

Certificate of Calibration



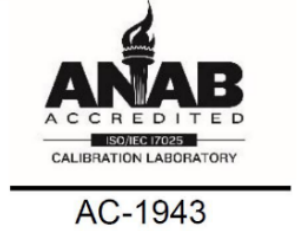
Tested in accordance to ISO 9972, CGSB 2002, ATTMA-TS1, ASTM-E779, RESNET: **Pass**

Issued by: **Retrotec**
Calibration Date: **2023-07-24**

Certificate Number: **202307240849-3PH602248**
Results: **As Left**

Calibration laboratory

Wohler Retrotec EU B.V.
Hardermaat 12
7244PZ Barchem, Netherlands
31 0 522 282941
salesEU@retrotec.com
<http://www.retrotec.com>



This calibration laboratory has been assessed by the ANSI-ASQ National Accreditation Board and meets the requirements of international standard ISO/IEC 17025. All pressure and flow devices used in this calibration are traceable to the International System of Units (SI), consensus standards, or ratio type measurements through national standards realized and maintained by NIST or an NMI.

Device being calibrated:

Description: **Test Fan**
Manufacturer: **Retrotec**
Model Number: **Model 6000**
Shell Serial Number: **3PH602248**
Main Voltage: **110 V - 240 V**
Main Frequency: **50 Hz / 60 Hz**

Calibrated by: Max Kabel

Signature

Issued Date: **2023-07-24**

Reference Flow:

OP Chamber 2018 (NL) Chamber, in accordance with ANSI/AMCA 210-07:

Device Under Test Gauge: **DM-32** Gauge Serial number **408919**
Reference Gauge: **DM-32** Gauge Serial number **407706**

Nozzle 2017 (NL) Chamber, in accordance with ANSI/AMCA 210-07 and ASTM E1258-88 standards:

Device Under Test Gauge: **DM-32** Gauge Serial number **412028**
Reference Gauge: **DM-32** Gauge Serial number **407993**

Calibration Information:

The Device was calibrated against laboratory standards whose values are traceable to recognized national standards. The uncertainty represents an expanded uncertainty using a coverage factor of $k=2$ to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits without taking uncertainty into account. The uncertainty evaluation has been carried out in accordance with ISO/IEC 17025 requirements.

Calibration Procedure:

Procedure ID No.CP-CHB-01

This calibration applies only to the unit listed on this certificate.

This Calibration Certificate shall not be reproduced except in full, without written approval from Retrotec.

Name	Calibration Expiration Date	Name	Calibration Expiration Date
ISO 9972	2028-07-24	CGSB 2002	2028-07-24
ATTMA-TS1	2024-07-24	ASTM-E779	2028-07-24
RESNET	2028-07-24		

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Calibration Results:

Flow rates are corrected to STP conditions of 20°C, 101.325 kPa, 50% RH and Air Density: 1.19886

Range	Humidity % (RH)	Temp (C)	Barometric Pressure (kPa)	Chamber Pressure (Pa)	Fan Pressure (Pa)	Reference Flow (m³/h)	Fan Flow (m³/h)	Error (%)
Open	63.5	21.6	100.300	50.2	24.8	4666.31	4784.39	2.5%
Open	63.9	21.5	100.300	52.1	121.5	10112.93	10541.86	4.2%
Open	63.0	21.9	100.300	50.8	186.0	12424.90	13027.96	4.9%

A	62.9	21.9	100.300	51.5	24.9	2452.33	2480.46	1.1%
A	63.0	21.9	100.300	48.4	140.7	5832.44	6025.03	3.3%
A	62.9	21.9	100.300	50.3	231.6	7463.27	7776.72	4.2%

B8	63.5	22.1	100.300	50.3	40.6	1444.03	1468.23	1.7%
B8	63.4	22.1	100.300	52.8	200.8	3322.94	3475.97	4.6%
B8	63.0	22.2	100.300	49.6	339.3	4458.51	4612.02	3.4%

B4	61.3	22.8	100.300	50.4	49.9	597.08	613.81	2.8%
B4	61.2	22.8	100.300	50.9	201.4	1509.91	1536.81	1.8%
B4	61.0	22.9	100.300	49.1	349.3	2025.14	2029.07	0.2%

B2	58.7	23.8	100.300	50.1	66.9	258.16	260.60	0.9%
B2	59.1	23.6	100.300	50.4	226.3	652.25	653.28	0.2%
B2	58.9	23.7	100.300	48.6	361.2	861.45	857.71	-0.4%

B1	57.2	24.4	100.300	48.7	79.3	143.05	147.81	3.3%
B1	57.7	24.2	100.300	51.0	230.0	317.95	323.08	1.6%
B1	57.5	24.3	100.300	48.6	358.9	415.57	416.13	0.1%

B74	68.6	21.4	100.300	50.3	75.0	87.94	83.72	-4.8%
B74	68.5	21.4	100.300	50.8	234.8	173.75	169.79	-2.3%
B74	68.1	21.5	100.300	49.9	357.0	219.46	215.84	-1.7%

B47	70.3	21.6	100.200	52.1	168.7	69.71	66.84	-4.1%
B47	70.1	21.7	100.200	49.8	281.4	91.18	88.95	-2.4%
B47	70.1	21.8	100.200	54.1	361.8	106.10	102.50	-3.4%

B29	71.3	21.2	100.200	50.2	100.9	18.06	18.72	3.7%
B29	71.4	21.3	100.200	46.1	262.7	29.88	30.62	2.5%
B29	71.4	21.3	100.200	48.9	368.5	36.09	36.37	0.8%

Calibration and measurement capability (Expanded Uncertainty): Laminar Flow Elements (0.01 to 3300CFM) = 1.4% of reading + 0.11 CFM. Flow Nozzles (10 to 8200CFM) = 1.5% of reading + 78 CFM. The uncertainty statement is based on a 95% confidence interval, using a coverage of k=2.

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Published Flow Equation Parameters (Units in m³/h):

Range Configuration	n	k	MF (Pa)
Open	0.497	970.26	25
A	0.512	477.51	25
B8	0.539	199.51	40

Flow = Pⁿ x k

Where P = Fan Pressure in Pascals

Range Configuration	g	f	a	b	c	d	MF (Pa)
B4	50	0.70	2.59492E-005	-2.48689E-002	10.9694	125.11	40
B2	50	0.85	9.44439E-006	-9.44419E-003	4.5644	-5.14	50
B1	50	0.20	3.56431E-006	-3.98448E-003	2.1223	2.57	60
B74	25	0.15	2.10396E-006	-1.98141E-003	0.9879	23.68	55
B47	25	0.09	3.17456E-007	-3.66007E-004	0.3098	25.91	25
B29	25	-0.02	9.98130E-008	-1.48786E-004	0.1176	7.76	100

Flow = (P³ x a) + (P² x b) + (P x c) + d + ((g - |PrA|) x f)

Where P = Fan Pressure in Pascals

Range Configuration	K1	K2	K3
Open	0	0.5	0
A	0	0.5	0
B8	0	0.8	0
B4	0	0.8	0
B2	0	1	0
B1	0	1	0
B74	0	0.8	0
B47	0	1	0
B29	0	0.6	0

Date Format:

This report adheres to ISO 8601: Data elements and interchange formats - Representation of dates and times.

All dates on this report are in the format: YYYY-MM-DD.

End of report