STAMFORD

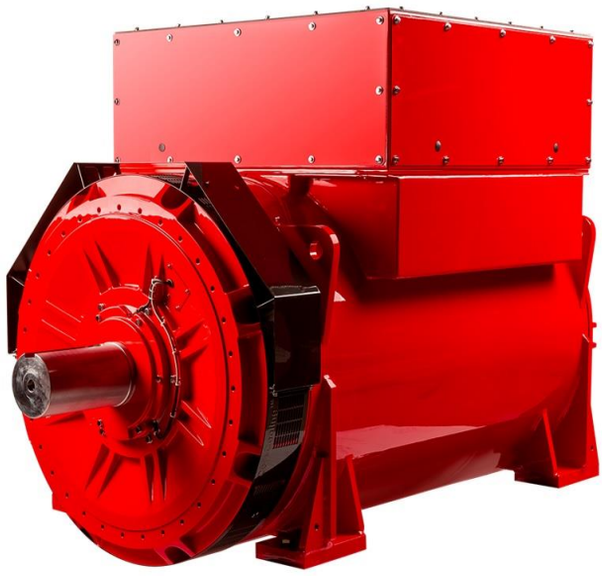
S9M1D-E4 Wdg.51 - Technical Data Sheet

Standards

STAMFORD industrial alternators meet the requirements of the relevant parts of the IEC EN 60034 and the relevant section of other international standards such as BS5000, VDE 0530, NEMA MG1-32, IEC34, CSA C22.2-100 and AS1359. 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)	10.4 - 10.8
No Load Excitation Current (A)	0.85 - 0.87
Full Load Excitation Voltage (V)	45
Full Load Excitation Current (A)	3.6
Exciter Time Constant (seconds)	0.34

STAMFORD

S9M1D-E4 Wdg.51

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	47.87	
	50 Hz	**60 Hz**
Telephone Interference	THF<2%	TIF<50
Cooling Air Flow	2.78 m³/sec	3.33 m³/sec
Voltage Star (V)	3300	4160
Voltage Parallel Star (V)	-	-
Voltage Delta (V)	-	-
kVA Base Rating (Class H) for Reactance Values (kVA)	3160	3900
Saturated Values in Per Unit at Base Ratings and Voltages		
Xd Dir. Axis Synchronous	2.95	2.75
X'd Dir. Axis Transient	0.20	0.19
X"d Dir. Axis Subtransient	0.15	0.14
Xq Quad. Axis Reactance	1.32	1.23
X"q Quad. Axis Subtransient	0.29	0.27
XL Stator Leakage Reactance	0.17	0.16
X2 Negative Sequence Reactance	0.27	0.25
X0 Zero Sequence Reactance	0.12	0.11
Unsaturated Values in Per Unit at Base Ratings and Voltages		
Xd Dir. Axis Synchronous	3.54	3.30
X'd Dir. Axis Transient	0.23	0.22
X"d Dir. Axis Subtransient	0.18	0.17
Xq Quad. Axis Reactance	1.36	1.27
X"q Quad. Axis Subtransient	0.35	0.32
XL Stator Leakage Reactance	0.19	0.18
Xlr Rotor Leakage Reactance	0.26	0.24
X2 Negative Sequence Reactance	0.32	0.30
X0 Zero Sequence Reactance	0.14	0.13

STAMFORD

S9M1D-E4 Wdg.51

Time Constants (Seconds)	
T'd Transient Time Const.	0.227
T''d Sub-Transient Time Const.	0.019
T'do O.C. Field Time Const.	2.743
Ta Armature Time Const.	0.083
T''q Sub-Transient Time Const.	0.0210

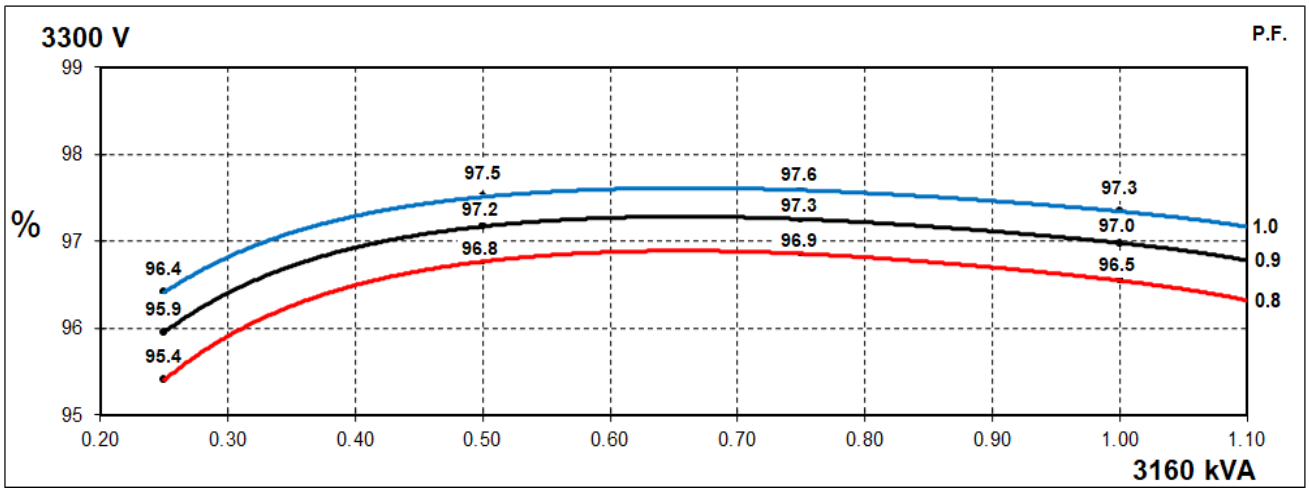
Resistances in Ohms (Ω) at 22^{0}C	
Stator Winding Resistance (Ra), per phase for series connected	0.0247
Rotor Winding Resistance (Rf)	0.63
Exciter Stator Winding Resistance	11.2
Exciter Rotor Winding Resistance per phase	0.016
PMG Phase Resistance (Rpmg) per phase	3.8
Positive Sequence Resistance (R1)	0.0309
Negative Sequence Resistance (R2)	0.0356
Zero Sequence Resistance (R0)	0.0309

Saturation Factors	3300V	4160V
SG1.0	0.152	0.115
SG1.2	0.63	0.621

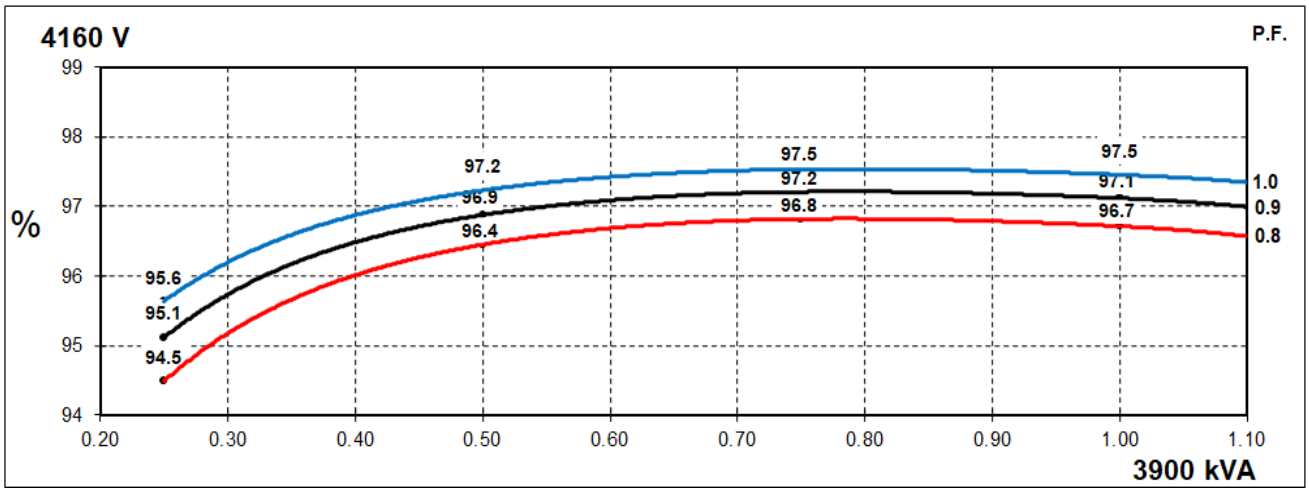
Mechanical Data		
Shaft and Keys	All alternator rotors are dynamically balanced to better than BS6861: Part 1 Grade 2.5 for minimum vibration in operation. Two bearing generators are balanced with a half key.	
	1 Bearing	2 Bearing
SAE Adaptor	-	0, 00, None
Moment of Inertia	-	96 kgm²
Weight Wound Stator	-	2198kg
Weight Wound Rotor	-	2297kg
Weight Complete Alternator	-	6150kg
Shipping weight in a Crate	-	6530kg
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	6324

THREE PHASE EFFICIENCY CURVES

50Hz

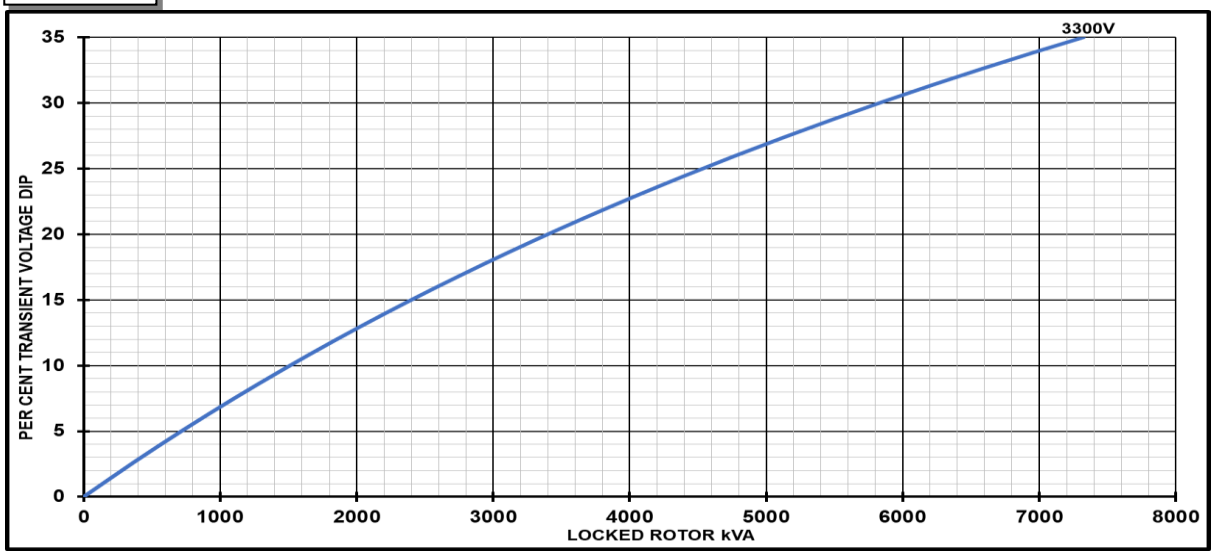


60Hz

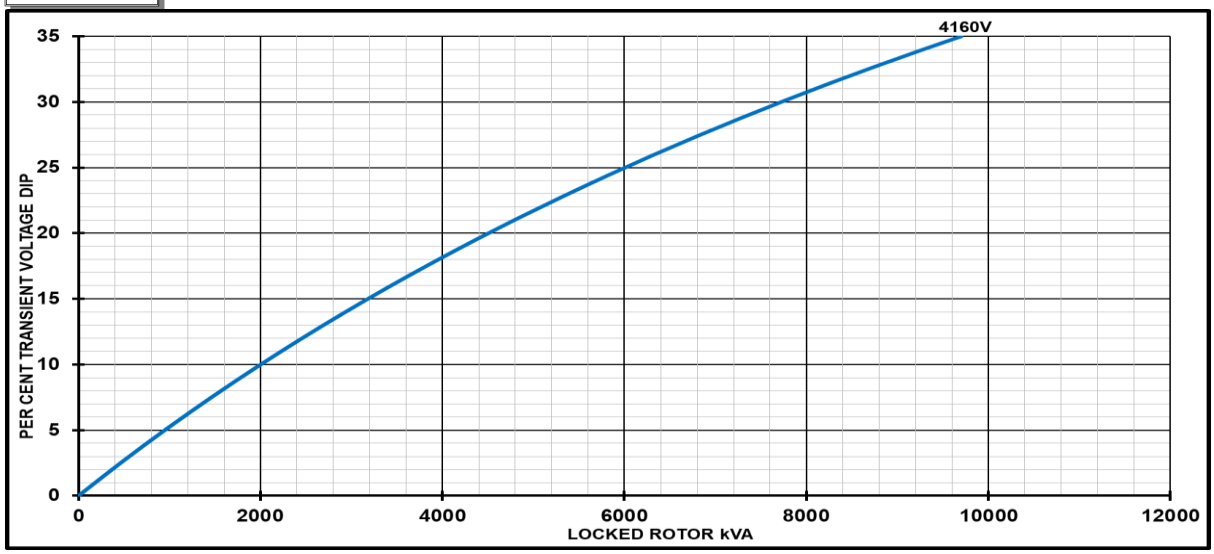


Locked Rotor Motor Starting Curves - Separately Excited

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		

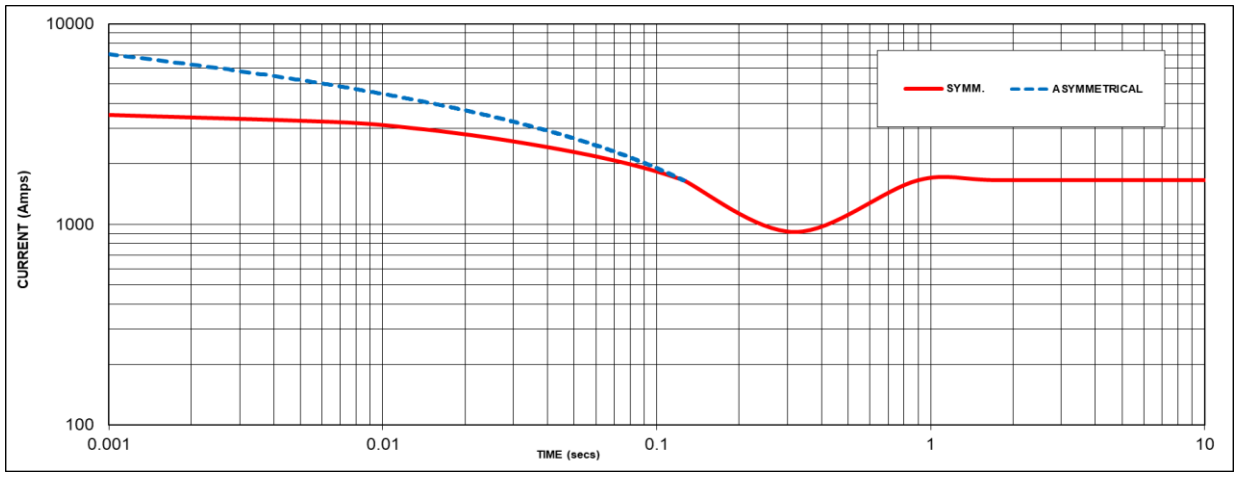
Note: To determine % Transient Voltage Dip or Voltage Rise at various PF, multiply the % Voltage Dip from the curve directly by the Scaling Factor.

STAMFORD

S9M1D-E4 Wdg.51

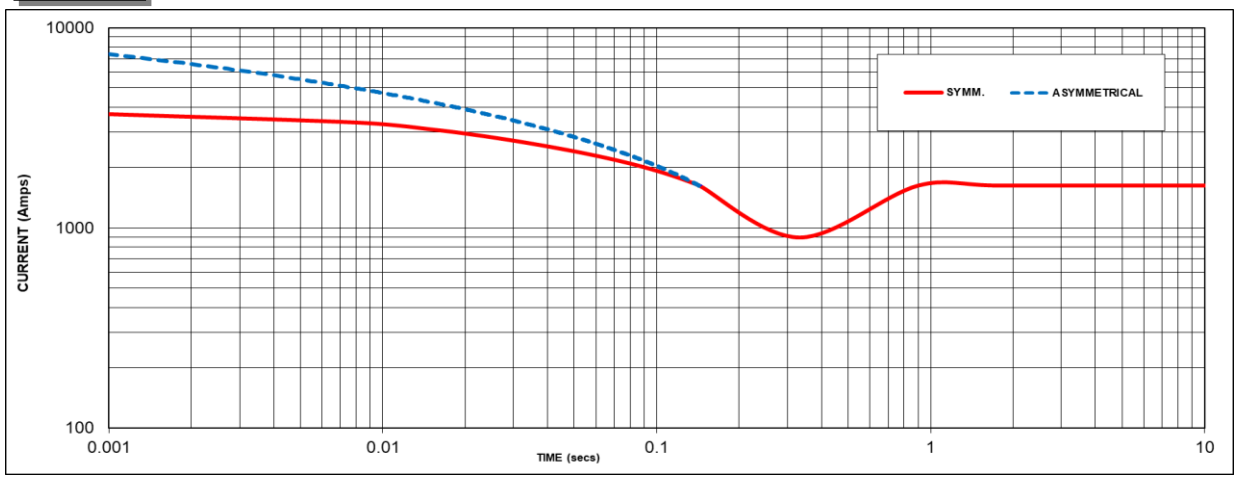
Three-phase Short Circuit Decrement Curve - Separately Excited

50Hz



Sustained Short Circuit = 1659 Amps

60Hz



Sustained Short Circuit = 1625 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

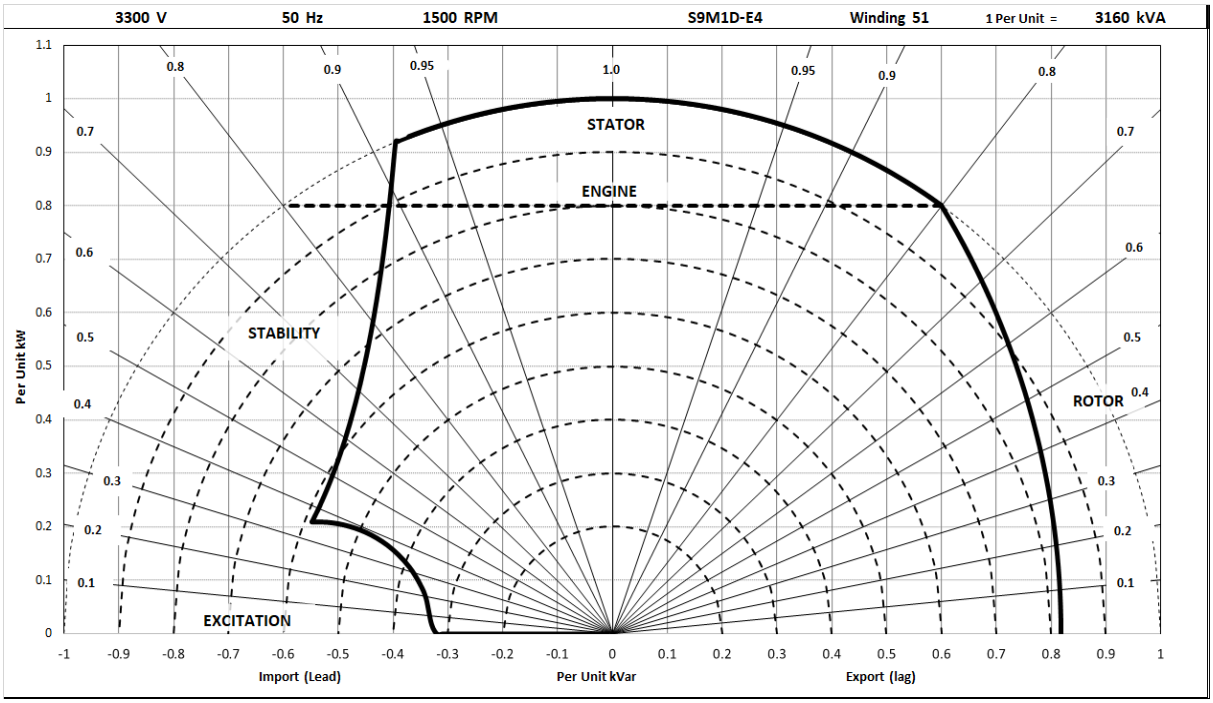
Note 3
Curves are drawn for Star connections under no-load excitation at rated speeds. For other connection (where applicable) the following multipliers should be applied to current values as shown :
Parallel Star = Curve current value X 2
Series Delta = Curve current value X 1.732

STAMFORD

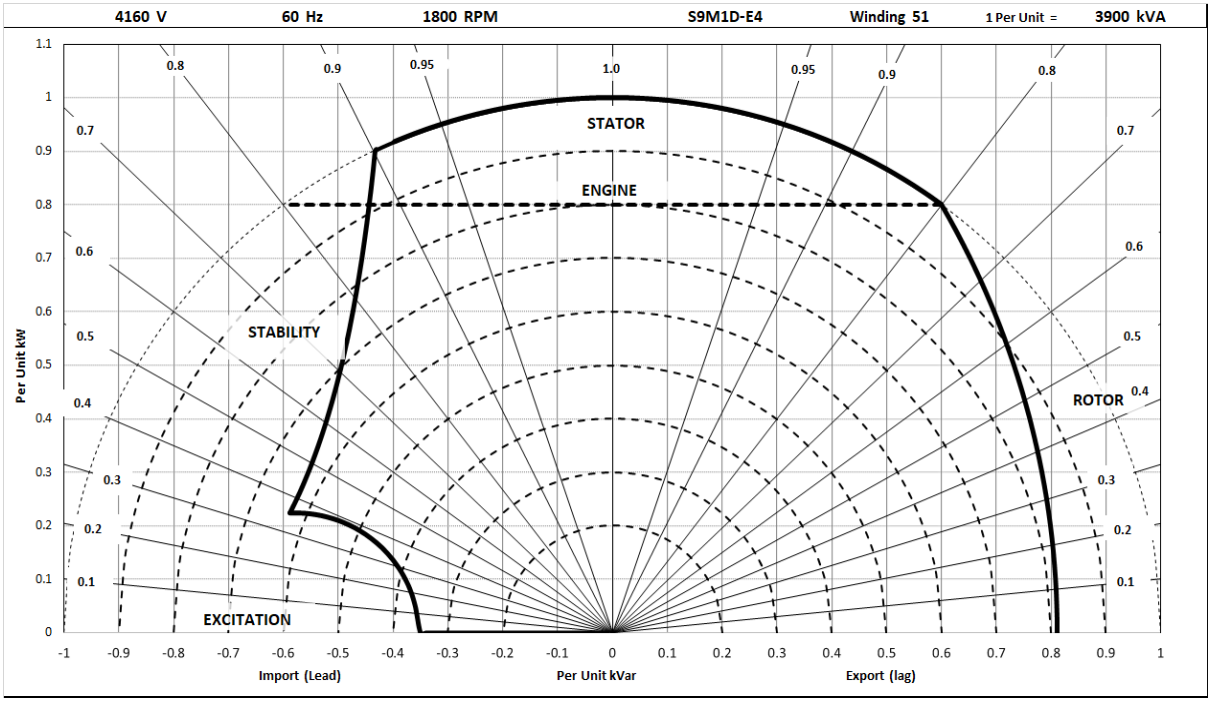
S9M1D-E4 Wdg.51

Typical Alternator Operating Charts

3300V/50Hz



4160V/60Hz



STAMFORD

S9M1D-E4 Wdg.51

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	3476	3381	3160	2907
	kW	2781	2705	2528	2326
	Efficiency (%)	96.3	96.4	96.5	96.7
	kW Input	2886	2806	2618	2405

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	4290	4173	3900	3588
	kW	3432	3338	3120	2870
	Efficiency (%)	96.6	96.6	96.7	96.8
	kW Input	3553	3455	3226	2966

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.

Follow us @stamfordavk

Cummins Generator Technologies

View our videos at youtube.com/stamfordavk

news.stamford-avk.com

For Applications Support:
applications@cummins.com

For Customer Service:
emea.service@cummins.com

For General Enquiries:
Stamford-avk@cummins.com