

# STAMFORD®

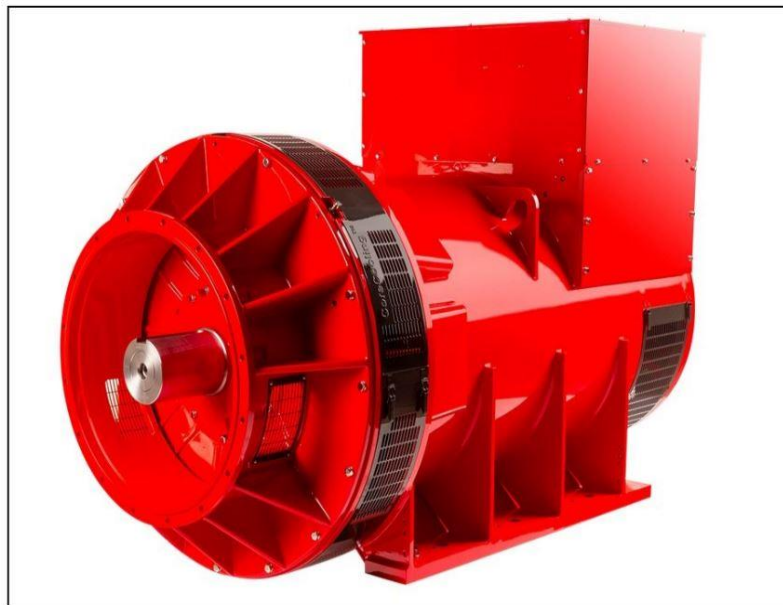
## S7L1D-D4 & S7L1W-D4 (Industrial) Wdg.312 - Technical Data Sheet

### 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)	15.6 - 14.8
No Load Excitation Current (A)	0.7 - 0.67
Full Load Excitation Voltage (V)	63
Full Load Excitation Current (A)	2.7
Exciter Time Constant (seconds)	0.125

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## S7L1D-D4 & S7L1W-D4 (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	24.02							
50 Hz					60 Hz			
Telephone Interference	THF<2%				TIF<50			
Cooling Air Flow	2.63 m³/sec				3.16 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)	1615	1650	1650	1620	1819	1937	1975	2019
Saturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	2.78	2.56	2.38	2.08	3.13	2.98	2.78	2.61
X'd Dir. Axis Transient	0.20	0.18	0.17	0.15	0.22	0.21	0.20	0.18
X''d Dir. Axis Subtransient	0.14	0.13	0.12	0.11	0.16	0.16	0.14	0.14
Xq Quad. Axis Reactance	1.98	1.82	1.69	1.48	2.23	2.12	1.98	1.86
X''q Quad. Axis Subtransient	0.24	0.22	0.20	0.18	0.27	0.26	0.24	0.22
XL Stator Leakage Reactance	0.09	0.08	0.08	0.07	0.10	0.10	0.09	0.09
X2 Negative Sequence Reactance	0.18	0.17	0.15	0.13	0.20	0.19	0.18	0.17
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	3.33	3.07	2.85	2.49	3.76	3.58	3.34	3.13
X'd Dir. Axis Transient	0.22	0.21	0.19	0.17	0.25	0.24	0.22	0.21
X''d Dir. Axis Subtransient	0.17	0.16	0.14	0.13	0.19	0.18	0.17	0.16
Xq Quad. Axis Reactance	2.04	1.88	1.74	1.52	2.30	2.18	2.04	1.91
X''q Quad. Axis Subtransient	0.29	0.26	0.25	0.21	0.32	0.31	0.29	0.27
XL Stator Leakage Reactance	0.10	0.10	0.09	0.08	0.12	0.11	0.10	0.10
Xlr Rotor Leakage Reactance	0.21	0.20	0.18	0.16	0.24	0.23	0.21	0.20
X2 Negative Sequence Reactance	0.21	0.20	0.18	0.16	0.24	0.23	0.22	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-D4 & S7L1W-D4 (Industrial) Wdg.312

Time Constants (Seconds)		
T'd Transient Time Const.	0.145	
T''d Sub-Transient Time Const.	0.014	
T'do O.C. Field Time Const.	3.990	
Ta Armature Time Const.	0.026	
T''q Sub-Transient Time Const.	0.0100	
Resistances in Ohms ( $\Omega$ ) at 22°C		
Stator Winding Resistance (Ra), per phase for series connected	0.00120	
Rotor Winding Resistance (Rf)	1.82	
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)	0.0015	
Negative Sequence Resistance (R2)	0.0017	
Zero Sequence Resistance (R0)	0.0015	
Saturation Factors	400V	480V
SG1.0	0.243	0.249
SG1.2	1.09	1.016
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	37.2 kgm <sup>2</sup>	36.3 kgm <sup>2</sup>
Weight Wound Stator	1395kg	1395kg
Weight Wound Rotor	1255kg	1203kg
Weight Complete Alternator	3066kg	3043kg
Shipping weight in a Crate	3115kg	3092kg
Packing Crate Size	200 X 105 X 155(cm)	200 X 105 X 155(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.

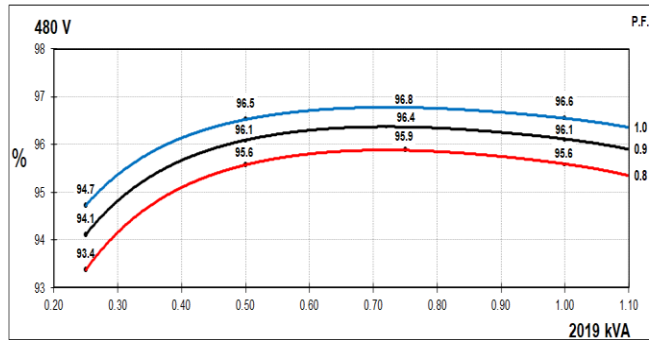
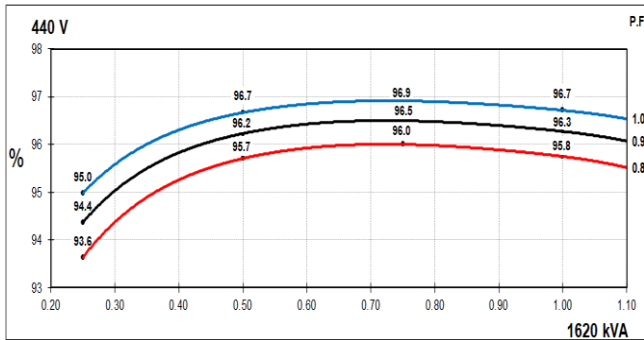
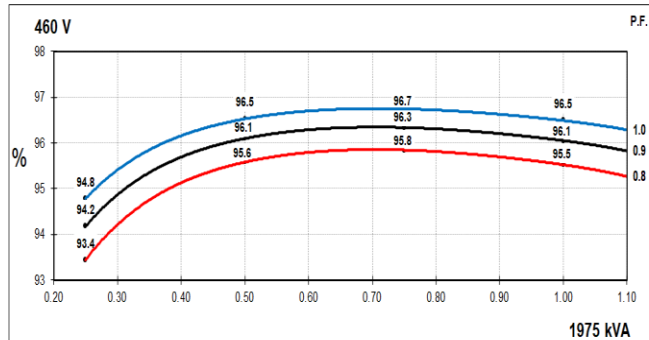
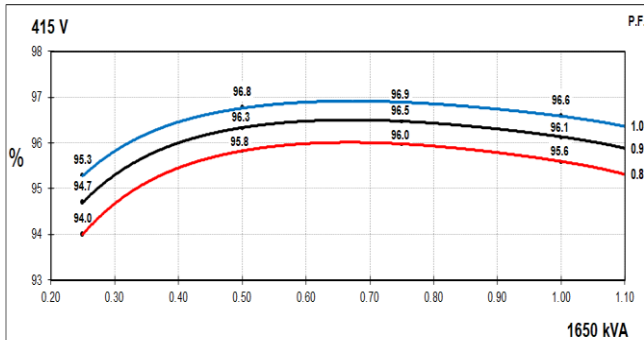
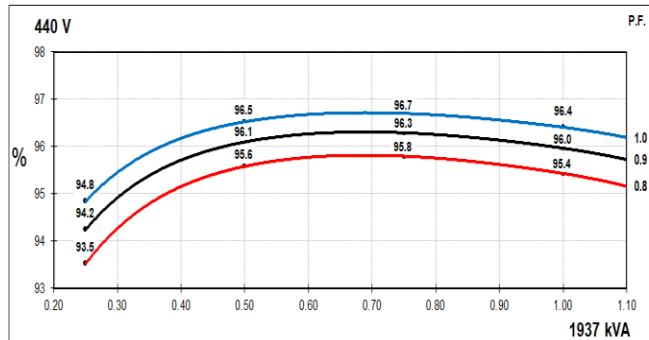
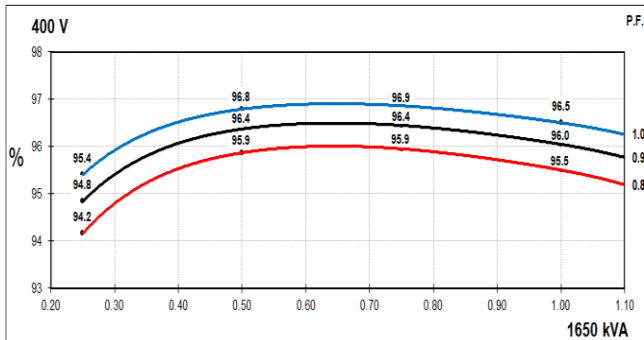
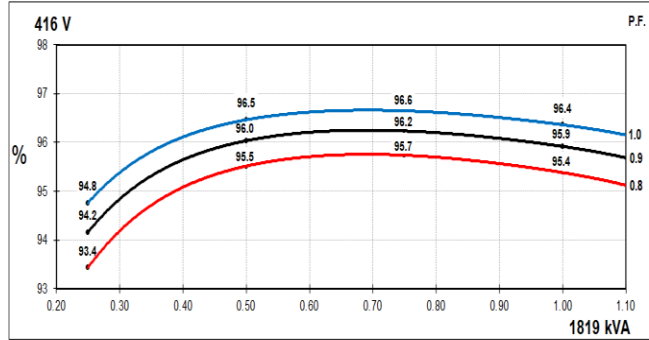
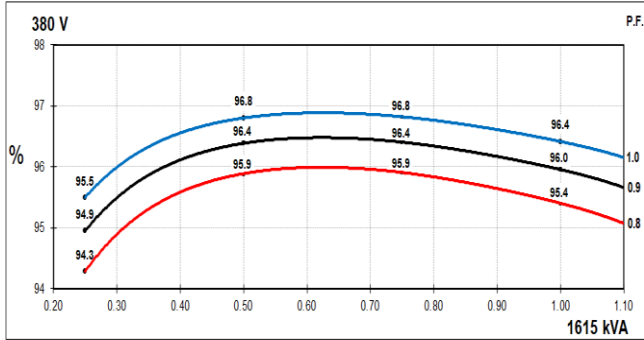
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## S7L1D-D4 & S7L1W-D4 (Industrial) Wdg.312

### THREE PHASE EFFICIENCY CURVES

**50Hz**

**60Hz**

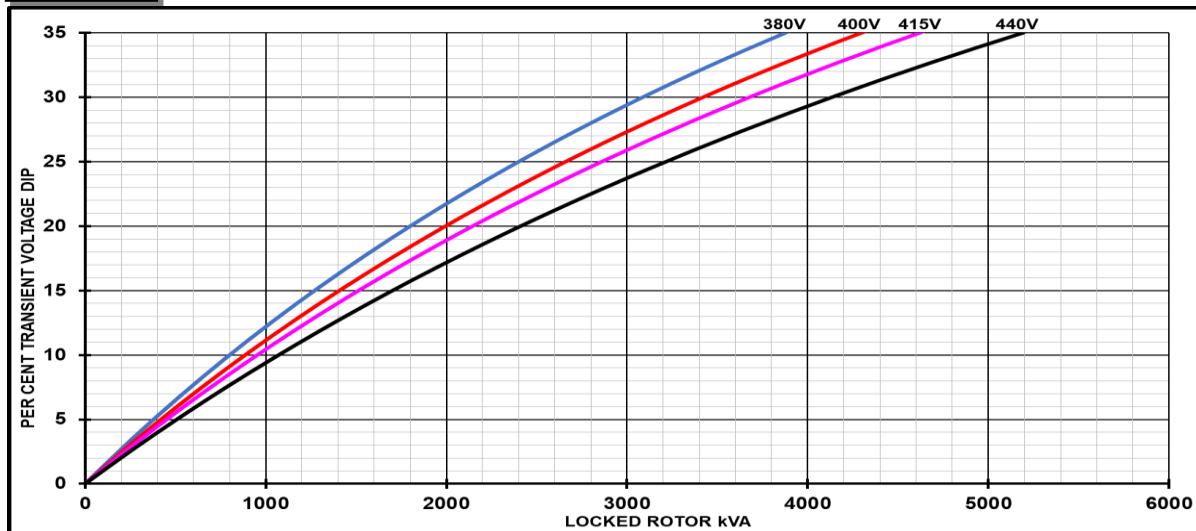


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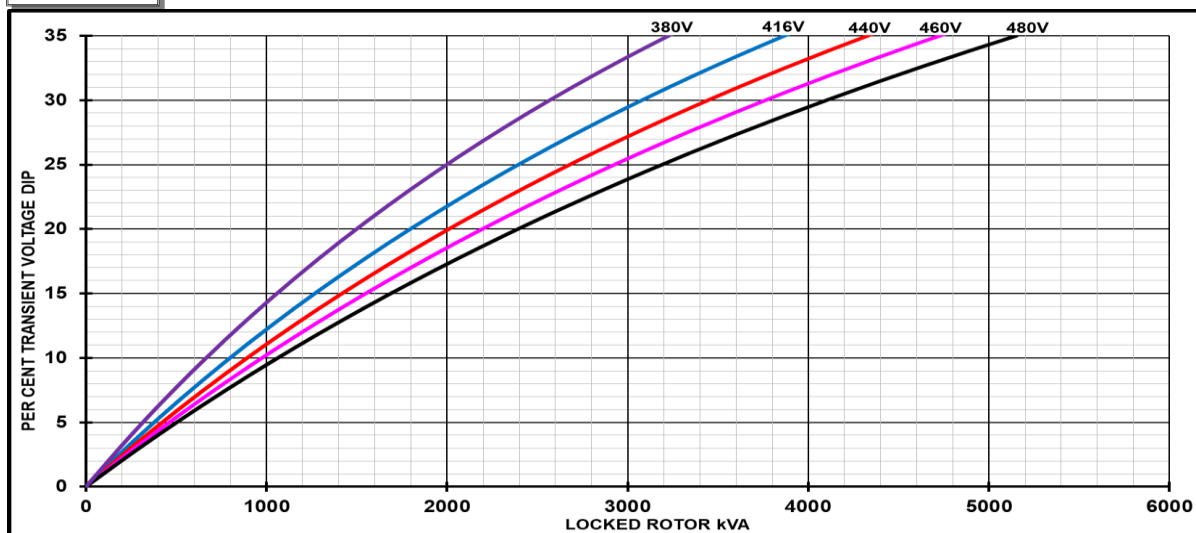
## S7L1D-D4 & S7L1W-D4 (Industrial) Wdg.312

### 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		

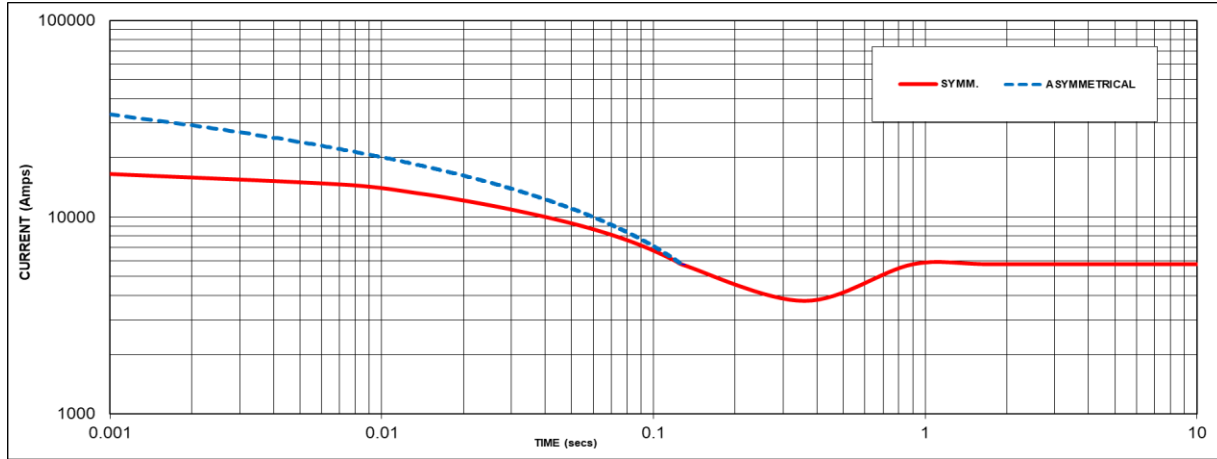
**Note:** To determine % Transient Voltage Dip or Voltage Rise at various PF, multiply the % Voltage Dip from the curve directly by the Scaling Factor.

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## S7L1D-D4 & S7L1W-D4 (Industrial) Wdg.312

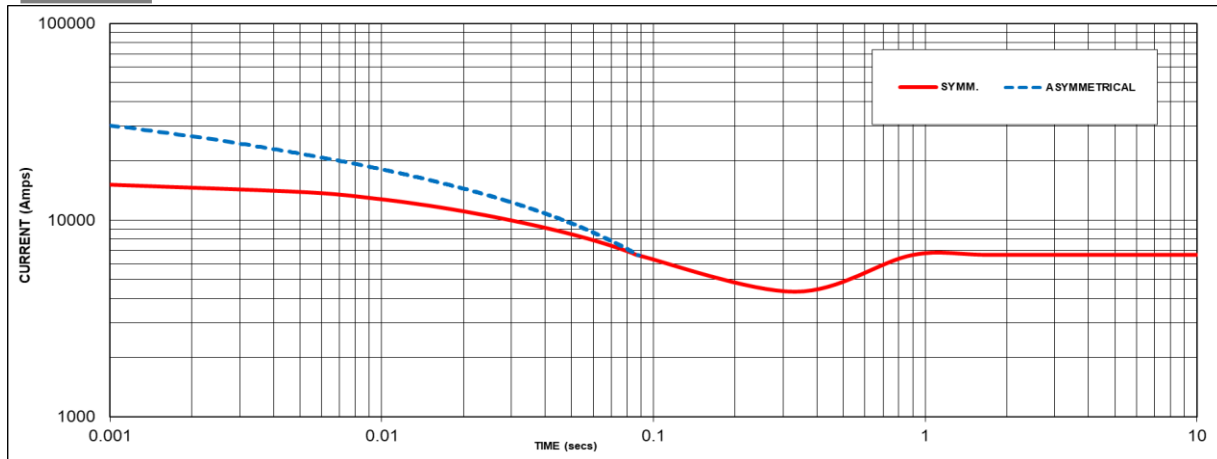
### Three-phase Short Circuit Decrement Curve - Separately Excited

**50Hz**



Sustained Short Circuit = 5751 Amps

**60Hz**



Sustained Short Circuit = 6665 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

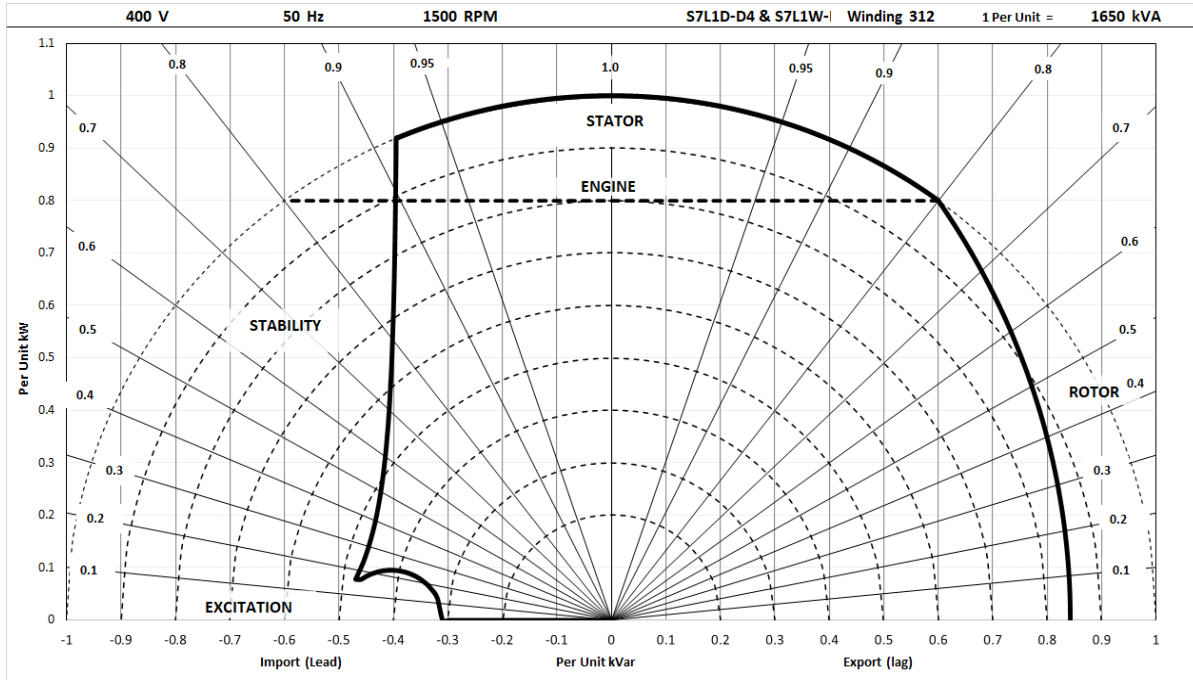
Series Delta = Curve current value X 1.732

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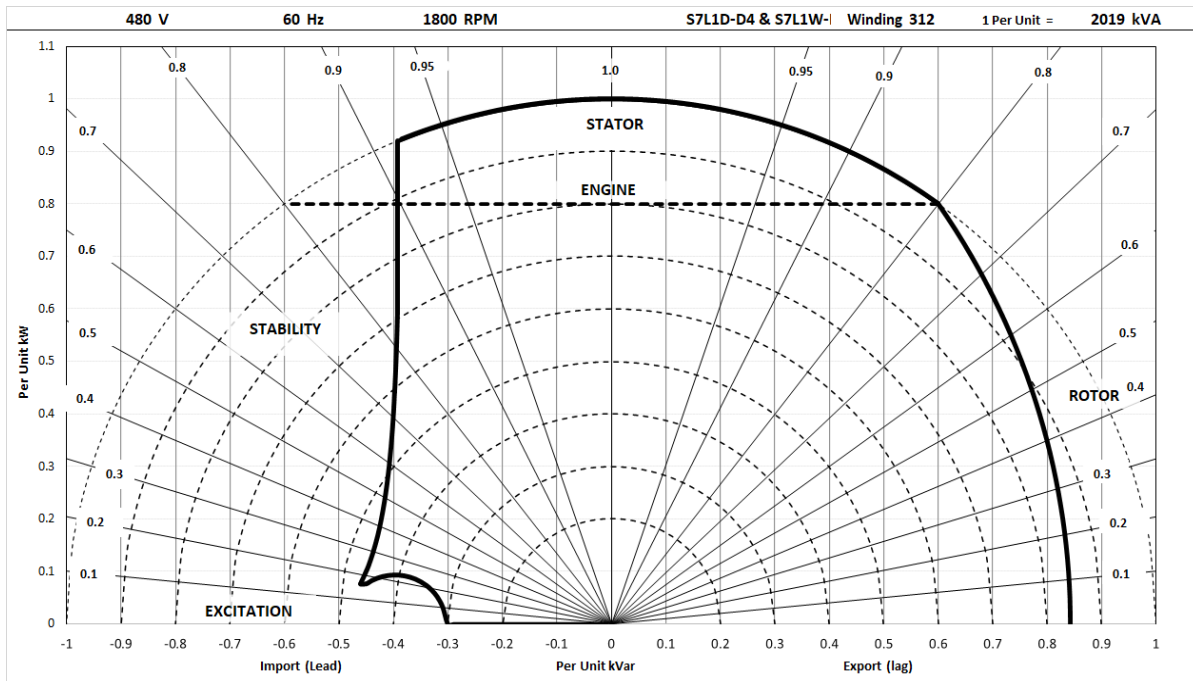
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### Typical Alternator Operating Charts

**400V/50Hz**



**480V/60Hz**



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## S7L1D-D4 & S7L1W-D4 (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	1715	1770	1770	1735	1675	1720	1720	1685	1615	1650	1650	1620	1500	1540	1540	1505
	kW	1372	1416	1416	1388	1340	1376	1376	1348	1292	1320	1320	1296	1200	1232	1232	1204
	Efficiency (%)	95.2	95.3	95.4	95.6	95.3	95.4	95.5	95.7	95.4	95.5	95.6	95.8	95.6	95.7	95.7	95.9
	kW Input	1441	1486	1484	1452	1406	1443	1441	1409	1354	1382	1381	1354	1255	1288	1287	1256

<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	1944	2075	2125	2162	1900	2019	2063	2100	1819	1937	1975	2019	1700	1800	1844	1875
	kW	1555	1660	1700	1730	1520	1615	1650	1680	1455	1550	1580	1615	1360	1440	1475	1500
	Efficiency (%)	95.2	95.3	95.3	95.4	95.3	95.3	95.4	95.5	95.4	95.4	95.5	95.6	95.5	95.6	95.7	95.7
	kW Input	1633	1743	1783	1812	1595	1694	1730	1759	1526	1624	1654	1690	1424	1507	1542	1567

**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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