

# STAMFORD®

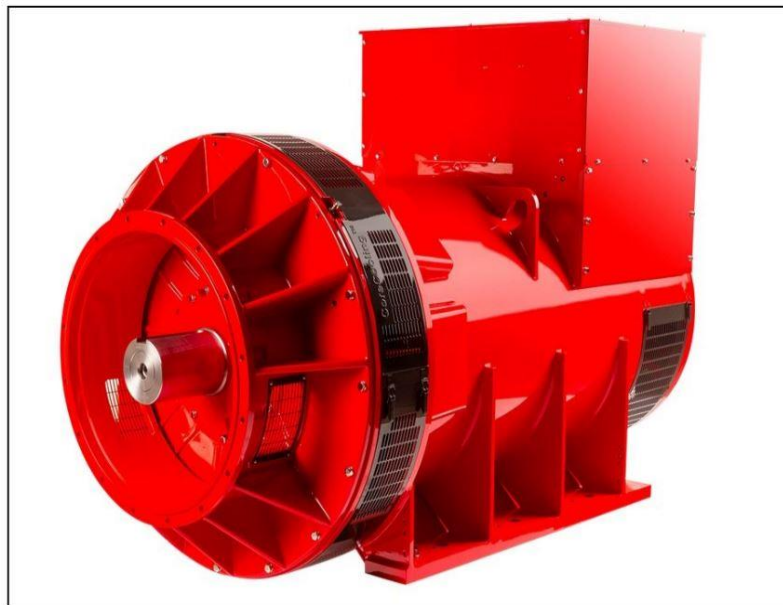
## S7L1D-F4 & S7L1W-F4 (Industrial) Wdg.312 - Technical Data Sheet

### 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.



\*Image depicts the S7L1D alternator

### Excitation and Voltage Regulators

Excitation System					
AVR Type	MX341	MX322	DECS150		
Voltage Regulation	± 1%	± 0.5%	± 0.25%		with 4% Engine Governing
AVR Power	PMG	PMG	PMG		

No Load Excitation Voltage (V)	15.4 - 14.7
No Load Excitation Current (A)	0.68 - 0.64
Full Load Excitation Voltage (V)	64
Full Load Excitation Current (A)	2.8
Exciter Time Constant (seconds)	0.125

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## S7L1D-F4 & S7L1W-F4 (Industrial) Wdg.312

Electrical Data								
Insulation System	H							
Stator Winding	Double Layer Concentric							
Winding Pitch	2/3							
Winding Leads	6							
Winding Number	312							
Number of Poles	4							
IP Rating	IP23 or IP44* (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	27.41							
50 Hz					60 Hz			
Telephone Interference	THF<2%				TIF<50			
Cooling Air Flow	2.52 m³/sec				3.02 m³/sec			
Voltage Star (V)	380	400	415	440	416	440	460	480
Voltage Parallel Star (V)	-	-	-	-	-	-	-	-
Voltage Delta (V)	-	-	-	-	-	-	-	-
kVA Base Rating (Class H) for Reactance Values (kVA)	1845	1900	1900	1865	2070	2212	2256	2300
Saturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	2.75	2.56	2.38	2.08	3.09	2.96	2.76	2.58
X'd Dir. Axis Transient	0.20	0.19	0.18	0.15	0.23	0.22	0.20	0.19
X''d Dir. Axis Subtransient	0.15	0.14	0.13	0.11	0.16	0.16	0.15	0.14
Xq Quad. Axis Reactance	2.02	1.88	1.75	1.52	2.27	2.17	2.02	1.90
X''q Quad. Axis Subtransient	0.24	0.22	0.20	0.18	0.26	0.25	0.24	0.22
XL Stator Leakage Reactance	0.09	0.08	0.08	0.07	0.10	0.09	0.09	0.08
X2 Negative Sequence Reactance	0.17	0.16	0.15	0.13	0.20	0.19	0.17	0.16
X0 Zero Sequence Reactance	0.03	0.03	0.03	0.02	0.04	0.03	0.03	0.03
Unsaturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	3.31	3.07	2.85	2.49	3.71	3.55	3.31	3.10
X'd Dir. Axis Transient	0.24	0.22	0.20	0.18	0.26	0.25	0.24	0.22
X''d Dir. Axis Subtransient	0.17	0.16	0.15	0.13	0.19	0.18	0.17	0.16
Xq Quad. Axis Reactance	2.08	1.94	1.80	1.57	2.34	2.23	2.09	1.95
X''q Quad. Axis Subtransient	0.28	0.26	0.24	0.21	0.32	0.30	0.28	0.27
XL Stator Leakage Reactance	0.10	0.09	0.08	0.07	0.11	0.11	0.10	0.09
Xlr Rotor Leakage Reactance	0.21	0.20	0.19	0.16	0.24	0.23	0.22	0.20
X2 Negative Sequence Reactance	0.21	0.19	0.18	0.16	0.23	0.22	0.21	0.20
X0 Zero Sequence Reactance	0.04	0.04	0.03	0.03	0.04	0.04	0.04	0.04

\*Notes:

- 1) S7L1W: IP44 rating with IC81W cooling (watercooled) and 25°C water inlet temperature.
- 2) S7L1D: IP23 rating with IC01 cooling (open-circuit cooling) as standard.

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## S7L1D-F4 & S7L1W-F4 (Industrial) Wdg.312

Time Constants (Seconds)		
T'd Transient Time Const.	0.150	
T''d Sub-Transient Time Const.	0.017	
T'do O.C. Field Time Const.	4.290	
Ta Armature Time Const.	0.028	
T''q Sub-Transient Time Const.	0.0102	
Resistances in Ohms ( $\Omega$ ) at 22°C		
Stator Winding Resistance (Ra), per phase for series connected	0.00085	
Rotor Winding Resistance (Rf)	1.95	
Exciter Stator Winding Resistance	22.3	
Exciter Rotor Winding Resistance per phase	0.065	
PMG Phase Resistance (Rpmg) per phase	1.91	
Positive Sequence Resistance (R1)	0.0011	
Negative Sequence Resistance (R2)	0.0012	
Zero Sequence Resistance (R0)	0.0011	
Saturation Factors	400V	480V
SG1.0	0.281	0.304
SG1.2	1.308	1.184
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	SAE0 , 00
Moment of Inertia	40.98 kgm <sup>2</sup>	40.08 kgm <sup>2</sup>
Weight Wound Stator	1518kg	1518kg
Weight Wound Rotor	1353kg	1300kg
Weight Complete Alternator	3350kg	3264kg
Shipping weight in a Crate	3399kg	3313kg
Packing Crate Size	200 X 105 X 155(cm)	200 X 105 X155(cm)
Maximum Over Speed	2250 RPM for two minutes	
Bearing Drive End	-	BALL. 6228; Sleeve EFWLK 14 (optional)
Bearing Non-Drive End	BALL. 6319	BALL. 6319; Sleeve EFNLQ 11 (optional)

Notes:

- 1) Mechanical data are applicable for S7L1D with anti-friction bearing. Refer the GA and rotor drawings for S7L1W and sleeve bearing.
- 2) S7L1W and/ or sleeve bearings are available for 2-bearing alternators only.
- 3) SAE adaptor options are not applicable for sleeve bearing.

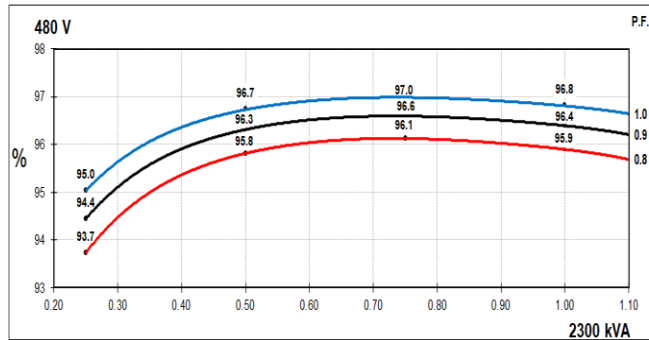
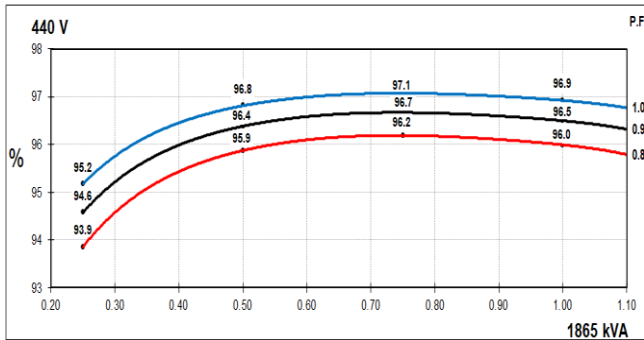
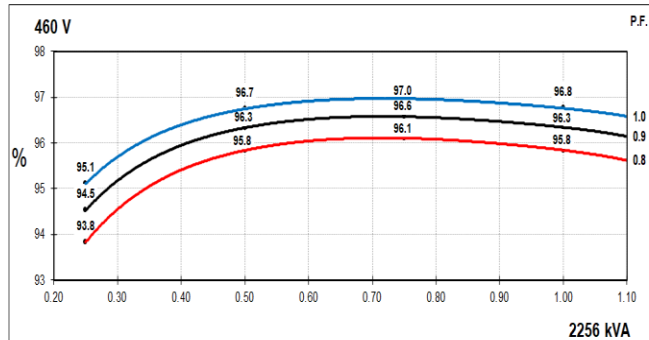
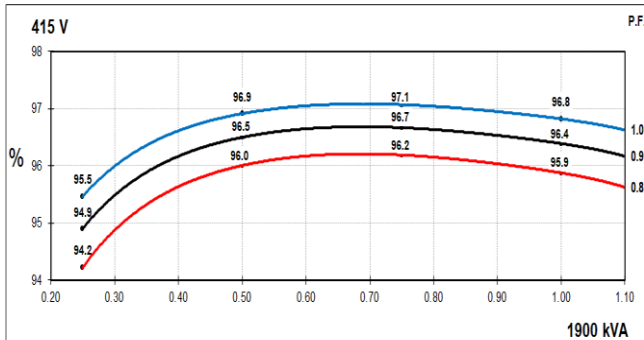
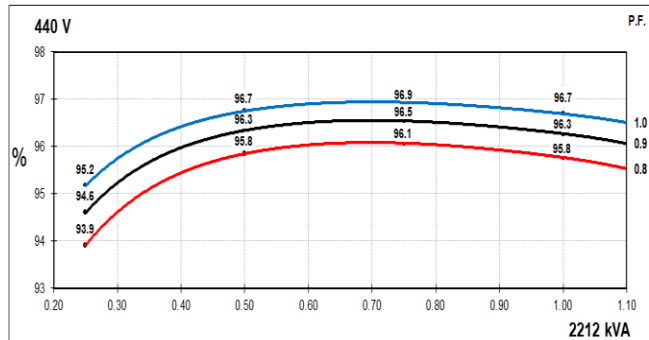
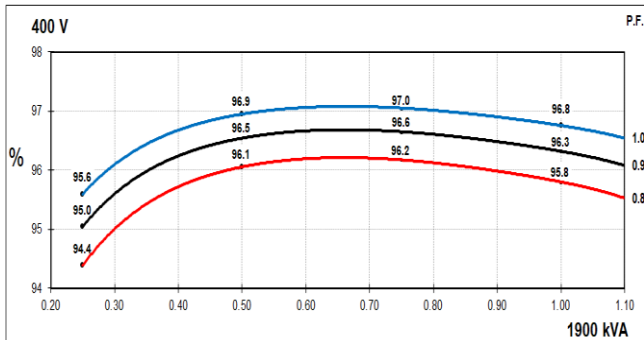
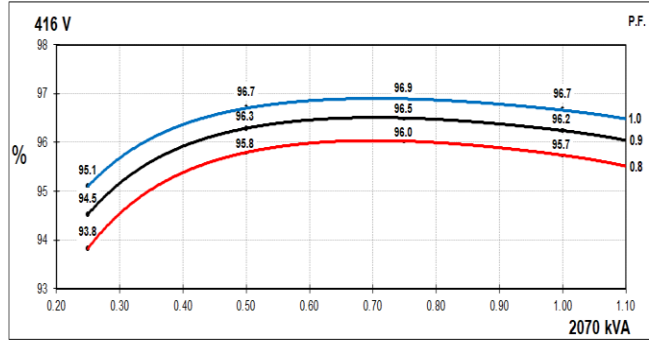
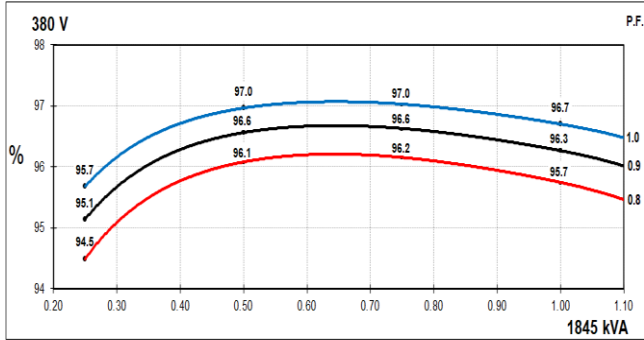
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## S7L1D-F4 & S7L1W-F4 (Industrial) Wdg.312

### THREE PHASE EFFICIENCY CURVES

**50Hz**

**60Hz**

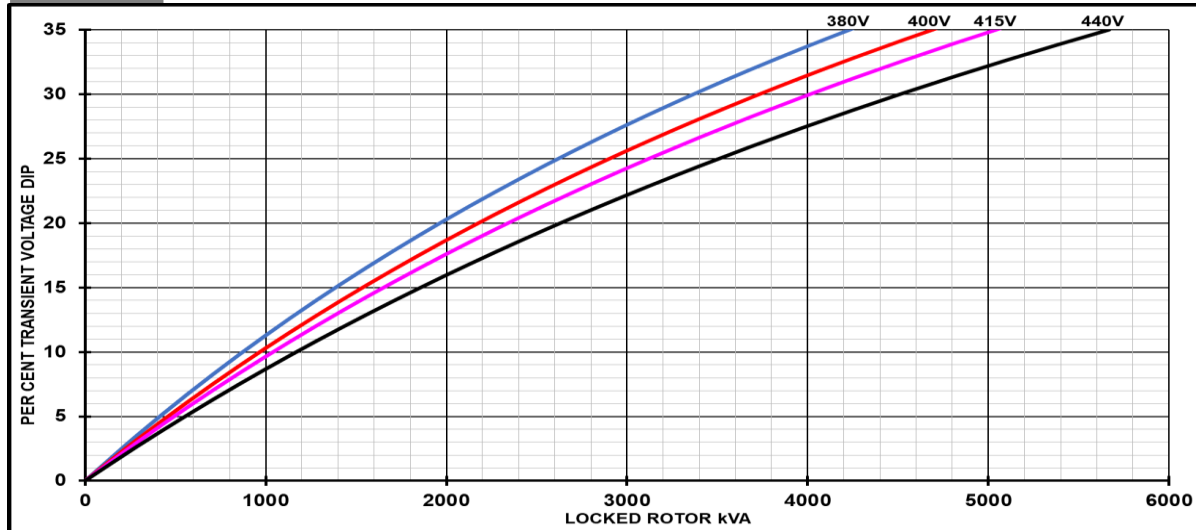


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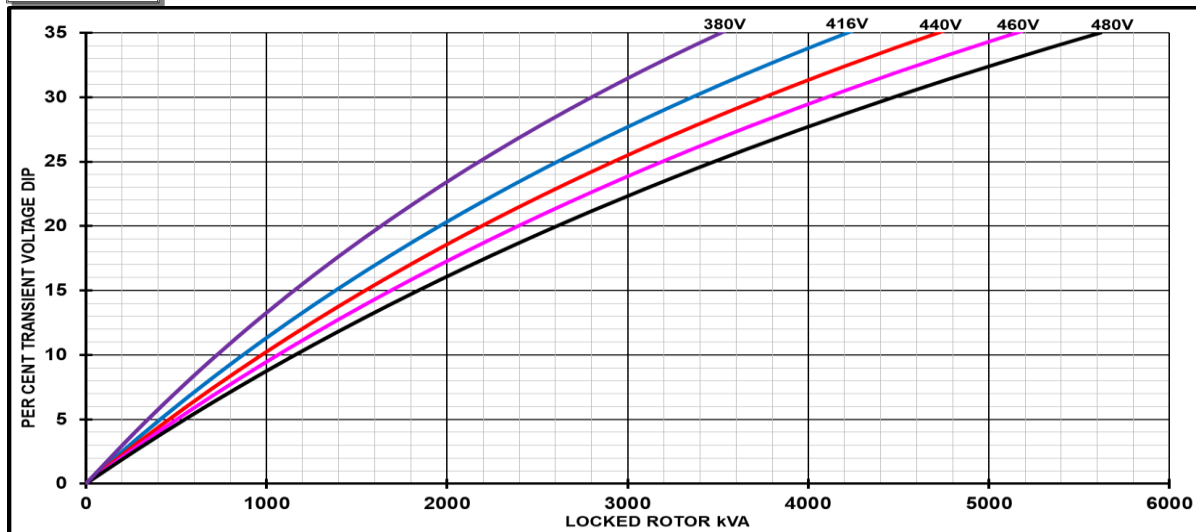
## S7L1D-F4 & S7L1W-F4 (Industrial) Wdg.312

### 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		

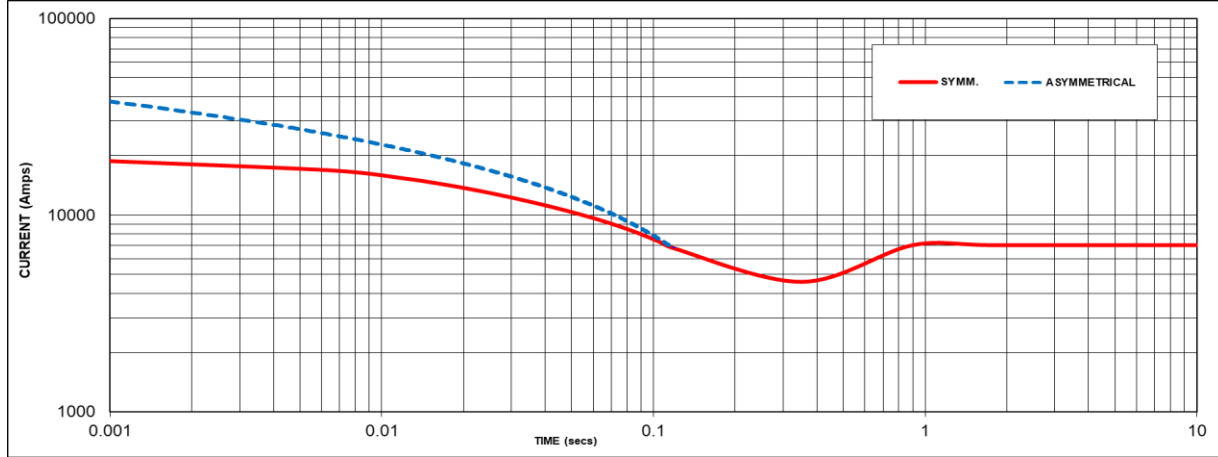
**Note:** To determine % Transient Voltage Dip or Voltage Rise at various PF, multiply the % Voltage Dip from the curve directly by the Scaling Factor.

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## S7L1D-F4 & S7L1W-F4 (Industrial) Wdg.312

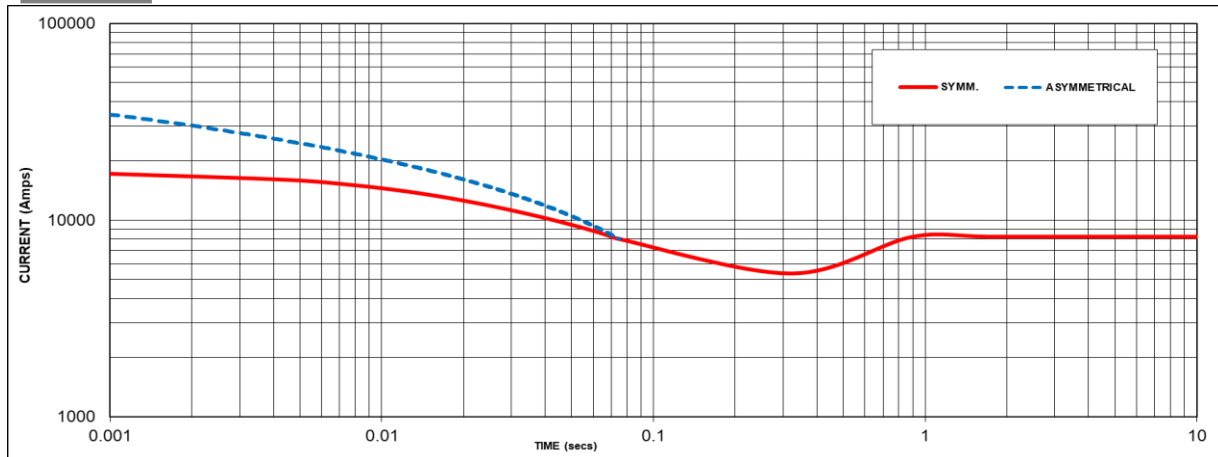
### Three-phase Short Circuit Decrement Curve - Separately Excited

**50Hz**



Sustained Short Circuit = 7046 Amps

**60Hz**



Sustained Short Circuit = 8246 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 1.05	440V	X 1.06
415V	X 1.09	460V	X 1.10
440V	X 1.16	480V	X 1.15

The sustained current value is constant irrespective of voltage level

If MX322 or digital AVR is used, the sustained short-circuit current value is to be multiplied by a factor of 1.2.

**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

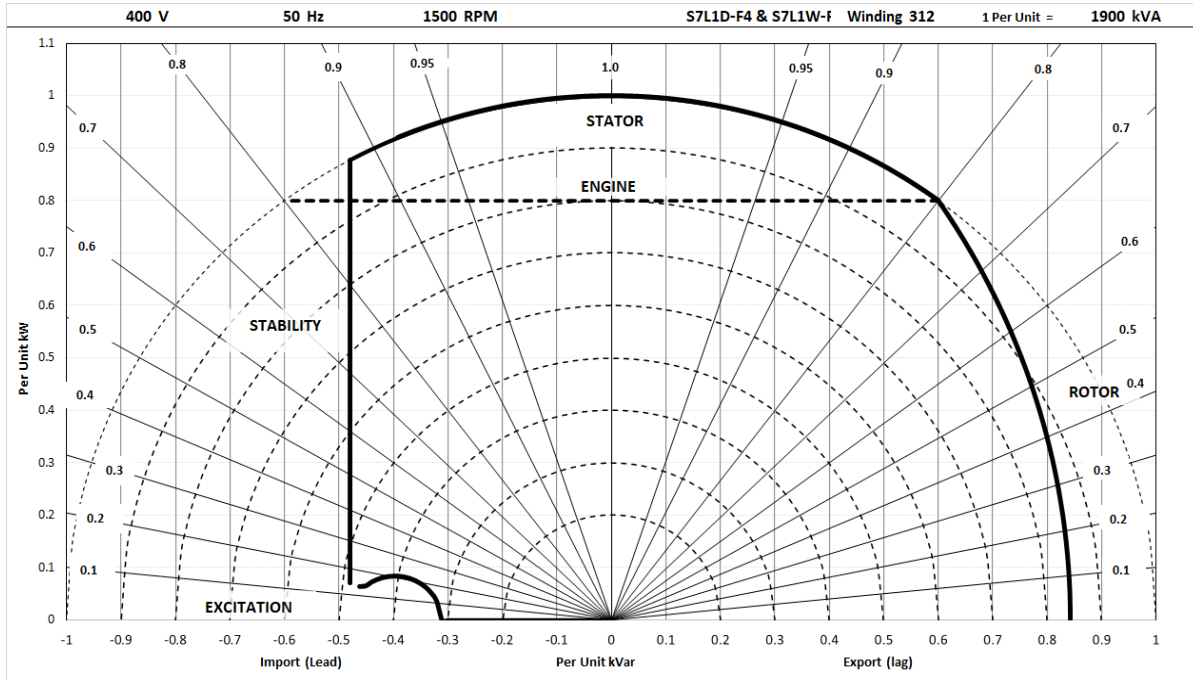
Series Delta = Curve current value X 1.732

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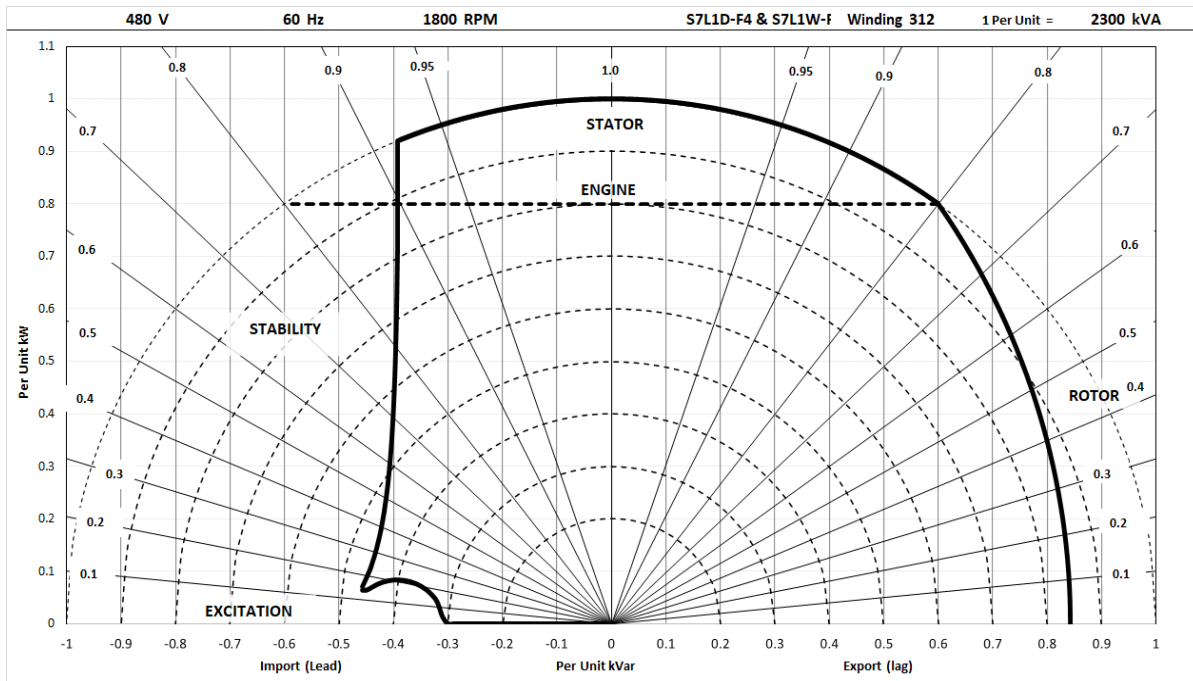
## S7L1D-F4 & S7L1W-F4 (Industrial) Wdg.312

### Typical Alternator Operating Charts

**400V/50Hz**



**480V/60Hz**





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## S7L1D-F4 & S7L1W-F4 (Industrial) Wdg.312

### 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)	380	400	415	440	380	400	415	440	380	400	415	440	380	400	415	440
	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	1975	2035	2035	1995	1920	1980	1980	1940	1845	1900	1900	1865	1715	1770	1770	1735
	kW	1580	1628	1628	1596	1536	1584	1584	1552	1476	1520	1520	1492	1372	1416	1416	1388
	Efficiency (%)	95.6	95.6	95.7	95.9	95.6	95.7	95.8	95.9	95.7	95.8	95.9	96.0	95.9	95.9	96.0	96.1
	kW Input	1653	1702	1701	1665	1606	1655	1654	1618	1542	1587	1585	1554	1431	1476	1475	1444

<b>60</b> 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	2219	2369	2419	2469	2156	2300	2350	2400	2070	2212	2256	2300	1937	2056	2100	2144
	kW	1775	1895	1935	1975	1725	1840	1880	1920	1656	1770	1805	1840	1550	1645	1680	1715
	Efficiency (%)	95.6	95.6	95.7	95.8	95.7	95.7	95.8	95.8	95.7	95.8	95.8	95.9	95.8	95.9	96.0	96.0
	kW Input	1857	1982	2022	2063	1803	1923	1963	2004	1730	1848	1883	1919	1617	1715	1751	1787

**Note:**

For S7L1W industrial application, ratings above are applicable for water inlet temperature up to 25°C.

Ratings are subject to the following reduction:

- 3% for every 5°C by which the water inlet temperature exceeds 25°C, up to maximum 38°C

Standby (163/27°C) ratings are not applicable for S7L1W.

**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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**For Applications Support:  
applications@cummins.com**

**For Customer Service:  
emea.service@cummins.com**

**For General Enquiries:  
Stamford-avk@cummins.com**

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