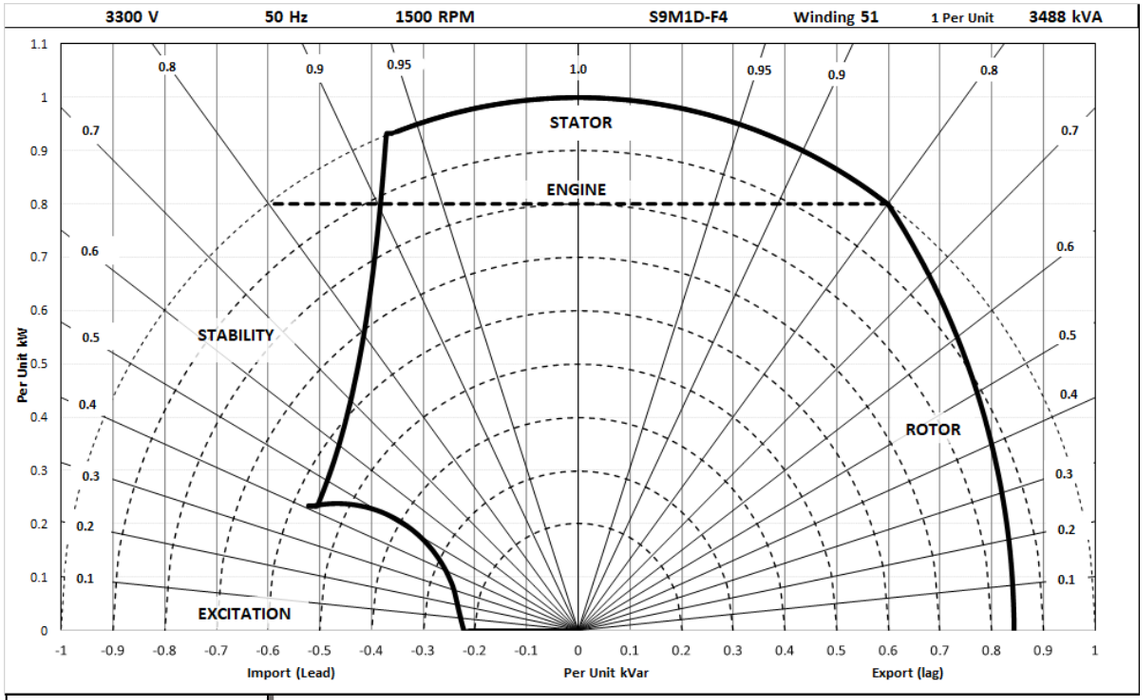
	3-phase	2-phase L-L	1-phase L-N
Instantaneous	x 1.00	x 0.87	x 1.30
Minimum	x 1.00	x 1.80	x 3.20
Sustained	x 1.00	x 1.50	x 2.50
Max. sustained duration	10 sec.	5 sec.	2 sec.

All other times are unchanged

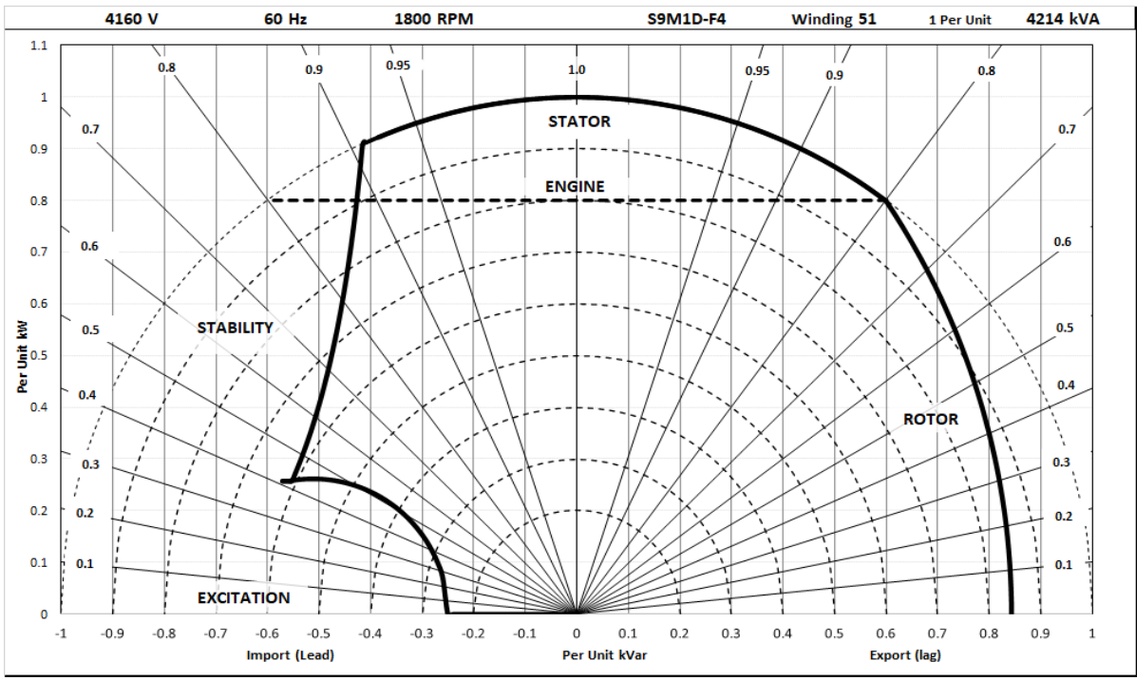
Note 3
Curves are drawn for Star connections under no-load excitation at rated speeds. For other connection (where applicable) the following multipliers should be applied to current values as shown :
Parallel Star = Curve current value X 2
Series Delta = Curve current value X 1.732

Typical Alternator Operating Charts

3300V/50Hz



4160V/60Hz



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RATINGS AT 0.8 POWER FACTOR

	Class - Temp Rise	Standby - 163/27°C	Standby - 150/40°C	Cont. H - 125/40°C	Cont. F - 105/40°C
50 Hz	Star (V)	3300	3300	3300	3300
	Parallel Star (V)	N/A	N/A	N/A	N/A
	Delta (V)	N/A	N/A	N/A	N/A
	kVA	3837	3732	3488	3209
	kW	3070	2986	2790	2567
	Efficiency (%)	96.6	96.7	96.8	96.9
	kW Input	3178	3089	2883	2649

60 Hz	Star (V)	4160	4160	4160	4160
	Parallel Star (V)	N/A	N/A	N/A	N/A
	Delta (V)	N/A	N/A	N/A	N/A
	kVA	4635	4509	4214	3877
	kW	3708	3607	3371	3102
	Efficiency (%)	96.8	96.8	96.9	97.0
	kW Input	3830	3725	3478	3198

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 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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