

# STAMFORD®

## S0L1-D1 Wdg.311 (Single Phase) - Technical Data Sheet

### Standards

Stamford industrial alternators meet the requirements of 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	
<b>AVR Type</b>	<b>AVR Power</b>
VITA01	Self-Excited / Aux winding
Voltage Regulation	± 0.5%
No Load Excitation Voltage (V)	10 V
Full Load Excitation Voltage (V)	40 V

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## SOL1-D1 Wdg.311 (Single Phase)

Electrical Data												
Insulation System	Class H											
IP Rating	IP23											
Stator Winding	Double Layer Concentric											
Winding Pitch	Two Thirds											
Winding Leads	12											
Winding Number	311											
Number of Poles	4											
RFI Suppression	EN 61000-6-2 & EN 61000-6-4, refer to factory for others											
Waveform Distortion	NO LOAD < 2.5% NON-DISTORTING LINEAR LOAD < 5.0%											
Short Circuit Ratio	1/Xd											
Steady State X/R Ratio	N/A											
	50Hz						60Hz					
VOLTAGE DOUBLE DELTA	220 / 110		230 / 115		240 / 120		220 / 110		230 / 115		240 / 120	
VOLTAGE PARALLEL DELTA	110		115		120		110		115		120	
POWER FACTOR	0.8	1.0	0.8	1.0	0.8	1.0	0.8	1.0	0.8	1.0	0.8	1.0
kVA BASE RATING FOR REACTANCE VALUES	4.5	5.1	4.4	4.9	4.3	4.8	4.6	5.2	4.8	5.4	5.0	5.6
Saturated Values in Per Unit at Base Ratings and Voltages												
Xd Dir. Axis Synchronous	2.14	2.42	1.91	2.13	1.72	1.91	2.62	2.96	2.50	2.81	2.39	2.68
X'd Dir. Axis Transient	0.17	0.19	0.15	0.17	0.13	0.15	0.20	0.23	0.19	0.22	0.19	0.21
X''d Dir. Axis Subtransient	0.14	0.16	0.13	0.14	0.11	0.13	0.17	0.19	0.16	0.18	0.16	0.18
Xq Quad. Axis Reactance	1.39	1.58	1.25	1.39	1.12	1.25	1.71	1.93	1.63	1.84	1.56	1.75
X''q Quad. Axis Subtransient	0.22	0.25	0.20	0.22	0.18	0.20	0.27	0.31	0.26	0.29	0.25	0.28
Xl Leakage Reactance	0.07	0.08	0.06	0.07	0.05	0.06	0.08	0.09	0.08	0.09	0.08	0.08
X2 Negative Reactance	0.23	0.26	0.21	0.23	0.18	0.21	0.28	0.32	0.27	0.30	0.26	0.29
X0 Zero Sequence	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.02	0.01	0.02
Unsaturated Values in Per Unit at Base Ratings and Voltages												
Xd Dir. Axis Synchronous	2.56	2.91	2.29	2.55	2.06	2.30	3.14	3.56	3.00	3.38	2.87	3.22
X'd Dir. Axis Transient	0.19	0.22	0.17	0.19	0.15	0.17	0.23	0.26	0.22	0.25	0.21	0.24
X''d Dir. Axis Subtransient	0.16	0.19	0.15	0.16	0.13	0.15	0.20	0.23	0.19	0.22	0.18	0.21
Xq Quad. Axis Reactance	1.44	1.63	1.28	1.43	1.15	1.29	1.76	1.99	1.68	1.89	1.61	1.80
X''q Quad. Axis Subtransient	0.26	0.30	0.24	0.26	0.21	0.24	0.32	0.37	0.31	0.35	0.30	0.33
Xl Leakage Reactance	0.08	0.09	0.07	0.08	0.06	0.07	0.09	0.11	0.09	0.10	0.09	0.10
X2 Negative Reactance	0.28	0.31	0.25	0.28	0.22	0.25	0.34	0.38	0.32	0.36	0.31	0.35
X0 Zero Sequence	0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
Time Constants (seconds)												
T'd TRANSIENT TIME CONST.	0.017											
T''d SUB-TRANSTIME CONST.	0.001											
T'do O.C. FIELD TIME CONST.	0.319											
Ta ARMATURE TIME CONST.	0.004											

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## S0L1-D1 Wdg.311 (Single Phase)

Resistances in Ohms ( $\Omega$ ) at 22°C	
Stator Winding Resistance (Ra)	1.289 $\Omega$ per phase series star connected
Rotor Winding Resistance (Rf)	0.368 $\Omega$
Exciter Stator Winding Resistance	13.989 $\Omega$
Exciter Rotor Winding Resistance	0.093 $\Omega$ per phase
Positive Sequence Resistance (R1)	1.611 $\Omega$
Negative Sequence Resistance (R2)	1.856 $\Omega$
Zero Sequence Resistance (R0)	1.611 $\Omega$
Aux Winding Resistance (with winding 711 only)	N/A
Mechanical data	
Cooling Air	0.058 m <sup>3</sup> /sec (50Hz)      0.07 m <sup>3</sup> /sec (60Hz)
Shaft and Keys	All alternator rotors are dynamically balanced to better than BS6861: Part 1 Grade 2.5 for minimum vibration in operation.
Bearing	Single Bearing
Weight Complete Alternator	68.5 kg
Weight Wound Stator	23.2 kg
Weight Wound Rotor	22.7 kg
Moment of Inertia	0.049 kgm <sup>2</sup>
Shipping weight in a Crate	107 kg
Packing Crate Size	930X590X760 mm
Maximum Over Speed	2250 RPM for two minutes
Bearing Drive End	N/A
Bearing Non-Drive End	Ball Bearing, 6305-2RS1

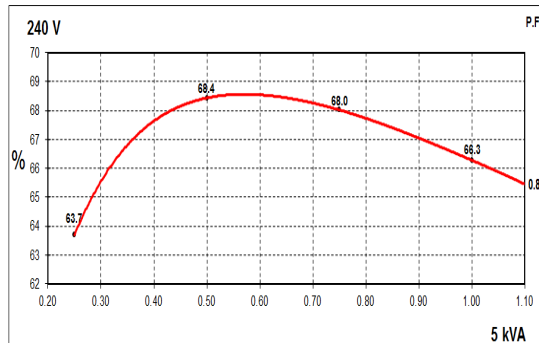
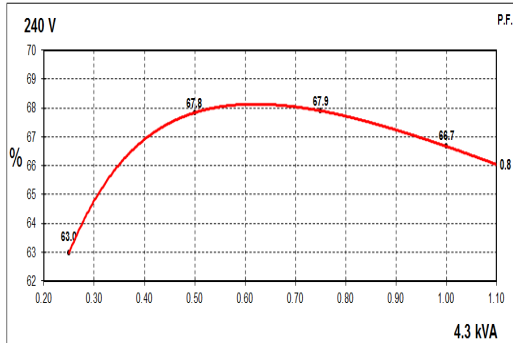
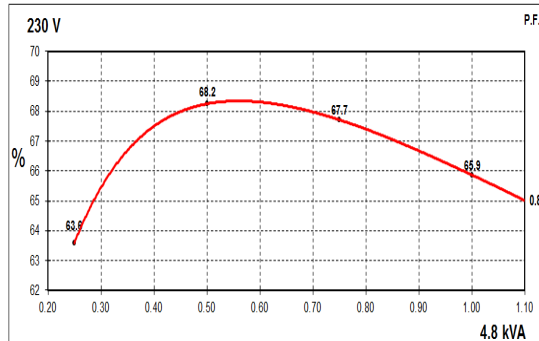
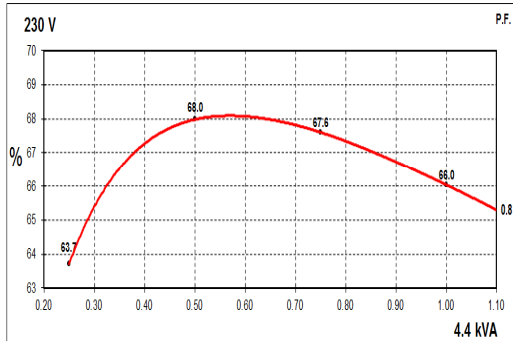
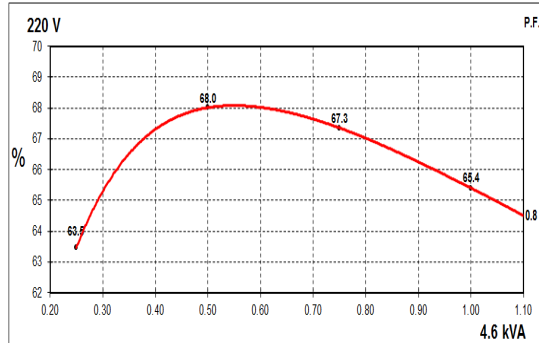
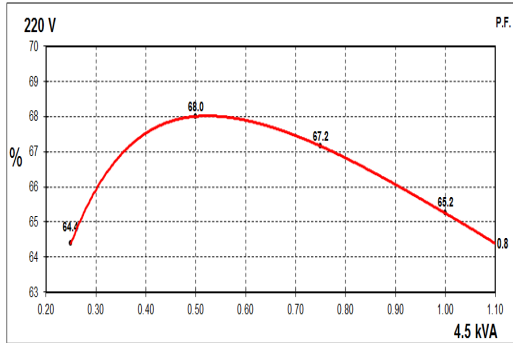
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## S0L1-D1 Wdg.311 (Single Phase)

### Double Delta Efficiency Curves with 0.8PF

50Hz Curves

60Hz Curves



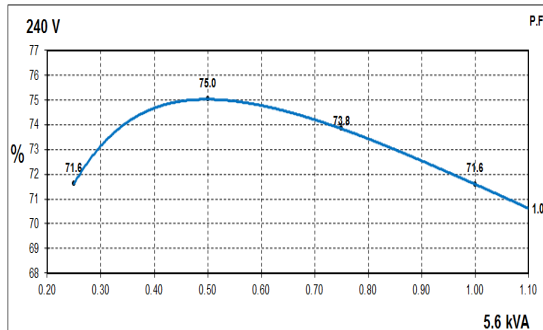
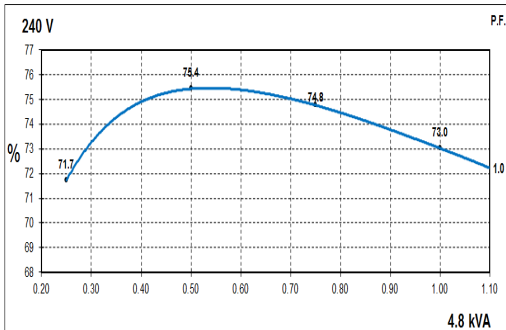
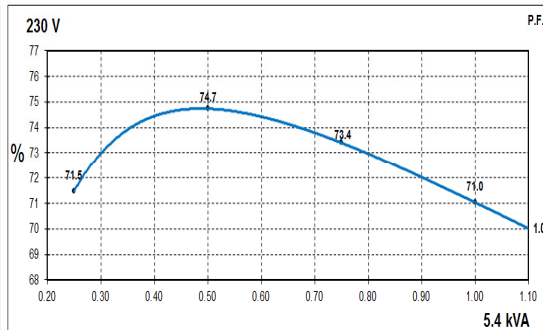
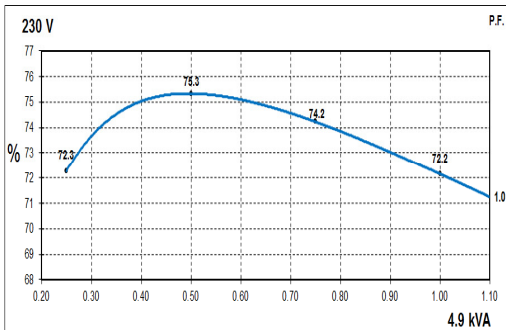
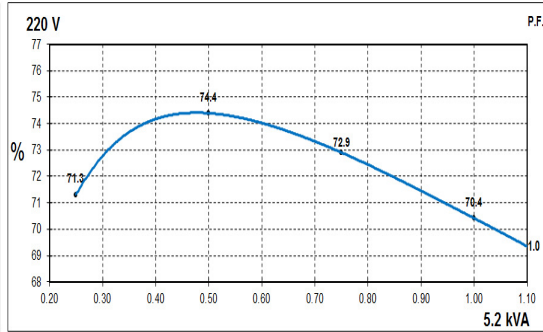
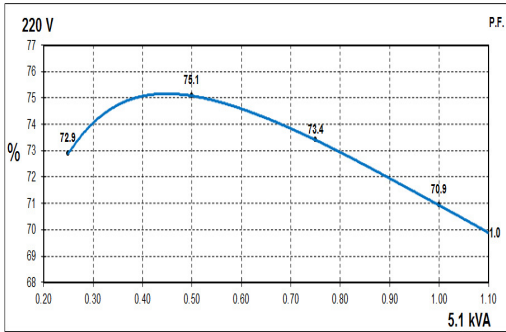
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## S0L1-D1 Wdg.311 (Single Phase)

### Double Delta Efficiency Curves with 1.0PF

50Hz Curves

60Hz Curves

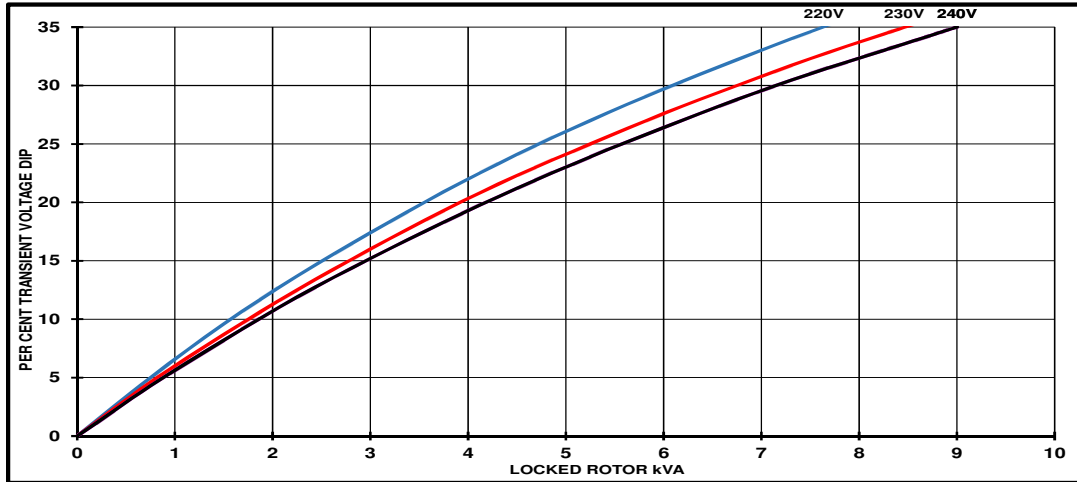


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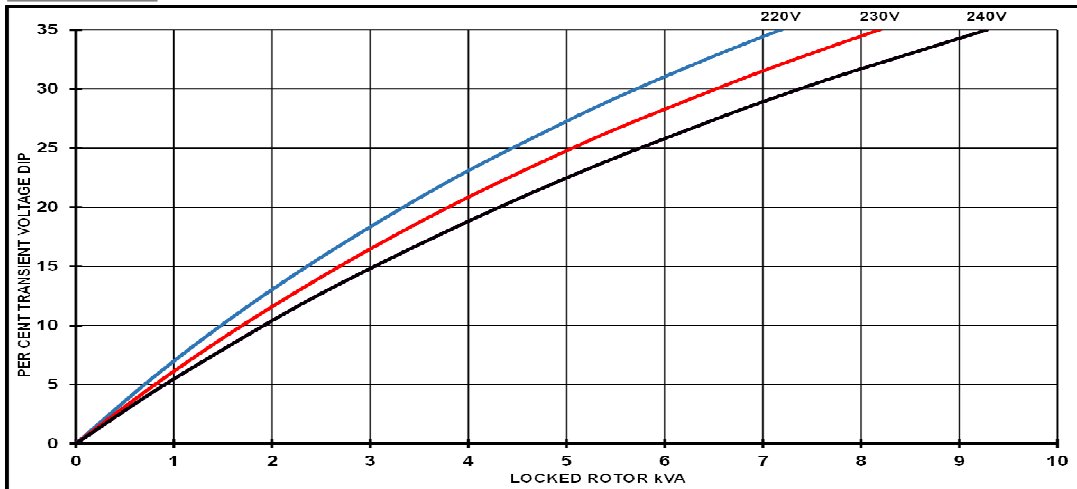
S0L1-D1 Wdg.311 (Single Phase)

## Locked Rotor Motor Starting Curves

**50Hz**



**60Hz**

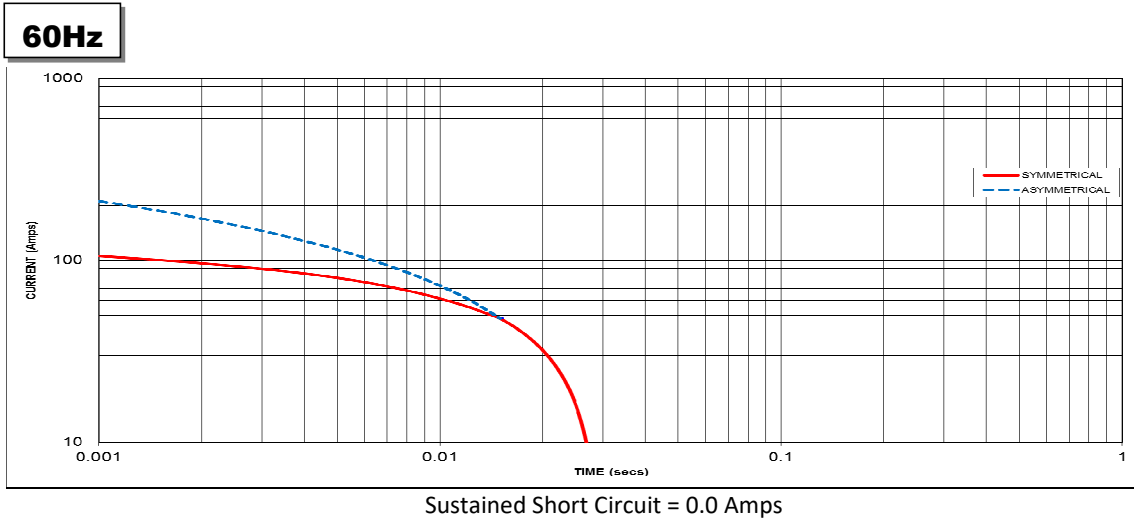
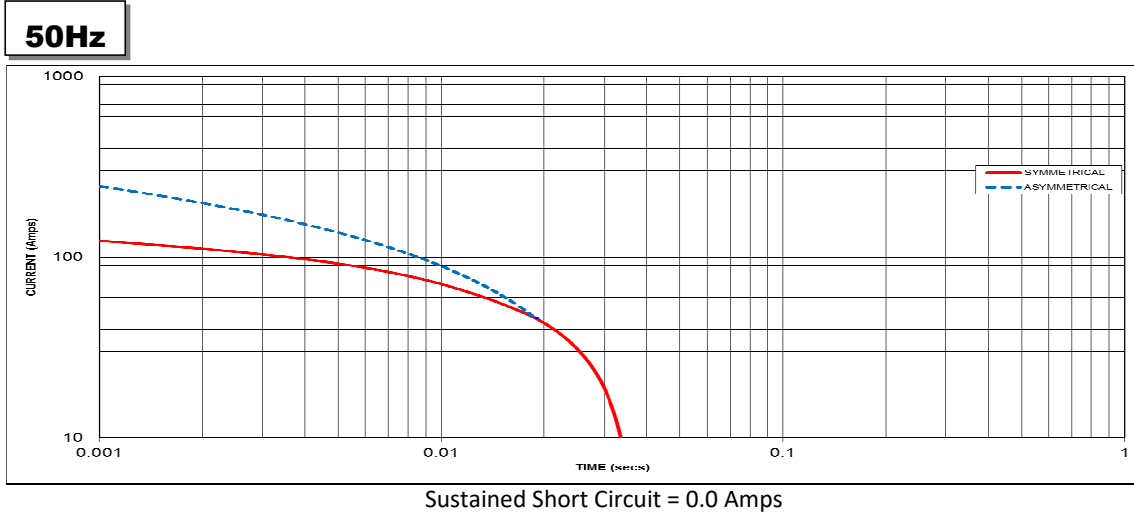


Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor
PF	Factor	
< 0.5	1.00	For voltage rise multiply voltage dip by 1.25
0.5	0.97	
0.6	0.93	
0.7	0.90	
0.8	0.85	
0.9	0.83	
1.0	0.80	

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## S0L1-D1 Wdg.311 (Single Phase) Double Delta Short Circuit Decrement Curve

*Winding 311 (no Auxiliary winding) will not provide short circuit capability.*



**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
220V	X 1.00	220V	X 1.00
230V	X 1.05	230V	X 1.05
240V	X 1.09	240V	X 1.09

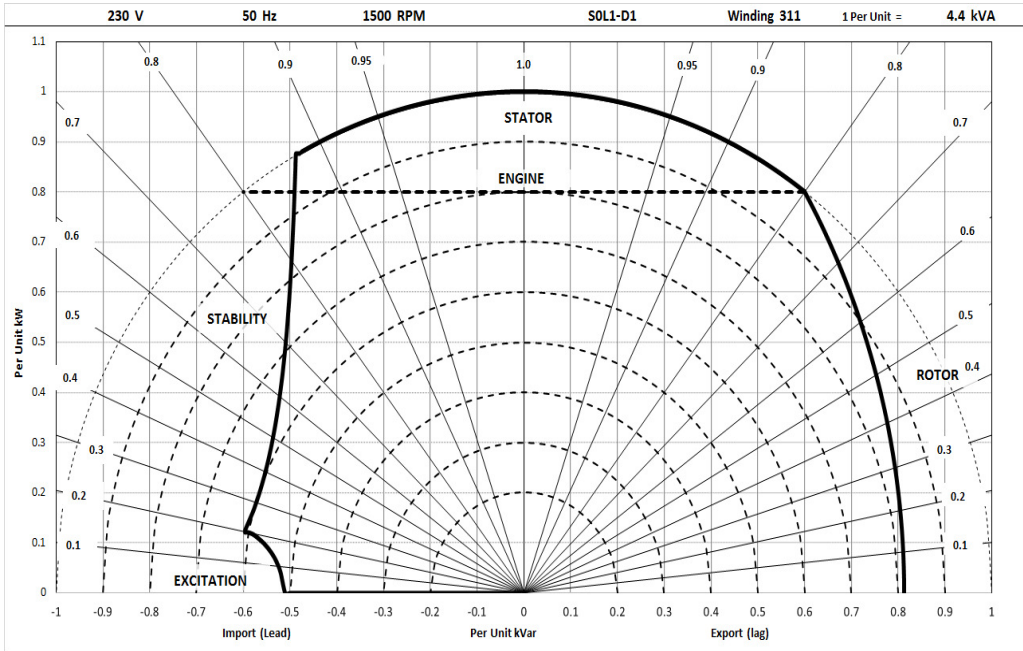
The sustained current value is constant irrespective of voltage level

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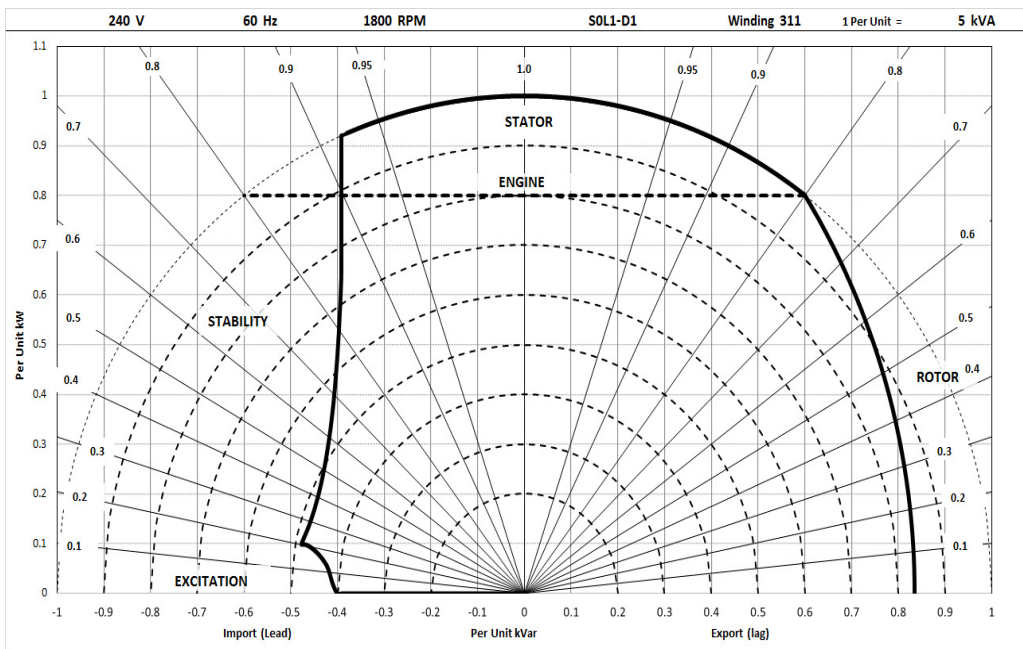
## SOL1-D1 Wdg.311 (Single Phase)

### Typical Alternator Operating Charts

**230V/50Hz**



**240V/60Hz**





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## S0L1-D1 Wdg.311 (Single Phase)

### RATINGS

#### 50Hz

Class - Temp Rise	Cont. F - 105/40°C <b>0.8pf</b>			Cont. H - 125/40°C <b>0.8pf</b>			Standby - 150/40°C <b>0.8pf</b>			Standby - 163/27°C <b>0.8pf</b>		
Double Delta (V)	220	230	240	220	230	240	220	230	240	220	230	240
Parallel Delta (V)	110	115	120	110	115	120	110	115	120	110	115	120
kVA	4.1	4.0	3.9	4.5	4.4	4.3	4.8	4.7	4.6	4.9	4.8	4.7
kW	3.3	3.2	3.1	3.6	3.5	3.4	3.8	3.8	3.7	3.9	3.8	3.8
Efficiency (%)	66.0	66.7	67.2	65.2	66.0	66.7	64.7	65.5	66.2	64.5	65.4	66.1
kW Input	5.0	4.8	4.6	5.5	5.3	5.2	5.9	5.7	5.6	6.1	5.9	5.7

Class - Temp Rise	Cont. F - 105/40°C <b>1.0pf</b>			Cont. H - 125/40°C <b>1.0pf</b>			Standby - 150/40°C <b>1.0pf</b>			Standby - 163/27°C <b>1.0pf</b>		
Double Delta (V)	220	230	240	220	230	240	220	230	240	220	230	240
Parallel Delta (V)	110	115	120	110	115	120	110	115	120	110	115	120
kVA	4.6	4.5	4.4	5.1	4.9	4.8	5.5	5.3	5.2	5.6	5.4	5.3
kW	4.6	4.5	4.4	5.1	4.9	4.8	5.5	5.3	5.2	5.6	5.4	5.3
Efficiency (%)	71.9	72.9	73.7	70.9	72.2	73.0	70.1	71.4	72.4	69.9	71.2	72.2
kW Input	6.4	6.2	6.0	7.2	6.8	6.6	7.8	7.4	7.2	8.0	7.6	7.3

#### 60Hz

Class - Temp Rise	Cont. F - 105/40°C <b>0.8pf</b>			Cont. H - 125/40°C <b>0.8pf</b>			Standby - 150/40°C <b>0.8pf</b>			Standby - 163/27°C <b>0.8pf</b>		
Double Delta (V)	220	230	240	220	230	240	220	230	240	220	230	240
Parallel Delta (V)	110	115	120	110	115	120	110	115	120	110	115	120
kVA	4.2	4.4	4.6	4.6	4.8	5.0	5.0	5.2	5.3	5.0	5.2	5.4
kW	3.4	3.5	3.7	3.7	3.8	4.0	4.0	4.2	4.2	4.0	4.2	4.3
Efficiency (%)	66.1	66.5	66.9	65.4	65.9	66.3	64.6	65.2	65.8	64.6	65.2	65.6
kW Input	5.1	5.3	5.5	5.6	5.8	6.0	6.2	6.4	6.4	6.2	6.4	6.6

Class - Temp Rise	Cont. F - 105/40°C <b>1.0pf</b>			Cont. H - 125/40°C <b>1.0pf</b>			Standby - 150/40°C <b>1.0pf</b>			Standby - 163/27°C <b>1.0pf</b>		
Double Delta (V)	220	230	240	220	230	240	220	230	240	220	230	240
Parallel Delta (V)	110	115	120	110	115	120	110	115	120	110	115	120
kVA	4.8	5.0	5.1	5.2	5.4	5.6	5.6	5.8	6.0	5.7	5.9	6.2
kW	4.8	5.0	5.1	5.2	5.4	5.6	5.6	5.8	6.0	5.7	5.9	6.2
Efficiency (%)	71.2	71.8	72.4	70.4	71.0	71.6	69.6	70.3	70.9	69.4	70.1	70.5
kW Input	6.7	7.0	7.0	7.4	7.6	7.8	8.0	8.3	8.5	8.2	8.4	8.8

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## SOL1-D1 Wdg.311 (Single Phase)

### De-Rates

All values tabulated above are subject to the following reductions:

- 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
- 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 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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