

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

Project Number: 20394
 Test Date: October 15, 2020

| | | | | | |
|--|--|-----------------------------------|--|---|--|
| Fan: | | Motor: | | Shutter: | |
| Make- <i>Ya Suh Dar</i> | | Make- <i>Yah Suh Dar</i> | | Material- <i>plastic w/ alum. Frame</i> | |
| Model- <i>50" N-C300DL-PMSM 1.1 33 700</i> | | Model- <i>PMSM1.1kW</i> | | # Doors- <i>14 per column</i> | |
| Blade dia.- <i>50"</i> | | Hp- <i>1.1 kW</i> | | # Columns- <i>2</i> | |
| Orifice dia.- <i>50.3"</i> | | RPM- <i>700</i> | | Door length <i>25.3"</i> | |
| | | Volts- <i>220</i> | | Location- <i>intake</i> | |
| | | Amps- <i>-</i> | | | |
| Blade: | | Hz- <i>60</i> | | Guards: | |
| Number- <i>3</i> | | Phase- <i>1</i> | | Description- <i>wire</i> | |
| Shape- <i>propeller</i> | | S. F.- <i>-</i> | | Spacing- <i>2.9" concentric</i> | |
| Material- <i>fiberglass</i> | | | | Location- <i>exhaust</i> | |
| Pitch- <i>33</i> | | | | | |
| Clearance- <i>0.2"</i> | | Housing: | | Discharge Cone: | |
| | | Material- <i>Fiberglass</i> | | Depth- <i>25.6"</i> | |
| Drive Sheaves: | | Intake area- <i>50.7" x 50.9"</i> | | Minor dia.- <i>50.3"</i> | |
| Drive dia.- <i>direct</i> | | Discharge- <i>50.3"</i> | | Major dia.- <i>55"</i> | |
| Axle dia.- <i>drive</i> | | Depth- <i>32.5"</i> | | | |

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

Test Conditions:
 T(wb) F: 58 Barometric pressure, recorded 29.18
 T(db) F: 76 Barometric Pressure, corrected 29.06 (In. Hg)

| Static Pressure (in.H2O) | Airflow (cfm) | rpm | Volts | Amps | Watts | cfm/Watt | SI Units | | | |
|--------------------------|---------------|-----|-------|------|-------|----------|----------------------|------------------|-----------|-------------|
| | | | | | | | Static Pressure (Pa) | Airflow (m³/hr.) | (m³/hr)/W | W/1000m³/hr |
| 10 VDC | | | | | | | | | | |
| 0.00 | 26200 | 700 | 229.7 | 6.21 | 1298 | 20.2 | 0 | 44500 | 34.3 | 29 |
| 0.05 | 24900 | 700 | 229.8 | 6.35 | 1348 | 18.5 | 12 | 42400 | 31.4 | 32 |
| 0.10 | 23500 | 700 | 229.8 | 6.49 | 1398 | 16.8 | 25 | 40000 | 28.6 | 35 |
| 0.15 | 22100 | 700 | 229.8 | 6.57 | 1425 | 15.5 | 37 | 37600 | 26.4 | 38 |
| 0.20 | 20200 | 700 | 229.8 | 6.63 | 1447 | 14.0 | 50 | 34400 | 23.8 | 42 |
| 0.25 | 17300 | 700 | 229.7 | 6.65 | 1453 | 11.9 | 62 | 29400 | 20.3 | 49 |
| 0.30 | 14800 | 700 | 229.8 | 6.68 | 1463 | 10.1 | 75 | 25200 | 17.2 | 58 |
| 0.35 | 12000 | 700 | 229.4 | 6.73 | 1481 | 8.1 | 87 | 20300 | 13.7 | 73 |
| 0.40 | 7900 | 700 | 230.6 | 6.55 | 1424 | 5.5 | 100 | 13400 | 9.4 | 106 |
| 9 VDC | | | | | | | | | | |
| 0.00 | 24200 | 651 | 229.8 | 5.49 | 1054 | 23.0 | 0 | 41100 | 39 | 26 |
| 0.05 | 23000 | 651 | 229.9 | 5.61 | 1092 | 21.1 | 12 | 39100 | 35.8 | 28 |
| 0.10 | 21400 | 651 | 229.6 | 5.73 | 1132 | 18.9 | 25 | 36400 | 32.1 | 31 |
| 0.15 | 19400 | 651 | 229.5 | 5.80 | 1153 | 16.9 | 37 | 33000 | 28.6 | 35 |
| 0.20 | 16500 | 651 | 229.5 | 5.82 | 1162 | 14.2 | 50 | 28100 | 24.2 | 41 |
| 0.25 | 14000 | 651 | 229.6 | 5.88 | 1181 | 11.9 | 62 | 23800 | 20.2 | 50 |
| 0.30 | 10300 | 651 | 231.4 | 5.84 | 1177 | 8.7 | 75 | 17500 | 14.8 | 67 |
| 0.35 | 6100 | 651 | 231.4 | 5.73 | 1140 | 5.4 | 87 | 10400 | 9.2 | 109 |
| 0.40 | 1100 | 651 | 231.9 | 5.68 | 1128 | 0.9 | 100 | 1800 | 1.6 | 631 |
| 8 VDC | | | | | | | | | | |
| 0.00 | 21700 | 583 | 230.8 | 3.93 | 768 | 28.3 | 0 | 37000 | 48.1 | 21 |
| 0.05 | 20200 | 583 | 230.6 | 4.15 | 804 | 25.1 | 12 | 34300 | 42.7 | 23 |
| 0.10 | 17500 | 583 | 230.7 | 4.32 | 837 | 20.9 | 25 | 29700 | 35.5 | 28 |
| 0.15 | 14700 | 583 | 230.4 | 4.39 | 853 | 17.2 | 37 | 24900 | 29.2 | 34 |
| 0.20 | 11500 | 583 | 230.6 | 4.45 | 865 | 13.3 | 50 | 19500 | 22.5 | 44 |
| 0.25 | 7200 | 583 | 230.2 | 4.51 | 844 | 8.5 | 62 | 12200 | 14.5 | 69 |
| 0.30 | 2100 | 583 | 229.8 | 4.49 | 826 | 2.5 | 75 | 3500 | 4.3 | 233 |
| 0.31 | 1000 | 582 | 230.1 | 4.40 | 816 | 1.2 | 77 | 1700 | 2.1 | 478 |
| 7 VDC | | | | | | | | | | |
| 0.00 | 18400 | 512 | 230.2 | 2.81 | 554 | 33.2 | 0 | 31200 | 56.4 | 18 |
| 0.05 | 15900 | 516 | 230.1 | 2.95 | 582 | 27.4 | 12 | 27100 | 46.5 | 22 |
| 0.10 | 13200 | 516 | 230.2 | 3.06 | 599 | 22.0 | 25 | 22400 | 37.4 | 27 |
| 0.15 | 9400 | 516 | 230.1 | 3.09 | 610 | 15.4 | 37 | 16000 | 26.2 | 38 |
| 0.20 | 4200 | 516 | 231.0 | 2.98 | 591 | 7.2 | 50 | 7200 | 12.2 | 82 |
| 0.23 | 1200 | 516 | 230.3 | 2.87 | 569 | 2.2 | 57 | 2100 | 3.7 | 271 |
| 6 VDC | | | | | | | | | | |
| 0.00 | 14900 | 448 | 230.5 | 1.86 | 384 | 38.9 | 0 | 25400 | 66.1 | 15 |
| 0.05 | 11900 | 448 | 230.1 | 1.94 | 401 | 29.8 | 12 | 20300 | 50.6 | 20 |
| 0.10 | 8000 | 448 | 230.1 | 2.01 | 411 | 19.4 | 25 | 13500 | 32.9 | 30 |
| 0.15 | 1800 | 448 | 229.6 | 1.90 | 390 | 4.7 | 37 | 3100 | 8 | 125 |
| 0.16 | 1100 | 448 | 229.8 | 1.86 | 387 | 2.8 | 40 | 1800 | 4.7 | 212 |
| 5 VDC | | | | | | | | | | |
| 0.00 | 11300 | 384 | 230.4 | 1.26 | 263 | 43.0 | 0 | 19200 | 73.1 | 14 |
| 0.05 | 7300 | 384 | 230.2 | 1.31 | 275 | 26.4 | 12 | 12300 | 44.9 | 22 |
| 0.10 | 2800 | 385 | 230.5 | 1.25 | 262 | 10.5 | 25 | 4700 | 17.9 | 56 |
| 0.11 | 1000 | 387 | 230.5 | 1.27 | 265 | 3.8 | 27 | 1700 | 6.4 | 157 |
| 4 VDC | | | | | | | | | | |
| 0.00 | 7500 | 321 | 229.9 | 0.83 | 169 | 44.1 | 0 | 12700 | 75 | 13 |
| 0.05 | 1500 | 321 | 229.9 | 0.81 | 165 | 9.4 | 12 | 2600 | 15.9 | 63 |
| 3 VDC | | | | | | | | | | |
| 0.00 | 2600 | 261 | 230.5 | 0.53 | 105 | 24.7 | 0 | 4400 | 42 | 24 |
| 0.02 | 1100 | 261 | 230.3 | 0.52 | 102 | 10.9 | 5 | 1900 | 18.5 | 54 |