

ภาคผนวก ค

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ใบรายงานผลการวิเคราะห์การติดตามตรวจสอบผลกระทบสิ่งแวดล้อม  
(Analysis Report)

## คุณภาพอากาศในบรรยากาศ

ตรวจวัดโดย บริษัท อินทิเกรทเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด

# Analysis Report

Job No. : QT.A018/2020

Issued Date : 14 December 2020

REPORT No. AP078/2020

CUSTOMER NAME บริษัท 304 อินดัสเตรียล ปาร์ค 19 จำกัด

CONTACT NAME คุณกัญญ์ณภัท ปัญญาประเสริฐ (085-835-1371)

SAMPLE DESIGNATED AS Ambient Air Quality

SAMPLING LOCATION วัดบูกายไบ ต.ท่าตูม อ.ศรีมหาโพธิ จ.ปราจีนบุรี  
(พิกัดจุดตรวจวัด 13° 55' 16.082" N, 101° 35' 23.218" E)

SAMPLING DATE 28 November - 1 December 2020

ANALYSIS DATE 8 December 2020

ANALYTICAL METHOD Gravimetric Method

Sampling Date	Result
	TSP(mg/m <sup>3</sup> )
28 - 29 November 2020	0.228
29 - 30 November 2020	0.177
30 November - 1 December 2020	0.230
Standard <sup>1/</sup>	0.33

Remarks : Concentration of each gas in ambient is based on 1 atm and 25°C

Reference : <sup>1/</sup> Notification of the National Environment Board, No.10, B.E. 2004

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## ระดับเสียง

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ตรวจวัดโดย บริษัท อินทิเกรทเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด





# Analysis Report

Job No. : A018/2020

Issued Date : 18 December 2020

REPORT No. ASL028/2020  
CUSTOMER NAME บริษัท 304 อินดัสเตรียล ปาร์ค 19 จำกัด  
CONTACT NAME คุณกัญญ์ณภัท บัญญาประเสริฐ (085-835-1371)  
MEASURED PARAMETER Leq 24 & L90  
MEASURED DATE 28 November - 1 December 2020  
MEASURED TIME 10.00 am -10.00 am  
MEASURED INSTRUMENT Sound Level Meter Model Aco Type 6226 No.1 Serial No.100142

Period	Station						Standard*
	สถานีอนามัยท่าตูม ต.ท่าตูม อ.ศรีมหาโพธิ จ.ปราจีนบุรี (Coordinates 13° 57' 26.30'' N, 101° 33' 41.44'' E)						
	Sound Level [dB(A)]						
	28 - 29 Nov 2020		29 - 30 Nov 2020		30 Nov - 1 Dec 2020		
	Leq	L90	Leq	L90	Leq	L90	
11.00 - 12.00	59.0	54.6	59.2	56.0	60.2	56.1	-
12.00 - 13.00	59.4	56.7	59.1	56.4	59.1	56.0	-
13.00 - 14.00	58.9	56.4	59.0	56.5	58.9	56.0	-
14.00 - 15.00	58.9	56.4	59.1	56.5	57.8	55.5	-
15.00 - 16.00	59.4	56.0	58.6	56.0	59.0	55.9	-
16.00 - 17.00	58.6	56.2	59.3	56.5	58.8	56.1	-
17.00 - 18.00	59.0	56.9	58.8	56.7	59.1	56.4	-
18.00 - 19.00	58.7	56.4	58.4	56.3	59.0	56.4	-
19.00 - 20.00	59.4	56.8	57.9	56.2	58.9	56.3	-
20.00 - 21.00	57.9	55.9	57.1	55.9	57.4	55.9	-
21.00 - 22.00	57.2	55.8	60.6	55.8	57.4	55.8	-
22.00 - 23.00	58.9	55.6	58.9	55.8	57.1	55.7	-
23.00 - 24.00	57.4	55.2	56.9	55.9	57.0	55.6	-
24.00 - 01.00	57.3	54.8	56.9	55.7	57.3	55.6	-
01.00 - 02.00	56.2	54.8	56.5	55.8	56.9	55.6	-
02.00 - 03.00	55.9	54.9	56.6	55.8	56.3	55.4	-
03.00 - 04.00	56.3	55.0	56.4	55.8	56.1	55.4	-
04.00 - 05.00	56.8	55.2	57.0	56.0	56.3	55.4	-
05.00 - 06.00	57.8	55.5	58.0	56.1	57.1	55.6	-
06.00 - 07.00	59.2	56.3	59.1	56.9	58.4	55.9	-
07.00 - 08.00	59.7	56.4	59.4	57.3	59.0	56.8	-
08.00 - 09.00	59.3	55.1	60.2	57.0	59.4	56.8	-
09.00 - 10.00	59.1	54.7	60.0	56.8	60.4	57.0	-
10.00 - 11.00	61.8	54.7	65.1	63.1	60.4	54.2	-
Leq 24 hrs [dB(A)]	58.6	-	59.2	-	58.4	-	70
Lmax [dB(A)]	95.8	-	83.7	-	92.6	-	115
Ldn [dB(A)]	64.3	-	64.4	-	64.0	-	-

Reference : \* Notification of the National Environment Board No.15, B.E. 2540 (1997).

\* Notification of the Ministry of Industry, subject Standard of Noise Level from Factory Operation B.E. 2548 (2005).

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# Analysis Report

Job No. : A018/2020

Issued Date : 18 December 2020

REPORT No. ASL028/2020  
 CUSTOMER NAME บริษัท 304 อินดัสเตรียล ปาร์ค 19 จำกัด  
 CONTACT NAME คุณกัญญ์ณภัส ปัญญาประเสริฐ (085-835-1371)  
 MEASURED PARAMETER Leq 24 & L90  
 MEASURED DATE 28 November - 1 December 2020  
 MEASURED TIME 10.30 am - 10.30 am  
 MEASURED INSTRUMENT Sound Level Meter Model Aco Type 6226 No.3 Serial No.100144

Period	Station						Standard*
	หมู่บ้านเอื้อทรีพีย ต.ท่าคูม อ.ศรีมหาโพธิ จ.ปราจีนบุรี (Coordinates 13°55'19.80"N, 101°34'40.46"E)						
	Sound Level [dB(A)]						
	28 - 29 Nov 2020		29 - 30 Nov 2020		30 Nov - 1 Dec 2020		
	Leq	L90	Leq	L90	Leq	L90	
10.30 - 11.30	64.1	56.7	60.8	55.1	63.8	56.1	-
11.30 - 12.30	64.9	56.3	63.7	53.6	64.2	55.5	-
12.30 - 13.30	65.5	55.8	62.5	53.3	66.3	55.3	-
13.30 - 14.30	63.1	54.5	60.8	53.6	65.0	55.3	-
14.30 - 15.30	65.1	56.1	64.0	52.9	64.7	55.3	-
15.30 - 16.30	64.4	54.9	63.8	53.8	66.1	57.3	-
16.30 - 17.30	64.0	55.3	67.0	54.4	66.1	59.3	-
17.30 - 18.30	68.1	56.2	63.0	53.7	68.2	58.1	-
18.30 - 19.30	63.6	55.5	64.4	54.6	66.3	57.4	-
19.30 - 20.30	62.9	54.2	62.6	54.1	64.1	55.2	-
20.30 - 21.30	63.6	54.6	65.3	54.5	65.9	54.2	-
21.30 - 22.30	60.4	54.6	63.7	54.8	63.5	54.7	-
22.30 - 23.30	61.3	55.5	66.2	55.1	62.2	56.2	-
23.30 - 00.30	64.6	55.9	65.4	54.7	64.5	56.7	-
00.30 - 01.30	62.6	55.1	62.1	55.7	60.7	55.8	-
01.30 - 02.30	58.7	55.1	58.8	55.4	59.1	55.7	-
02.30 - 03.30	59.5	55.2	59.7	55.9	60.5	55.1	-
03.30 - 04.30	60.4	55.3	57.5	55.1	62.8	54.7	-
04.30 - 05.30	61.7	55.9	61.3	55.2	59.7	54.0	-
05.30 - 06.30	59.8	56.3	58.8	53.6	60.0	54.7	-
06.30 - 07.30	59.4	55.8	57.6	53.3	59.5	54.7	-
07.30 - 08.30	60.4	55.1	58.0	54.2	59.5	54.6	-
08.30 - 09.30	58.4	53.9	56.8	53.7	61.9	56.3	-
09.30 - 10.30	60.2	55.5	57.2	54.0	62.1	58.8	-
Leq 24 hrs [dB(A)]	63.1	-	62.7	-	63.9	-	70
Lmax [dB(A)]	92.2	-	100.3	-	98.4	-	115
Ldn [dB(A)]	68.2	-	68.6	-	68.5	-	-

Reference : \* Notification of the National Environment Board No.15, B.E. 2540 (1997).

\* Notification of the Ministry of Industry, subject Standard of Noise Level from Factory Operation B.E. 2548 (2005).

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# Analysis Report

Job No. : A018/2020

Issued Date : 18 December 2020

REPORT No. ASL028/2020  
 CUSTOMER NAME บริษัท 304 อินดัสเตรียล ปาร์ค 19 จำกัด  
 CONTACT NAME คุณกัญญณัฐภัส ปัญญาประเสริฐ (085-835-1371)  
 MEASURED PARAMETER Leq 24 & L90  
 MEASURED DATE 28 November - 1 December 2020  
 MEASURED TIME 10.30 am - 10.30 am  
 MEASURED INSTRUMENT Sound Level Meter Model Rion NL-42 No.9 Serial No.01022362

Period	Station						Standard*
	พื้นที่โครงการฯ ต.ท่าตม อ.ศรีมหาโพธิ จ.ปราจีนบุรี						
	(Coordinates 13° 55' 57.298" N, 101° 34' 9.737" E)						
	Sound Level [dB(A)]						
	28 - 29 Nov 2020		29 - 30 Nov 2020		30 Nov - 1 Dec 2020		
Leq	L90	Leq	L90	Leq	L90		
10.30 - 11.30	57.3	56.4	66.6	55.9	60.0	56.8	-
11.30 - 12.30	56.2	55.3	57.2	55.8	58.7	56.4	-
12.30 - 13.30	57.7	56.8	58.0	57.2	58.0	56.0	-
13.30 - 14.30	57.0	56.0	57.5	56.5	57.5	56.2	-
14.30 - 15.30	57.5	56.2	58.1	56.8	58.0	56.5	-
15.30 - 16.30	56.3	55.4	57.2	56.2	57.9	57.1	-
16.30 - 17.30	57.0	55.7	56.6	56.1	57.5	56.4	-
17.30 - 18.30	56.9	55.8	56.6	55.9	56.7	56.0	-
18.30 - 19.30	57.1	55.9	56.8	56.3	57.0	56.0	-
19.30 - 20.30	61.2	55.9	56.8	56.3	57.1	56.2	-
20.30 - 21.30	59.9	56.0	61.1	56.5	56.7	56.1	-
21.30 - 22.30	57.4	56.1	57.9	56.6	56.8	56.0	-
22.30 - 23.30	57.4	56.6	57.0	56.2	56.2	55.8	-
23.30 - 00.30	57.9	57.0	58.1	56.5	56.4	55.9	-
00.30 - 01.30	58.2	57.6	57.4	56.1	56.4	55.8	-
01.30 - 02.30	58.2	56.8	58.8	56.9	56.8	56.1	-
02.30 - 03.30	59.1	57.5	57.8	57.0	57.3	56.6	-
03.30 - 04.30	59.0	58.0	57.5	56.6	57.4	56.7	-
04.30 - 05.30	58.6	58.0	57.1	56.3	57.6	57.0	-
05.30 - 06.30	57.9	56.0	57.7	56.9	58.0	57.4	-
06.30 - 07.30	57.0	55.2	57.2	56.5	58.4	57.7	-
07.30 - 08.30	58.6	56.6	57.5	56.4	57.4	56.4	-
08.30 - 09.30	57.9	55.8	59.2	57.2	57.3	56.5	-
09.30 - 10.30	58.5	56.9	59.6	56.8	57.6	56.8	-
Leq 24 hrs [dB(A)]	58.1	-	58.9	-	57.5	-	70
Lmax [dB(A)]	78.3	-	101.5	-	87.1	-	115
Ldn [dB(A)]	64.6	-	64.4	-	63.7	-	-

Reference : \* Notification of the National Environment Board No.15, B.E. 2540 (1997).

\* Notification of the Ministry of Industry, subject Standard of Noise Level from Factory Operation B.E. 2548 (2005).

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## คุณภาพน้ำผิวดิน

ตรวจวัดโดยบริษัท อินทิเกรทเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด

## รายงานผลการทดสอบคุณภาพน้ำ

รายงานเลขที่ : 2020/11/161  
 ชื่อลูกค้า : บริษัท 304 อินดัสเตรียล ปาร์ค 19 จำกัด  
 ที่อยู่ : 106 หมู่ 7 ต.ท่าตูม อ.ศรีมหาโพธิ จ.ปราจีนบุรี 25140  
 ตัวอย่างเลขที่ : 2020/11/133  
 วันที่เก็บตัวอย่าง : 02/11/2020  
 เวลาเก็บตัวอย่าง : 11.00 น.  
 วันที่รับตัวอย่าง : 02/11/2020  
 สถานที่เก็บตัวอย่าง : บริเวณก่อนไหลผ่านพื้นที่สวนอุตสาหกรรม 304 IP1  
 วันที่วิเคราะห์ : 2-9/11/2020  
 วิธีการเก็บตัวอย่าง : Grab  
 ชนิดตัวอย่าง : น้ำผิวดิน

พารามิเตอร์ที่ทดสอบ	หน่วย	วิธีทดสอบ	ผลการทดสอบ	Standard*
pH	-	Electrometric Method	7.1	5.0 - 9.0
Suspended Solids	mg/l	Dried at 103-105 °C	5	-
BOD	mg/l	5 -Day BOD Test,Azide Modification Method	0.6	≤ 1.5

**ลักษณะตัวอย่าง** : ไม่มีสี ความขุ่นน้อย ตะกอนขนาดเล็ก แฉวนลอย มีกลิ่น

**หมายเหตุ** : วิธีวิเคราะห์ตามมาตรฐาน Standard Methods for the Examination of Water and Wastewater ,  
 23<sup>rd</sup> Edition, 2017 ออกโดย APHA - AWWA - WEF.  
 : \*ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 8 พ.ศ. 2537 เรื่อง กำหนดมาตรฐานคุณภาพน้ำ  
 ในแหล่งน้ำผิวดิน (ประเภทที่ 2)

**ผู้เก็บตัวอย่าง** : นายกิตติพงษ์ คำกิ่ง (ว-199-จ-8449)



อนุมัติโดย :



รายงานฉบับนี้รับรองเฉพาะตัวอย่างที่ได้ทำการทดสอบเท่านั้น ห้ามนำไปคัดลอกหรือรายงานผลเพียงบางส่วน โดยไม่ได้รับอนุญาตจากห้องปฏิบัติการเป็นลายลักษณ์อักษร

## รายงานผลการทดสอบคุณภาพน้ำ

รายงานเลขที่ : 2020/11/162  
 ชื่อลูกค้า : บริษัท 304 อินดัสเตรียล ปาร์ค 19 จำกัด  
 ที่อยู่ : 106 หมู่ 7 ต.ท่าตูม อ.ศรีมหาโพธิ จ.ปราจีนบุรี 25140  
 ตัวอย่างเลขที่ : 2020/11/162 วันที่เก็บตัวอย่าง : 02/11/2020  
 เวลาเก็บตัวอย่าง : 12.10 น. วันที่รับตัวอย่าง : 02/11/2020  
 สถานที่เก็บตัวอย่าง : บริเวณหลังโหลผ่านพื้นที่สวนอุตสาหกรรม 304 IP1 วันที่วิเคราะห์ : 2-9/11/2020  
 วิธีการเก็บตัวอย่าง : Grab ชนิดตัวอย่าง : น้ำผิวดิน

พารามิเตอร์ที่ทดสอบ	หน่วย	วิธีทดสอบ	ผลการทดสอบ	Standard*
pH	-	Electrometric Method	7.0	5.0 - 9.0
Suspended Solids	mg/l	Dried at 103-105 °C	11	-
BOD	mg/l	5 -Day BOD Test,Azide Modification Method	1.8	≤ 1.5

**ลักษณะตัวอย่าง** : สีเหลือง ความขุ่นน้อย ตะกอนขนาดเล็ก แขนวลอย มีกลิ่น

**หมายเหตุ** : วิเคราะห์ตามมาตรฐาน Standard Methods for the Examination of Water and Wastewater ,  
 23<sup>rd</sup> Edition, 2017 ออกโดย APHA - AWWA - WEF.  
 : ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 8 พ.ศ. 2537 เรื่อง กำหนดมาตรฐานคุณภาพน้ำ  
 ในแหล่งน้ำผิวดิน (ประเภทที่ 2)

**ผู้เก็บตัวอย่าง** : นายกิตติพงษ์ คำกิ่ง (1-199-จ-8449)



อนุมัติโดย :



รายงานฉบับนี้รับรองเฉพาะตัวอย่างที่ได้ทำการทดสอบเท่านั้น ห้ามนำไปคัดลอกหรือรายงานผลเพียงบางส่วน โดยไม่ได้รับอนุญาตจากห้องปฏิบัติการเป็นลายลักษณ์อักษร

## รายงานผลการทดสอบคุณภาพน้ำ

รายงานเลขที่ : 2020/11/163  
 ชื่อลูกค้า : บริษัท 304 อินดัสเตรียล ปาร์ค 19 จำกัด  
 ที่อยู่ : 106 หมู่ 7 ต.ท่าตูม อ.ศรีมหาโพธิ จ.ปราจีนบุรี 25140  
 ตัวอย่างเลขที่ : 2020/11/114 วันที่เก็บตัวอย่าง : 02/11/2020  
 เวลาเก็บตัวอย่าง : 13.30 น. วันที่รับตัวอย่าง : 02/11/2020  
 สถานที่เก็บตัวอย่าง : แม่น้ำปราจีนบุรี บริเวณก่อนไหลผ่านจุดเชื่อมต่อคลองชลองแนว 500 เมตร วันที่วิเคราะห์ : 2-9/11/2020  
 วิธีการเก็บตัวอย่าง : Grab ชนิดตัวอย่าง : น้ำผิวดิน

พารามิเตอร์ที่ทดสอบ	หน่วย	วิธีทดสอบ	ผลการทดสอบ	Standard*
pH	-	Electrometric Method	6.8	5.0 - 9.0
Suspended Solids	mg/l	Dried at 103-105 °C	12	-
BOD	mg/l	5 -Day BOD Test,Azide Modification Method	2.4	≤ 1.5

**ลักษณะตัวอย่าง** : สีเหลือง ความขุ่นปานกลาง ตะกอนขนาดเล็ก แขนวนลอย มีกลิ่น

**หมายเหตุ** : วิเคราะห์ตามมาตรฐาน Standard Methods for the Examination of Water and Wastewater , 23<sup>rd</sup> Edition, 2017 ออกโดย APHA - AWWA - WEF.

: \*ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 8 พ.ศ. 2537 เรื่อง กำหนดมาตรฐานคุณภาพน้ำในแหล่งน้ำผิวดิน (ประเภทที่ 2)

**ผู้เก็บตัวอย่าง** : นายกิตติพงษ์ คำกิ่ง (๑-199-๑-8449)



อนุมัติโดย : ...



รายงานฉบับนี้รับรองเฉพาะตัวอย่างที่ได้ทำการทดสอบเท่านั้น ห้ามนำไปคัดลอกหรือรายงานผลเพียงบางส่วน โดยไม่ได้รับอนุญาตจากห้องปฏิบัติการเป็นลายลักษณ์อักษร

## รายงานผลการทดสอบคุณภาพน้ำ

รายงานเลขที่ : 2020/11/164  
 ชื่อลูกค้า : บริษัท 304 อินดัสเทรียล ปาร์ค 19 จำกัด  
 ที่อยู่ : 106 หมู่ 7 ต.ท่าตูม อ.ศรีมหาโพธิ จ.ปราจีนบุรี 25140  
 ตัวอย่างเลขที่ : 2020/11/116 วันที่เก็บตัวอย่าง : 02/11/2020  
 เวลาเก็บตัวอย่าง : 12.50 น. วันที่รับตัวอย่าง : 02/11/2020  
 สถานที่เก็บตัวอย่าง : คลองชลองแวง บริเวณจุดเชื่อมต่อแม่น้ำปราจีนบุรี วันที่วิเคราะห์ : 2-9/11/2020  
 วิธีการเก็บตัวอย่าง : Grab ชนิดตัวอย่าง : น้ำผิวดิน

พารามิเตอร์ที่ทดสอบ	หน่วย	วิธีทดสอบ	ผลการทดสอบ	Standard*
pH	-	Electrometric Method	7.1	5.0 - 9.0
Suspended Solids	mg/l	Dried at 103-105 °C	602	-
BOD	mg/l	5 -Day BOD Test,Azide Modification Method	1.7	≤ 1.5

**ลักษณะตัวอย่าง** : สีเหลือง ความขุ่นน้อย ตะกอนขนาดเล็ก แขนวลอย มีกลิ่น

**หมายเหตุ** : วิเคราะห์ตามมาตรฐาน Standard Methods for the Examination of Water and Wastewater ,  
23<sup>rd</sup> Edition,2017 ออกโดย APHA - AWWA - WEF.

: \*ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 8 พ.ศ. 2537 เรื่อง กำหนดมาตรฐานคุณภาพน้ำ  
ในแหล่งน้ำผิวดิน (ประเภทที่ 2)

**ผู้เก็บตัวอย่าง** : นายกิตติพงษ์ คำกิ่ง (ว-199-จ-8449)



อนุมัติโดย : .

รายงานฉบับนี้รับรองเฉพาะตัวอย่างที่ได้ทำการทดสอบเท่านั้น ห้ามนำไปคัดลอกหรือรายงานผลเพียงบางส่วน โดยไม่ได้รับอนุญาตจากห้องปฏิบัติการเป็นลายลักษณ์อักษร



## รายงานผลการทดสอบคุณภาพน้ำ

รายงานเลขที่ : 2020/11/165  
 ชื่อลูกค้า : บริษัท 304 อินดัสเตรียล ปาร์ค 19 จำกัด  
 ที่อยู่ : 106 หมู่ 7 ต.ท่าตูม อ.ศรีมหาโพธิ จ.ปราจีนบุรี 25140  
 ตัวอย่างเลขที่ : 2020/11/115 วันที่เก็บตัวอย่าง : 02/11/2020  
 เวลาเก็บตัวอย่าง : 14.05 น. วันที่รับตัวอย่าง : 02/11/2020  
 สถานที่เก็บตัวอย่าง : แม่น้ำปราจีนบุรี บริเวณหลังโหลผ่านจุดเชื่อมต่อคลองชลประทาน 500 เมตร วันที่วิเคราะห์ : 2-9/11/2020  
 วิธีการเก็บตัวอย่าง : Grab ชนิดตัวอย่าง : น้ำผิวดิน

พารามิเตอร์ที่ทดสอบ	หน่วย	วิธีทดสอบ	ผลการทดสอบ	Standard*
pH	-	Electrometric Method	7.1	5.0 - 9.0
Suspended Solids	mg/l	Dried at 103-105 °C	89	-
BOD	mg/l	5 -Day BOD Test,Azide Modification Method	1.7	≤ 1.5

**ลักษณะตัวอย่าง** : สีเหลือง ความขุ่นปานกลาง ตะกอนขนาดเล็ก แขนวลอย มีกลิ่น

**หมายเหตุ** : วิเคราะห์ตามมาตรฐาน Standard Methods for the Examination of Water and Wastewater ,  
 23<sup>rd</sup> Edition, 2017 ออกโดย APHA - AWWA - WEF.  
 : ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 8 พ.ศ. 2537 เรื่อง กำหนดมาตรฐานคุณภาพน้ำ  
 ในแหล่งน้ำผิวดิน (ประเภทที่ 2)

**ผู้เก็บตัวอย่าง** : นายกิตติพงษ์ คำกิ่ง (ว-199-จ-8449)



อนุมัติโดย :



รายงานฉบับนี้รับรองเฉพาะตัวอย่างที่ได้ทำการทดสอบเท่านั้น ห้ามนำไปคัดลอกหรือรายงานผลเพียงบางส่วน โดยไม่ได้รับอนุญาตจากห้องปฏิบัติการเป็นลายลักษณ์อักษร

## คุณภาพน้ำผิวดิน

ตรวจวัดโดย บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

## ANALYSIS REPORT

**CUSTOMER NAME** : 304 INDUSTRIAL PARK 19 CO.,LTD. (PULP 3)  
**ADDRESS** : 106 MOO.7, THATOOM, SRIMAHAPHOTE, PRACHINBURI THAILAND 25140.  
**CONTACT INFORMATION** : TEL. 08 5835 1371 e-mail : kunnapat\_p@doublea1991.com  
**SAMPLING SOURCE** : คลองรังก่อนไหลผ่านพื้นที่โครงการ (บริเวณสะพานคลองรัง 3079)  
**SAMPLE TYPE** : SURFACE WATER **RECEIVED DATE** : NOVEMBER 2, 2020  
**SAMPLING DATE** : NOVEMBER 2, 2020 **ANALYTICAL DATE** : NOVEMBER 2-9, 2020  
**SAMPLING TIME** : 10:00 HOUR **REPORT NO.** : 2020-U75104  
**SAMPLING METHOD <sup>c</sup>** : GRAB, GRAB AND STERILE TECHNIQUE **WORK NO.** : 2019-009437  
**SAMPLING BY <sup>c</sup>** : MR KRIDSANAPONG NAMTHIP **ANALYSIS NO.** : T20AR647-0002  
**ANALYZED BY** : MISS ITSARIYAPORN BUATIB

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			คลองรังก่อนไหลผ่านพื้นที่โครงการ (บริเวณสะพานคลองรัง 3079) T20AR647-0001	
ELECTRICAL CONDUCTIVITY <sup>c</sup>	µmhos/cm	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM :2510 B)	350 (29°C)	-
DISSOLVED OXYGEN <sup>c</sup>	mg/L	AZIDE MODIFICATION METHOD (SM :4500-O C)	4.8	≥ 6.0
AMMONIA-NITROGEN <sup>c</sup>	mg/L NH <sub>3</sub> -N	DISTILLATION NESSLERIZATION METHOD	ND	≤ 0.5
NITRATE-NITROGEN <sup>c</sup>	mg/L NO <sub>3</sub> -N	CADMIUM REDUCTION METHOD (SM :4500-NO <sub>3</sub> <sup>-</sup> E)	0.10	≤ 5.0
<b>MICROBIOLOGY</b>				
TOTAL COLIFORM BACTERIA <sup>b</sup>	MPN/100 mL	MULTIPLE TUBE FERMENTATION TECHNIQUE (SM :9221 B)	54,000	≤ 5,000
<b>SAMPLE CONDITION</b>				
WATER'S COLOUR/TURBID			YELLOW/CLEAR	
SEDIMENT			YELLOW	

<sup>a</sup> : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

<sup>b</sup> : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

<sup>c</sup> : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23<sup>rd</sup> EDITION, 2017.

REGULATORY STANDARD : NOTIFICATION OF THE NATIONAL ENVIRONMENTAL BOARD, NO.8, B.E.2537 ISSUED UNDER THE ENHANCEMENT AND CONSERVATION OF NATIONAL ENVIRONMENTAL QUALITY ACT.2535, PUBLISHED IN THE ROYAL GOVERNMENT GAZETTE, VOL.111, PART 16, DATED FEBRUARY 24, B.E.2537 (CLASS 2).

ND : NON-DETECTABLE (AMMONIA-NITROGEN < 0.5 mg/L).



LABORATORY SUPERVISOR

NOVEMBER 11, 2020

## ANALYSIS REPORT

**CUSTOMER NAME** : 304 INDUSTRIAL PARK 19 CO.,LTD. (PULP 3)  
**ADDRESS** : 106 MOO.7, THATOOM, SRIMAHAPHOTE, PRACHINBURI THAILAND 25140.  
**CONTACT INFORMATION** : TEL. 08 5835 1371 e-mail : kunnapat\_p@doublea1991.com  
**SAMPLING SOURCE** : คลองรัง บริเวณหลังไหลผ่านพื้นที่สวนอุตสาหกรรม 304 ปาร์ค 1 ประมาณ 500 เมตร  
**SAMPLE TYPE** : SURFACE WATER **RECEIVED DATE** : NOVEMBER 2, 2020  
**SAMPLING DATE** : NOVEMBER 2, 2020 **ANALYTICAL DATE** : NOVEMBER 2-9, 2020  
**SAMPLING TIME** : 12:10 HOUR **REPORT NO.** : 2020-U75103  
**SAMPLING METHOD <sup>c</sup>** : GRAB, GRAB AND STERILE TECHNIQUE **WORK NO.** : 2019-009437  
**MEASURING BY <sup>c</sup>** : MR KRIDSANAPONG NAMTHIP **ANALYSIS NO.** : T20AR647-0001  
**ANALYZED BY** : MISS ITSARIYAPORN BUATIB

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			คลองรัง บริเวณหลังไหลผ่านพื้นที่สวนอุตสาหกรรม 304 ปาร์ค 1 ประมาณ 500 เมตร T20AR647-0001	
ELECTRICAL CONDUCTIVITY <sup>c</sup>	µmhos/cm	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM :2510 B)	529 (31°C)	-
DISSOLVED OXYGEN <sup>c</sup>	mg/L	AZIDE MODIFICATION METHOD (SM :4500-O C)	4.6	≥ 6.0
AMMONIA-NITROGEN <sup>c</sup>	mg/L NH <sub>3</sub> -N	DISTILLATION NESSLERIZATION METHOD	ND	≤ 0.5
NITRATE-NITROGEN <sup>c</sup>	mg/L NO <sub>3</sub> -N	CADMIUM REDUCTION METHOD (SM :4500-NO <sub>3</sub> <sup>-</sup> E)	0.13	≤ 5.0
<b>MICROBIOLOGY</b>				
TOTAL COLIFORM BACTERIA <sup>b</sup>	MPN/100 mL	MULTIPLE TUBE FERMENTATION TECHNIQUE (SM :9221 B)	4,900	≤ 5,000
<b>SAMPLE CONDITION</b>				
WATER'S COLOUR/TURBID			YELLOW/CLEAR	
SEDIMENT			YELLOW	

<sup>a</sup> : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

<sup>b</sup> : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

<sup>c</sup> : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23<sup>rd</sup> EDITION, 2017.

REGULATORY STANDARD : NOTIFICATION OF THE NATIONAL ENVIRONMENTAL BOARD, NO.8, B.E.2537 ISSUED UNDER THE ENHANCEMENT AND CONSERVATION OF NATIONAL ENVIRONMENTAL QUALITY ACT.2535, PUBLISHED IN THE ROYAL GOVERNMENT GAZETTE, VOL.111, PART 16, DATED FEBRUARY 24, B.E.2537 (CLASS 2).

ND : NON-DETECTABLE (AMMONIA-NITROGEN < 0.5 mg/L).



LABORATORY SUPERVISOR

NOVEMBER 11, 2020



## ANALYSIS REPORT

**CUSTOMER NAME** : 304 INDUSTRIAL PARK 19 CO.,LTD. (PULP 3)  
**ADDRESS** : 106 MOO.7, THATOOM, SRIMAHAPHOTE, PRACHINBURI THAILAND 25140.  
**CONTACT INFORMATION** : TEL. 08 5835 1371 e-mail : kunnapat\_p@doublea1991.com  
**SAMPLING SOURCE** : วัดวังบัวทอง  
**SAMPLE TYPE** : SURFACE WATER **RECEIVED DATE** : NOVEMBER 2, 2020  
**SAMPLING DATE** : NOVEMBER 2, 2020 **ANALYTICAL DATE** : NOVEMBER 2-9, 2020  
**SAMPLING TIME** : 12:50 HOUR **REPORT NO.** : 2020-U75357  
**SAMPLING METHOD <sup>c</sup>** : GRAB, GRAB AND STERILE TECHNIQUE **WORK NO.** : 2019-009437  
**SAMPLING BY <sup>c</sup>** : MR KRIDSANAPONG NAMTHIP **ANALYSIS NO.** : T20AR660-0001  
**ANALYZED BY** : MISS ITSARIYAPORN BUATIB

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			วัดวังบัวทอง T20AR660-0001	
ELECTRICAL CONDUCTIVITY <sup>c</sup>	µmhos/cm	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM :2510 B)	116 (28°C)	-
DISSOLVED OXYGEN <sup>c</sup>	mg/L	AZIDE MODIFICATION METHOD (SM :4500-O C)	4.5	≥ 6.0
AMMONIA-NITROGEN <sup>c</sup>	mg/L NH <sub>3</sub> -N	DISTILLATION NESSLERIZATION METHOD	ND	≤ 0.5
NITRATE-NITROGEN <sup>c</sup>	mg/L NO <sub>3</sub> -N	CADMIUM REDUCTION METHOD (SM :4500-NO <sub>3</sub> E)	0.09	≤ 5.0
<b>MICROBIOLOGY</b>				
TOTAL COLIFORM BACTERIA <sup>b</sup>	MPN/100 mL	MULTIPLE TUBE FERMENTATION TECHNIQUE (SM :9221 B)	3,300	≤ 5,000
<b>SAMPLE CONDITION</b>				
WATER'S COLOUR/TURBID			BROWN/TURBID	
SEDIMENT			BROWN	

<sup>a</sup> : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

<sup>b</sup> : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

<sup>c</sup> : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23<sup>rd</sup> EDITION, 2017.

REGULATORY STANDARD : NOTIFICATION OF THE NATIONAL ENVIRONMENTAL BOARD, NO.8, B.E.2537 ISSUED UNDER THE ENHANCEMENT AND CONSERVATION OF NATIONAL ENVIRONMENTAL QUALITY ACT.2535, PUBLISHED IN THE ROYAL GOVERNMENT GAZETTE, VOL.111, PART 16, DATED FEBRUARY 24, B.E.2537 (CLASS 2).

ND : NON-DETECTABLE (AMMONIA-NITROGEN < 0.5 mg/L).

LABORATORY SUPERVISOR

NOVEMBER 11, 2020

## ANALYSIS REPORT

**CUSTOMER NAME** : 304 INDUSTRIAL PARK 19 CO.,LTD. (PULP 3)  
**ADDRESS** : 106 MOO.7, THATOOM, SRIMAHAPHOTE, PRACHINBURI THAILAND 25140.  
**CONTACT INFORMATION** : TEL. 08 5835 1371 e-mail : kunnapat\_p@doublea1991.com  
**SAMPLING SOURCE** : วัดหลังถ้ำ  
**SAMPLE TYPE** : SURFACE WATER **RECEIVED DATE** : NOVEMBER 2, 2020  
**SAMPLING DATE** : NOVEMBER 2, 2020 **ANALYTICAL DATE** : NOVEMBER 2-9, 2020  
**SAMPLING TIME** : 14:00 HOUR **REPORT NO.** : 2020-U75358  
**SAMPLING METHOD °** : GRAB, GRAB AND STERILE TECHNIQUE **WORK NO.** : 2019-009437  
**SAMPLING BY °** : MR KRIDSANAPONG NAMTHIP **ANALYSIS NO.** : T20AR660-0002  
**ANALYZED BY** : MISS ITSARIYAPORN BUATIB

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			วัดหลังถ้ำ T20AR660-0002	
ELECTRICAL CONDUCTIVITY °	µmhos/cm	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM :2510 B)	231 (29°C)	-
DISSOLVED OXYGEN °	mg/L	AZIDE MODIFICATION METHOD (SM :4500-O C)	4.8	≥ 6.0
AMMONIA-NITROGEN °	mg/L NH <sub>3</sub> -N	DISTILLATION NESSLERIZATION METHOD	ND	≤ 0.5
NITRATE-NITROGEN °	mg/L NO <sub>3</sub> -N	CADMIUM REDUCTION METHOD (SM :4500-NO <sub>3</sub> ° E)	0.08	≤ 5.0
<b>MICROBIOLOGY</b>				
TOTAL COLIFORM BACTERIA °	MPN/100 mL	MULTIPLE TUBE FERMENTATION TECHNIQUE (SM :9221 B)	7,000	≤ 5,000
<b>SAMPLE CONDITION</b>				
WATER'S COLOUR/TURBID			YELLOW/TURBID	
SEDIMENT			YELLOW	

<sup>a</sup> : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

<sup>b</sup> : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

<sup>c</sup> : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23<sup>rd</sup> EDITION, 2017.

REGULATORY STANDARD : NOTIFICATION OF THE NATIONAL ENVIRONMENTAL BOARD, NO.8, B.E.2537 ISSUED UNDER THE ENHANCEMENT AND CONSERVATION OF NATIONAL ENVIRONMENTAL QUALITY ACT.2535, PUBLISHED IN THE ROYAL GOVERNMENT GAZETTE, VOL.111, PART 16, DATED FEBRUARY 24, B.E.2537 (CLASS 2).

ND : NON-DETECTABLE (AMMONIA-NITROGEN < 0.5 mg/L).

LABORATORY SUPERVISOR

NOVEMBER 11, 2020



## ANALYSIS REPORT

**CUSTOMER NAME** : 304 INDUSTRIAL PARK 19 CO.,LTD. (PULP 3)  
**ADDRESS** : 106 MOO.7, THATOOM, SRIMAHAPHOTE, PRACHINBURI THAILAND 25140.  
**CONTACT INFORMATION** : TEL. 08 5835 1371 e-mail : kunnapat\_p@doublea1991.com  
**SAMPLING SOURCE** : คลองชลองแวง (จุดปล่อยน้ำ)  
**SAMPLE TYPE** : SURFACE WATER **RECEIVED DATE** : NOVEMBER 2, 2020  
**SAMPLING DATE** : NOVEMBER 2, 2020 **ANALYTICAL DATE** : NOVEMBER 2-9, 2020  
**SAMPLING TIME** : 13:35 HOUR **REPORT NO.** : 2020-U75359  
**SAMPLING METHOD °** : GRAB, GRAB AND STERILE TECHNIQUE **WORK NO.** : 2019-009437  
**SAMPLING BY °** : MR KRIDSANAPONG NAMTHIP **ANALYSIS NO.** : T20AR660-0003  
**ANALYZED BY** : MISS ITSARIYAPORN BUATIB

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			คลองชลองแวง (จุดปล่อยน้ำ) T20AR660-0003	
ELECTRICAL CONDUCTIVITY °	µmhos/cm	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM :2510 B)	364 (31°C)	-
DISSOLVED OXYGEN °	mg/L	AZIDE MODIFICATION METHOD (SM :4500-O C)	3.7	≥ 6.0
AMMONIA-NITROGEN °	mg/L NH <sub>3</sub> -N	DISTILLATION NESSLERIZATION METHOD	ND	≤ 0.5
NITRATE-NITROGEN °	mg/L NO <sub>3</sub> -N	CADMIUM REDUCTION METHOD (SM :4500-NO <sub>3</sub> E)	0.10	≤ 5.0
<b>MICROBIOLOGY</b>				
TOTAL COLIFORM BACTERIA °	MPN/100 mL	MULTIPLE TUBE FERMENTATION TECHNIQUE (SM :9221 B)	1,100	≤ 5,000
<b>SAMPLE CONDITION</b>				
WATER'S COLOUR/TURBID			YELLOW/CLEAR	
SEDIMENT			YELLOW	

° : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

° : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

° : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23<sup>rd</sup> EDITION, 2017.

REGULATORY STANDARD : NOTIFICATION OF THE NATIONAL ENVIRONMENTAL BOARD, NO.8, B.E.2537 ISSUED UNDER THE ENHANCEMENT AND CONSERVATION OF NATIONAL ENVIRONMENTAL QUALITY ACT.2535, PUBLISHED IN THE ROYAL GOVERNMENT GAZETTE, VOL.111, PART 16, DATED FEBRUARY 24, B.E.2537 (CLASS 2).

ND : NON-DETECTABLE (AMMONIA-NITROGEN < 0.5 mg/L).

LABORATORY SUPERVISOR

NOVEMBER 11, 2020

ภาคผนวก ง

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เอกสารสอบเทียบเครื่องมือ



ภาคผนวก ง-1

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เอกสารสอบเทียบเครื่องมือ  
บริษัท อินทิเกรทเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด



TISCH ENVIRONMENTAL, INC.  
145 SOUTH MIAMI AVE.  
VILLAGE OF CLEVELAND, OH 45002  
513.467.9000  
877.263.7610 TOLL FREE  
513.467.9009 FAX  
WWW.TISCH-ENV.COM

# AIR POLLUTION MONITORING EQUIPMENT

## ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Aug 6, 2020 Rootmeter S/N 9833620 Ta (K) - 298  
Operator Tisch Orifice I.D. - 1635 Pa (mm) - 749.3

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	1.3840	3.2	2.00
2	NA	NA	1.00	0.9760	6.3	4.00
3	NA	NA	1.00	0.8740	7.9	5.00
4	NA	NA	1.00	0.8360	8.7	5.50
5	NA	NA	1.00	0.6900	12.6	8.00

## DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9817	0.7093	1.4042	0.9957	0.7194	0.8919
0.9776	1.0017	1.9859	0.9916	1.0160	1.2613
0.9754	1.1161	2.2203	0.9894	1.1320	1.4101
0.9744	1.1656	2.3286	0.9884	1.1823	1.4790
0.9693	1.4048	2.8084	0.9831	1.4248	1.7837
Qstd slope (m) = 2.02199			Qa slope (m) = 1.26614		
intercept (b) = -0.03332			intercept (b) = -0.02116		
coefficient (r) = 0.99992			coefficient (r) = 0.99992		
y axis = $\text{SQRT}[\text{H2O}(\text{Pa}/760)(298/\text{Ta})]$			y axis = $\text{SQRT}[\text{H2O}(\text{Ta}/\text{Pa})]$		

## CALCULATIONS

Vstd = Diff. Vol [(Pa-Diff. Hg)/760] (298/Ta)  
Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa]  
Qa = Va/Time

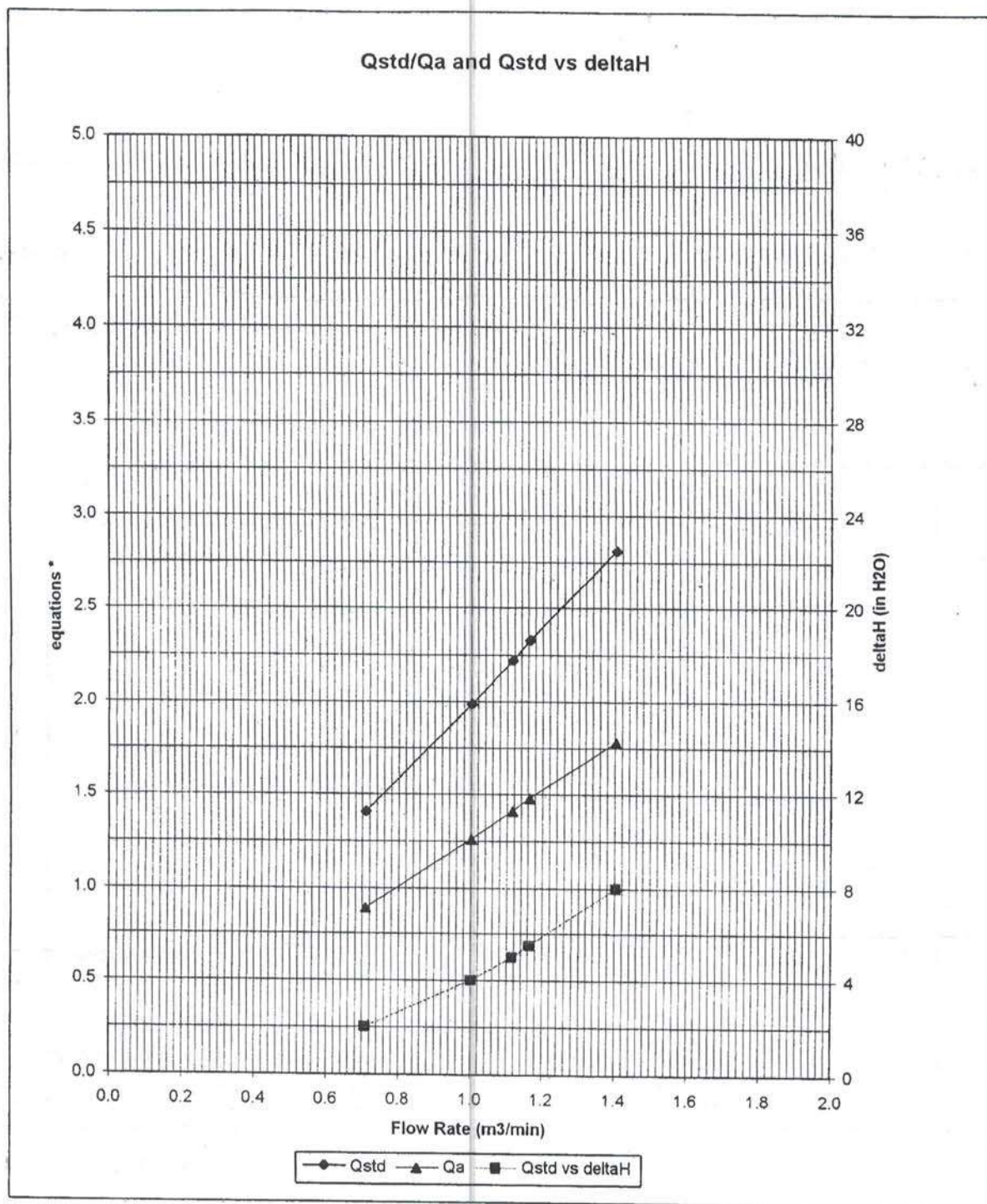
For subsequent flow rate calculations:

$Qstd = 1/m \{ [\text{SQRT}(\text{H2O}(\text{Pa}/760)(298/\text{Ta}))] - b \}$   
 $Qa = 1/m \{ [\text{SQRT} \text{H2O}(\text{Ta}/\text{Pa})] - b \}$



TISCH ENVIRONMENTAL, INC.  
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VILLAGE OF CLEVELAND, OH 44102  
513.467.9000  
877.263.7610 TOLL FREE  
513.467.9009 FAX  
WWW.TISCH-ENV.COM

# AIR POLLUTION MONITORING EQUIPMENT



\* y-axis equations:

Qstd series:

$$\sqrt{\Delta H \left( \frac{P_a}{P_{std}} \right) \left( \frac{T_{std}}{T_a} \right)}$$

Qa series:

$$\sqrt{(\Delta H (T_a / P_a))}$$

#1635



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-63/0257

MTC No. EEL. BP. 131/0163

## CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.

Address : 122 T.Thatoom A.Srimahaphote Prachinburi 25140.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Center.  
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

### Instrument Calibrated :

Description : Sound Level Meter

Manufacturer : Rion

Model : NL-42

Serial No. : 01022362

Microphone : Type UC-52 No.142301

Preamplifier : Type NH-24 No.22410

### Ambient Environment

Temperature :  $(23 \pm 3) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15) \%$

Ambient Pressure :  $(101.325 \pm 1.5) \text{ kPa}$

### Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712;
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871;
3. Decade Attenuator Ando AL-205 S/N 00464602;
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668;
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037;
6. Digital Multimeter Fluke 8520A S/N 4985007;
7. Pistonphone Rion NC-72 S/N 00402446;
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484;

Date of Receipt : 14 Jan. 2020

Date of Calibration : 3-6 Feb. 2020

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FM.BL.MTC.002 Rev.3

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

**Request No.** 21-63/0257

**MTC No.** EEL. BP. 131/0163

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650;
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300;
11. Digital Multimeter Agilent 34401A S/N MY44005560; and
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

**Calibration Procedure :**

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a level of confidence of approximately 95%.

**Date of Calibration** : 3-6 Feb. 2020

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-63/0257

MTC No. EEL. BP. 131/0163

### 1. Absolute Sensitivity

Reference	Unit Under Test				Tolerance
Acoustic Signal  (dB)	Measured Value (dB)		Deviation  (dB)	Uncertainty  (+dB)	Limit Class 2  (+dB)
	Before adjust	After adjust			
113.96	114.3	114.0	0.0	0.30	1.4

**Note:** The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 114.0 dB.

### 2. Self-generated noise

#### 2.1 Normal test

Measured value (dB)	Uncertainty (±dB)
16.4	0.10

#### 2.2 The microphone of the sound level meter was replaced by electrical signal input device

Frequency Weighting	Measured Value (dB)	Uncertainty (±dB)
A-Weighting	12.9	0.10
C-Weighting	18.4	0.10
Flat	24.1	0.10

Date of Calibration : 3-6 Feb. 2020

3 / 8

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Request No. 21-63/0257

MTC No. EEL. BP. 131/0163

### 3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from response curve			Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
	A-weighting (dB)	C-weighting (dB)	Flat (dB)		
125	0.1	0.2	0.2	0.40	2.0
1 000	-0.1	-0.1	-0.1	0.40	1.4
4 000	-2.6	-2.6	-2.6	0.40	3.6

### 4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from response curve			Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
	A-weighting (dB)	C-weighting (dB)	Flat (dB)		
63	0.0	-0.1	-0.1	0.20	2.5
125	-0.1	0.0	-0.1	0.20	2.0
250	-0.1	0.0	0.0	0.20	1.9
500	-0.1	0.0	0.0	0.20	1.9
1 000	0.0	0.0	0.0	0.20	1.4
2 000	0.0	0.2	0.0	0.20	2.6
4 000	-0.1	0.0	0.0	0.20	3.6
8 000	0.0	0.0	0.0	0.20	5.6

Date of Calibration : 3-6 Feb. 2020

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-63/0257

MTC No. EEL. BP. 131/0163

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ dB)
A-weighting	94.0	0.0	0.20	0.4
C-weighting	94.0	0.0	0.20	0.4
Flat	94.0	0.0	0.20	0.4

5.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ dB)
Fast	94.0	0.0	0.20	0.3
Slow	94.0	0.0	0.20	0.3
Leq	94.0	0.0	0.20	0.3

6. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ dB)
137	137.0	0.0	0.30	1.4
136	136.0	0.0	0.30	1.4
135	135.0	0.0	0.30	1.4
134	134.0	0.0	0.30	1.4
133	133.0	0.0	0.30	1.4
132	132.0	0.0	0.30	1.4
131	131.0	0.0	0.30	1.4

Date of Calibration : 3-6 Feb. 2020

5 / 8

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*Kornlue*

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Request No. 21-63/0257

MTC No. EEL. BP. 131/0163

6. Level linearity on the reference level range (continue)

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (+dB)	Tolerance Limits Class 2 (+dB)
130	130.0	0.0	0.30	1.4
129	129.0	0.0	0.30	1.4
124	124.0	0.0	0.30	1.4
119	119.0	0.0	0.30	1.4
114	114.0	0.0	0.30	1.4
109	109.0	0.0	0.30	1.4
104	104.0	0.0	0.30	1.4
99	99.0	0.0	0.30	1.4
94	94.0	0.0	0.30	1.4
89	89.0	0.0	0.30	1.4
84	84.1	0.1	0.30	1.4
79	79.0	0.0	0.30	1.4
74	74.0	0.0	0.30	1.4
69	69.0	0.0	0.30	1.4
64	64.0	0.0	0.30	1.4
59	58.9	-0.1	0.30	1.4
54	53.9	-0.1	0.30	1.4
49	48.9	-0.1	0.30	1.4
44	44.0	0.0	0.30	1.4
39	38.9	-0.1	0.30	1.4
34	33.9	-0.1	0.30	1.4
29	29.0	0.0	0.30	1.4
28	27.9	-0.1	0.30	1.4

Date of Calibration : 3-6 Feb. 2020

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Request No. 21-63/0257

MTC No. EEL. BP. 131/0163

#### 6. Level linearity on the reference level range (continue)

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (+dB)	Tolerance Limits Class 2 (+dB)
27	27.0	0.0	0.30	1.4
26	26.0	0.0	0.30	1.4
25	25.0	0.0	0.30	1.4

#### 7. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (+dB)	Tolerance Limits Class 2 (+dB)
20-130	125	125.0	0.0	0.30	1.4

#### 8. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (+dB)	Tolerance Limits Class 2 (dB)
Fast	200	126.0	0.0	0.20	$\pm 1.3$
	2	108.9	-0.1	0.20	+1.3; -2.8
	0.25	99.8	-0.2	0.20	+1.8; -5.3
Slow	200	119.5	-0.1	0.20	$\pm 1.3$
	2	99.9	-0.1	0.20	+1.3; -5.3
SEL	200	120.0	0.0	0.20	$\pm 1.3$
	2	99.9	-0.1	0.20	+1.3; -2.8
	0.25	90.8	-0.2	0.20	+1.8; -5.3

Date of Calibration : 3-6 Feb. 2020

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*Komhad*

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-63/0257

MTC No. EEL. BP. 131/0163

### 9. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (+dB)	Tolerance limits Class 2 (+dB)
Complete cycle	125.4	125.4	0.0	0.20	2.4
Positive half cycle	124.4	124.1	-0.3	0.20	1.4
Negative half cycle	124.4	124.1	-0.3	0.20	1.4

### 10. Overload indication

Measured value (dB)		Deviated value (dB)	Uncertainty (+dB)	Tolerance Limits Class 2 (+dB)
Positive one-half cycle	Negative one-half cycle			
136.5	136.5	0.0	0.30	1.8

Calibrated by :

  
.....  
(Mr. Komkrit Laohasiri)

Approved by :

  
.....  
fa (Ms. Wadee Wichaidit)  
Director

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Center

Date of Calibration : 3-6 Feb. 2020

Date of Issue : 11 Feb. 2020

Ref : 2011263011400199002

End of Certificate

8 / 8

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FM.BL.MTC.002 Rev.3

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Request No. 21-63/0253

MTC No. EEL. BP. 122/0163

## CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.

Address : 122 T.Thatoom, A.Srimahaphote, Prachinburi 25140.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.  
: Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

### Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : Rion

Model : NC-74

Serial No. : 35046798

### Ambient Environment

Temperature :  $(23 \pm 3) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15) \%$

Ambient Pressure :  $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037 .

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Keithley 2015-P S/N 4106495.

7. Condenser Microphone B&K 4180 S/N 2889871.

Calibration Procedure : CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique .

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through

- National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 14 Jan. 2020

Date of Calibration : 23 Jan. 2020

1 / 2

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FM.BL.MTC.002 Rev.3

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Request No. 21-63/0253

MTC No. EEL. BP. 122/0163

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20 $\mu$ Pa at 1000 Hz

Acoustic Output in dB re 20 $\mu$ Pa, Corrected to Reference Conditions : 101.325 kPa, 23.0 °C and 50 %RH

### 1. Sound Pressure Level

Standard Microphone Type	Sound Pressure Level			
	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch B&K 4180	93.99	-0.01	$\pm 0.10$	$\pm 0.40$ dB

### 2. Frequency

Standard Microphone Type	Frequency			
	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch B&K 4180	1001.6	1.6	$\pm 1.5$	$\pm 1.0\%$

### 3. Total distortion

Standard Microphone Type	Total distortion		
	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch B&K 4180	1.36	$\pm 0.50$	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibration results exclude the calibrator pressure correction.

3. The calibration results include the microphone volume correction at the level of 0.16 dB from manual.

Calibrated by :

Approved by :

.....  
(Mr. Tawikiat Iamsamran)

.....  
(Ms. Wadee Wichaidit)  
Director

Date of Calibration : 23 Jan. 2020

Date of Issue : 27 Jan. 2020

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Ref: 2011263011400194001

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End of Certificate

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FM.BL.MTC.002 Rev.3

#### Head Office

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E-mail : sumalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-63/0254

MTC No. EEL. BP. 123/0163

## CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.

Address : 122 T.Thatoom A.Srimahaphote Prachinburi 25140.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Center.  
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

### Instrument Calibrated :

Description : Integrating Sound Level Meter

Manufacturer : ACO

Model : 6226

Serial No. : 100142

Microphone : Type 7052 No.57063

Preamplifier

### Ambient Environment

Temperature :  $(23 \pm 3) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15) \%$

Ambient Pressure :  $(101.325 \pm 1.5) \text{ kPa}$

### Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712;
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871;
3. Decade Attenuator Ando AL-205 S/N 00464602;
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668;
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037;
6. Digital Multimeter Fluke 8520A S/N 4985007;
7. Pistonphone Rion NC-72 S/N 00402446;
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484;

Date of Receipt : 14 Jan. 2020

Date of Calibration : 3-6 Feb. 2020

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-63/0254

MTC No. EEL. BP. 123/0163

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650;
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300;
11. Digital Multimeter Agilent 34401A S/N MY44005560; and
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

**Calibration Procedure :**

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a level of confidence of approximately 95%.

Date of Calibration : 3-6 Feb. 2020

2 / 8

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-63/0254

MTC No. EEL. BP. 123/0163

1. Absolute Sensitivity

Reference	Unit Under Test				Tolerance
Acoustic Signal  (dB)	Measured Value (dB)		Deviation  (dB)	Uncertainty  (+dB)	Limit Class 2  (+dB)
	Before adjust	After adjust			
113.99	114.6	114.0	0.0	0.30	1.4

**Note:** The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 113.5 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (+dB)
19.5	0.10

2.2 The microphone of the sound level meter was replaced by electrical signal input device

Frequency Weighting	Measured Value (dB)	Uncertainty (+dB)
A-Weighting	14.4	0.10
C-Weighting	23.7	0.10
Flat	26.8	0.10

Date of Calibration : 3-6 Feb. 2020

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*Komhant*

FM.BL.MTC.002 Rev.3

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-63/0254

MTC No. EEL. BP. 123/0163

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from response curve			Uncertainty (+dB)	Tolerance Limits Class 2 (+dB)
	A-weighting (dB)	C-weighting (dB)	Flat (dB)		
125	0.2	0.2	0.1	0.40	2.0
1 000	0.1	0.0	0.1	0.40	1.4
4 000	-0.5	-0.3	-0.2	0.40	3.6

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from response curve			Uncertainty (+dB)	Tolerance Limits Class 2 (+dB)
	A-weighting (dB)	C-weighting (dB)	Flat (dB)		
63	0.1	0.0	0.0	0.20	2.5
125	0.1	0.1	0.1	0.20	2.0
250	0.1	0.1	0.1	0.20	1.9
500	0.1	0.0	0.0	0.20	1.9
1 000	0.0	0.0	0.0	0.20	1.4
2 000	-0.2	-0.1	0.0	0.20	2.6
4 000	-0.3	-0.3	-0.1	0.20	3.6
8 000	-0.3	-0.2	-0.2	0.20	5.6

Date of Calibration : 3-6 Feb. 2020

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FM.BL.MTC.002 Rev.3

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-63/0254

MTC No. EEL. BP. 123/0163

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty (+dB)	Tolerance Limits Class 2 (+dB)
A-weighting	94.0	0.0	0.20	0.4
C-weighting	94.0	0.0	0.20	0.4
Flat	94.1	0.1	0.20	0.4

5.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty (+dB)	Tolerance Limits Class 2 (+dB)
Fast	94.0	0.0	0.20	0.3
Slow	94.0	0.0	0.20	0.3
Leq	94.0	0.0	0.20	0.3

6. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (+dB)	Tolerance Limits Class 2 (+dB)
123	122.9	-0.1	0.30	1.4
122	121.9	-0.1	0.30	1.4
121	120.9	-0.1	0.30	1.4
120	119.9	-0.1	0.30	1.4
119	119.0	0.0	0.30	1.4
114	113.9	-0.1	0.30	1.4
109	108.9	-0.1	0.30	1.4

Date of Calibration : 3-6 Feb. 2020

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*Komhad*

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-63/0254

MTC No. EEL. BP. 123/0163

6. Level linearity on the reference level range (continue)

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ dB)
104	103.9	-0.1	0.30	1.4
99	99.0	0.0	0.30	1.4
94	94.0	0.0	0.30	1.4
89	89.0	0.0	0.30	1.4
84	84.0	0.0	0.30	1.4
79	78.9	-0.1	0.30	1.4
74	73.9	-0.1	0.30	1.4
69	68.9	-0.1	0.30	1.4
64	63.8	-0.2	0.30	1.4
59	58.8	-0.2	0.30	1.4
54	53.8	-0.2	0.30	1.4
49	48.8	-0.2	0.30	1.4
44	43.8	-0.2	0.30	1.4
39	38.8	-0.2	0.30	1.4
34	33.9	-0.1	0.30	1.4
33	32.9	-0.1	0.30	1.4
32	31.9	-0.1	0.30	1.4
31	31.0	0.0	0.30	1.4
30	30.1	0.1	0.30	1.4

Date of Calibration : 3-6 Feb. 2020

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-63/0254

MTC No. EEL. BP. 123/0163

7. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (+dB)	Tolerance Limits Class 2 (+dB)
40-130	125	125.0	0.0	0.30	1.4
30-120	115	115.0	0.0	0.30	1.4
20-110	105	105.0	0.0	0.30	1.4
20-100	95	95.0	0.0	0.30	1.4
20-90	85	85.0	0.0	0.30	1.4
20-80	75	74.9	-0.1	0.30	1.4

8. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (+dB)	Tolerance Limits Class 2 (dB)
Fast	200	115.6	-0.4	0.20	$\pm 1.3$
	2	98.9	-0.1	0.20	+1.3; -2.8
	0.25	89.6	-0.4	0.20	+1.8; -5.3
Slow	200	109.4	-0.2	0.20	$\pm 1.3$
	2	89.9	-0.1	0.20	+1.3; -5.3
SEL	200	110.1	0.1	0.20	$\pm 1.3$
	2	90.1	0.1	0.20	+1.3; -2.8
	0.25	81.2	0.2	0.20	+1.8; -5.3

Date of Calibration : 3-6 Feb. 2020

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*Komhad*

FM.BL.MTC.002 Rev.3

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Request No. 21-63/0254

MTC No. EEL. BP. 123/0163

9. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (+dB)	Tolerance limits Class 2 (+dB)
Complete cycle	125.4	125.8	0.4	0.20	2.4
Positive half cycle	124.4	124.2	-0.2	0.20	1.4
Negative half cycle	124.4	124.2	-0.2	0.20	1.4

10. Overload indication

Measured value (dB)		Deviated value (dB)	Uncertainty (+dB)	Tolerance Limits Class 2 (+dB)
Positive one-half cycle	Negative one-half cycle			
132.9	132.8	0.1	0.30	1.8

Calibrated by :

*Komkrit Laohasiri*  
(Mr. Komkrit Laohasiri)

Approved by :

*Wadee Wichaidit*  
(Ms. Wadee Wichaidit)  
Director

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Center

Date of Calibration : 3-6 Feb. 2020

Date of Issue : 11 Feb. 2020

Ref : 2011263011400196001

End of Certificate

8 / 8

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FM.BL.MTC.002 Rev.3

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Request No. 21-63/0251

MTC No. EEL. BP. 120/0163

## CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.

Address : 122 T.Thatoom, A.Srimahaphote, Prachinburi 25140.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.  
: Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

### Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 100012

### Ambient Environment

Temperature :  $(23 \pm 3) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15) \%$

Ambient Pressure :  $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037 .

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Keithley 2015-P S/N 4106495.

7. Condenser Microphone B&K 4180 S/N 2889871.

Calibration Procedure : CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique .

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through

- National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 14 Jan. 2020

Date of Calibration : 24 Jan. 2020

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2

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Request No. 21-63/0251

MTC No. EEL. BP. 120/0163

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20 $\mu$ Pa at 1000 Hz

Acoustic Output in dB re 20 $\mu$ Pa, Corrected to Reference Conditions : 101.325 kPa, 23.0 °C and 50 %RH

### 1. Sound Pressure Level

Standard Microphone Type	Sound Pressure Level			
	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch B&K 4180	93.90	-0.10	$\pm 0.10$	$\pm 0.40$ dB

### 2. Frequency

Standard Microphone Type	Frequency			
	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch B&K 4180	999.9	-0.1	$\pm 1.5$	$\pm 1.0\%$

### 3. Total distortion

Standard Microphone Type	Total distortion		
	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch B&K 4180	1.38	$\pm 0.50$	$\pm 3.0\%$


Note : 1. No adjustment.

2. The calibration results exclude the calibrator pressure correction.

3. The calibration results exclude the microphone volume correction.

Calibrated by :

Approved by :

  
.....  
(Mr. Tawikiat Iamsamran)

  
.....  
fa (Ms. Wadee Wichaidit)  
Director

Date of Calibration : 24 Jan. 2020

Date of Issue : 27 Jan. 2020

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 2011263011400192001

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End of Certificate

The results relate only to the items tested or calibrated.

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-63/0254

MTC No. EEL. BP. 124/0163

## CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.

Address : 122 T.Thatoom A.Srimahaphote Prachinburi 25140.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Center.  
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

### Instrument Calibrated :

Description : Integrating Sound Level Meter

Manufacturer : ACO

Model : 6226

Serial No. : 100144

Microphone : Type 7052 No.62698

Preamplifier

### Ambient Environment

Temperature :  $(23 \pm 3) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15) \%$

Ambient Pressure :  $(101.325 \pm 1.5) \text{ kPa}$

### Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712;
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871;
3. Decade Attenuator Ando AL-205 S/N 00464602;
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668;
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037;
6. Digital Multimeter Fluke 8520A S/N 4985007;
7. Pistonphone Rion NC-72 S/N 00402446;
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484;

Date of Receipt : 14 Jan. 2020

Date of Calibration : 3-6 Feb. 2020

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*Kemhant*

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#### Head Office

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**Request No.** 21-63/0254

**MTC No.** EEL. BP. 124/0163

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650;
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300;
11. Digital Multimeter Agilent 34401A S/N MY44005560; and
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

**Calibration Procedure :**

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a level of confidence of approximately 95%.

**Date of Calibration** : 3-6 Feb. 2020

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Request No. 21-63/0254

MTC No. EEL. BP. 124/0163

1. Absolute Sensitivity

Reference	Unit Under Test				Tolerance
Acoustic Signal (dB)	Measured Value (dB)		Deviation (dB)	Uncertainty (+dB)	Limit Class 2 (+dB)
	Before adjust	After adjust			
113.98	111.4	114.0	0.0	0.30	1.4

**Note:** The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 116.8 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)
19.5	0.10

2.2 The microphone of the sound level meter was replaced by electrical signal input device

Frequency Weighting	Measured Value (dB)	Uncertainty (±dB)
A-Weighting	17.1	0.10
C-Weighting	24.1	0.10
Flat	29.0	0.10

Date of Calibration : 3-6 Feb. 2020

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-63/0254

MTC No. EEL. BP. 124/0163

### 3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from response curve			Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
	A-weighting (dB)	C-weighting (dB)	Flat (dB)		
125	0.4	0.1	0.1	0.40	2.0
1 000	0.1	0.2	0.2	0.40	1.4
4 000	-0.2	-0.3	-0.1	0.40	3.6

### 4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from response curve			Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
	A-weighting (dB)	C-weighting (dB)	Flat (dB)		
63	0.3	0.1	0.0	0.20	2.5
125	0.2	0.1	0.1	0.20	2.0
250	0.2	0.0	0.1	0.20	1.9
500	0.1	0.0	0.0	0.20	1.9
1 000	0.0	0.0	0.0	0.20	1.4
2 000	-0.2	-0.1	0.0	0.20	2.6
4 000	-0.4	-0.2	0.0	0.20	3.6
8 000	-0.3	-0.2	-0.2	0.20	5.6

Date of Calibration : 3-6 Feb. 2020

4 / 8

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### 5. Frequency and time weightings at 1 kHz

#### 5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ dB)
A-weighting	94.0	0.0	0.20	0.4
C-weighting	94.0	0.0	0.20	0.4
Flat	94.1	0.1	0.20	0.4

#### 5.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ dB)
Fast	94.0	0.0	0.20	0.3
Slow	94.0	0.0	0.20	0.3
Leq	94.1	0.1	0.20	0.3

### 6. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ dB)
122	122.0	0.0	0.30	1.4
121	121.0	0.0	0.30	1.4
120	120.0	0.0	0.30	1.4
119	119.0	0.0	0.30	1.4
114	113.9	-0.1	0.30	1.4
109	108.9	-0.1	0.30	1.4

Date of Calibration : 3-6 Feb. 2020

5 / 8

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-63/0254

MTC No. EEL. BP. 124/0163

6. Level linearity on the reference level range (continue)

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ dB)
104	103.9	-0.1	0.30	1.4
99	99.1	0.1	0.30	1.4
94	94.0	0.0	0.30	1.4
89	89.0	0.0	0.30	1.4
84	84.0	0.0	0.30	1.4
79	79.1	0.1	0.30	1.4
74	74.1	0.1	0.30	1.4
69	69.0	0.0	0.30	1.4
64	63.9	-0.1	0.30	1.4
59	59.0	0.0	0.30	1.4
54	53.9	-0.1	0.30	1.4
49	49.0	0.0	0.30	1.4
44	44.0	0.0	0.30	1.4
39	39.0	0.0	0.30	1.4
34	34.0	0.0	0.30	1.4
33	33.1	0.1	0.30	1.4
32	32.1	0.1	0.30	1.4
31	31.2	0.2	0.30	1.4
30	30.3	0.3	0.30	1.4

Date of Calibration : 3-6 Feb. 2020

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Request No. 21-63/0254

MTC No. EEL. BP. 124/0163

7. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (+dB)	Tolerance Limits Class 2 (+dB)
40-130	125	125.0	0.0	0.30	1.4
30-120	115	115.0	0.0	0.30	1.4
20-110	105	105.0	0.0	0.30	1.4
20-100	95	95.0	0.0	0.30	1.4
20-90	85	85.0	0.0	0.30	1.4
20-80	75	74.9	-0.1	0.30	1.4

8. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (+dB)	Tolerance Limits Class 2 (dB)
Fast	200	115.9	-0.1	0.20	±1.3
	2	98.2	-0.8	0.20	+1.3; -2.8
	0.25	89.6	-0.4	0.20	+1.8; -5.3
Slow	200	109.4	-0.2	0.20	±1.3
	2	89.7	-0.3	0.20	+1.3; -5.3
SEL	200	110.1	0.1	0.20	±1.3
	2	90.1	0.1	0.20	+1.3; -2.8
	0.25	81.1	0.1	0.20	+1.8; -5.3

Date of Calibration : 3-6 Feb. 2020

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Request No. 21-63/0254

MTC No. EEL. BP. 124/0163


### 9. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (+dB)	Tolerance limits Class 2 (+dB)
Complete cycle	125.4	125.7	0.3	0.20	2.4
Positive half cycle	124.4	124.2	-0.2	0.20	1.4
Negative half cycle	124.4	124.3	-0.1	0.20	1.4

### 10. Overload indication

Measured value (dB)		Deviated value (dB)	Uncertainty (+dB)	Tolerance Limits Class 2 (+dB)
Positive one-half cycle	Negative one-half cycle			
133.1	133.1	0.0	0.30	1.8

Calibrated by :

  
(Mr. Komkrit Laohasiri)

Approved by :

  
(Ms. Watee Wichaidit)  
Director

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Center

Date of Calibration : 3-6 Feb. 2020

Date of Issue : 11 Feb. 2020

Ref : 2011263011400196002

End of Certificate

8 / 8

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# Certificate of Calibration

Equipment: Balance  
Model: ME36S  
Serial No. (or ID.): 27206085  
Manufacturer: Sartorius  
Condition: In condition

Certificate No.: C01202535  
Issued Date: 05 August 2020  
Job No.: KSPR2009656  
Page: 1 of 3

Customer: D.A. Research Center Co., Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 25 °C  $\pm$  0.6 °C  
Humidity 61 %RH  $\pm$  2.2 %RH


Calibration Place: D.A. Research Center Co., Ltd. ( ห้องเครื่องชั่ง )  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Calibration By: Mr. Ratchatapong Tanngam

Calibration Date: 24 July 2020

The Method used: In house method, SPCC-WI-47, base on UKAS Lab 14

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C02190531, C02193160



(Mr. Ratchatapong Tanngam)

Person in charge




(Mr. Rungrod Jenkitrakulchai)

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 SPC RT Co., Ltd.



## Calibration Results:

### Before Adjustment

**Eccentric Error:** Weight to be 1/4 or 1/3 of Maximum capacity, taken from the center of the pan as a zero reference.

			Nominal Test Value	1000	(mg)
Reference Points (mg)					
A	B	C	D	E	
-	-0.003	0.001	0.002	0.000	

**Repeatability:** Determination of the standard deviation of weighing balance., Readability 0.001 (mg)

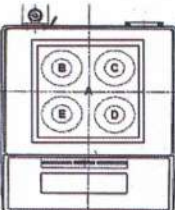
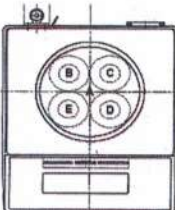
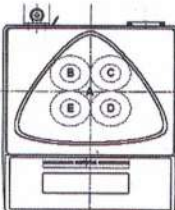
Nominal test value (mg)	Standard Deviation
2000	0.0011
20000	0.0012

**Departure of indication from nominal value.,** Readability 0.001 (mg)

Nominal Value (mg)	Conventional Mass (mg)	Displayed Value (mg)	Correction of Balance (mg)	Uncertainty (mg)	k
1	1.0010	1.001	0.000	0.0035	2.01
5	5.0010	5.002	-0.001	0.0035	2.01
10	10.0010	10.000	0.001	0.0048	2.00
50	50.0040	50.002	0.002	0.0063	2.00
100	99.9980	99.997	0.001	0.0082	2.00
500	500.0000	500.000	0.000	0.013	2.00
1000	999.9880	999.987	0.001	0.016	2.00
5000	4999.9790	4999.974	0.005	0.027	2.00
10000	9999.9930	9999.987	0.006	0.033	2.00
20000	19999.9670	19999.960	0.007	0.048	2.00
30000	29999.9600	29999.951	0.009	0.080	2.00

### After Adjustment

**Eccentric Error:** Weight to be 1/4 or 1/3 of Maximum capacity, taken from the center of the pan as a zero reference.

			Nominal Test Value	1000	(mg)
Reference Points (mg)					
A	B	C	D	E	
-	-0.002	0.001	0.002	0.000	

**Repeatability:** Determination of the standard deviation of weighing balance., Readability 0.001 (mg)

Nominal test value (mg)	Standard Deviation
2000	0.0008
20000	0.0010

**Departure of indication from nominal value.,** Readability 0.001 (mg)

Nominal Value (mg)	Conventional Mass (mg)	Displayed Value (mg)	Correction of Balance (mg)	Uncertainty (mg)	k
1	1.0010	1.001	0.000	0.0034	2.00
5	5.0010	5.001	0.000	0.0034	2.00
10	10.0010	10.001	0.000	0.0048	2.00
50	50.0040	50.003	0.001	0.0063	2.00
100	99.9980	99.998	0.000	0.0082	2.00
500	500.0000	499.999	0.001	0.013	2.00
1000	999.9880	999.988	0.000	0.016	2.00
5000	4999.9790	4999.977	0.002	0.027	2.00
10000	9999.9930	9999.990	0.003	0.033	2.00
20000	19999.9670	19999.964	0.003	0.048	2.00
30000	29999.9600	29999.956	0.004	0.080	2.00

The End of Certificate

ภาคผนวก ง-2

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เอกสารสอบเทียบเครื่องมือ  
บริษัท ยูโนเต็ด แอนนาลิสต์ แอนด์เอ็นจิเนียริง คอนซัลแตนท์ จำกัด



### List of Instruments Certification for Surfacewater Quality Analysis.

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
<b>Laboratory Instrument/Equipments.</b>									
1	Conductivity Meter	Electrical Conductivity	SI Analytics	Lab955 / 16300356	SPC Calibration Center Co.,Ltd.	C24200075	2 Apr 20	1 Apr 21	-
2	UV-VIS Spectrophotometer	Nitrate -Nitrogen Ammonia-Nitrogen	Agilent Technologies	Cary60 G6860A / MY15410009	DQE Services Co.,Ltd.	SP20-007	9 Aug 20	9 Aug 21	-
3	UV-VIS Spectrophotometer	Nitrate -Nitrogen Ammonia-Nitrogen	Hitachi	U-1900 / 2021-064	DQE Services Co.,Ltd.	SP20-005	14 Feb 20	12 Feb 21	-
4	UV-VIS Spectrophotometer	Nitrate -Nitrogen Ammonia-Nitrogen	Merck	Pharo 100 / 12390016	DQE Services Co.,Ltd.	SP20-001	27 Jan 20	25 Jan 21	-
5	Distillation Unit (Kjeldahl Method)	Nitrate -Nitrogen Ammonia-Nitrogen	FOSS TECATOR	KT200 / 91790524	Sithiporn Associates Co.,Ltd.	MS63FOT0084A	26 Aug 20	25 Aug 21	-
6	Distillation Unit (Kjeldahl Method)	Nitrate -Nitrogen Ammonia-Nitrogen	FOSS TECATOR	2100 / 520001424	Sithiporn Associates Co.,Ltd.	MS63FOT0084A	26 Aug 20	25 Aug 21	-
7	Incubator	Total Coliform Bacteria	Memmert	IPP 260 / V613.0095	Technology Promotion Association (Thailand-Japan)	20TM841	27 Apr 20	26 Apr 21	-
8	Incubator	Total Coliform Bacteria	Memmert	IF 75 / D317.0305	Technology Promotion Association (Thailand-Japan)	20TM8	8 May 20	7 May 21	-
9	Water Bath	Total Coliform Bacteria	Memmert	WNE 14 / L416.0606	Technology Promotion Association (Thailand-Japan)	20TM402	26 Feb 20	25 Feb 21	-
10	Water Bath	Total Coliform Bacteria	Memmert	WNE 14 / L416.0612	Technology Promotion Association (Thailand-Japan)	20TM403	26 Feb 20	25 Feb 21	-
11	Analytical Balance	Total Coliform Bacteria	Mettler-Toledo	MS603S / B0070110311	National Food Institute, Ministry of Industry, Thailand	2000970-001-01	25 Dec 19	23 Dec 20	-

### List of Instruments Certification for Surfacewater Quality Analysis.

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Laboratory Instrument/Equipments.									
12	Auto Clave	Total Coliform Bacteria	ALP	CL-40L / 802664	Technology Promotion Association (Thailand-Japan)	20TM405	27 Feb 20	25 Feb 21	-
13	Auto Clave	Total Coliform Bacteria	ALP	CL-40L / 807298	Technology Promotion Association (Thailand-Japan)	20TM853	8 May 20	7 May 21	-

Due Date of Calibration\* : กำหนดตามแผนการสอบเทียบประจำปี อย่างน้อยปีละ 1 ครั้ง

## CERTIFICATE OF CALIBRATION

Certificate No. : SP20-007 Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

Address : 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Location of calibration : Laboratory 315

Equipment : Spectrophotometer

Manufacturer : Agilent Technologies

Model : Cary 60

Serial No. : MY15410009

ID No. : N/A

Received Date : 9 August 2020

Calibration Date : 9 August 2020

Issue Date : 11 August 2020

Condition of Instrument : Used

Calibrated by :   
( Mr.Tanawut Rittidach )

Technical Manager

Approved by :   
( Miss Chonthicha Sangngern )

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE

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FM-510-02 R03 1/03/2019

## REPORT OF CALIBRATION

Certificate No. : SP20-007 Page 2 of 5

Environment Condition : Ambient Temperature  $25 \pm 5$  °C

Relative humidity  $50 \pm 15$  %RH

Calibration method : In-house method CP-01 Calibration of UV-Vis Spectrophotometer Based on ASTM E275-08

### Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	80102	7/11/2021
Absorbance Standard set	25757	80105	7/11/2021
Wavelength Standard set	25806	80103	7/11/2021
Wavelength Standard set	25758	80104	7/11/2021

Traceability : This certification is traceable to the International System of Unit maintained at National Institute -

of Standards and Technology (NIST) through Sarna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 100 nm./min

Scan Interval of UUC : 0.15 nm.

Resolution of UUC : Photometric 0.0001 Abs.

Wavelength 0.1 nm.

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FM-510-02 R03 1/03/2019



## REPORT OF CALIBRATION

Certificate No. : SP20-007

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## Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor <i>k</i>
241.72	241.8	-0.08	0.19	2.00
279.45	279.3	0.15	0.19	2.00
287.81	287.7	0.11	0.19	2.00
334.06	333.7	0.36	0.19	2.00
360.93	360.6	0.33	0.19	2.00
418.59	418.2	0.39	0.19	2.00
445.94	445.6	0.34	0.19	2.00
453.66	453.4	0.26	0.19	2.00
460.02	459.6	0.42	0.19	2.00
536.59	536.4	0.19	0.19	2.00
637.98	638.2	-0.22	0.19	2.00
431.38	431.0	0.38	0.19	2.00
472.50	472.4	0.10	0.19	2.00
513.47	513.3	0.17	0.19	2.00
528.88	528.9	-0.02	0.19	2.00
573.17	573.4	-0.23	0.19	2.00
585.35	585.5	-0.15	0.19	2.00
684.40	684.7	-0.30	0.19	2.00
740.72	740.5	0.22	0.21	2.00
748.55	748.8	-0.25	0.19	2.00
807.03	807.0	0.03	0.19	2.00
879.28	879.1	0.18	0.19	2.00

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FM-510-02 R03 11/03/2019

## REPORT OF CALIBRATION

Certificate No. : SP20-007

Page 4 of 5

Calibration Results : Without adjustment

## Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
420	0.0000	0.0001	-0.0001	0.0042	2.00
	0.5791	0.5762	0.0029	0.0042	2.00
	1.0488	1.0441	0.0047	0.0042	2.00
	2.1914	2.1828	0.0086	0.0098	2.00
440	0.0000	0.0000	0.0000	0.0042	2.00
	0.5618	0.5604	0.0014	0.0042	2.00
	1.0260	1.0248	0.0012	0.0042	2.00
	2.1259	2.1149	0.0110	0.0097	2.00
465	0.0000	-0.0001	0.0001	0.0042	2.00
	0.5240	0.5215	0.0025	0.0042	2.00
	0.9639	0.9643	-0.0004	0.0042	2.00
	1.9788	1.9714	0.0074	0.0093	2.00
546.1	0.0000	0.0000	0.0000	0.0042	2.00
	0.5194	0.5188	0.0006	0.0042	2.00
	0.9991	0.9996	-0.0005	0.0042	2.00
	1.9970	1.9959	0.0011	0.0097	2.00
590	0.0000	0.0000	0.0000	0.0042	2.00
	0.5523	0.5523	0.0000	0.0042	2.00
	1.0810	1.0806	0.0004	0.0043	2.00
	2.0369	2.0365	0.0004	0.0092	2.00
635	0.0000	0.0000	0.0000	0.0042	2.00
	0.5596	0.5596	0.0000	0.0042	2.00
	1.0513	1.0518	-0.0005	0.0042	2.00
	1.9268	1.9238	0.0030	0.0092	2.00

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## REPORT OF CALIBRATION

Certificate No. : SP20-007

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## Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor <i>k</i>
235	0.0000	0.0001	-0.0001	0.0076	2.00
	0.7498	0.7493	0.0005	0.0076	2.00
257	0.0000	0.0000	0.0000	0.0076	2.00
	0.8712	0.8690	0.0022	0.0076	2.00
313	0.0000	0.0000	0.0000	0.0076	2.00
	0.2920	0.2917	0.0003	0.0076	2.00
350	0.0000	0.0000	0.0000	0.0076	2.00
	0.6459	0.6416	0.0043	0.0076	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement *U* is stated as the standard uncertainty of measurement multiplied by the coverage factor *k*,

which for a normal distribution corresponds to a coverage probability of approximately 95%

- End of Certificate -

## CERTIFICATE OF CALIBRATION

Certificate No. : SP20-005

Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

Address : 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Location of calibration : Laboratory 315

Equipment : Spectrophotometer

Manufacturer : Hitachi

Model : U-1900

Serial No. : 2021-064

ID No. : UAE.LAB.006/2552

Received Date : 14 February 2563

Calibration Date : 14 February 2563

Issue Date : 19 February 2020

Condition of Instrument : Used

Calibrated by :

  
( Mr.Tanawut Rittidach )

Technical Manager

Approved by :

  
( Miss Chonthicha Sangngem )

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

## REPORT OF CALIBRATION

Certificate No. : SP20-005

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Environment Condition : Ambient Temperature  $25 \pm 5$  °CRelative humidity  $50 \pm 15$  %RH

Calibration method : In-house method CP-01 Calibration of UV-Vis Spectrophotometer Based on ASTM E275-08

## Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	80102	7/11/2021
Absorbance Standard set	25757	80105	7/11/2021
Wavelength Standard set	25806	80103	7/11/2021
Wavelength Standard set	25758	80104	7/11/2021

Traceability : This certification is traceable to the International System of Unit maintained at National Institute -

of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 4.0 nm.

Scan Speed of UUC : 200 nm./min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

## REPORT OF CALIBRATION


Certificate No. : SP20-005

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## Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.54	241.2	0.34	0.19	2.00
279.40	279.2	0.20	0.19	2.00
288.70	288.4	0.30	0.19	2.00
334.22	334.0	0.22	0.19	2.00
361.26	360.8	0.46	0.19	2.00
418.48	418.2	0.28	0.19	2.00
446.70	446.6	0.10	0.19	2.00
453.20	453.0	0.20	0.19	2.00
460.06	460.0	0.06	0.19	2.00
536.90	537.0	-0.10	0.19	2.00
637.94	637.6	0.34	0.19	2.00
440.74	440.4	0.34	0.19	2.00
472.22	472.0	0.22	0.19	2.00
513.70	513.6	0.10	0.19	2.00
528.72	528.4	0.32	0.19	2.00
574.60	574.4	0.20	0.19	2.00
585.48	585.6	-0.12	0.19	2.00
684.63	684.4	0.23	0.19	2.00
740.27	740.0	0.27	0.19	2.00
748.28	748.0	0.28	0.19	2.00
807.16	806.8	0.36	0.19	2.00
879.70	879.4	0.30	0.19	2.00





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### REPORT OF CALIBRATION

Certificate No. : SP20-005

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Calibration Results : Without adjustment

Photometric Accuracy :


Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0042	2.00
	0.5791	0.578	0.0011	0.0042	2.00
	1.0488	1.046	0.0028	0.0042	2.00
	2.1914	2.185	0.0064	0.0092	2.00
440	0.0000	0.000	0.0000	0.0042	2.00
	0.5618	0.561	0.0008	0.0042	2.00
	1.0260	1.026	0.0000	0.0042	2.00
	2.1259	2.121	0.0049	0.0091	2.00
465	0.0000	0.000	0.0000	0.0042	2.00
	0.5240	0.523	0.0010	0.0042	2.00
	0.9639	0.965	-0.0011	0.0042	2.00
	1.9788	1.977	0.0018	0.0092	2.00
546.1	0.0000	0.000	0.0000	0.0042	2.00
	0.5194	0.520	-0.0006	0.0042	2.00
	0.9991	1.001	-0.0019	0.0042	2.00
	1.9970	1.999	-0.0020	0.0092	2.00
590	0.0000	0.000	0.0000	0.0042	2.00
	0.5523	0.554	-0.0017	0.0042	2.00
	1.0810	1.083	-0.0020	0.0042	2.00
	2.0369	2.037	-0.0001	0.0092	2.00
635	0.0000	0.000	0.0000	0.0042	2.00
	0.5596	0.561	-0.0014	0.0042	2.00
	1.0513	1.053	-0.0017	0.0042	2.00
	1.9268	1.927	-0.0002	0.0092	2.00

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### REPORT OF CALIBRATION

Certificate No. : SP20-005

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Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.000	0.0000	0.0076	2.00
	0.7498	0.747	0.0028	0.0076	2.00
257	0.0000	0.000	0.0000	0.0076	2.00
	0.8712	0.864	0.0072	0.0076	2.00
313	0.0000	0.000	0.0000	0.0076	2.00
	0.2920	0.292	0.0000	0.0076	2.00
350	0.0000	0.000	0.0000	0.0076	2.00
	0.6459	0.639	0.0069	0.0076	2.00

Remark : -UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k ,

which for a normal distribution corresponds to a coverage probability of approximately 95%.

- End of Certificate -

FM-510-02 R03 11/03/2019

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NIST-TLS-TLS 17025  
CALIBRATION 0143

### CERTIFICATE OF CALIBRATION

Certificate No. : SP20-001

Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

Address : 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Location of calibration : Laboratory 213

Equipment : Spectrophotometer

Manufacturer : Merck

Model : Pharo 100

Serial No. : 12390016

ID No. : UAE.LAB.009/2556

Received Date : 27 January 2563

Calibration Date : 27 January 2563

Issue Date : 29 January 2563

Condition of Instrument : Used

Calibrated by :                     

( Mr.Tanawat Rittidach )

Technical Manager

Approved by :                     

( Miss Chonthicha Sangngern )

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

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NIST-TLS-TLS 17025  
CALIBRATION 0143

### REPORT OF CALIBRATION

Certificate No. : SP20-001

Page 2 of 5

Environment Condition : Ambient Temperature  $25 \pm 5$  °C

Relative humidity  $50 \pm 15$  %RH

Calibration method : In-house method CP-01 Calibration of UV-Vis Spectrophotometer Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	80102	7/11/2021
Absorbance Standard set	25757	80105	7/11/2021
Wavelength Standard set	25806	80103	7/11/2021
Wavelength Standard set	25758	80104	7/11/2021

Traceability : This certification is traceable to the International System of Unit maintained at National Institute -  
of Standards and Technology (NIST) through Sarna Scientific Limited

Spectral Band Width of UUC : 4.0 nm.

Scan Speed of UUC : N/A

Scan Interval of UUC : N/A nm.

Resolution of UUC : Photometric 0.001 Abs.

Wavelength 1.0 nm.

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ISO 9001:2015  
CALIBRATION 0143

REPORT OF CALIBRATION

Certificate No. : SP20-001

Page 3 of 5

Wavelength Accuracy :


CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.54	N/A	N/A	N/A	2.00
279.40	N/A	N/A	N/A	2.00
288.70	N/A	N/A	N/A	2.00
334.22	332	2.22	0.61	2.00
361.26	359	2.26	0.61	2.00
418.48	418	0.48	0.61	2.00
446.70	446	0.70	0.61	2.00
453.20	453	0.20	0.61	2.00
460.06	460	0.06	0.61	2.00
536.90	537	-0.10	0.61	2.00
637.94	638	-0.06	0.61	2.00
440.74	440	0.74	0.61	2.00
472.22	471	1.22	0.61	2.00
513.70	513	0.70	0.61	2.00
528.72	528	0.72	0.61	2.00
574.60	574	0.60	0.61	2.00
585.48	585	0.48	0.61	2.00
684.63	684	0.63	0.61	2.00
740.27	738	2.27	0.61	2.00
748.28	746	2.28	0.61	2.00
807.16	804	3.16	0.61	2.00
879.70	877	2.70	0.61	2.00

DQE Services

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ISO 9001:2015  
CALIBRATION 0143

REPORT OF CALIBRATION

Certificate No. : SP20-001

Page 4 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0042	2.00
	0.5791	0.578	0.0011	0.0042	2.00
	1.0488	1.048	0.0008	0.0042	2.00
	2.1914	2.193	-0.0016	0.0092	2.00
440	0.0000	0.000	0.0000	0.0042	2.00
	0.5618	0.560	0.0018	0.0042	2.00
	1.0260	1.025	0.0010	0.0042	2.00
	2.1259	2.125	0.0009	0.0092	2.00
465	0.0000	0.000	0.0000	0.0042	2.00
	0.5240	0.521	0.0030	0.0042	2.00
	0.9639	0.965	-0.0011	0.0042	2.00
	1.9788	1.978	0.0008	0.0092	2.00
546.1	0.0000	0.000	0.0000	0.0042	2.00
	0.5194	0.518	0.0014	0.0042	2.00
	0.9991	1.001	-0.0019	0.0042	2.00
	1.9970	1.997	0.0000	0.0092	2.00
590	0.0000	0.000	0.0000	0.0042	2.00
	0.5523	0.551	0.0013	0.0042	2.00
	1.0810	1.080	0.0010	0.0042	2.00
	2.0369	2.034	0.0029	0.0092	2.00
635	0.0000	0.000	0.0000	0.0042	2.00
	0.5596	0.559	0.0006	0.0042	2.00
	1.0513	1.050	0.0013	0.0042	2.00
	1.9268	1.925	0.0018	0.0092	2.00

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เอกสารไม่ควบคุม



## Preventive Maintenance Protocol

Instrument: Kjeltac™ 2100	Model KJ200	S/N: ๗๗๐๕๕๔
Customer บริษัท ซูโม่เค็ด แอมนาลีส์ แอนด์ เอ็นจิเนียริง คออสท์แอนด์ จำกัด	Job No. MS63POT0084A	
Certified performed PM interval (whichever occurs first between interval and no. of samples analysed)	12 Months	No. of samples analysed (if applicable):

### Introduction

A maintenance protocol provides a systematic and functional means of maintaining a specific instrument type. the certified performed PM interval depends on the operational conditions, and is based on our extensive experience and knowledge of manufacturing and maintaining analytical instruments.


Apart from sample throughput, the environmental conditions also need to be taken into account. Demanding environments, such as high ambient temperature, humidity, dirtiness etc can measurably shorten component lifetime and also the maintenance and component replacement intervals.

The content of this protocol is subject to change over time. In order to ensure you the correct parts, please make sure to indicate serial number and date of installation when contacting you FOSS representative.


### Maintenance Procedure

#### Parts to be Exchanged

Step	Action	Part	P/N	OK
1	Replace	Adapter for dig. tube 250 ml	10000056	<input type="checkbox"/>
2	Replace	Non return valve	10003538	<input type="checkbox"/>
3	Replace valves in alkali pump	Valve kit reagent/water pump	15750093	<input type="checkbox"/>
4	Replace steam tubing	Silicone tubing 8/12 mm	15820006	<input type="checkbox"/>
5	Replace alkali tubing	Tubing reinforced for alkali	15820011	<input type="checkbox"/>
6	Replace water tubing	Tubing PVC 8/11 mm	15820004	<input type="checkbox"/>
7	Cleaning	Steam generator		<input type="checkbox"/>
8	Cleaning	Splash head		<input type="checkbox"/>



DQE Services Co.,Ltd.  
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230  
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



ISO 9001:2015  
CALIBRATION QMS

REPORT OF CALIBRATION

Certificate No. : SP20-001
Page 5 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	N/A	N/A	N/A	2.00
	0.7498	N/A	N/A	N/A	2.00
257	0.0000	N/A	N/A	N/A	2.00
	0.8712	N/A	N/A	N/A	2.00
313	0.0000	N/A	N/A	N/A	2.00
	0.2920	N/A	N/A	N/A	2.00
350	0.0000	N/A	N/A	N/A	2.00
	0.6459	N/A	N/A	N/A	2.00

Remark : - UUC = Unit Under Calibration  
- N/A = Not Available  
- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor, which for a normal distribution corresponds to a coverage probability of approximately 95%  
- End of Certificate -

FM-510-02 R03 11/03/2019

เอกสารไม่ควบคุม

## Check and Adjustment

Step	Action	Module	Measured	Limits	OK
1	Check alkali volume, 10 ml/stroke	Alkali pump	50ml	At 50 ml -0/+3 ml	<input checked="" type="checkbox"/>
2	Check distillation volume		120ml	100 - 150 ml/4min	<input checked="" type="checkbox"/>
3	Check front panel switches				<input checked="" type="checkbox"/>
4	Check cable,electrical connection and main power supply AC 220 Volts				<input checked="" type="checkbox"/>
5	Check level pins in steam generator				<input checked="" type="checkbox"/>
6	Check safety door switch				<input checked="" type="checkbox"/>

Remark \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

หิรัญพร  
Customer's Signature

อ.ก้อง  
Engineer's Signature

Date 26/04/2020

## Preventive Maintenance Protocol

Instrument: Kjeltec™ 2100	Model 2100 S/N: <u>05001294</u>
Customer <u>บริษัท ยูโนเด็ค เอนเนอจิสต์ บอนส์ เอนจิเนียริง คอนซัลแตนท์ จำกัด</u>	Job No. <u>MS63FOY0084A</u>
Certified performed PM interval (whichever occurs first between interval and no. of samples analysed)	12 Months No. of samples analysed (if applicable): _____

### Introduction

A maintenance protocol provides a systematic and functional means of maintaining a specific instrument type. the certified performed PM interval depends on the operational conditions, and is based on our extensive experience and knowledge of manufacturing and maintaining analytical instruments.

Apart from sample throughput, the environmental conditions also need to be taken into account. Demanding environments, such as high ambient temperature, humidity, dirtiness etc can measurably shorten component lifetime and also the maintenance and component replacement intervals.

The content of this protocol is subject to change over time. In order to ensure you the correct parts, please make sure to indicate serial number and date of installation when contacting you FQSS representative.

### Maintenance Procedure

#### Parts to be Exchanged

Step	Action	Part	P/N	OK
1	Replace	Adapter for dig. tube 250 ml	10000056	<input type="checkbox"/>
2	Replace	Non return valve	10003538	<input type="checkbox"/>
3	Replace valves in alkali pump	Valve kit reagent/water pump	15750093	<input type="checkbox"/>
4	Replace steam tubing	Silicone tubing 8/12 mm	15820006	<input type="checkbox"/>
5	Replace alkali tubing	Tubing reinforced for alkali	15820011	<input type="checkbox"/>
6	Replace water tubing	Tubing PVC 8/11 mm	15820004	<input type="checkbox"/>
7	Cleaning	Steam generator		<input type="checkbox"/>
8	Cleaning	Splash head		<input type="checkbox"/>

Check and Adjustment

Step	Action	Module	Measured	Limits	OK
1	Check alkali volume, 10 ml/stroke	Alkali pump	5ml.	At 50 ml -0/+3 ml	<input checked="" type="checkbox"/>
2	Check distillation volume		105ml.	100 - 150 ml/4min	<input checked="" type="checkbox"/>
3	Check front panel switches				<input checked="" type="checkbox"/>
4	Check cable,electrical connection and main power supply AC 220 Volts				<input checked="" type="checkbox"/>
5	Check level pins in steam generator				<input checked="" type="checkbox"/>
6	Check safety door switch				<input checked="" type="checkbox"/>

Remark \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

พริ้มพรรณ  
Customer's Signature

อนันต์  
Engineer's Signature

Date 24/04/2020

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 20TM841  
Page.: 1 of 3

## Certificate of Calibration

**Equipment :** Incubator

**Manufacturer :** Memmert

**Model :** IPP 260

**Serial No. :** V613.0095

**ID No. :** UAE.LAB.009/2558

**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260

**Location :** Microbiology Laboratory

**Received Order :** 27 April 2020  
**Calibration Date :** 27 April 2020  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Preecha Hlahib

**Approved by :** Malee  
Approved Signatory

( ) Pornthippa Tameyakul  
(✓) Malee Bulkruea  
( ) Suwit Imjai

**Issue Date :** 7 May 2020

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

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Equipment : Incubator  
 Condition As-Received : Used Item  
 Reference : 2004-0379OC-3

Cert. No.: 20TM841  
 Page.: 2 of 3

#### Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ).

The temperature scale used was based on ITS-90.

#### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY44031769	19LM5	NIST	02 Aug 2020

2. This certification is traceable to the SI unit.

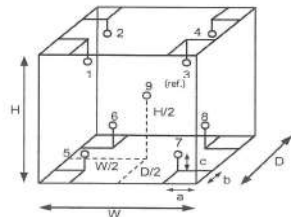
3. This result of calibration was found accurate as shown on date and place of calibration only.

Remark : NIST : National Institute of Standards and Technology, The United State of America.

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Not Available



Environment during calibration		
	Beginning	Finished
Temp. ( °C )	21	20
REL.Humid. ( % )	60	62
AC Supply ( Volt )	220	222

#### Probe Installation Details :

#### Dimension of Chamber :

a = 5.0 cm	D = 0.50 m
b = 5.0 cm	W = 0.64 m
c = 5.0 cm	H = 0.80 m
	Capacity = 0.26 m <sup>3</sup>

Position :	Ref. Std./ID No.:
1	9RTD-2/1
2	9RTD-2/2
3	9RTD-2/3
4	9RTD-2/4
5	9RTD-2/5
6	9RTD-2/6
7	9RTD-2/7
8	9RTD-2/8
9 (ref.)	9RTD-2/9

เอกสารไม่ควบคุม

0 0007749



Equipment : Incubator  
 Condition As-Received : Used Item  
 Reference : 2004-0379OC-3

Cert. No.: 20TM841  
 Page.: 3 of 3

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Uncertainty ( ± °C )	Coverage Factor k
35.0	35.0	35.0	0.039	0.68	0.91	0.30	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
35.0	35.287	35.460	35.091	35.234	34.838	34.732	34.595	34.732	35.247

Average\* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC\* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

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เอกสารไม่ควบคุม

0 0007749



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
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TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 20TM8  
Page.: 1 of 3

## Certificate of Calibration

**Equipment :** Incubator  
**Manufacturer :** Memmert  
**Model :** IF 75  
**Serial No. :** D317.0305  
**ID No. :** UAE.LAB.022/2561  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Microbiology Laboratory  
**Received Order :** 8 May 2020  
**Calibration Date :** 8 May 2020  
**Ambient Temperature :**  $(26 \pm 10) ^\circ\text{C}$   
**Relative Humidity :**  $(50 \pm 30) \%$

**Calibrated by :** Suwit Imjai

**Approved by :**

Approved Signatory

( ) Pornthippa Tameyakul  
(✓) Malee Butkruea

**Issue Date :** 12 May 2020

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2005-0107OC-2  
**Procedure Used :-**

**Cert. No.:** 20TM8  
**Page.:** 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY44031769	19LM5	NIST	02 Aug 2020

2. This certification is traceable to the SI unit.

3. This result of calibration was found accurate as shown on date and place of calibration only.

**Remark :** NIST : National Institute of Standards and Technology, The United State of America.

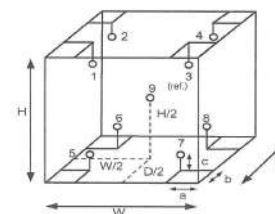
**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Close

**Fan setting :** 60%

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	25	24
REL.Humid. ( % )	62	64
AC Supply ( Volt )	231	233



**Probe Installation Details :**

a = 5.0 cm  
b = 5.0 cm  
c = 5.0 cm

**Dimension of Chamber :**

D = 0.32 m  
W = 0.42 m  
H = 0.56 m  
Capacity = 0.075 m<sup>3</sup>

Position :	Ref. Std./ID No.:
1	9RTD-2/1
2	9RTD-2/2
3	9RTD-2/10
4	9RTD-2/4
5	9RTD-2/5
6	9RTD-2/6
7	9RTD-2/7
8	9RTD-2/8
9 (ref.)	9RTD-2/9

เอกสารไม่ควบคุม



Equipment : Incubator  
 Condition As-Received : Used Item  
 Reference : 2005-0107OC-2  
 Result of Calibration :- (\*) Without Adjustment  
 Function of UUC\* : Temperature Source

Cert. No.: 20TM8  
 Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (±°C)	Coverage Factor k
44.0	43.9	43.9	0.059	0.33	0.41	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
44.0	44.084	44.045	44.187	44.158	44.167	44.095	43.877	43.927	44.186

Average\* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC\* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k$ , providing a level of confidence of approximately 95 %.

-o0o-

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
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 TEL: 0-2717-3000-27 FAX: 0-2719-9484



## Certificate of Calibration

Cert. No.: 20TM402  
 Page.: 1 of 3

Equipment : Water Bath  
 Model : WNE 14  
 Serial No. : L416.0606  
 ID No. : UAE.LAB.002/2560  
 Manufacturer : Memmert  
 Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
 3 Soi Udomsuk 41, Sukhumvit Road,  
 Bangchak, Phrakhanong,  
 Bangkok 10260  
 Location : Microbiology Laboratory  
 Ambient Temperature : ( 26 ± 10 ) °C  
 Relative Humidity : ( 50 ± 30 ) %  
 Calibrated by : Tawatchai Pama

Approved by :

Approved Signatory

( ) Pornthippa Tameyakul  
 ( ) Malee Butkruea  
 (✓) Suwit Imjai

Issue Date : 4 March 2020

The Uncertainties are for a confidence probability of approximately 95 %

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 Approval of the head of Corporate Services 3: Equipment, Calibration and Testing Services.

เอกสารไม่ควบคุม

A 0011861





Equipment : Water Bath  
 Model : WNE 14  
 Serial No. : L416.0606  
 ID No. : UAE.LAB.002/2560  
 Manufacturer : Memmert  
 Received Order : 26 February 2020  
 Condition As-Received : Used Item  
 Calibration Date : 26 February 2020  
 Reference : 2002-0784OC-2

Cert. No.: 20TM402  
 Page.: 2 of 3

**Procedure Used :-**

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer ( IPRT ).

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

**1. Reference standard instrument:-**

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY44060450	191276	NIMT	05 Mar 2020

2. This certification is traceable to the SI unit.

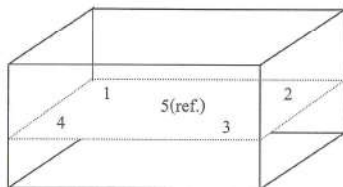
3. This result of calibration was found accurate as shown on date and place of calibration only.

**Remark :** NIMT : National Institute of Metrology Thailand.

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	22	45	241
Finished of Calibration	20	55	240



Front

Position :	Ref. Std. ID No.
1	4803988-001
2	4803988-002
3	4803988-003
4	4803988-004
5(ref.)	4803988-005

*[Signature]*

เอกสารไม่ควบคุม a 0988433



Equipment : Water Bath  
 Model : WNE 14  
 Serial No. : L416.0606  
 ID No. : UAE.LAB.002/2560  
 Manufacturer : Memmert  
 Received Order : 26 February 2020  
 Condition As-Received : Used Item  
 Calibration Date : 26 February 2020  
 Reference : 2002-0784OC-2

Cert. No.: 20TM402  
 Page.: 3 of 3

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.547	44.494	44.507	44.547	44.544

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Uncertainty ( ± °C )	Coverage Factor k
44.5	0.096	0.029	0.15	2

**Average\* :** The average of 30 values in each position.

**Uniformity :** The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

**Stability :** One-half of the greatest maximum difference of measured temperature at any one probe.

**UUC\* :** Unit Under Calibration

**Note :** The reported uncertainty of measurement was included stability and excluded uniformity.

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

-o0o-

*[Signature]*

เอกสารไม่ควบคุม a 0988432



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TEL. 0-2717-3000-27 FAX. 0-2719-9484



## Certificate of Calibration

Cert. No.: 20TM403  
Page.: 1 of 3

**Equipment :** Water Bath  
**Model :** WNE 14  
**Serial No. :** L416.0612  
**ID No. :** UAE.LAB.003/2560  
**Manufacturer :** Memmert  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Microbiology Laboratory  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Tawatchai Pama

**Approved by :**

  
Approved Signatory

- ( ) Pornthippa Tameyakul  
( ) Malee Butkruea  
(✓) Suwit Imjai

**Issue Date :** 4 March 2020

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

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A 011862



**Equipment :** Water Bath  
**Model :** WNE 14  
**Serial No. :** L416.0612  
**ID No. :** UAE.LAB.003/2560  
**Manufacturer :** Memmert  
**Received Order :** 26 February 2020  
**Condition As-Received :** Used Item  
**Calibration Date :** 26 February 2020  
**Reference :** 2002-0784OC-3

Cert. No.: 20TM403  
Page.: 2 of 3

### Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer ( IPRT ).

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY44060450	19/276	NIMT	05 Mar 2020

2. This certification is traceable to the SI unit.

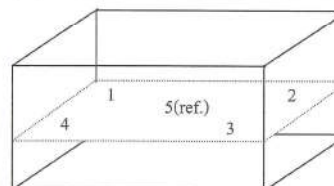
3. This result of calibration was found accurate as shown on date and place of calibration only.

**Remark :** NIMT : National Institute of Metrology Thailand.

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	22	45	241
Finished of Calibration	20	56	240



Front

Position :	Ref. Std. ID No.
1	4803988-001
2	4803988-002
3	4803988-003
4	4803988-004
5(ref.)	4803988-005

เอกสารไม่ควบคุม

a 0988431



**Equipment :** Water Bath  
**Model :** WNE 14  
**Serial No. :** L416.0612  
**ID No. :** UAE.LAB.003/2560  
**Manufacturer :** Memmert  
**Received Order :** 26 February 2020  
**Condition As-Received :** Used Item  
**Calibration Date :** 26 February 2020  
**Reference :** 2002-0784OC-3  
**Result of Calibration :** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source

**Cert. No.:** 20TM403  
**Page:** 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.525	44.470	44.507	44.540	44.532

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
44.5	0.12	0.035	0.15	2

**Average\* :** The average of 30 values in each position.

**Uniformity :** The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

**Stability :** One-half of the greatest maximum difference of measured temperature at any one probe.

**UUC\* :** Unit Under Calibration

**Note :** The reported uncertainty of measurement was included stability and excluded uniformity.

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

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เอกสารไม่ควบคุม  
 a 0988430



National Food Institute, Ministry of Industry, Thailand

2008 Soi Arun Amnath 38, Arun Amnath Rd, Bangsuekhan, Bangkok, Bangkok 10700 Thailand  
 Tel : +66 (0) 2422 0505 Fax : +66 (0) 2422 8550 Website : www.nfi.go.th E-mail : cal@nfi.go.th



## Calibration Certificate

**Certificate No.:** 2000970-001-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
**Address:** 3 Soi Udomsuk 41, Sukhumvit Road,  
 Bangchak, Phrakhanong, Bangkok 10260

Page 1 of 3

**Equipment:** Electronic Balance

**Manufacturer:** METTLER TOLEDO

**Model:** MS603S/01

**Serial No.:** B007010311

**ID No.:** UAE.LAB.008/2553

**Order No.:** 2000970

**Operation No.:** 2000970-001

**Date of Receipt:** 25 December 2019

**Date of Calibration:** 25 December 2019

**Calibrated by** Mr.Manas Somsak  
 Senior Analyst

**Approved by**   
 ( Mr.Pheraphat Tuanjit )  
 Manager, Division of Calibration Laboratory  
 Responsible for the Technical Management Team

**Date of Issue:** 27 December 2019

The uncertainties are for a confidence probability of approximately 95%

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม





National Food Institute, Ministry of Industry, Thailand

2008 Soi Arun Amarin 36, Arun Amarin Rd, Bangyeekhan, Bangkok 10700 Thailand  
Tel : +66 (0) 2432 8558 Fax : +66 (0) 2432 8558 Website : www.nfi.go.th E-mail : cal@nfi.go.th



## Calibration Report

Certificate No.: 2000970-001-01

Equipment:

Electronic Balance

Manufacturer: METTLER TOLEDO

Model: MS6035/01

Resolution: 0.001 g

Serial No.: B007010311

ID No.: UAE.LAB.008/2553

Capacity: 620 g

Date of Calibration: 25 December 2019

Page 2 of 3

Environment Condition: Ambient Temperature 23.6 ± 0.2 °C Relative Humidity: 50 ± 2.5 %

Place of Calibration: 306 Balance Room, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001. In-House Method Based on UKAS LAB 14 Calibration of Weighing Machines : 2006

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	BS05567572	TCS	M1904059S	6 April 2020

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	11A1	๙๙๙.๙๙๙. BTH 003/55	Quality Reborn	QR19-1416	19 August 2020

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

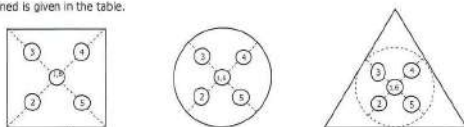
1. Repeatability of Reading:

Nominal Value ( g )	Standard Deviation of Reading ( g )
300	0.00032
600	0.00032

2. Off-Center Error:

A mass of 200 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
( g )	( g )	( g )	( g )	( g )	( g )	( g )
200.000	199.999	200.000	200.001	200.001	200.000	0.001



National Food Institute, Ministry of Industry, Thailand

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Tel : +66 (0) 2432 8558 Fax : +66 (0) 2432 8558 Website : www.nfi.go.th E-mail : cal@nfi.go.th



## Calibration Report

Certificate No.: 2000970-001-01

Equipment:

Electronic Balance

Manufacturer: METTLER TOLEDO

Model: MS6035/01

Resolution: 0.001 g

Serial No.: B007010311

ID No.: UAE.LAB.008/2553

Capacity: 620 g

Date of Calibration: 25 December 2019

Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0 - 600 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value ( g )	Standard Value ( g )	Average Reading ( g )	Correction ( g )	Uncertainty ( ± g )	Coverage Factor k
Unload	0.0000	0.000	0.000	0.00085	2.00
0.1	0.1000	0.100	0.000	0.00085	2.00
0.5	0.5000	0.500	0.000	0.00085	2.00
1	1.0000	1.000	0.000	0.00085	2.00
5	5.0000	5.000	0.000	0.00085	2.00
10	10.0000	10.000	0.000	0.00085	2.00
20	20.0000	20.000	0.000	0.00085	2.00
50	50.0000	50.000	0.000	0.00085	2.00
70	70.0001	70.000	0.000	0.00085	2.00
100	100.0001	100.000	0.000	0.00086	2.00
150	150.0001	150.000	0.000	0.00087	2.00
200	200.0002	200.000	0.000	0.00088	2.00
300	300.0003	300.000	0.000	0.00092	2.00
400	400.0004	400.000	0.000	0.00098	2.00
500	500.0004	500.000	0.000	0.0011	2.00
600	600.0005	600.000	0.000	0.0012	2.00

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k$ , providing a level of confidence of approximately 95 %.

----- End -----

F-CS-012 Revision: 00 Date: 14-12-61

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-9484



## Certificate of Calibration

Cert. No.: 20TM405

Page.: 1 of 3

**Equipment :** Autoclave  
**Model :** CL-40L  
**Serial No. :** 802664  
**ID No. :** UAE.LAB.014/2550  
**Manufacturer :** ALP  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location :** Air Analysis Unit  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**Calibrated by :** Tawatchai Pama

**Approved by :**

  
Approved Signatory

( ) Pornthippa Tameyakul  
( ) Malee Butkruea  
(✓) Suwit Imjai

**Issue Date :** 4 March 2020

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

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A 0011864



**Equipment :** Autoclave  
**Model :** CL-40L  
**Serial No. :** 802664  
**ID No. :** UAE.LAB.014/2550  
**Manufacturer :** ALP  
**Received Order :** 26 February 2020  
**Condition As-Received :** Used Item  
**Calibration Date :** 27 February 2020  
**Reference :** 2002-0784OC-5  
**Procedure Used :-**

Cert. No.: 20TM405

Page.: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T  
The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY44060450	19I276	NIMT	05 Mar 2020

2. This certification is traceable to the SI unit.

3. This result of calibration was found accurate as shown on date and place of calibration only.

4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3\*\*

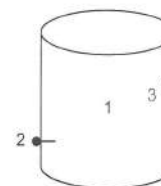
(\*\* = Categorization of pathogens according to hazard and categories of containment, second edition, 1990 )  
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

**Remark :** NIMT : National Institute of Metrology Thailand.

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source



	Environmental		
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	24	87	240
Finished of Calibration	23	85	240

Position	Description	Ref. Std. Thermocouple
1 =	Center of chamber	19-14TC-04
2 =	Temperature sensor	19-14TC-05
3 =	Exhaust port	19-14TC-06

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a 0088427



Equipment : Autoclave  
 Model : CL-40L  
 Serial No. : 802664  
 ID No. : UAE.LAB.014/2550  
 Manufacturer : ALP  
 Received Order : 26 February 2020  
 Condition As-Received : Used Item  
 Calibration Date : 27 February 2020  
 Reference : 2002-0784OC-5  
 Result of Calibration :- ( \* ) Without Adjustment

Cert. No.: 20TM405  
 Page.: 3 of 3

Operating parameter Set : Temperature = 116 °C  
 Sterilization period = 15 minute

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Average* Standard Reading ( °C )	Stability ( ± °C )	Pressure Reading ( MPa )	Uncertainty ( ± °C )	Coverage Factor k
116	116	1	116.594	0.18	0.08	0.90	2
		2	116.430				
		3	116.361				

Operating parameter Set : Temperature = 122 °C  
 Sterilization period = 15 minute

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Average* Standard Reading ( °C )	Stability ( ± °C )	Pressure Reading ( MPa )	Uncertainty ( ± °C )	Coverage Factor k
122	122	1	122.474	0.17	0.12	1.1	2
		2	122.301				
		3	122.285				

Average\* : The average of 30 values in each position.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC\* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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*Signature*

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
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 TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 20TM853  
 Page.: 1 of 3

## Certificate of Calibration

Equipment : Autoclave  
 Manufacturer : ALP  
 Model : CL-40L  
 Serial No. : 807298  
 ID No. : UAE.LAB.019/2560  
 Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
 3 Soi Udomsuk 41, Sukhumvit Road,  
 Bangchak, Phrakhanong,  
 Bangkok 10260  
 Location : 301 Room  
 Received Order : 8 May 2020  
 Calibration Date : 8 May 2020  
 Ambient Temperature : ( 26 ± 10 ) °C  
 Relative Humidity : ( 50 ± 30 ) %

Calibrated by : Preecha Hlahib

Approved by : *Malee*  
 Approved Signatory

( ) Pornthippa Tameyakul  
 (✓) Malee Butkruea  
 ( ) Suwit Imjai

Issue Date : 12 May 2020

The Uncertainties are for a confidence probability of approximately 95%

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 Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

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Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2005-0107OC-1

Cert. No.: 20TM853  
Page.: 2 of 3

**Procedure Used :-**

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY44060450	20LM3	NIMT	07 Mar 2021

2. This certification is traceable to the SI unit.

3. This result of calibration was found accurate as shown on date and place of calibration only.

4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3\*\*

(\*\* = Categorization of pathogens according to hazard and categories of containment, second edition, 1990 )

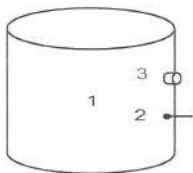
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

**Remark :** NIMT : National Institute of Metrology Thailand.

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source



	Environmental		
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	26	60	220
Finished of Calibration	26	63	221

Position	Description	Ref. Std. Thermocouple
1 =	Center of chamber	19-14TC-04
2 =	Temperature sensor	19-14TC-05
3 =	Exhaust port	19-14TC-06

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Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2005-0107OC-1

Cert. No.: 20TM853  
Page.: 3 of 3

**Result of Calibration :-** ( \* ) Without Adjustment

Operating parameter Set : Temperature = 116 °C  
Sterilization period = 15 minute

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Average* Standard Reading ( °C )	Stability ( ± °C )	Pressure Reading ( MPa )	Uncertainty ( ± °C )	Coverage Factor k
115	116	1	116.900	0.13	0.08	0.89	2
		2	116.642				
		3	116.552				

Operating parameter Set : Temperature = 122 °C  
Sterilization period = 30 minute

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Average* Standard Reading ( °C )	Stability ( ± °C )	Pressure Reading ( MPa )	Uncertainty ( ± °C )	Coverage Factor k
122	122	1	122.762	0.12	0.12	1.1	2
		2	122.610				
		3	122.597				

**Average\* :** The average of 30 values in each position.

**Stability :** One-half of the greatest maximum difference of measured temperature at any one probe.

**UUC\* :** Unit Under Calibration

**Note :** The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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## Certificate of Calibration

**Equipment:** CONDUCTIVITY METER  
**Model:** Lab 955  
**Serial No. (or ID.):** 16300356  
**Manufacturer:** SI Analytics  
**Electrode Serial No.** 1415  
**Condition:** In Condition

**Certificate No.:** C24200075  
**Issued Date:** 2 April 2020  
**Job No.:** KSPR2004094  
**Page:** 1 of 2  
**Model :** LF413T **Brand :** SI Analytics

**Customer:** United Analyst and Engineering Consultant Company Limited  
 3 Soi Udomsuk 41 Sukhumvit Road,  
 Bangkak, Prakanong, Bangkok 10260 Thailand

**Environment Condition:** Temperature 23 °C ± 2 °C  
 Humidity 50 %RH ± 15 %RH

**Calibration Place:** Environment Laboratory, SPC RT Co., Ltd.  
 1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Rd.,  
 Bangchak, Prakanong, Bangkok 10260 Thailand

**Calibration By:** Miss. Kaewkan Suradech  
**Calibration Date:** 2 April 2020  
**The Method used:** In house method, SPCC-WI-49, base on ASTM D 1125-14 and D 5391-14  
**Traceability:** This certificate is traceable to the CRM maintained by DAkkS/DKD calibration laboratory through Radiometer Analytical Co., Ltd. Certificate No. 1410, 1376, 1284

(Miss Kaewkan Suradech)

Person in charge

บริษัท เอสพีซี อาร์ที จำกัด  
SPC RT Co., Ltd

(Mr. Dumrong Boonsopon)

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 SPC RT Co., Ltd.

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 SPC RT CO., LTD.  
 สาขาที่ 00003 1194 ซอยวชิรธรรมสาริต 57 ถนนสุขุมวิท 101/1 แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260  
 Branch 00003 1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Road, Bangchak, Prakanong, Bangkok 10260 Thailand  
 Tel: 0 2185 4333 Ext. 3300-3308 Fax: 0 2185 4424 E-mail: info.spc@spc-rt.com Website: www.spc-rt.com

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SPCC-FM-C24-04: 11 Feb 2020

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Certificate No. : C24200075

Page 2 of 2

### Calibration Results:

#### Before Adjustment

Standard Conductivity Solution	Unit Under Calibration Reading	Correction	Coverage Factor ( k )	Uncertainty ( ± )
24.78 μS/cm	24.6 μS/cm	0.18 μS/cm	2.00	0.52 μS/cm
1409.1 μS/cm	1426 μS/cm	-16.9 μS/cm	2.00	7.7 μS/cm
111.19 mS/cm	108.8 mS/cm	2.39 mS/cm	2.00	0.54 mS/cm

#### After Adjustment ; at 1409.1 μS/cm

Standard Conductivity Solution	Unit Under Calibration Reading	Correction	Coverage Factor ( k )	Uncertainty ( ± )
24.78 μS/cm	24.3 μS/cm	0.48 μS/cm	2.00	0.52 μS/cm
1409.1 μS/cm	1409 μS/cm	0.1 μS/cm	2.00	7.7 μS/cm
111.19 mS/cm	107.0 mS/cm	4.19 mS/cm	2.00	0.54 mS/cm

The End of Certificate

บริษัท เอสพีซี อาร์ที จำกัด  
 SPC RT CO., LTD.  
 สาขาที่ 00003 1194 ซอยวชิรธรรมสาริต 57 ถนนสุขุมวิท 101/1 แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260  
 Branch 00003 1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Road, Bangchak, Prakanong, Bangkok 10260 Thailand  
 Tel: 0 2185 4333 Ext. 3300-3308 Fax: 0 2185 4424 E-mail: info.spc@spc-rt.com Website: www.spc-rt.com

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SPCC-FM-C24-04: 11 Feb 2020

### List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
<b>Water</b>									
1	pH Meter	pH Meter	HORIBA	LAQUA-PH210 HA0A0007	National Food Institute, Ministry of Industry,Thailand	2002482-002-01	12 May 20	11 May 21	-
2	DO Meter	DO Meter	YSI	Pro 20i 18K104053	Technology Promotion Association (Thailand-Japan)	20TW177	28 Aug 20	27 Aug 21	-



National Food Institute, Ministry of Industry, Thailand

2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand  
Tel : +66 (0) 2422 6545 Fax : +66 (0) 2422 6545 Website : www.nfi.or.th E-mail : cal@nfi.or.th



## Calibration Certificate

**Certificate No.:** 2002482-004-01  
**Client name:** UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
**Address:** 81 Udomsuk 41 Alley,  
Bangchak, Phra Khanong, Bangkok 10260

Page 1 of 5

**Equipment:** pH Meter  
**Manufacturer:** HORIBA  
**Model:** LAQUA-PH210  
**Serial No.:** HA0A0005  
**ID No.:** UAE.EFM.004/2563  
**Order No.:** 2002482  
**Operation No.:** 2002482-004  
**Date of Receipt:** 29 April 2020  
**Date of Calibration:** 12 May 2020

**Calibrated by** Mr.Manas Somsak  
Senior Analyst

**Approved by** *for N. Ingudat*  
( Mr.Pheraphat Tuanjit )

Manager, Division of Calibration Laboratory

**Date of Issue:** 15 May 2020

Responsible for the Technical Management Team

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

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F-CS-009 Revision: 00 Date: 14-12-61



National Food Institute, Ministry of Industry, Thailand

2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand  
Tel : +66 (0) 2422 6545 Fax : +66 (0) 2422 6545 Website : www.nfi.or.th E-mail : cal@nfi.or.th



## Calibration Report

**Certificate No.:** 2002482-004-01  
**Equipment:** pH Meter  
**Resolution:** 0.01 pH : 0.1 mV  
**Manufacturer:** HORIBA  
**Model:** LAQUA-PH210  
**Serial No.:** HA0A0005  
**Type:** Mobile  
**ID No.:** UAE.EFM.004/2563

Page 2 of 5

**Date of Calibration:** 12 May 2020  
**Location:** Chemical Calibration Laboratory, National Food Institute  
**Environment Condition:** Ambient Tempe ( 23.5 ± 1.5 ) °C **Relative Humidity:** ( 54.5 ± 5 ) %  
**Condition of Equipment:** Good Condition  
**Condition of this Results of Calibration**

1. Calibration Method In house method : W-CG-002 based on direct measurement by using standard voltage calibrator and certified reference material (CRM)

2. Reference Standards / Certified Reference Material

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2709007	Fluke	SCL-19E-0584	10 June 2020
2.2 Digital Thermometer	2709007	Fluke	CC 630042	31 October 2020
2.3 Thermo-Hygro Meter	ana.kj.BTH 001/58	AMTAST	QR19-1406	19 August 2020

Certified Reference Material	Lot No.	Manufacturer	Ref N	Expire Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	679461	CPAchem	PH216.L5	12 March 2022
2.5 pH buffer 6.865 (Primary pH buffer Solution)	677226	CPAchem	PH217.L5	16 February 2022
2.6 pH buffer 10.01 (Primary pH buffer Solution)	677230	CPAchem	PH220.L5	9 November 2020
2.7 pH buffer 7.00 (Standard pH buffer Solution)	677231	CPAchem	PH167.L5	16 February 2021

3. This certification is traceable to The International System of Unit (SI Unit)

3.1 Instruments No.2.1	through	NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0075
3.2 Instruments No.2.2	through	NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0061
3.3 Instruments No.2.3	through	NSC-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0292
3.4 Certified Reference Material No. 2.4 to 2.6	traceable to	Primary measurement method- Hamed cell using calibrated thermometer, barometer, and nanovoltmeter. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025
3.5 Certified Reference Material No. 2.7	traceable to	BIM RefN HI-31 LotN 05.2019; BIM RefN HI-33 LotN 05.2019; BIM RefN HI-30 LotN 05.2019; BIM RefN HI-32 LotN 05.2019. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025

4. This certificate was certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

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F-CS-012 Revision: 00 Date: 14-12-61



National Food Institute, Ministry of Industry, Thailand

2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand.  
Tel: +66 (0) 2422 8588 Fax: +66 (0) 2422 8545 Website: www.nfi.or.th E-mail: cal@nfi.or.th



## Calibration Report

**Certificate No.:** 2002482-004-01  
**Equipment:** pH Meter  
**Resolution:** 0.01 pH ; 0.1 mV  
**Manufacturer:** HORIBA  
**Model:** LAQUA-PH210  
**Serial No.:** HAQA0005  
**Type:** Mobile  
**ID No.:** UAE EFM.004/2563

**Date of Calibration:** 12 May 2020

Page 3 of 5

### Calibration Results:

1. Calibration of pH Meter ( Manual Temperature Compensation at 25 °C )

Nominal pH	DC Voltage Standard ( mV )	Average Indicator Reading		Uncertainty ( ±mV )	Coverage Factor ( k )
		mV	pH		
0.00	414.118	414.0	0.00	0.063	2.00
2.00	295.811	295.7	2.00	0.063	2.00
4.00	177.461	177.4	4.00	0.063	2.00
6.00	59.160	59.1	6.00	0.063	2.00
7.00	0.000	0.0	7.00	0.063	2.00
8.00	-59.158	-59.1	8.00	0.063	2.00
10.00	-177.461	-177.3	10.00	0.063	2.00
12.00	-295.812	-295.7	12.00	0.063	2.00
14.00	-414.118	-413.9	14.00	0.063	2.00

2. Calibration of pH Meter with Electrode ( Manual Temperature Compensation at 25 °C )

**Equipment:** pH Electrode  
**Type:** Combined Electrode  
**Manufacturer:** HORIBA  
**Model:** LAQUA 9652  
**Serial No.:** 999M0144  
**ID No.:** N/A

**Performance of Electrode system** (Three-Point Calibration at pH4, pH7 and pH10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty ( ± pH )	Coverage Factor ( k )
	pH	mV			
4.008	4.01	172.2	98.9	0.0071	2.00
6.866	6.86	5.5		0.0075	2.00
6.866	6.86	5.5	97.7	0.0075	2.00
10.009	10.01	-176.6		0.0093	2.00
6.987	6.99	-2.5	-	0.011	2.00

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National Food Institute, Ministry of Industry, Thailand

2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand.  
Tel: +66 (0) 2422 8588 Fax: +66 (0) 2422 8545 Website: www.nfi.or.th E-mail: cal@nfi.or.th



## Calibration Report

**Certificate No.:** 2002482-004-01  
**Equipment:** Digital Thermometer with RTD  
**Resolution:** 0.1 °C  
**Model:** LAQUA-PH210  
**Serial No.:** HAQA0005  
**ID No.:** UAE EFM.004/2563  
**Manufacturer:** HORIBA

**Date of Calibration:** 12 May 2020

Page 4 of 5

**Location:** Temperature Calibration Laboratory, National Food Institute

**Environment Condition:** Ambient Temperature 23 °C ± 3 °C  
Relative Humidity 55 % ± 15 %

### Condition of this results of Calibration:

1. Calibration Method :
  - NFI Method W-TE-016 in house method by Comparison with Standard thermometer.
  - The Calibration is determined by comparing with a known temperature from a standard resistance thermometer.
  - The temperature scale in use at this laboratory is the International Temperature scale of 1990 ( ITS-90 ).

### 2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
BLACK STACK THERMOMETER	1560/2560	A39258/A39719	PSL-T 529/62	03-Jun-20	TISTR
Platinum Resistance Thermometer (PRT)	5614	649301			

- Support Equipment :**
- Low Temperature Bath (Deep Well Compact Bath), Model: 7381, S/N: B53496.
  - Low Temperature Bath (Deep Well Compact Bath), Model: 7341, S/N: A5A084.
  - High Temperature Bath (Deep Well Compact Bath), Model: 6331, S/N: A5A087.
  - High Temperature Bath (Metrology Well), Model: 9173, S/N: B5C115.

3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.

**6. Condition of Calibrated item :** Good  
**7. Result of Calibration :** ☒ Without adjustment ☐ After adjustment

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## Calibration Report

**Certificate No.:** 2002482-004-01  
**Equipment:** Digital Thermometer with RTD  
 Resolution: 0.1 °C Model: LAQUA-PH210  
 Serial No.: HADA0005 ID No.: UAE.EFM.004/2563  
 Manufacturer: HORBA

**Date of Calibration:** 12 May 2020 Page 5 of 5

**Calibration point:** 25.0, 30.0 and 35.0 °C

**Calibration result:**

- The probe was immersed in liquid bath or dry bath to a minimum depth of 125 mm.
- Description of probe, model : LAQUA 9652 S/N : 999M0144
- Dimension of probe : Diameter 16 mm., Length 150 mm.,
- Sheath material : Plastic

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
25.0	25.00	0.0	0.077
30.0	30.00	0.0	0.077
35.0	35.00	0.0	0.077

Note

- UUC\* : Unit Under Calibration

The report uncertainty of measurement was based on standard uncertainty multiplied by coverage factor  $k=2$ , providing a level of confidence of approximately 95 %.

----- End -----

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
 CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES  
 534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
 TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 20TW177  
 Page.: 1 of 2

## Certificate of Testing

**Equipment :** DO Meter  
**Manufacturer :** YSI  
**Model :** Pro 20i  
**Serial No. :** 18K104053  
**ID No. :** UAE.EFM.066/2562(ENV.DO.01/62)  
**Received Date :** 27 August 2020  
**Test Date :** 28 August 2020  
**Reference :** 2008-1089WSC-3  
**Submitted by :** United Analyst and Engineering Consultant Co.,Ltd.  
 3 Soi Udumsuk 41, Sukhumvit Road,  
 Bangchak, Phrakhanong, Bangkok 10260  
**Laboratory Condition :** Temperature (  $25 \pm 5$  ) °C  
 Humidity (  $50 \pm 20$  ) %  
**Test Procedure :** In - house method : CP-CH9  
 by Comparison Technique with Azide Modification Method  
**Calibrated by :** Walalak Sirithean  
**Approved by :**   
 Approved Signatory  
 ( ) Pornthippa Tameyakul  
 (✓) Malee Butkruea  
 ( ) Ponpan Paipim  
 ( ) Salthip Meangmai  
**Issue Date :** 3 September 2020

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Cert.No.: 20TW177  
Page.: 2 of 2

**Result :** Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: 18K100663

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.10	8.10	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency. The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory.

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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250  
TEL. 0-2717-3000-24 FAX. 0-2719-9484



## Certificate of Calibration

Certificate No. : 20T1954  
Page : 1 of 2

Equipment : DO Meter With Sensor  
Manufacturer: YSI  
Model : Pro 20i  
Serial No.: 18K104053  
ID No.: UAE.EFM.066/2562(ENV.DO.01/62)  
Condition As-Received: Used Item  
Received Date: 27 August 2020  
Calibration Date: 03 September 2020  
to 09 September 2020  
2008-1089WSC  
Reference: Submitted by: United Analyst and Engineering Consultant Co., Ltd.  
Ambient Temperature: ( 25 ± 3 ) °C  
Relative Humidity: ( 50 ± 20 ) %

This certificate may not be reproduced other than in full,  
except with the prior written approval of the head of  
Corporate Services 3: Equipment Calibration and Testing Services.

3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong, Bangkok 10260

**Procedure used:** Calibration were conducted using in-house calibration procedure CP-T01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into liquid bath temperature controller.  
The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Digital Thermometer	1529	A66176	19I1397	01 Nov 2020
2) Industrial Platinum Resistance Thermometer	5627	739435	19I1397	01 Nov 2020

2. The certificate is valid only to the item calibrated on date and place of calibration.

3. This Certification is traceable to the International System of Unit maintained at-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Theerapong Ameen  
Issue Date : 16 September 2020

Approved Signatory :

[ ] Phalinee Prabpaipal  
[ ] Chatchawan Khunpluek  
[x] Wanlop Larprkurn

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Cert. No.: 20T1954

Page.: 2 of 2

**Result of Calibration:-**

Without Adjustment

**Function:** Temperature measurement

This equipment was connected with Temperature Sensor S/N. 18K100663

Dimension of probe : Diameter 2 mm., Length 7 mm. Sheath material : Stainless Steel

Immersion Depth ( mm. )	Standard Temperature ( °C )	UUC* Reading ( °C )	Error ( °C )	Uncertainty of Measurement ( ±°C )
45	24.9966	24.9	-0.0966	0.12
45	30.0004	29.9	-0.1004	0.12
45	35.0080	34.9	-0.1080	0.12

UUC\* : Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%.

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