



CRYSTAL CALIBRATION SALES AND SERVICE CO., LTD.

45/48 Soi Salathammasop31, Salathammasop Rd.,

Salathammasop, Thawewatthana, Bangkok 10170 Thailand

Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com

CERTIFICATE OF TEST

Report No. : 25-1390-102

Issue Date : 31 October 2025

Work Order No. : 25/1390

Customer Name : กลุ่มงานเทคนิคการแพทย์ โรงพยาบาลพระจอมเกล้า จังหวัดเพชรบุรี
53 ถนนไฟ ต.คลองกระแซง
อ.เมือง จ.เพชรบุรี 76000

Date of Received : 27 October 2025

Date of test : 27 October 2025

Instrument Details : Description : Biological Safety Cabinet
Manufacturer : BIOBASE
Model : BSC-1500IIA2-X
Serial No. : BSC15A20040572
ID No. : 6525-003-5205-2/63
Class / Type : Class II / A2
Location : Special Lab

Test Method : This equipment was performance test by procedure is according to calibration procedure no. CWI-BSC-01 compliance EN 12469 : 2000 Biotechnology performance criteria for microbiological safety cabinet and AS 1807.23 : 2000 Determination of intensity of radiation from germicidal ultraviolet lamp and NSF/ANSI 49 Biosafety Cabinet : Desing, Construction, Performance, and filed certificate

Environment Conditions :

Temperature : Area Monitoring between 15°C to 40°C

Humidity : Area Monitoring between 30%RH to 85%RH

Line Voltage : Area Monitoring 220 VAC $\pm$ 10%

Traceability of Measurement

This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI)

Calibrated by : Mr. Kritsada Kaewwangpa
Calibration Engineer

Approved by : 
(Mr. Surasit Sakprasert)
Authorized Signatory

This certificate may not be reproduced other than in full except with the prior written approval of Crystal Calibration Sales and Service co., Ltd.

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Details of Reference

1. Reference Standards Instrument

No	Instrument	Model	Serial No./Ins No.	Certificate No.	Due Date
1.1	Thermo aneometer	440	83787941	TTH-0-146567	01 October 2026
1.2	Aerosol Photometer	2I	24056	ST325/1025	01 October 2026
1.3	Lux meter	540	83474414/0921	MTE250357-1	14 July 2026
1.4	UVC LIGHT METER	UV-370SD	Q977896	CO20240101EA	12 December 2025
1.5	Sound level meter	815	30833548/203	MTE250356-1	15 July 2026

2. Certificate traceable

: This certificate traceable to The International System of Unit refer to

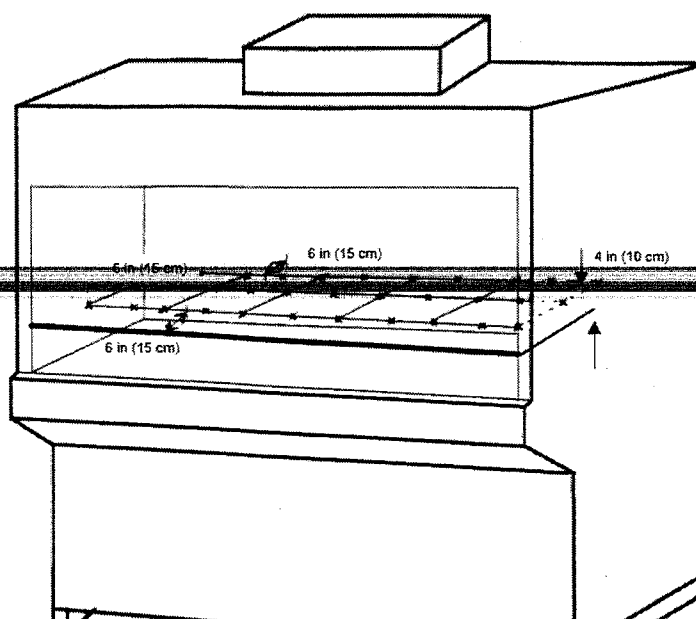
- 1.1 Techmaster asia (Thailand) Co., Ltd., ANAB AC-1736.08
- 1.2 Particle Measurig Technique Co., Ltd.
- 1.3 Ming Deng Metrology Services (Thailand) Co., Ltd., ANAB ACT-2515
- 1.4 Electrical and Electronics institute.
- 1.5 Ming Deng Metrology Services (Thailand) Co., Ltd., ANAB ACT-2515

3. Condition of item

: Normal

Part 1 Velocity test performane

1. Downflow velocity test



Downflow velocity diagrams of measurement

Signature



REPORT OF TEST

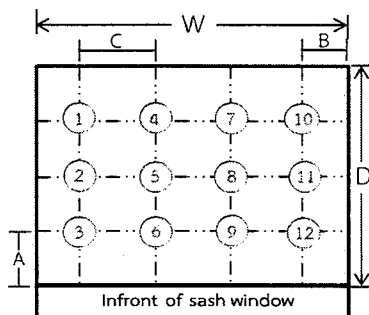
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1. Downflow velocity test (continued)

Turn the MSC on. With the anemometer inside the MSC, make air velocity measurement in the horizontal plane 50mm to 100mm above the top edge of the front aperture, Make measurement over a period at least 1min in each position for at least eight positions, namely four along a line 1/4 of the depth of working space forward of the rear wall and four along a line same distance behind the front window. Ensure that the measurement are spaced along these lines at 1/8 and 3/8 of the width of working space from both the left-hand and right-hand sides.(Refer to EN 12469:2000 , G.3.2 page 36)



when ; size of cabinet

W = width is 1.35 m

D = depth is 0.6 m

Air velocity measurement (m/s)					
No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
0.40	0.38	0.38	0.34	0.32	0.33
No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
0.35	0.37	0.36	0.39	0.38	0.39

A = distance from front 150 mm

B = distance from wall 169 mm

C = distance of measurement 337 mm

Acceptance criteria follow up to EN 12469 : 2000 (Table H.1)

Mean Downflow velocity (m/s)	Minimum Downflow velocity (m/s)	Maximum Downflow velocity (m/s)	± 20% of Mean Downflow velocity (m/s)
0.37	0.32	0.40	0.30 to 0.44

*Mean downflow velocity to achieve product protection in method EN12469 specific range 0.25 m/s to 0.50 m/s

Measurement of test result inspection of EN 12469

PASS

2. Inflow velocity test

Laboratory used alternative method measured by thermo anemometer is opening sash window screen 3 inches (76mm) and installation thermo anemometer from the top window 1.5 inches (38mm) and moved thermo anemometer coverage area in horizontal measured inflow velocity point to point distance 4 inches (100mm), Inflow velocity in report is correct value by correction factor for 8 - window (estimate and 7 or refer to factory factor)

Position of measured inflow velocity (m/s)																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1.27	1.20	1.23	1.38	1.33	1.25	1.25	1.28	1.32	1.29	1.27	1.31	1.30	-	-	-	-	-

Mean Inflow velocity (m/s)	EN 12469 Recommendation Specification (m/s)	Judgment refer to EN 12469
0.48	≥ 0.40	Pass

*Mean inflow velocity to achieve product protection in method EN12469 ≥ 0.40 m/s refer to table H.1

S.S.



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Part 2 HEPA Filter Leak test performane

HEPA Filter leak test by the aerosol challenge at a suitable location on the upstream side of HEPA Filter, sea and construction joints to be tested Ensure that the challenge aerosol concentration , Measure the average upstream aerosol concentration than scan the downstream side of the HEPA Filter by passing the aerosol detection probe slightly overlapping over the entire surface of the HEPA Filter (Refer to EN 12469 D.4)

Detail of the PAO test performance

PAO Concentration on upstream side of HEPA is 36 µg/l

Downstream measured by aerosol photometer calulate ratio of concentration		
Main HEPA Filter (%)	Exhaust HEPA Filter (%)	Pre HEPA Filter (%)
0.002	0.002	N/A

* Acceptance criteria The leak should be not more than 0.01% of the specific before the filter refer to EN 12469 D.3 (a).

Main HEPA Filter diagrams

Leak position

M : Media leak position

H : Maximum leak position

X : Gasket leak position

Main HEPA Result of test

Pass

Exhaust HEPA Filter diagrams

Leak position

M : Media leak position

H : Maximum leak position

X : Gasket leak position

Exhaust HEPA Result of test

Pass

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Part 3 Airflow smoke pattern test performance

The airflow smoke pattern is verification for check cabinet on working area air velocity in cabinet shall be not escape from cabinet to the room.

1. Downflow pattern test	:	Pass
2. View screen retention test	:	Pass
3. Work opening edge retention test	:	Pass
4. Sash / Window seal	:	Pass

Part 4 Site installation test

1. Airflow visual alarms shall be to indicate when 20% loss exhaust volume within 15 s	:	Pass
2. Sash alarms raise the window above 1 inch (2.5cm) from working position	:	Pass
3. Exhaust system alarms for cabinet has the function properly	:	N/A
4. Electrical leakage and ground circuit resistance test (it not circuit leakage)	:	Pass

* site installation refer to NSF/ANSI 49-2008 section F.7 and F.8

Part 5 Cabinet integrity test (For BSC Class II type A1)

The Bio safety cabinet refer test leakage of internal pressure 250 pa from manometer or difference pressure gauge or using soap solution 25g/l in tepid distilled water it not bubble in joint and gaskets, Hower using difference pressure gauge increasing pressure into cabinet estimate 500pa hold the time 30 min the pressure has to decasing not least 10%

The part 5 cabinet integrity test laboratory will be ckeck when cabinet new installation, repare, change or remove HEPA filter and relocate to new location

1. soap test check and visul bubbles	:	N/A
2. pressure in cabinet not least 10%	:	N/A

Part 6 sound level test

Measured by the sound meter is placed 1m from the front of the cabinet. With the cabinet running, 2,3 readings will be taken for different duration's (10 and 30 sec).

Mean of measured Background sound level (dBA)**	Mean of measured sound level (dBA)	Accepting criteria	Judgment Refer EN 12469
58.5	61.6	Less than 65 dBA	Pass

* Acceptance criteria less than 65 dBA refer to EN 12469 A.3 or not exceed 70 dBA refer to NSF/ANSI 49 F. 11.4

** Background sound level is measured when trun off the cabinet

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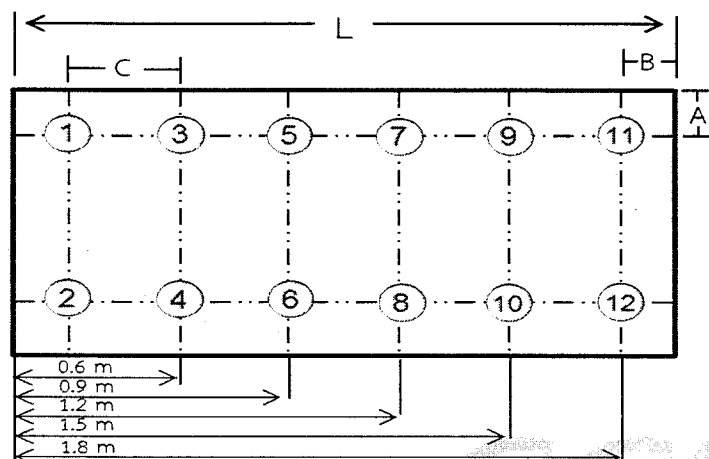
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Part 7 Illumination and UV test performance

Illumination and Ultraviolet radiation (UV) measured at the work surface and cover using area grid installation

lux meter and UVC meter at any position in below diagram relate with the size of cabinet



when ;

A = distance from wall 6.35 mm

B = distance from eadge 150 mm

C = distance of measured 300mm

L = wide of cabinet is 1.35 m

Diagrams of Illumination and UV measured on work surface

Illumination measured report at any position (Lux)

1	2	3	4	5	6	7	8	9	10	11	12
738	626	901	919	804	799	828	739	-	-	-	-

Mean of illumination at work surface (Lux)	Acceptance of illumination (Lux)	Judgment Refer EN 12496
794	> 750	Pass

* Acceptance criteria average not less than 750 lux refer to EN 12469 A.2

Ultraviolet radiation measured report at any position ($\mu\text{W}/\text{cm}^2$)

1	2	3	4	5	6	7	8	9	10	11	12
225	137	368	193	396	183	318	168	-	-	-	-

Mean of illumination at work surface ($\mu\text{W}/\text{cm}^2$)	Acceptance of illumination ($\mu\text{W}/\text{cm}^2$)	Judgment Refer to DMSC
249	> 40	Pass

* Acceptance criteria average not less than 40 $\mu\text{W}/\text{cm}^2$ refer to DMSC ISBN 978-616-11-2130-3 page 29

- DMSC is Department of Medical Sciences Ministry of Public Health

- Mean of illumination at work surface in report show data after correction value

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