

University of Illinois Department of Agricultural and Biological Engineering  
 Bioenvironmental and Structural Systems Lab  
 Final Report

Project Number: 20402  
 Test Date: October 21, 2020

<b>Fan:</b>	<b>Motor:</b>	<b>Shutter:</b>
Make- <i>Ya Suh Dar</i>	Make- <i>Ya Suh Dar</i>	Material- <i>plastic w/ alum. Frame</i>
Model- <i>57" K300DL-PMSM 1.1 30 700</i>	Model- <i>PMSM1.1kW</i>	# Doors- <i>16 per column</i>
Blade dia.- <i>56.5"</i>	Hp- <i>1.1 kW</i>	# Columns- <i>3</i>
Orifice dia.- <i>57"</i>	RPM- <i>700</i>	Door length <i>19.6", 18", 19.6"</i>
	Volts- <i>220</i>	Location- <i>intake</i>
	Amps- <i>-</i>	
<b>Blade:</b>	Hz- <i>60</i>	<b>Guards:</b>
Number- <i>3</i>	Phase- <i>1</i>	Description- <i>wire</i>
Shape- <i>propeller</i>	S. F.- <i>-</i>	Spacing- <i>7.1" concentric</i>
Material- <i>fiberglass</i>		Location- <i>exhaust</i>
Pitch- <i>30</i>		
Clearance- <i>0.3"</i>	<b>Housing:</b>	
	Material- <i>Fiberglass</i>	<b>Discharge Cone:</b>
<b>Drive Sheaves:</b>	Intake area- <i>58.8" x 58.8"</i>	Depth- <i>36.5"</i>
Drive dia.- <i>direct</i>	Discharge- <i>57" dia.</i>	Minor dia.- <i>57"</i>
Axle dia.- <i>drive</i>	Depth- <i>25"</i>	Major dia.- <i>67.3"</i>

Notes: 230 VAC, single phase input to ADT8700PFC speed controller  
 0 - 10 VDC speed control signal

Test Conditions:  
 T(wb) F: 57.5 Barometric pressure, recorded 29.47  
 T(db) F: 72.5 Barometric Pressure, corrected 29.35 (In. Hg)

Static Pressure (in.H2O)	Airflow (cfm)	rpm	Volts	Amps	Watts	cfm/Watt	SI Units			
							Static Pressure (Pa)	Airflow (m <sup>3</sup> /hr.)	(m <sup>3</sup> /hr)/W	W/1000m <sup>3</sup> /hr
<b>10 VDC</b>										
0.00	31100	700	230.5	6.43	1373	22.7	0	52900	38.5	26
0.05	29600	700	230.1	6.60	1430	20.7	12	50200	35.1	28
0.10	28000	700	230.3	6.72	1478	19.0	25	47600	32.2	31
0.15	26300	700	229.9	6.84	1518	17.3	37	44700	29.5	34
0.20	24100	700	229.8	6.93	1549	15.6	50	41000	26.5	38
0.25	21000	700	230.0	6.97	1565	13.4	62	35700	22.8	44
0.30	18000	700	230.1	6.93	1553	11.6	75	30600	19.7	51
0.35	13300	700	230.0	6.84	1521	8.7	87	22500	14.8	68
0.40	8600	700	230.3	6.62	1447	6.0	100	14700	10.1	99
<b>9 VDC</b>										
0.00	28800	651	230.9	5.66	1110	26.0	0	49000	44.1	23
0.05	27100	651	230.7	5.81	1159	23.4	12	46100	39.7	25
0.10	25100	651	230.2	5.94	1199	20.9	25	42700	35.6	28
0.15	22900	651	230.4	6.05	1237	18.5	37	38900	31.5	32
0.20	19800	651	230.2	6.09	1253	15.8	50	33600	26.8	37
0.25	16300	651	230.1	6.05	1240	13.2	62	27800	22.4	45
0.30	11800	651	230.3	5.99	1217	9.7	75	20100	16.5	61
0.35	6300	651	230.5	5.67	1113	5.7	87	10700	9.6	104
0.38	1000	651	231.4	5.21	960	1.1	93	1800	1.9	539
<b>8 VDC</b>										
0.00	25500	583	231.5	4.48	811	31.4	0	43300	53.4	19
0.05	23100	583	231.4	4.75	856	27.0	12	39200	45.8	22
0.10	20600	583	231.4	4.93	890	23.2	25	35000	39.4	25
0.15	17300	583	230.9	4.95	894	19.3	37	29300	32.8	30
0.20	13400	583	231.2	4.96	895	15.0	50	22800	25.4	39
0.25	8400	583	230.8	4.70	847	9.9	62	14300	16.9	59
0.30	1000	583	232.4	3.87	693	1.4	73	1700	2.4	410
<b>7 VDC</b>										
0.00	21400	516	231.3	3.02	581	36.8	0	36300	62.5	16
0.05	18700	516	231.2	3.19	614	30.4	12	31700	51.6	19
0.10	15200	516	231.2	3.24	621	24.4	25	25800	41.5	24
0.15	10700	516	231.4	3.24	623	17.1	37	18100	29.1	34
0.20	4000	516	231.6	2.78	545	7.3	50	6800	12.4	80
0.22	1200	516	230.8	2.41	489	2.5	55	2100	4.3	233
<b>6 VDC</b>										
0.00	16900	448	231.4	1.97	405	41.7	0	28700	70.8	14
0.05	13400	448	230.9	2.00	410	32.8	12	22800	55.7	18
0.10	9100	448	230.9	2.02	413	22.0	25	15400	37.3	27
0.15	1500	449	231.1	1.63	338	4.5	37	2600	7.7	130
0.16	1100	448	231.3	1.60	337	3.4	40	1900	5.7	175
<b>5 VDC</b>										
0.00	12600	384	231.6	1.25	262	47.9	0	21300	81.4	12
0.05	8400	384	231.6	1.28	273	30.7	12	14200	52.2	19
0.10	1300	387	231.0	1.12	235	5.7	25	2300	9.7	103
<b>4 VDC</b>										
0.00	7600	321	231.1	0.84	156	48.5	0	12900	82.4	12
0.05	1400	321	230.6	0.75	140	9.7	12	2300	16.4	61
<b>3 VDC</b>										
0.00	2800	256	230.6	0.50	94	29.4	0	4700	50	20
0.02	1200	258	230.7	0.46	86	14.2	5	2100	24.2	41
<b>2 VDC</b>										
0.00	1000	193	230.5	0.29	53	18.2	0	1600	31	32