

# STAMFORD®

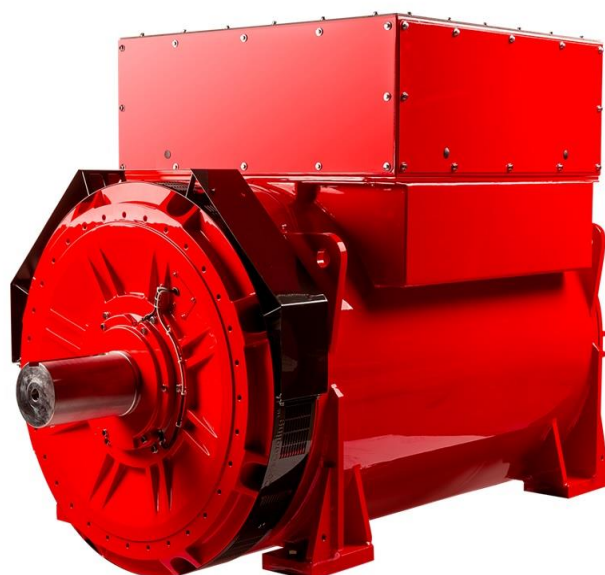
## S9H1D-F4 Wdg.91 - Technical Data Sheet

### 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)	11.6
No Load Excitation Current (A)	0.94
Full Load Excitation Voltage (V)	40.7
Full Load Excitation Current (A)	3.29
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	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	27.74			
60 Hz				
Telephone Interference	TIF<50			
Cooling Air Flow	3.33 m³/sec			
Voltage Star (V)	12470	13200	13800	-
Voltage Parallel Star (V)	-	-	-	-
Voltage Delta (V)	-	-	-	-
kVA Base Rating (Class H) for Reactance Values (kVA)	3810	4030	4215	-
Saturated Values in Per Unit at Base Ratings and Voltages				
Xd Dir. Axis Synchronous	2.44	2.30	2.20	-
X'd Dir. Axis Transient	0.20	0.19	0.19	-
X''d Dir. Axis Subtransient	0.14	0.13	0.13	-
Xq Quad. Axis Reactance	1.24	1.17	1.12	-
X''q Quad. Axis Subtransient	0.26	0.25	0.24	-
XL Stator Leakage Reactance	0.15	0.15	0.14	-
X2 Negative Sequence Reactance	0.24	0.23	0.22	-
X0 Zero Sequence Reactance	0.11	0.10	0.10	-
Unsaturated Values in Per Unit at Base Ratings and Voltages				
Xd Dir. Axis Synchronous	2.92	2.76	2.64	-
X'd Dir. Axis Transient	0.24	0.22	0.21	-
X''d Dir. Axis Subtransient	0.17	0.16	0.15	-
Xq Quad. Axis Reactance	1.28	1.21	1.15	-
X''q Quad. Axis Subtransient	0.32	0.30	0.29	-
XL Stator Leakage Reactance	0.18	0.17	0.16	-
Xlr Rotor Leakage Reactance	0.00	0.00	0.00	-
X2 Negative Sequence Reactance	0.29	0.28	0.26	-
X0 Zero Sequence Reactance	0.13	0.12	0.11	-

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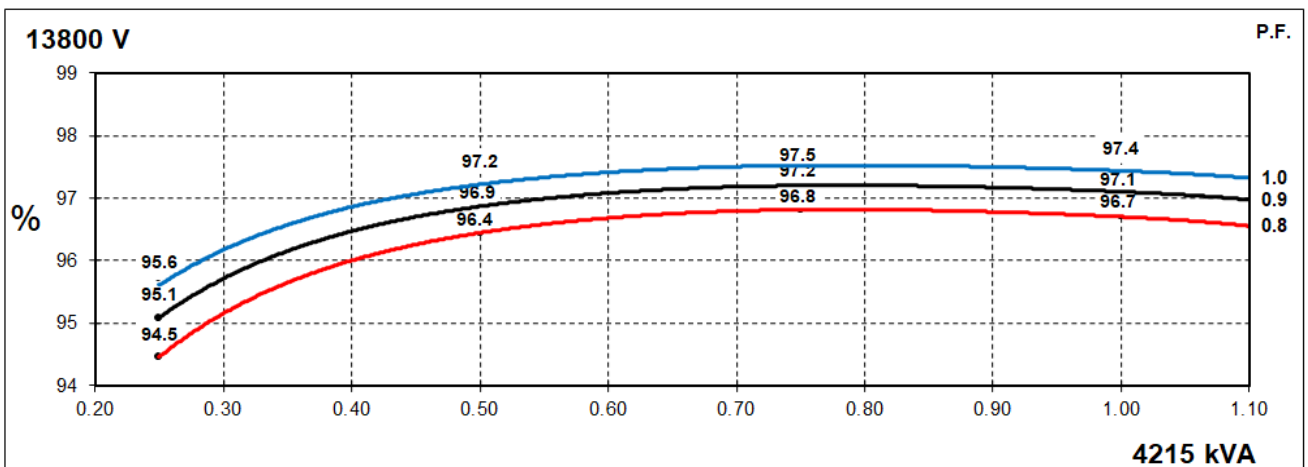
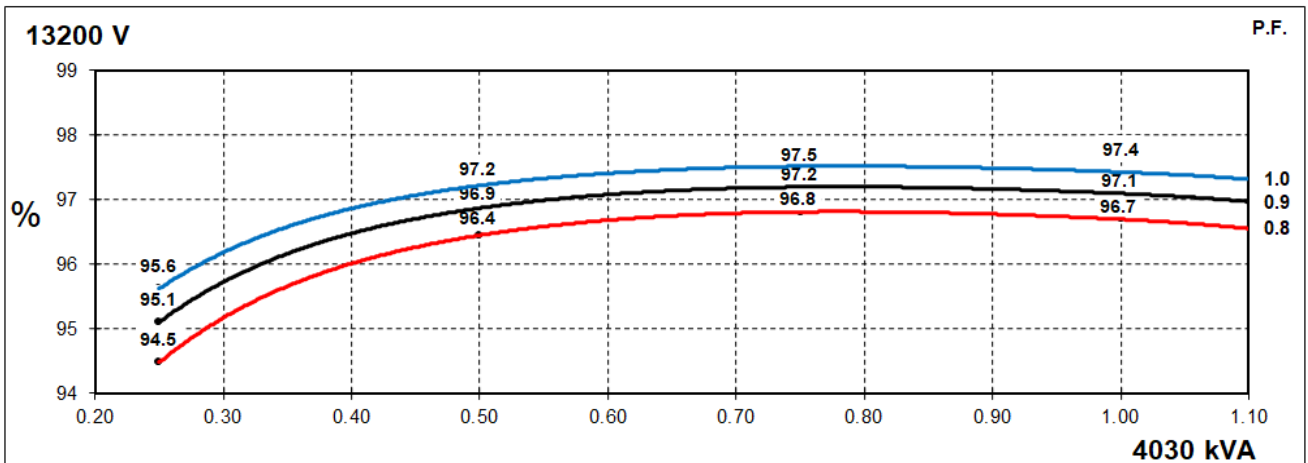
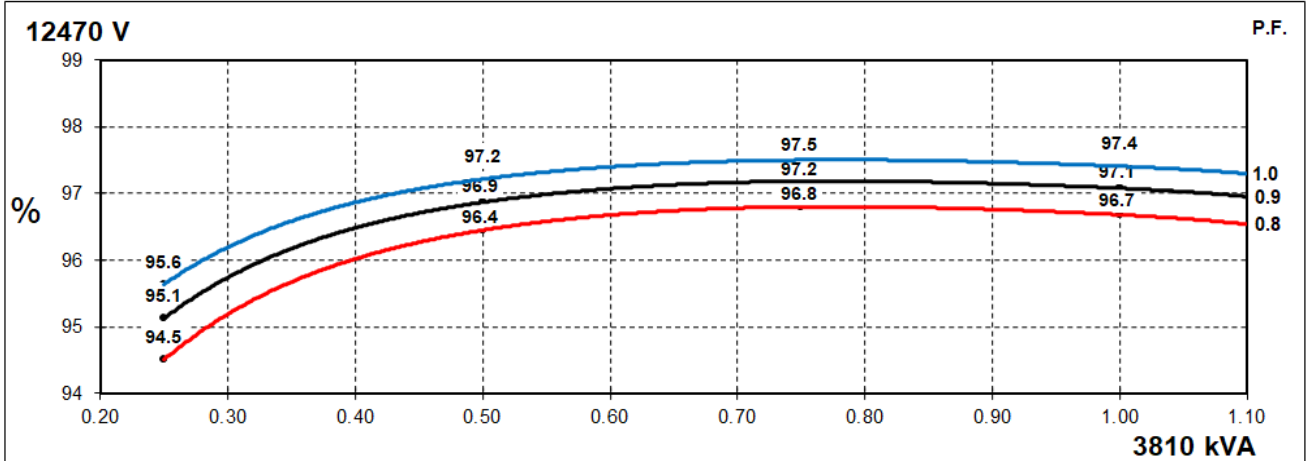
<b>Time Constants (Seconds)</b>		
T'd Transient Time Const.		0.231
T''d Sub-Transient Time Const.		0.0180
T'do O.C. Field Time Const.		2.878
Ta Armature Time Const.		0.0600
T''q Sub-Transient Time Const.		0.0210
<b>Resistances in Ohms (<math>\Omega</math>) at 22°C</b>		
Stator Winding Resistance (Ra), per phase for series connected		0.3360
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)		0.4200
Negative Sequence Resistance (R2)		0.4838
Zero Sequence Resistance (R0)		0.4200
<b>Saturation Factors</b>		<b>13800V</b>
SG1.0		0.188
SG1.2		0.8
<b>Mechanical Data</b>		
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	-	107.5 kgm <sup>2</sup>
Weight Wound Stator	-	2487kg
Weight Wound Rotor	-	2495kg
Weight Complete Alternator	-	6700kg
Shipping weight in a Crate	-	7080kg
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

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## THREE PHASE EFFICIENCY CURVES

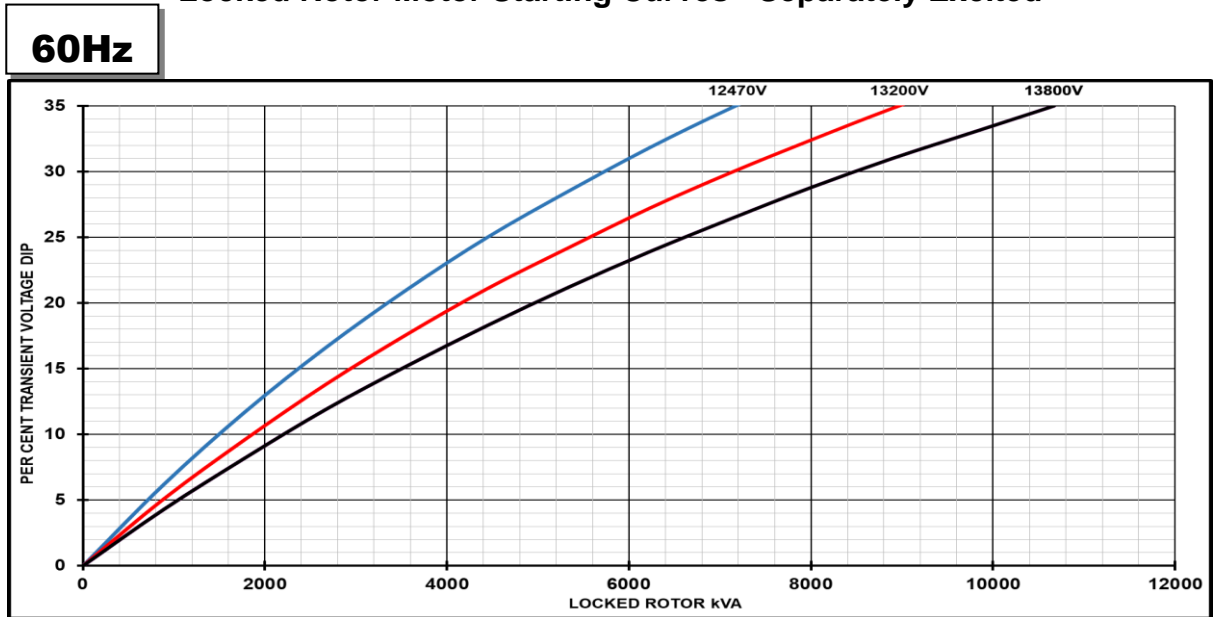
60Hz



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## Locked Rotor Motor Starting Curves - Separately Excited



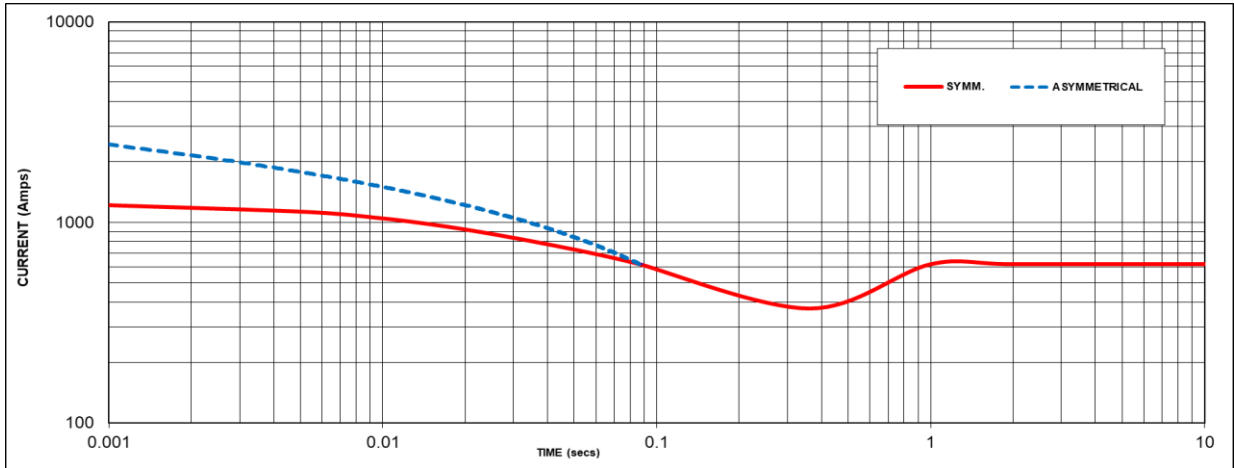
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor
PF	Factor	For voltage rise multiply voltage dip by 1.25
< 0.5	1	
0.5	0.97	
0.6	0.93	
0.7	0.9	
0.8	0.85	
0.9	0.83	

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

**60Hz**



Sustained Short Circuit = 618 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
-	-	12470V	X 0.90
-	-	13200V	X 0.95
-	-	13800V	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.

**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

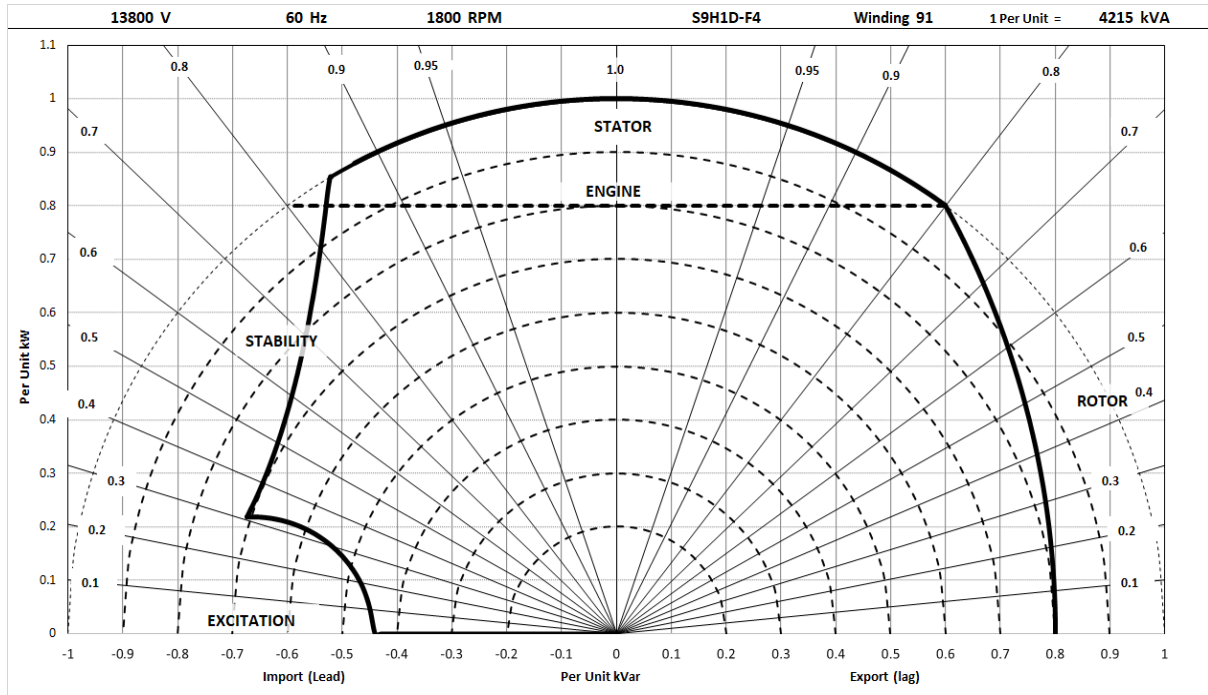
Series Delta = Curve current value X 1.732

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## Typical Alternator Operating Charts

**13800V/60Hz**



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### RATINGS AT 0.8 POWER FACTOR

Class - Temp Rise		Standby - 163/27°C				Standby - 150/40°C				Cont. H - 125/40°C				Cont. F - 105/40°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)	12470	13200	13800	N/A	12470	13200	13800	N/A	12470	13200	13800	N/A	12470	13200	13800	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	4191	4433	4636	N/A	4077	4312	4510	N/A	3810	4030	4215	N/A	3505	3707	3878	N/A
	kW	3353	3546	3709	N/A	3262	3450	3608	N/A	3048	3224	3372	N/A	2804	2966	3102	N/A
	Efficiency (%)	96.6	96.6	96.6	N/A	96.6	96.6	96.6	N/A	96.7	96.7	96.7	N/A	96.8	96.8	96.8	N/A
	kW Input	3473	3672	3841	N/A	3377	3571	3734	N/A	3153	3334	3487	N/A	2898	3065	3206	N/A

#### 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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