

# STAMFORD®

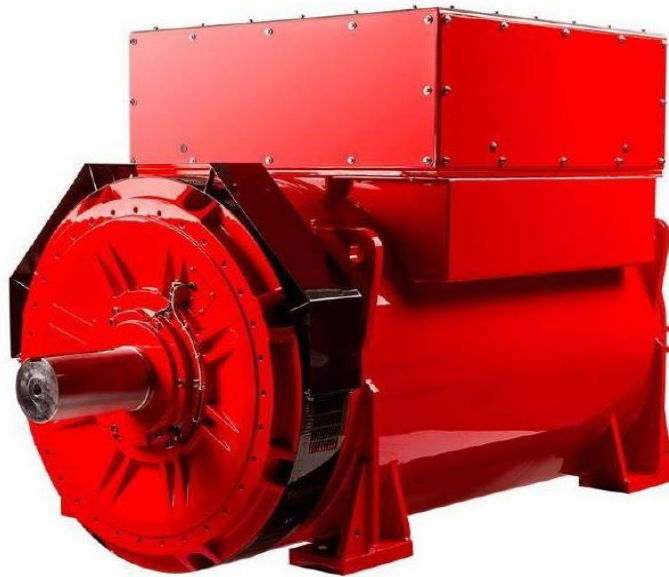
## S9H1D-G4 Wdg.91 - Technical Data Sheet

### 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)	12.5
No Load Excitation Current (A)	1
Full Load Excitation Voltage (V)	40
Full Load Excitation Current (A)	3.2
Exciter Time Constant (seconds)	0.28

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Electrical Data				
Insulation System	H			
Stator Winding	Double Layer Lap			
Winding Pitch	5/6			
Winding Leads	6			
Winding Number	91			
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	31.62			
60 Hz				
Telephone Interference	TIF<50			
Cooling Air Flow	3.33 m³/sec			
Voltage Star (V)	11000	12470	13200	13800
Voltage Parallel Star (V)	-	-	-	-
Voltage Delta (V)	-	-	-	-
kVA Base Rating (Class H) for Reactance Values (kVA)	3667	4155	4400	4600
Saturated Values in Per Unit at Base Ratings and Voltages				
Xd Dir. Axis Synchronous	2.384	2.102	1.986	1.900
X'd Dir. Axis Transient	0.205	0.180	0.170	0.163
X''d Dir. Axis Subtransient	0.141	0.124	0.118	0.113
Xq Quad. Axis Reactance	1.275	1.124	1.062	1.016
X''q Quad. Axis Subtransient	0.258	0.228	0.215	0.206
XL Stator Leakage Reactance	0.105	0.093	0.088	0.084
X2 Negative Sequence Reactance	0.196	0.173	0.163	0.156
X0 Zero Sequence Reactance	0.127	0.112	0.106	0.101
Unsaturated Values in Per Unit at Base Ratings and Voltages				
Xd Dir. Axis Synchronous	2.861	2.522	2.384	2.280
X'd Dir. Axis Transient	0.235	0.207	0.196	0.187
X''d Dir. Axis Subtransient	0.165	0.146	0.138	0.132
Xq Quad. Axis Reactance	1.313	1.158	1.094	1.046
X''q Quad. Axis Subtransient	0.310	0.273	0.258	0.247
XL Stator Leakage Reactance	0.119	0.105	0.099	0.095
Xlr Rotor Leakage Reactance	0.236	0.208	0.197	0.188
X2 Negative Sequence Reactance	0.235	0.207	0.196	0.187
X0 Zero Sequence Reactance	0.148	0.131	0.124	0.118

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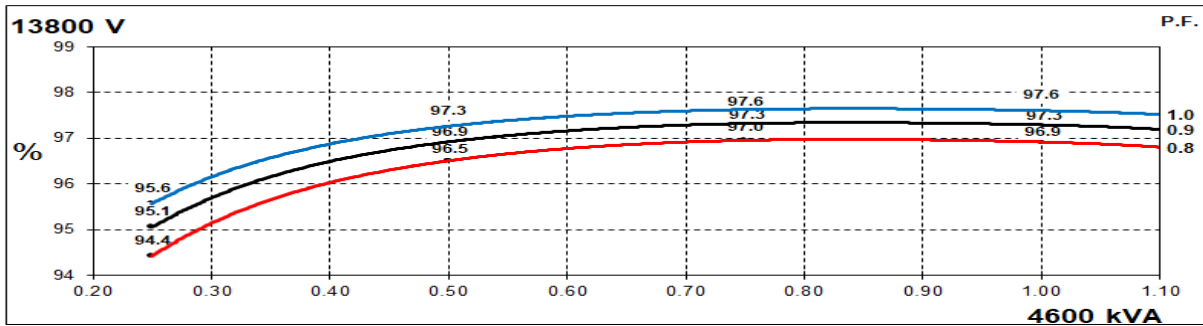
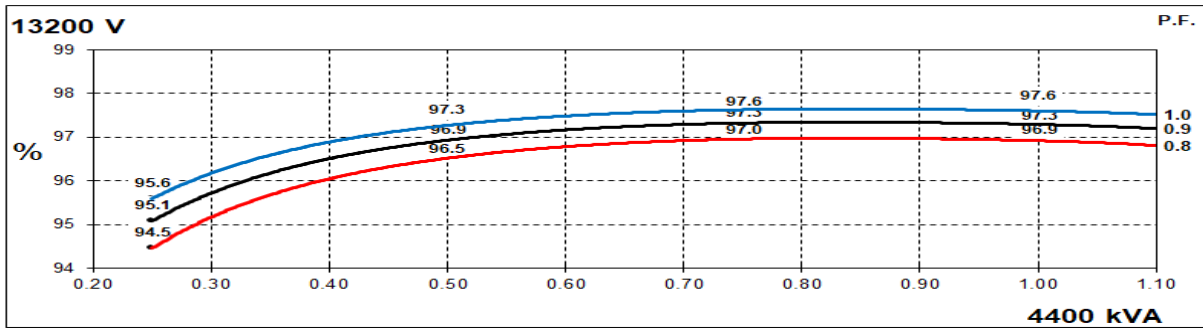
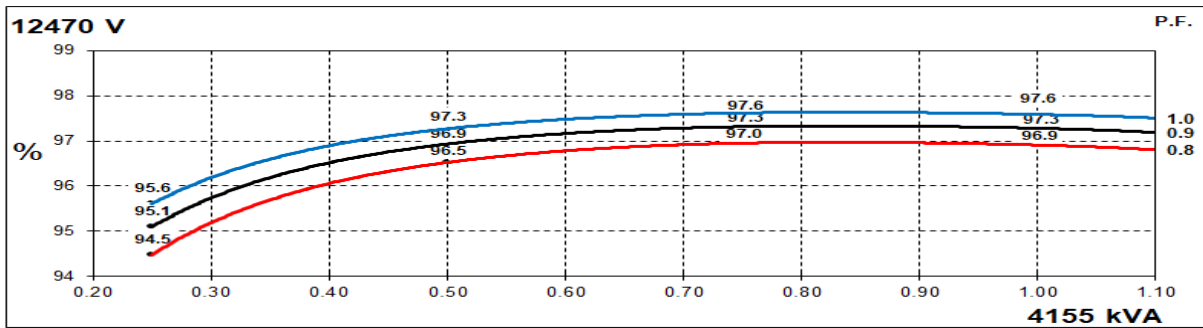
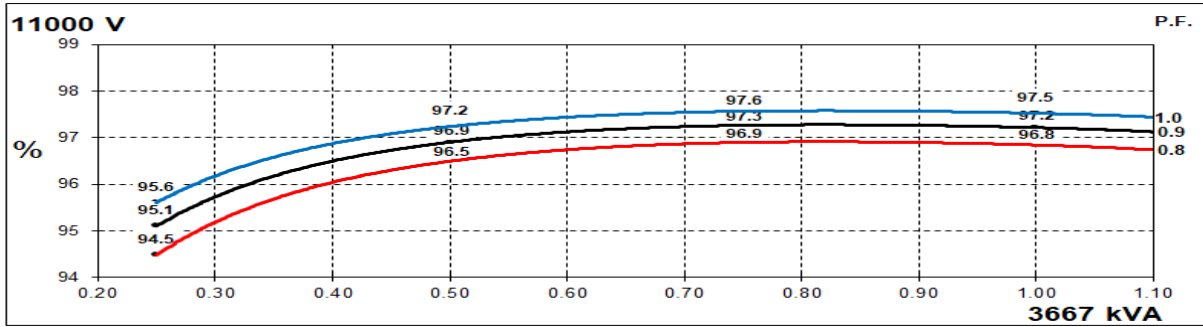
Time Constants (Seconds)		
T'd Transient Time Const.		0.231
T''d Sub-Transient Time Const.		0.018
T'do O.C. Field Time Const.		3.88
Ta Armature Time Const.		0.063
T''q Sub-Transient Time Const.		0.020
Resistances in Ohms ( $\Omega$ ) at 22 <sup>o</sup> C		
Stator Winding Resistance (Ra), per phase for series connected		0.2530
Rotor Winding Resistance (Rf)		0.73
Exciter Stator Winding Resistance		11.2
Exciter Rotor Winding Resistance per phase		0.016
PMG Phase Resistance (Rpmg) per phase		1.91
Positive Sequence Resistance (R1)		0.3163
Negative Sequence Resistance (R2)		0.3643
Zero Sequence Resistance (R0)		0.3163
Saturation Factors		13800V
SG1.0		0.192
SG1.2		0.8
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		00, None
Moment of Inertia	-	116.3 kgm <sup>2</sup>
Weight Wound Stator	-	2792kg
Weight Wound Rotor	-	2689kg
Weight Complete Alternator	-	7300kg
Shipping weight in a Crate	-	7750kg
Packing Crate Size	-	300 x 200 x 220(cm)
Maximum Over Speed	2250 RPM for two minutes	
Bearing Drive End	-	NU1036
Bearing Non-Drive End	-	6328

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### THREE PHASE EFFICIENCY CURVES

60Hz

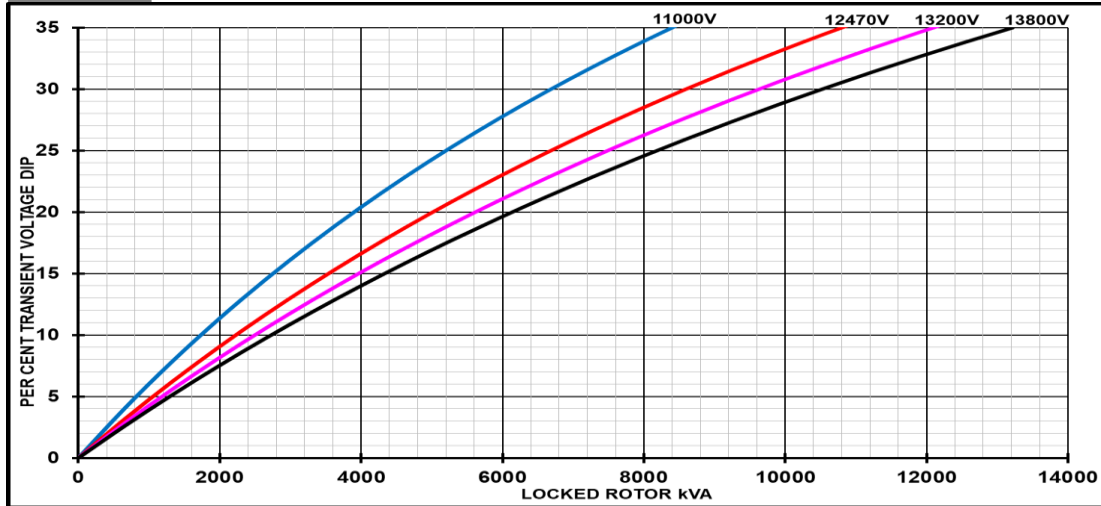


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## Locked Rotor Motor Starting Curves - Separately Excited

**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		

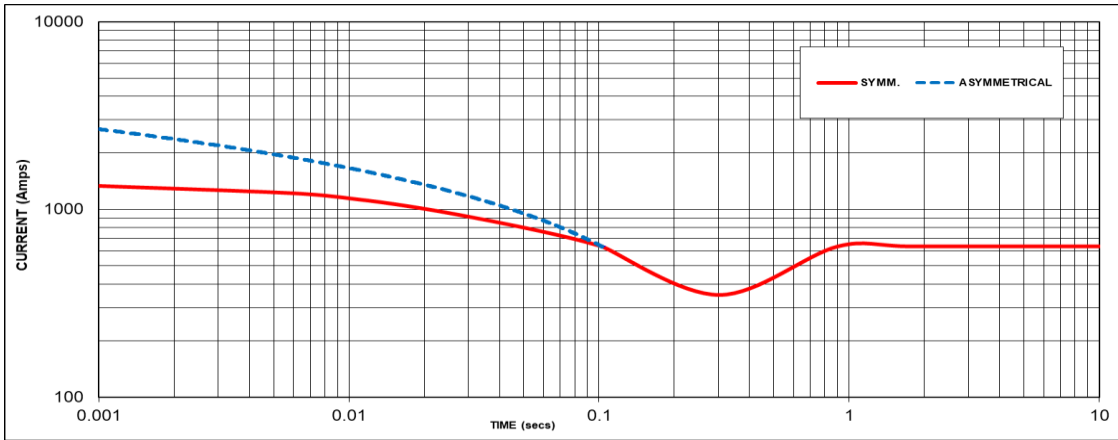
Note: To determine % Transient Voltage Dip or Voltage Rise at various PF, multiply the % Voltage Dip from the curve directly by the Scaling Factor.

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

**60Hz**



Sustained Short Circuit = 635 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
-	-	11000V	X 1.00
-	-	12470V	X 1.13
-	-	13200V	X 1.20
-	-	13800V	X 1.25

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

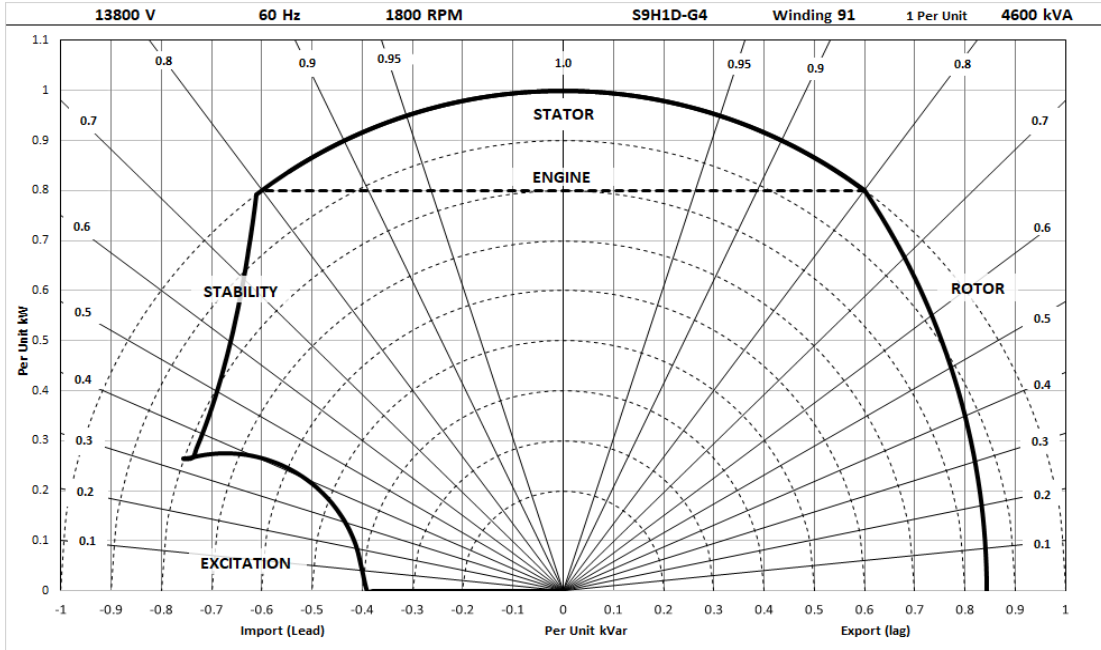
Series Delta = Curve current value X 1.732

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## Typical Alternator Operating Charts

**13800V/60Hz**



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### RATINGS AT 0.8 POWER FACTOR

Class - Temp Rise		Standby - 150/40°C	Cont. H - 125/40°C	Cont. F - 105/40°C	Cont. B - 80/40°C
<b>50</b> Hz	Star (V)	N/A	N/A	N/A	N/A
	Parallel Star (V)	N/A	N/A	N/A	N/A
	Delta (V)	N/A	N/A	N/A	N/A
	kVA	N/A	N/A	N/A	N/A
	kW	N/A	N/A	N/A	N/A
	Efficiency (%)	N/A	N/A	N/A	N/A
	kW Input	N/A	N/A	N/A	N/A

<b>60</b> Hz	Star (V)	11000	12470	13200	13800	11000	12470	13200	13800	11000	12470	13200	13800	11000	12470	13200	13800	
	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	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	N/A
	kVA	3924	4446	4708	4922	3667	4155	4400	4600	3374	3823	4048	4232	2934	3324	3520	3680	
	kW	3139	3557	3766	3938	2934	3324	3520	3680	2699	3058	3238	3386	2347	2659	2816	2944	
	Efficiency (%)	96.8	96.8	96.9	96.9	96.8	96.9	96.9	96.9	96.9	97.0	97.0	97.0	96.9	97.0	97.0	97.0	
	kW Input	3244	3673	3889	4066	3029	3430	3632	3797	2786	3154	3340	3492	2422	2742	2904	3036	

#### 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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**For Applications Support:  
[applications@cummins.com](mailto:applications@cummins.com)**

**For Customer Service:  
[emea.service@cummins.com](mailto:emea.service@cummins.com)**

**For General Enquiries:  
[Stamford-avk@cummins.com](mailto:Stamford-avk@cummins.com)**

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