



**AIR MOVEMENT AND CONTROL
ASSOCIATION INTERNATIONAL, INC.**

International Headquarters
30 West University Drive
Arlington Heights, Illinois
60004-1893 USA

Phone: +1 847-394-0150
Fax: +1 847-253-0088
E-Mail: jparent@amca.org
Website: www.amca.org

Test No. 33026-A1

May 18, 2016

TO: Dae Ryun Ind Ltd
115 Wanjusandan 7-ro
Bongdong-eup, Wanju-gun, Jeon-Buk, CA REPUBLIC OF KOREA 55318

ATTN: Song Eun Jung
drair@daum.net

**SUBJECT: CONTRACT TESTING
MODEL No. DR-AF #4.5DD**

Attached are the test results of the subject model performed on April 12, 2016.

If you should have any questions concerning these data, please let us know.

Sincerely,
AIR MOVEMENT AND CONTROL
ASSOCIATION INTERNATIONAL, INC.

Josh Parent
Laboratory Manager

Attachment



Korea Testing Certification

82, Pyeongtaekhang-ro 156 beon-gil, Poseung-eup, Pyeongtaek-si, Gyeonggi-do, Korea

Test Number

33026-A1

Test Unit: DWDI Centrifugal
 Manufacturer: Daeryun Ind. Ltd.
 Trade Name: DR-AF Series
 Model Number: DR-AF #4.5DD
 Impeller Diameter: 684 mm
 Inlet Area: 0.407 m²
 Outlet Area: 0.683 m²

Test Purpose: Contract Test
 Date of Test: April 12, 2016
 Client: Daeryun Ind. Ltd.
 Witness: No
 Personnel: KTC_HONG
 P_b: 102 kPa
 Unit System: SI

Test Method per ANSI / AMCA Standard 210-07, Figure 12 Setup, Installation Type B

Comments:

Results at Standard Air and Speed = 1000 rpm





Korea Testing Certification

82, Pyeongtaekhang-ro 156 beon-gil, Poseung-eup, Pyeongtaek-si, Gyeonggi-do, Korea

Test Number

33026-A1

Test Unit: DWDI Centrifugal
 Manufacturer: Daeryun Ind. Ltd.
 Trade Name: DR-AF Series
 Model Number: DR-AF #4.5DD
 Impeller Diameter: 684 mm
 Inlet Area: 0.407 m²
 Outlet Area: 0.683 m²

Test Purpose: Contract Test
 Date of Test: April 12, 2016
 Client: Daeryun Ind. Ltd.
 Witness: No
 Personnel: KTC_HONG
 P_b: 102 kPa
 Unit System: SI

Test Method per ANSI / AMCA Standard 210-07, Figure 12 Setup, Installation Type B

Comments:

Results at Test Conditions:

Det. No.	ρ (kg/m ³)	N (rpm)	P_t (Pa)	P_v (Pa)	P_s (Pa)	Q (m ³ /s)	H (W)	K_p -	η_t (%)	η_s (%)
1	1.22	999	85.92	72.98	12.94	7.46	3319.1	1.0002	19.3%	2.9%
2	1.22	999	164.03	65.57	98.46	7.08	3366.9	0.9999	34.5%	20.7%
3	1.22	999	249.14	58.79	190.35	6.70	3642.0	0.9995	45.8%	35.0%
4	1.22	999	404.36	46.42	357.94	5.96	3901.4	0.9989	61.7%	54.6%
5	1.22	999	458.73	35.87	422.86	5.24	3707.3	0.9987	64.7%	59.7%
6	1.22	999	571.74	26.00	545.74	4.46	3641.5	0.9983	69.9%	66.8%
7	1.22	999	658.87	18.11	640.77	3.73	3449.1	0.9981	71.0%	69.1%
8	1.22	999	679.59	11.46	668.13	2.97	3121.5	0.9981	64.5%	63.4%
9	1.22	999	699.87	6.84	693.04	2.29	2666.0	0.9982	60.1%	59.5%
10	1.22	999	722.59	3.47	719.12	1.63	2314.3	0.9984	50.9%	50.7%
11	1.22	1000	734.13	2.55	731.58	1.40	2165.6	0.9986	47.4%	47.2%
12	1.22	1000	668.23	0.00	668.23	0.00	1420.4	0.9967	0.0%	0.0%

Results at Standard Air and Speed (N) = 1000 rpm:

Det. No.	P_t (Pa)	P_v (Pa)	P_s (Pa)	Q (m ³ /s)	H (W)	K_p -	η_t (%)	η_s (%)
1	84.50	71.77	12.73	7.46	3267.2	1.0002	19.3%	2.9%
2	161.97	64.75	97.22	7.09	3327.8	0.9999	34.5%	20.7%
3	245.19	57.86	187.33	6.71	3587.8	0.9995	45.8%	35.0%
4	398.15	45.71	352.44	5.96	3845.3	0.9990	61.7%	54.6%
5	451.66	35.32	416.34	5.24	3653.9	0.9988	64.7%	59.7%
6	562.85	25.60	537.25	4.47	3588.5	0.9984	69.9%	66.8%
7	648.89	17.83	631.06	3.73	3400.2	0.9981	71.0%	69.1%
8	670.09	11.30	658.78	2.97	3080.9	0.9982	64.5%	63.4%
9	690.13	6.74	683.39	2.30	2631.5	0.9982	60.1%	59.5%
10	712.59	3.42	709.17	1.63	2284.6	0.9985	50.9%	50.7%
11	722.64	2.51	720.13	1.40	2131.7	0.9986	47.4%	47.2%
12	657.99	0.00	657.99	0.00	1398.7	0.9968	0.0%	0.0%



Korea Testing Certification

82, Pyeongtaekhang-ro 156 beon-gil, Poseung-eup, Pyeongtaek-si, Gyeonggi-do, Korea

Test Number

33026-A1

Test Unit: DWDI Centrifugal
 Manufacturer: Daeryun Ind. Ltd.
 Trade Name: DR-AF Series
 Model Number: DR-AF #4.5DD
 Impeller Diameter: 684 mm
 Inlet Area: 0.407 m²
 Outlet Area: 0.683 m²

Test Purpose: Contract Test
 Date of Test: April 12, 2016
 Client: Daeryun Ind. Ltd.
 Witness: No
 Personnel: KTC_HONG
 P_b: 102 kPa
 Unit System: SI

Test Method per ANSI / AMCA Standard 210-07, Figure 12 Setup, Installation Type B

Comments:

Data at Test Conditions:

Det. No.	t _{d0} (°C)	t _{wo} (°C)	t _{d2} (°C)	t _{d5} (°C)	P _{s5} (Pa)	ΔP (Pa)	t _{d7} (°C)	P _{s7} (Pa)	N (rpm)	T (N·m)
1	15.8	11.6	16.4	16.4	12.94	731.48	0.0	12.94	999	31.7
2	17.0	12.4	17.7	17.7	98.46	657.05	0.0	98.46	999	32.2
3	16.1	11.7	16.9	16.9	190.35	588.89	0.0	190.35	999	34.8
4	16.2	11.8	17.0	17.0	357.94	464.84	0.0	357.94	999	37.3
5	16.2	11.9	17.1	17.1	422.86	359.22	0.0	422.86	999	35.4
6	16.1	11.8	17.1	17.1	545.74	260.56	0.0	545.74	999	34.8
7	16.2	11.9	17.2	17.2	640.77	181.62	0.0	640.77	999	33.0
8	16.6	12.1	17.2	17.2	668.13	115.23	0.0	668.13	999	29.8
9	16.6	12.2	17.3	17.3	693.04	68.94	0.0	693.04	999	25.5
10	16.6	12.1	17.3	17.3	719.12	35.11	0.0	719.12	999	22.1
11	16.7	12.2	17.3	17.3	731.58	25.89	0.0	731.58	1000	20.7
12	16.8	12.2	17.8	17.8	668.23	667.54	0.0	668.23	1000	13.6

Open Nozzle Diameters (mm.):

Det. No.	Open Nozzle Diameters
1	304.6 mm, 304.6 mm, 304.7 mm
2	304.6 mm, 304.6 mm, 304.7 mm
3	304.6 mm, 304.6 mm, 304.7 mm
4	304.6 mm, 304.6 mm, 304.7 mm
5	304.6 mm, 304.6 mm, 304.7 mm
6	304.6 mm, 304.6 mm, 304.7 mm
7	304.6 mm, 304.6 mm, 304.7 mm
8	304.6 mm, 304.6 mm, 304.7 mm
9	304.6 mm, 304.6 mm, 304.7 mm
10	304.6 mm, 304.6 mm, 304.7 mm
11	304.6 mm, 304.6 mm, 304.7 mm
12	All nozzles closed.



Korea Testing Certification

82, Pyeongtaekhang-ro 156 beon-gil, Poseung-eup, Pyeongtaek-si, Gyeonggi-do, Korea

Test Number

33026-A1

Test Unit: DWDI Centrifugal
Manufacturer: Daeryun Ind. Ltd.
Trade Name: DR-AF Series
Model Number: DR-AF #4.5DD
Impeller Diameter: 684 mm
Inlet Area: 0.407 m²
Outlet Area: 0.683 m²

Test Purpose: Contract Test
Date of Test: April 12, 2016
Client: Daeryun Ind. Ltd.
Witness: No
Personnel: KTC_HONG
P_b: 102 kPa
Unit System: SI

Test Method per ANSI / AMCA Standard 210-07, Figure 12 Setup, Installation Type B

Comments:



**KTC INSTRUMENT LIST**

Test Number: 33026-A1

Date: 12-Apr-16

Technician KTC_HONG

The following instrument, calibrated as applicable per the test standard were used for this test

Facility: KTC C 1260

Standard : AMCA 210-07

Figure : Figure 12

Pressure

Barometer									
	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input checked="" type="checkbox"/>	3093-3	YOKOGAWA	UNE31-SHS2		0	6818BA030		2015-05-28	2016-05-28

Pressure Meter									
	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input type="checkbox"/>	3093-33	YOKOGAWA	EJA110A	KTC R 1240	7	91G740641	-300-300 mmWg.	2015-05-28	2016-05-28
<input type="checkbox"/>	3093-34	YOKOGAWA	EJA110A	KTC R 1240	5	91G740640	0 - 300 mmWg.	2015-05-28	2016-05-28
<input checked="" type="checkbox"/>	3093-25	YOKOGAWA	EJA110A	KTC C 1260	7	91HC23940	-300 - 700 mmWg.	2015-05-28	2016-05-28
<input checked="" type="checkbox"/>	3093-26	YOKOGAWA	EJA110A	KTC C 1260	5	91J208748	0 - 300 mmWg.	2015-05-28	2016-05-28
<input type="checkbox"/>	3093-18	YOKOGAWA	EJA110A	KTC L 1560	8	91HA27332	-700 - 300 mmWg.	2015-05-28	2016-05-28
<input type="checkbox"/>	3093-19	YOKOGAWA	EJA110A	KTC L 1560	5	91J208747	0 - 300 mmWg.	2015-05-28	2016-05-28

Temperature

RTD									
	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input type="checkbox"/>	3093-31	YAMARI	PT 100	KTC R 1240	5	1570329	-40-250 Celsius	2015-05-28	2016-05-28
<input checked="" type="checkbox"/>	3434-1	YAMARI	PT 100	KTC C 1260	5	1570318	-40-250 Celsius	2015-05-28	2016-05-28
<input type="checkbox"/>	3093-20	YAMARI	PT 100	KTC L 1560	2	1570328	-40-250 Celsius	2015-05-28	2016-05-28
<input type="checkbox"/>	3093-22	YAMARI	PT 100	KTC L 1560	8	646062	-40-250 Celsius	2015-05-28	2016-05-28
<input type="checkbox"/>	3093-27	YAMARI	PT 100	KTC L 1560	5	1570317	-40-250 Celsius	2015-05-28	2016-05-28
<input checked="" type="checkbox"/>	4375-1	YAMARI	PT 100	-	0	837680	-40-250 Celsius	2015-05-28	2016-05-28
<input checked="" type="checkbox"/>	4375-2	YAMARI	PT 100	-	0	837681	-40-250 Celsius	2015-05-28	2016-05-28

Torque

Torque									
	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input type="checkbox"/>	3093-06	ONNOSOKKI	SS-201	-	-	2010359	0 - 200 Nm	2016-04-01	2016-05-01
<input checked="" type="checkbox"/>	3093-09	ONNOSOKKI	SS-501	-	-	5010499	0 - 500 Nm	2016-04-01	2016-05-01
<input type="checkbox"/>	3093-12	ONNOSOKKI	SS-102	-	-	1020158	0 - 1000 Nm	2016-04-01	2016-05-01
<input type="checkbox"/>	3336-01	ONNOSOKKI	SS-500	-	-	74302009	0 - 500 Nm	2016-04-01	2016-05-01
<input type="checkbox"/>	3338-01	ONNOSOKKI	SS-102	-	-	N/A	0 - 100 Nm	2016-04-01	2016-05-01

Torque Arm									
	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input checked="" type="checkbox"/>	3421	KBR	N/A	-	-	N/A	-	2014-07-01	2016-07-01

Weights									
	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input type="checkbox"/>	4835	SATORIUS	MSE70200S	-	-	32602042	0-70.2 kg	2015-03-06	2016-03-06

Power									
	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input type="checkbox"/>	3387	HIOKI	3169-20	-	-	3890	-	2015-05-29	2016-05-29

Speed

Speed									
	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input type="checkbox"/>	3093-07	ONNOSOKKI	MP-981	-	-	00303009	0-6000 r/min	2016-04-01	2016-05-01
<input checked="" type="checkbox"/>	3093-10	ONNOSOKKI	MP-981	-	-	00303101	0-6000 r/min	2016-04-01	2016-05-01
<input type="checkbox"/>	3093-13	ONNOSOKKI	MP-981	-	-	10304670	0-6000 r/min	2016-04-01	2016-05-01
<input type="checkbox"/>	3336-02	ONNOSOKKI	MP-981	-	-	N/A	0-6000 r/min	2016-04-01	2016-05-01
<input type="checkbox"/>	3308-02	ONNOSOKKI	MP-981	-	-	N/A	0-6000 r/min	2016-04-01	2016-05-01
<input type="checkbox"/>	3337	B&K	4912	-	-	Y0425N	-	2015-05-28	2016-05-28

Sound

Sound Pressure Level									
	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input type="checkbox"/>	3218-3	B&K	4228	-	-	2484517	-	2015-08-17	2016-08-17
<input type="checkbox"/>	3218-5	B&K	4942	-	-	2518399	-	2015-08-22	2016-08-22

Sound Power level									
	Asset	Manufacturer	Model	Facility	Plane	Serial Number	Scale Range	Last Calibration	Next Calibration
<input type="checkbox"/>	3218-1	B&K	4204	-	-	250111093	-	2013-01-31	2016-01-31