



## Certificate of Calibration



**Equipment:** SPECTROPHOTOMETER  
**Model:** SPCORD 50PLUS  
**Serial No. (or ID.):** 232H1012 (LB-HE-073)  
**Manufacturer:** Analytik jena  
**Condition:** In Condition

**Certificate No.:** C06230188  
**Issued Date:** 09 May 2023  
**Job No.:** KSPR2306806  
**Page:** 1 of 3

**Customer:** Health & Envitech Co., Ltd.  
6 Ngamwongwan Soi 5, Tumbon Bangkokhen,  
Mueangnontaburi, Nontaburi 11000 Thailand

**Environment Condition:**  
Temperature 26.2 °C ± 0.3 °C  
Humidity 53.9 %RH ± 0.7 %RH

**Calibration Place:** Health & Envitech Co., Ltd. (Lab ชั้น 2)  
6 Ngamwongwan Soi 5, Tumbon Bangkokhen,  
Mueangnontaburi, Nontaburi 11000 Thailand

**Calibration By:** Mr. Piypat Saidoung  
**Calibration Date:** 08 May 2023  
**The Method used:** In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04  
**Traceability:** This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.  
The standard for Wavelength Certificate No. 97349 and 97350  
The standard for Photometric Certificate No. 97356 and 106006  
The standard for Stray light Certificate No. 105899 and 105900  
The standard for Spectral resolution Certificate No. 105941

(Mr. Piypat Saidoung)

Person in charge

(Mr. Nitinun Srihawan)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ( $k=2$ ) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

บริษัท ดีเคเอส อีที จำกัด  
DKSH Technology Limited  
2533 สุขุมวิท ถนน, บางกะปิ, กรุงเทพมหานคร 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - In Asia and Beyond.

CAL-FM-C06-15: 12 Sep 2022

## ENVIR SERVICE CO., LTD.

42 RAMINTHRA 14 YEAK 9, THA RAENG, BANGKHEN, BANGKOK 10230  
TAX ID 0105555170865  
TEL 029435814-5 FAX 02-9438201



## CALIBRATION CERTIFICATE

Certificate No. : 202211001  
Date of issue : 10-Nov.-22

### Standard References

Standard	Reference No.	Due Date
Nitrogen (Zero) (ppm)	8241	20-Apr.-27
Carbon monoxide 45 (ppm)	EB0129027	29-Oct.-27
Carbon dioxide 850 (ppm)	3805/21	31-Aug.-25

### Measured room conditions

Temperature : 25 °C Humidity : 51 %RH Pressure : 1010 mbra.

### Calibration conditions

Gas Temperature : 25 °C

### Calibration Results (Before Adjustment)

Parameter of Standard	Standard Values	Mean of UUC	Drift	Drift%
Nitrogen (Zero) (ppm)	0.0	0.6	0.6	0.6
Carbon monoxide 45 (ppm)	45.0	45.2	0.2	0.4
Carbon dioxide 850 (ppm)	850.0	864.0	14.0	1.6

### Calibration Results (After Adjustment)

Parameter of Standard	Standard Values	Mean of UUC	Drift	Drift%
Nitrogen (Zero) (ppm)	0.0	0.0	0.0	0.0
Carbon monoxide 45 (ppm)	45.0	45.0	0.0	0.0
Carbon dioxide 850 (ppm)	850.0	852.0	2.0	0.2



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Calibration Results:  
Without Adjustment

Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.0000	0.0000	0.0080
	0.7534	0.7464	0.0070	0.0080
257 nm	0.0000	0.0000	0.0000	0.0080
	0.8759	0.8688	0.0071	0.0080
313 nm	0.0000	0.0000	0.0000	0.0080
	0.2934	0.2918	0.0016	0.0080
350 nm	0.0000	0.0000	0.0000	0.0080
	0.6498	0.6465	0.0033	0.0080

Stray light \*

Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
260.63 +/- 0.11 nm	260.64	0.40	2.3979
391.23 +/- 0.11 nm	391.24	0.73	2.1367

Spectral Resolution \*

Nominal Concentration 0.02 % v/v	Peak	Trough	Ratio	SBW
Standard Wavelength ( nm )	268.75	266.78	1.57	1.50
UUC: Wavelength (nm)	268.86	266.80		
Std Absorbance ( A )	0.5260	0.3585		
Absorbance ( A )	0.5653	0.3595		

\* Calibration Marked " Not TISI Accredited " in this Certificate have been included for completeness.

The End of Certificate

บริษัท ดีเคเอส เอช จำกัด  
DKSH Technology Limited  
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Calibration Results:  
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 1.5 nm and UUC at 1.4 nm				
Standard Wavelength	Unit Under Calibration	Correction	Uncertainty	
360.93	360.86	0.07	0.13	
418.59	418.62	-0.03	0.13	
460.02	459.90	0.12	0.13	
536.59	536.70	-0.11	0.13	
684.40	684.56	-0.16	0.13	

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.0000	0.0000	0.0045
	0.5786	0.5782	0.0004	0.0045
	0.7215	0.7208	0.0007	0.0045
	1.0398	1.0401	-0.0003	0.0045
440 nm	0.0000	0.0000	0.0000	0.0045
	0.5624	0.5613	0.0011	0.0045
	0.7078	0.7067	0.0011	0.0045
	1.0195	1.0197	-0.0002	0.0045
465 nm	0.0000	0.0000	0.0000	0.0045
	0.5231	0.5218	0.0013	0.0045
	0.6666	0.6657	0.0009	0.0045
	0.9585	0.9586	-0.0001	0.0045
546.1 nm	0.0000	0.0000	0.0000	0.0045
	0.5205	0.5189	0.0016	0.0045
	0.6919	0.6898	0.0021	0.0045
	0.9960	0.9938	0.0022	0.0045
590 nm	0.0000	0.0000	0.0000	0.0045
	0.5542	0.5520	0.0022	0.0045
	0.7570	0.7538	0.0032	0.0045
	1.0775	1.0740	0.0035	0.0045
635 nm	0.0000	0.0000	0.0000	0.0045
	0.5616	0.5593	0.0023	0.0045
	0.7434	0.7402	0.0032	0.0045
	1.0480	1.0446	0.0034	0.0045

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CAL-FM-C06-15: 12 Sep 2022

### Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 1.5 nm and UUC at 1.4 nm

Unit Under Calibration	Correction	Guard Band (w)	Tolerance (±)	Conformity
360.86	0.07	0.13	3	Pass
418.62	-0.03	0.13	3	Pass
459.90	0.12	0.13	3	Pass
536.70	-0.11	0.13	3	Pass
684.56	-0.16	0.13	3	Pass

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

### Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The error of temperature determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, ASTM E 275-08 and ASTM E 387-04. Therefore, those parameters have not been assessed separately.

#### Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

Decision rule : ☐ Choice A Binary Statement for Simple Acceptance Rule ( $w = 0$ ), Specific Risk < 50% PFA

☒ Choice B Non-binary statement with guard band ( $w = 1$  U), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA

☐ Choice C Customer defined, Customers may define arbitrary multiple of  $r$  to have applied as guard band ( $w = r$  U).

; PFA – Probability of False Accept



( Nitinun Srihawan )  
Authorized signatory





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Without Adjustment

Photometric Accuracy (Absorbance)

Wavelength	Unit Under Calibration	Correction	Guard Band (w)	Tolerance (±)	Conformity
235 nm	0.0000	0.0000	0.0080	0.02	Pass
	0.7464	0.0070	0.0080	0.02	Pass
257 nm	0.0000	0.0000	0.0080	0.02	Pass
	0.8688	0.0071	0.0080	0.02	Pass
313 nm	0.0000	0.0000	0.0080	0.02	Pass
	0.2918	0.0016	0.0080	0.02	Pass
350 nm	0.0000	0.0000	0.0080	0.02	Pass
	0.6465	0.0033	0.0080	0.02	Pass

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Without Adjustment

Photometric Accuracy (Absorbance)

Wavelength	Unit Under Calibration	Correction	Guard Band (w)	Tolerance (±)	Conformity
420 nm	0.0000	0.0000	0.0045	0.015	Pass
	0.5782	0.0004	0.0045	0.015	Pass
	0.7208	0.0007	0.0045	0.015	Pass
	1.0401	-0.0003	0.0045	0.015	Pass
440 nm	0.0000	0.0000	0.0045	0.015	Pass
	0.5613	0.0011	0.0045	0.015	Pass
	0.7067	0.0011	0.0045	0.015	Pass
	1.0197	-0.0002	0.0045	0.015	Pass
465 nm	0.0000	0.0000	0.0045	0.015	Pass
	0.5218	0.0013	0.0045	0.015	Pass
	0.6657	0.0009	0.0045	0.015	Pass
	0.9586	-0.0001	0.0045	0.015	Pass
546.1 nm	0.0000	0.0000	0.0045	0.015	Pass
	0.5189	0.0016	0.0045	0.015	Pass
	0.6898	0.0021	0.0045	0.015	Pass
	0.9938	0.0022	0.0045	0.015	Pass
590 nm	0.0000	0.0000	0.0045	0.015	Pass
	0.5520	0.0022	0.0045	0.015	Pass
	0.7538	0.0032	0.0045	0.015	Pass
	1.0740	0.0035	0.0045	0.015	Pass
635 nm	0.0000	0.0000	0.0045	0.015	Pass
	0.5593	0.0023	0.0045	0.015	Pass
	0.7402	0.0032	0.0045	0.015	Pass
	1.0446	0.0034	0.0045	0.015	Pass

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.





## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: SPECORD 50PLUS

เลขที่ใบงาน: KSPR2306806

หมายเลขเครื่อง: 232H1012

ตรวจสอบ (รับ)		รายการตรวจเช็ค		ตรวจสอบ (ส่ง)	หมายเหตุ
08 May 2023			08 May 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
<b>General</b>					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>Spectrophotometer</b>					
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) $\geq 2.5$ VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหน่วงแสงความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV $< 3,000$ hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible $< 5,000$ hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>	
<b>pH Meter and Conductivity Meter</b>					
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฟังก์ชันปิดฝา Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
<b>Turbidimeter</b>					
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง ( $\geq 2.5$ ไม่นเกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
<b>Automatic titrator</b>					
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เพิ่มเติม/ข้อแนะนำ :

Mr.Piyapat Saidoung  
Service Engineer

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Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/identific-thailand

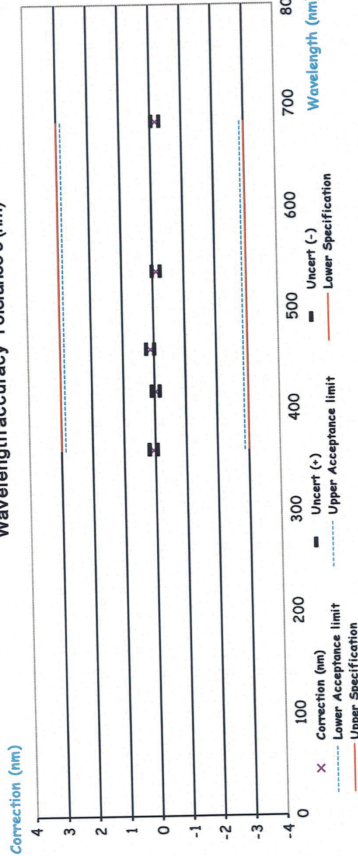
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CAL-FM-R31-03: 20 Jul 2022

Job No.: KSPR2306806

Wavelength accuracy Tolerance 3 (nm)

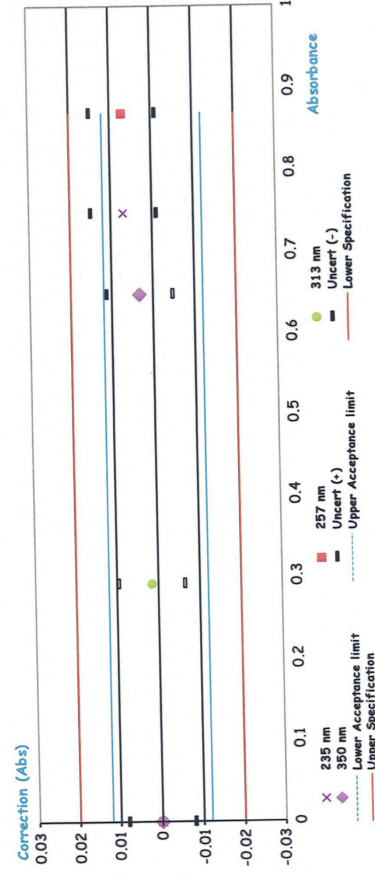
Without Adjustment



Photometric Accuracy (Absorbance) Tolerance 0.015 (Abs)



Photometric Accuracy (Absorbance) Tolerance 0.02 (Abs)



**Result**  
**Calibration Point** : 50, 90, 100, 110 ml  
**Without adjustment**

Nominal value (ml)	Standard reading (ml)	UUC* correction (ml)	Uncertainty of measurement (+/- ml)
50	50.0176	0.0176	0.056
90	90.0217	0.0217	0.063
100	100.0269	0.0269	0.063
110	110.0290	0.0290	0.073

**Certificate No.** : MC22-2790  
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**UUC\*** = Unit under calibration

Rev.02 / Mar 2020

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FM-MC-008

## Certificate of Calibration

**Certificate No.** : MC22-2790  
**Page** : 1 of 2

**Customer** : Health & Envitech Co., Ltd.  
**Address** : 77/11 M.2 Ngamwongwan Rd., Soi 5, T. Bangkhen, A. Muang Nontaburi 11000

**Description** : Personal Sampler Calibrator  
**Manufacturer** : SKC  
**Model** : 303  
**Serial No.** : N/A  
**Identification No.** : PC-001  
**Calibration Place** : Chemical Laboratory 2

**Order No.** : 348622  
**Received date** : Nov 28, 2022  
**Calibration date** : Nov 29, 2022

**Environment Condition:**  
**Temperature** : (20±2) °C  
**Humidity** : (50±15) %RH

**Calibration Method** : Calibration were conducted using In-house calibration procedure CP-MC-004 According to comparison with Analytical Balance. The calibration methods based on ASTM E542-01.

### Reference Standard Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
Analytical Balance	AE-FA220	201907106	MM22-2494	Aug 29, 2023
Humidity / Baro / Temp. Data Recorder	MH-382SD	N/A	MT22-4415	Jul 27, 2023
Digital Thermometer	EFT-4	EFT42020033	MT22-3124	May 03, 2023

This result of calibration was found accurate as shown on date and place of calibration only.  
**Traceability** : This measurement are traceable to the International System of Unit (SI), through National Institute of Metrology Thailand ( NIMT )



The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor k = 2, providing a level of confidence of not less than 95%

**Calibrated by** : Miss Nuengruethai Siripoch  
**Issue date** : Nov 29, 2022  
**Approved by** : ( Mr. Choochong Khumdet )

This calibration certificate shall not be reproduced other than in full except with the prior written approval of Inctech Metrological Center Co., Ltd

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FM-MC-008