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S0L2-F Winding 311 / 711

S0L2-F - 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	
AVR Type	**AVR Power**
VITA01	Self-Excited / Aux winding
Voltage Regulation	± 0.5%
No Load Excitation Voltage (V)	13 V
Full Load Excitation Voltage (V)	47 V

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Electrical Data								
Insulation System	Class H							
Stator Winding	Double Layer Concentric							
Winding Pitch	Two Thirds							
Winding Leads	12							
Winding Number	311/711							
Number of Poles	4							
IP Rating	IP23							
RFI Suppression	EN 61000-6-2 & EN 61000-6-4, refer to factory for others							
Waveform Distortion	NO LOAD < 2.5% NON-DISTORTING BALANCED LINEAR LOAD < 5.0%							
Short Circuit Ratio	1/Xd							
Steady State X/R Ratio	5.1							
	50 Hz				**60 Hz**			
Telephone Interference	THF<2%				TIF<75			
Voltage Series Star	380/220	400/231	415/240	440/254	416/240	440/254	460/266	480/277
Voltage Parallel Star	190/110	200/115	208/120	220/127	208/120	220/127	230/133	240/138
Voltage Series Delta	220/110	230/115	240/120	254/127	240/120	254/127	266/133	277/138
kVA Base Rating (Class H)	16	17.5	17.5	N/A	18.5	19.6	N/A	21
Saturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	2.677	2.643	2.455		3.099	2.935		2.643
X'd Dir. Axis Transient	0.169	0.167	0.155		0.196	0.185		0.167
X"d Dir. Axis Subtransient	0.140	0.138	0.128		0.162	0.153		0.138
Xq Quad. Axis Reactance	1.421	1.403	1.303		1.645	1.558		1.403
X"q Quad. Axis Subtransient	0.177	0.174	0.162		0.205	0.194		0.174
XL Stator Leakage Reactance	0.084	0.083	0.077		0.097	0.092		0.083
X2 Negative Sequence Reactance	0.241	0.238	0.221		0.279	0.264		0.238
X0 Zero Sequence Reactance	0.050	0.050	0.046		0.058	0.055		0.050
Unsaturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	3.213	3.171	2.946		3.719	3.522		3.171
X'd Dir. Axis Transient	0.194	0.192	0.178		0.225	0.213		0.192
X"d Dir. Axis Subtransient	0.163	0.161	0.150		0.189	0.179		0.161
Xq Quad. Axis Reactance	1.463	1.445	1.342		1.694	1.605		1.445
X"q Quad. Axis Subtransient	0.212	0.209	0.194		0.245	0.232		0.209
XL Stator Leakage Reactance	0.095	0.094	0.087		0.110	0.104		0.094
X2 Negative Sequence Reactance	0.289	0.285	0.265		0.335	0.317		0.285
X0 Zero Sequence Reactance	0.059	0.058	0.054		0.068	0.064		0.058
Time Constants (Seconds)								
T'd TRANSIENT TIME CONST.	0.021							
T''d SUB-TRANSTIME CONST.	0.002							
T'do O.C. FIELD TIME CONST.	0.487							
Ta ARMATURE TIME CONST.	0.006							

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Resistances in Ohms (Ω) at 22°C	
Stator Winding Resistance (Ra)	0.465 Ω per phase series star connected
Rotor Winding Resistance (Rf)	0.6 Ω
Exciter Stator Winding Resistance	14.624 Ω
Exciter Rotor Winding Resistance	0.135Ω per phase
Positive Sequence Resistance (R1)	0.617 Ω
Negative Sequence Resistance (R2)	0.711 Ω
Zero Sequence Resistance (R0)	0.617 Ω
Aux Winding Resistance (with winding 711 only)	5.950 Ω

Mechanical data		
Cooling Air	0.105 m³/sec (50Hz)	0.126 m³/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	1 Bearing	2 Bearing
Weight Complete Alternator	101 kg	112 kg
Weight Wound Stator	38.8 kg	38.8 kg
Weight Wound Rotor	34.557 kg	35.551 kg
Moment of Inertia	0.1127 kgm2	0.113 kgm2
Shipping weight in a Crate	139 kg	151 kg
Packing Crate Size	930X590X760 mm	930X590X760 mm
Maximum Over Speed	2250 RPM for two minutes	
Bearing Drive End	-	BALL. 6309-2RS (ISO)
Bearing Non-Drive End	Ball Bearing, 6305-2RS1	Ball Bearing, 6305-2RS1

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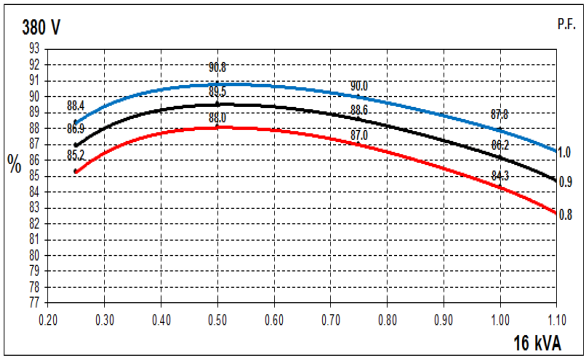
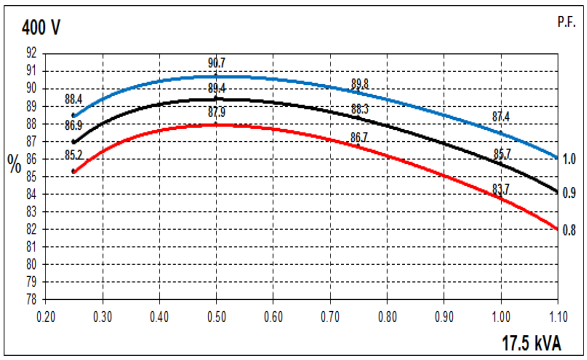
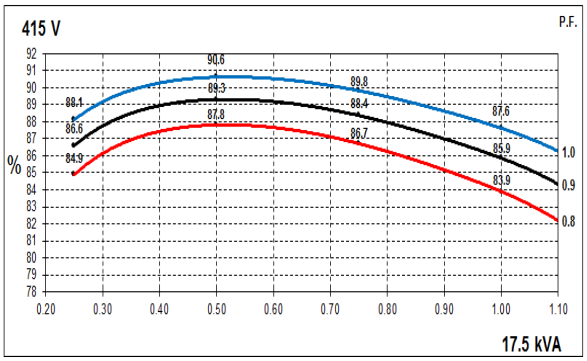
Three Phase Efficiency Curves

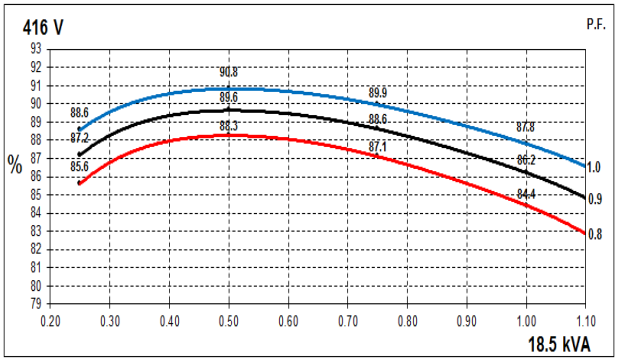
50Hz Curves

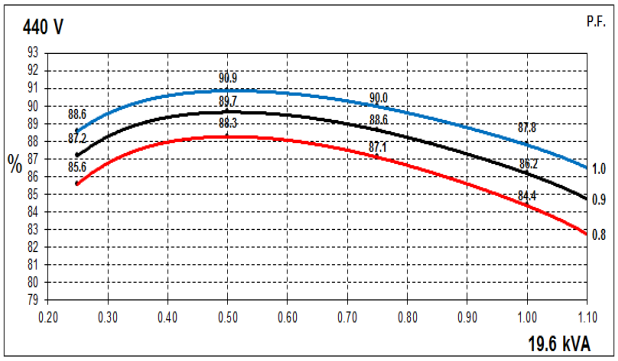


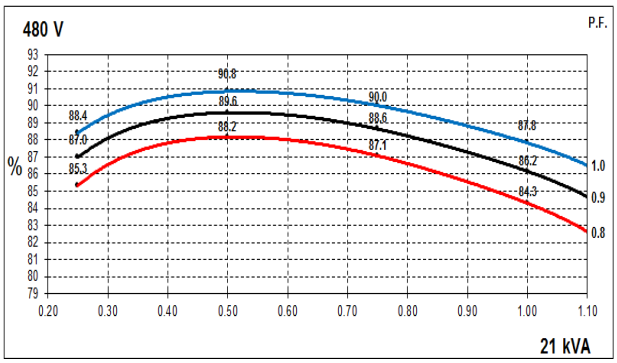




60Hz Curves







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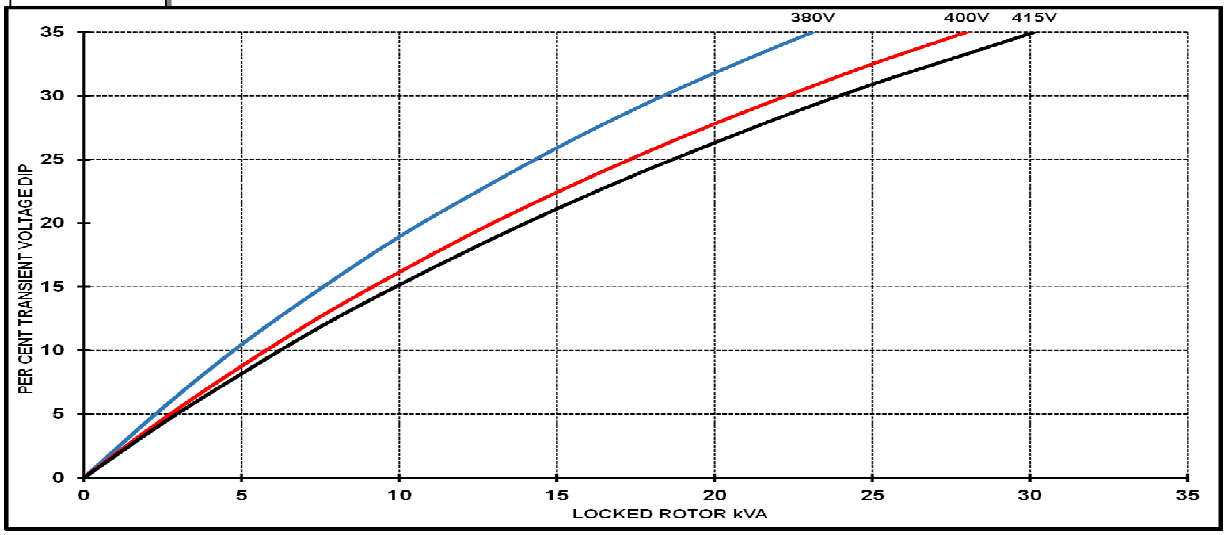
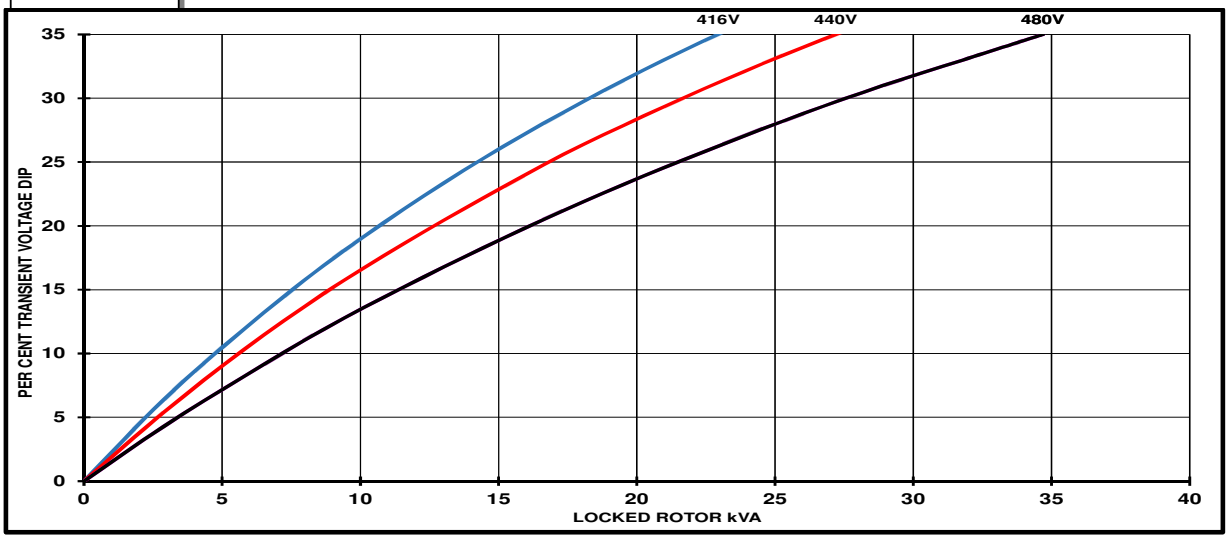
Locked Rotor Motor Starting Curves

50Hz



60Hz



Transient Voltage Dip Scaling Factor	
PF	Factor
< 0.5	1.00
0.5	0.97
0.6	0.93
0.7	0.90
0.8	0.85
0.9	0.83
1.0	0.80

Transient Voltage Rise Scaling Factor
For voltage rise multiply voltage dip by 1.25

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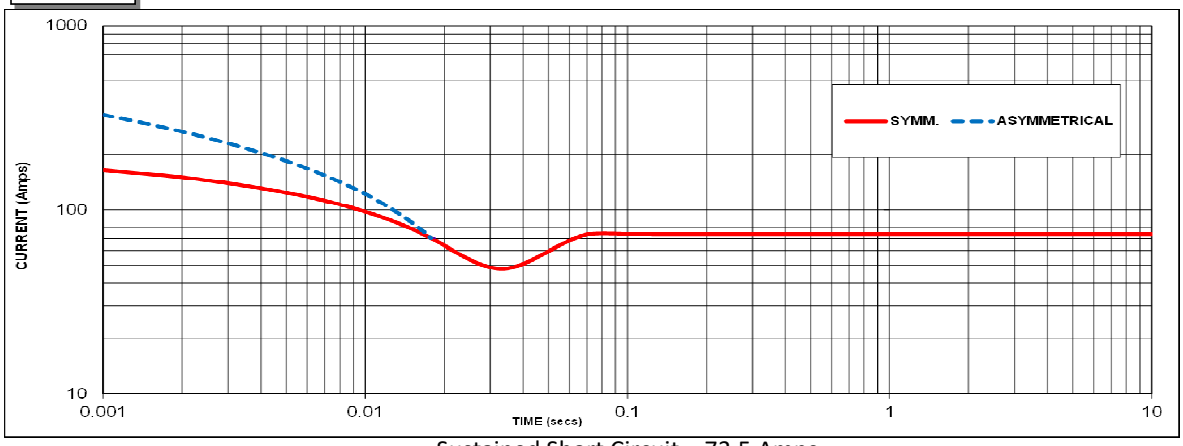
S0L2-F Winding 711
Three-phase Short Circuit Decrement Curve

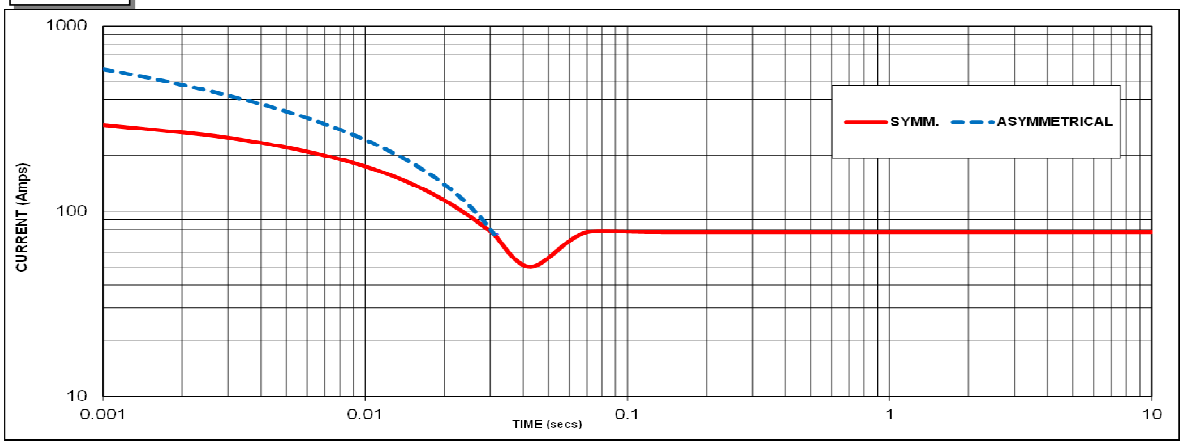
Note: Applicable only for Winding 711 (Auxiliary winding).
Winding 311 (no Auxiliary winding) will not provide sustained short circuit capability.

50Hz



Sustained Short Circuit = 73.5 Amps

60Hz



Sustained Short Circuit = 77 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	N/A	416V	X 1.00
400V	X 1.00	440V	X 1.06
415v	X 1.04	460V	N/A
440V	N/A	480V	X 1.15

The sustained current value is constant irrespective of voltage level

This alternator is capable of achieving a balanced 300% sustained short circuit for up to 10 seconds.

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.

All other times are unchanged

Note 3
Curves are drawn for Star connected machines under no-load excitation at rated speeds. For other connection 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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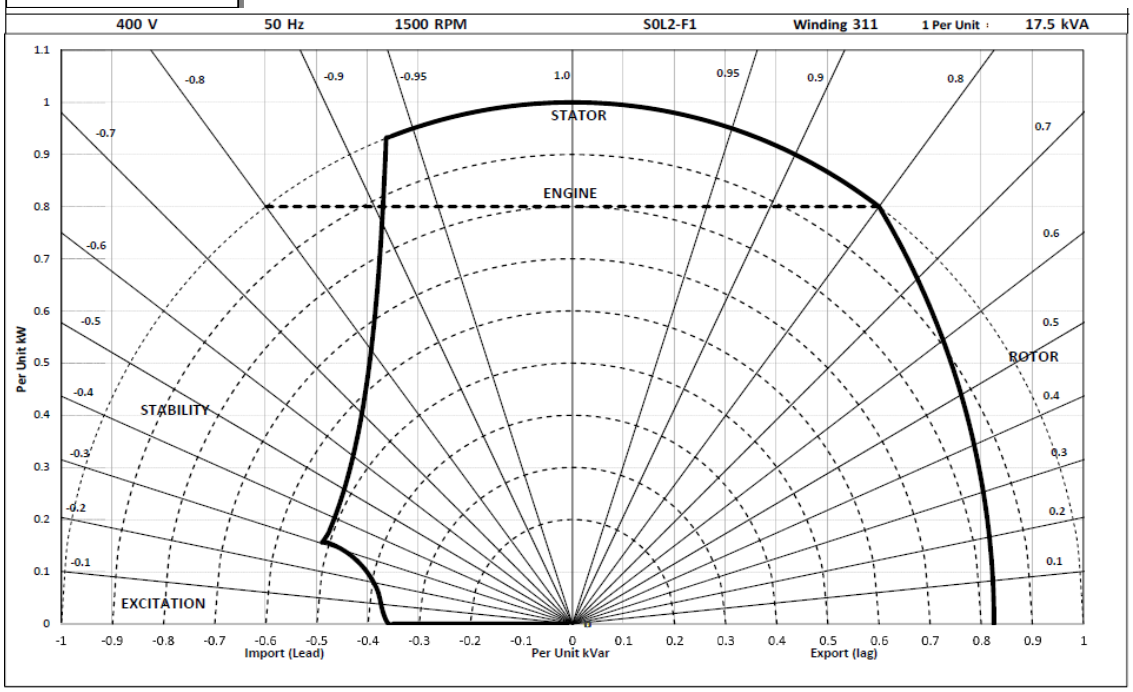
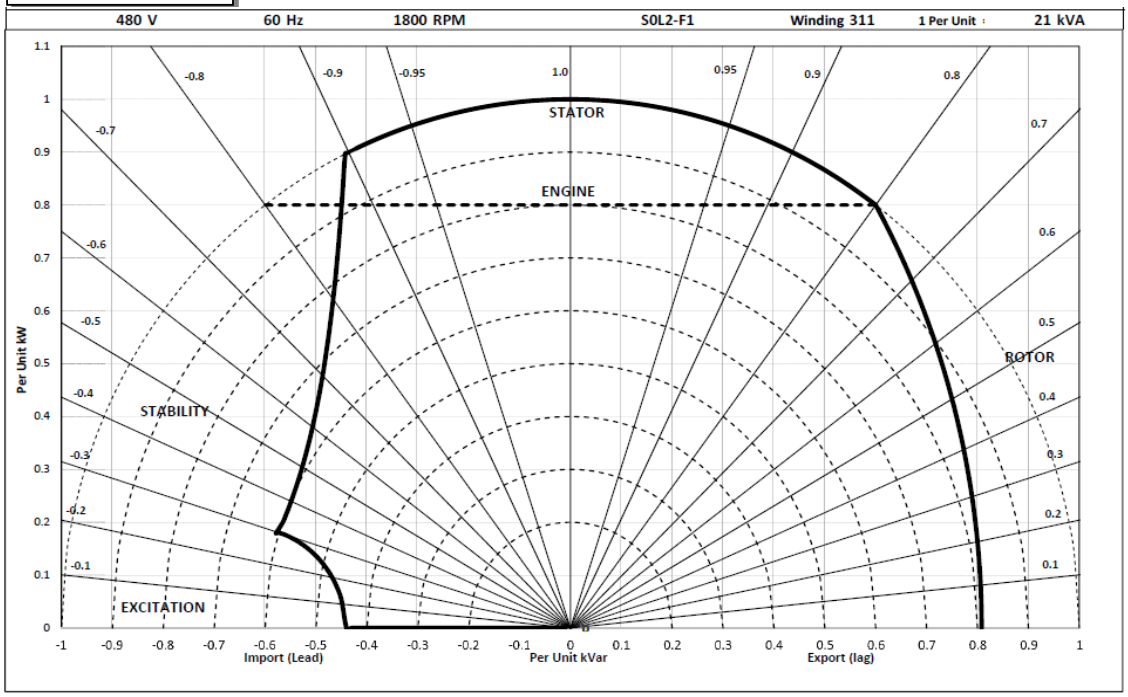
Typical Alternator Operating Charts

400V/50Hz



480V/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			
50 Hz	Series Star (V)	380	400	415	440	380	400	415	440	380	400	415	440	380	400	415	440
	Parallel Star (V)	190	200	208	220	190	200	208	220	190	200	208	220	190	200	208	220
	Series Delta (V)	220	230	240	254	220	230	240	254	220	230	240	254	220	230	240	254
	kVA	17.7	19.3	19.3	N/A	17.1	18.7	18.7	N/A	16.0	17.5	17.5	N/A	14.6	15.9	15.9	N/A
	kW	14.2	15.4	15.4	N/A	13.7	15.0	15.0	N/A	12.8	14.0	14.0	N/A	11.7	12.7	12.7	N/A
	Efficiency (%)	82.5	81.9	82.1	N/A	83.1	82.5	82.7	N/A	84.3	83.7	83.9	N/A	85.3	84.9	85.0	N/A
	kW Input	17.2	18.9	18.8	N/A	16.5	18.1	18.1	N/A	15.2	16.7	16.7	N/A	13.7	15.0	15.0	N/A

60 Hz	Series Star (V)	416	440	460	480	416	440	460	480	416	440	460	480	416	440	460	480
	Parallel Star (V)	208	220	230	240	208	220	230	240	208	220	230	240	208	220	230	240
	Delta (V)	240	254	266	277	240	254	266	277	240	254	266	277	240	254	266	277
	kVA	20.3	21.5	N/A	23.1	19.8	21.0	N/A	22.4	18.5	19.6	N/A	21.0	16.8	17.8	N/A	19.1
	kW	16.2	17.2	N/A	18.5	15.8	16.8	N/A	17.9	14.8	15.7	N/A	16.8	13.4	14.2	N/A	15.3
	Efficiency (%)	82.9	82.8	N/A	82.6	83.3	83.2	N/A	83.2	84.4	84.4	N/A	84.3	85.5	85.5	N/A	85.4
	kW Input	19.6	20.8	N/A	22.4	19.0	20.2	N/A	21.5	17.5	18.6	N/A	19.9	15.7	16.7	N/A	17.9

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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