

ภาคผนวก ค

สำเนาใบรับรองการสอบเทียบเครื่องมือ



Smart Cap™ Quality Certificate

11/10/22

Membrane: HI76413-1
Parameter: Dissolved Oxygen
Serial No: 4EE4788F
Factory Calibration: 4/27/2022
Compatibility: HI764113
HI7698494-5
Description: Smart Cap™ for Optical Dissolved Oxygen probe

Hanna Instruments certifies that this electrode has been produced, calibrated and tested to meet all applicable Hanna Procedures, using standards and reference instruments, the accuracy of which is traceable to the National Institute of Standards (NIST) in the USA or to internationally acceptable national physical standards. The standards and reference instruments used in calibration and testing are supported by a calibration system which meets requirements of ISO9001.

Reference Devices: HI764113 OC Probe

Test	Specification	Measured	Pass
Measurement @ 100% saturated *	100 ±3%	100.3	<input checked="" type="checkbox"/>
Measurement in N ₂ (0% saturated) *	0.0 ±2%	0.2	<input checked="" type="checkbox"/>

*Tested with Master factory HI764113
All references are periodically checked and are used only if certified

Mechanical Inspection ☒
RFID Communication ☒

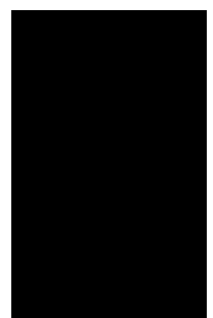
Quality control and testing have been met.

Inspector: Kyle Willner
Date: 5/2/2022
Approval: A-F 4/10
Production Manager

USCERT_000_7698494-5_rev 1

Hanna Instruments Inc. 584 Park East Drive Moonstown, RI 02895
www.hannainst.com

อีเมล: info@scinetics.com | โทร: 666-888-5152-0-0 | แฟกซ์: 00601-1666-888-5152-0-0 | เว็บไซต์: www.scinetics.com
ผู้ขาย: อุตสาหกรรม อุตสาหกรรม อุตสาหกรรม



SCINETICS

TEST VALUES			
	BEFORE	AFTER	API MODEL T300
SPAN GAS	14	620.07	16
ZERO GAS	750	100.0	15
CO READING (AMBIENT)	339	511.0	13
OFFSET	45	937.0	12
SLOPE	1065	680.1	11
AMBIENT ± 5	38.8	37.3	10
BOX TEMP	68.3	67.9	9
WHEEL TEMP	48	87	8
BENCH TEMP	48	59	7
SAMPLE TEMP	837	558	6
SAMPLE FLOW	800	592	5
PRESEURE	3673.5	3886.3	4
CO REFERENCE	4899.4	11059	3
CO MEASURE	15.0	12.0	2
STABILITY	50	05	1
RANGE	1000-1	1000-1	

1681 : อุตสาหกรรม / อุตสาหกรรม อุตสาหกรรม
1682 : อุตสาหกรรม / อุตสาหกรรม อุตสาหกรรม
1683 : อุตสาหกรรม / อุตสาหกรรม อุตสาหกรรม
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1697 : อุตสาหกรรม / อุตสาหกรรม อุตสาหกรรม
1698 : อุตสาหกรรม / อุตสาหกรรม อุตสาหกรรม
1699 : อุตสาหกรรม / อุตสาหกรรม อุตสาหกรรม
1700 : อุตสาหกรรม / อุตสาหกรรม อุตสาหกรรม

SCINETICS CORPORATION LTD.



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการสอบและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd
วันที่ : 25 กรกฎาคม 2565
รายชื่ออุปกรณ์ / เครื่องมือ : NO_x Analyzer
บริษัทผู้ผลิต : Teledyne API
รุ่นของอุปกรณ์ / เครื่องมือ : T200

TEST VALUES		
API MODEL T200	BEFORE	AFTER
1 RANGE	50 - 20,000 PPB	500
2 STABILITY	≤ 1 PPB	0.2
3 SAMPLE FLOW	500 ± 10% cc/min	501
4 OZONE FLOW	80 ± 10% cc/min	79
5 PMT	mV	779.2
6 NORM PMT	mV	659.8
7 A ZERO	-20 To 150 mV	277.1
8 HPVS	400 - 900 V	681
9 RX CELL TEMP	50 ± 1 °C	50.0
10 BOX TEMP	AMBIENT ± 5 °C	30.6
11 PMT TEMP	7 ± 2 °C	7.2
12 MOLY TEMP	315 ± 5 °C	316.1
13 RX CELL PRESSURE	<10 in -Hg-A	6.9
14 SAMPLE PRESSURE	25 - 35 in -Hg-A	27.8
15 NOX SLOPE	1.0 ± 0.3	1.272
16 NOX OFFSET	-50 To 150	196.7
17 NO SLOPE	1.0 ± 0.3	1.179
18 NO OFFSET	-50 To 150	160.9
19 NO SAMPLE READING	PPB	303.1
20 NO2 SAMPLE READING	PPB	24.6
21 NOX SAMPLE READING	PPB	327.1
22 OPTIC TEST	2000 ± 1000 mV	2492.1
23 ELECTRICAL TEST	2000 ± 1000 mV	4900.8
24 VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.22 / 12.54 / 15.75 / -15.22
25 ZERO GAS NOINOX	0.000/0.00 PPB	188.5 / 185.0
26 SPAN GAS NOINOX	400.00/400.00 PPB	786.3 / 842.1

หมายเหตุ

- Sample Pressure คำนวณ / แก้ไขเรียบร้อยแล้ว
- Auto Zero Warning จี๊วให้ PMT และ NORM PMT มีค่าสูง / แก้เรียบร้อยแล้ว
- ทำการเปลี่ยน Pressure Sensor 1 ชิ้น



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย มาตวันกัทธ โทรศัทพ์ : 0-2515-8988 E-Mail : info@kinetics.co.th
เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทน์เกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999

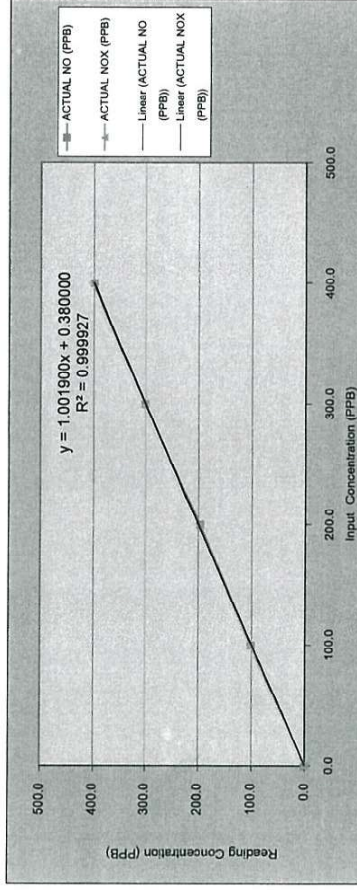
MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd
EQUIPMENT NAME : NO_x Analyzer
MANUFACTURER : Teledyne - API MODEL : T200
SERIAL NO : 1652
STANDARD GAS CONCENTRATION (PPM) : 53.40
CYLINDER NO : CC745169
CERTIFIED DATE : Mar 10, 2021
EXPIRED DATE : Mar 10, 2029

CERTIFIED BY : AIRGAS SPECIALTY GASES

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS				
	IDEAL (PPB)	ACTUAL NO (PPB)	ERROR NO (PPB)	ACTUAL NO _x (PPB)	% ERROR NO _x
ZERO	0.0	0.1	0.1	0.1	0.1
1	100.0	100.7	0.7	102.3	2.3
2	200.0	197.0	-3	198.8	-1.2
3	300.0	300.7	0.7	300.8	0.3
4	400.0	399.2	-0.8	407.8	1.8
AVERAGE (%)					0.5



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

CALIBRATED BY : คุณพรชัย มาตวันกัทธ
ต้องการข้อมูลเพิ่มเติมติดต่อ : คุณพรชัย มาตวันกัทธ โทรศัพท์ : 02-515-8987
เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทน์เกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N099E/5A0822
Cylinder Number: C745169
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12021
Gas Code: CO, NO, NOX, SO2, BALN
Reference Number: 160-402045691-1
Cylinder Volume: 144.4 CF
Valve Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Mar 10, 2021
Expiration Date: Mar 10, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gasous Calibration Standards" (May 2012) document EPA 600/R-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This is a full analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration material. All concentrations are of a mole/mole basis unless otherwise noted.
Do Not Use This Cylinder Below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Assay Dates
NOX	53.00 PPM	53.40 PPM	G1	03/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	03/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	03/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	03/03/2021, 03/10/2021
NITROGEN	BALANCE			03/04/2021

CALIBRATION STANDARDS			
Type	Lot ID	Cylinder No	Expiration Date
NTRM	07060227	EB0079116	Jul 23, 2023
PRM	12386	D685025	Feb 20, 2020
GMIS	124206889	CC323707	Aug 15, 2021
NTRM	18010203	KAL003087	Dec 23, 2021
NTRM	08012341	KAL004716	Jun 07, 2024

The SRM, PRM or RGM noted above is only in reference to the GMS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 NIKO079	NDIR	Feb 28, 2021
Nicolet IS60 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet IS60 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet IS60 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

NOTES:
Gross Weight: 28.1 Kg
Net Weight: 4.6 Kg



388 Ratchadapisek Rd. 32
Chadrasasem, Chatuchak
Bangkok 10900 | Thailand
+66 (0) 2-515-8999
Env_Service@kinetics.co.th

Customer Name : SGS (Thailand) Co., Ltd	
Contact : 02-678-1813	
Description	
Manufacturer : Teledyne API	Model : T200
Equipment : NOx Analyzer	Serial No : 1652
Working Date : 25/07/2022	Quotation : Q-B2-2022-142-SV

Environmental Science Business Unit

Service Report

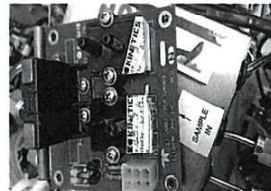
Physical Checking

ตรวจเช็คเบื้องต้นว่า

- หน้าจอเครื่อง
- Sample Pressure ดำเนิน
- Auto Zero Warning ใช้งาน PMT และ NORM PMT ได้สูง



รูป หน้าจอแสดงผล



รูป Pressure Sensor

Correction Working

1. ทำการทดสอบเปลี่ยน Pressure Sensor 1 ชิ้น
2. จากการทดสอบการเปลี่ยนและให้ผลค่าของใช้งานเครื่อง *เครื่องสามารถทำงานปกติ

*รายการวัดสิ่งแวดล้อม

Recommendation

ต้องทำการเปลี่ยนและให้ค่าตามรายการที่ 1 เพื่อให้เครื่องใช้งานได้ปกติ



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการร้อมและรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

วันที่ : 29 สิงหาคม 2565

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 2550

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd

รหัสอุปกรณ์ / เครื่องมือ : CO Analyzer

รุ่นอุปกรณ์ / เครื่องมือ : T300

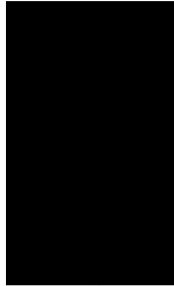
TEST VALUES			BEFORE	AFTER
API MODEL T300				
1	RANGE	1 - 1000 PPM	50.0	50.0
2	STABILITY	≤ 1 PPM	0.01	0.01
3	CO MEASURE	2500 - 4800 mV	3064.5	3567.0
4	CO REFERENCE	2000 - 4800 mV	2564.2	2987.2
5	PRESEURE	25 - 35 in - Hg-A	29.4	29.7
6	SAMPLE FLOW	800 ± 10% cc/min	805.7	804.2
7	SAMPLE TEMP	48 ± 4 °C	44.4	44.4
8	BENCH TEMP	48 ± 2 °C	44.0	48.0
9	WHEEL TEMP	68 ± 2 °C	68.0	68.0
10	BOX TEMP	AMBIENT ± 5 °C	32.1	33.4
11	SLOPE	1.0 ± 0.3	0.921	0.925
12	OFFSET	0.0 ± 0.3	-0.006	-0.007
13	CO READING (AMBIENT)	PPM	0.85	0.33
14	ELECTRICAL TEST	40 ± 2 PPM	-	-
15	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.21 / 12.22 / 16.56 / -15.15	5.21 / 12.22 / 16.56 / -15.19
16	ZERO GAS	0.00 PPM	0.32	0.01
17	SPAN GAS	40.0 PPM	39.72	40.02

หมายเหตุ

- เปลี่ยน O-ring 2 ชิ้น, Spring 1 ชิ้น, Sintered Filter 1 ชิ้น



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด



ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย ภาติวนากัษ์ โทรศัพท์ : 0-2515-8987
เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทน์เกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd

EQUIPMENT NAME : CO Analyzer

MANUFACTURER : Teledyne - API MODEL : T300 SERIAL NO : 2550

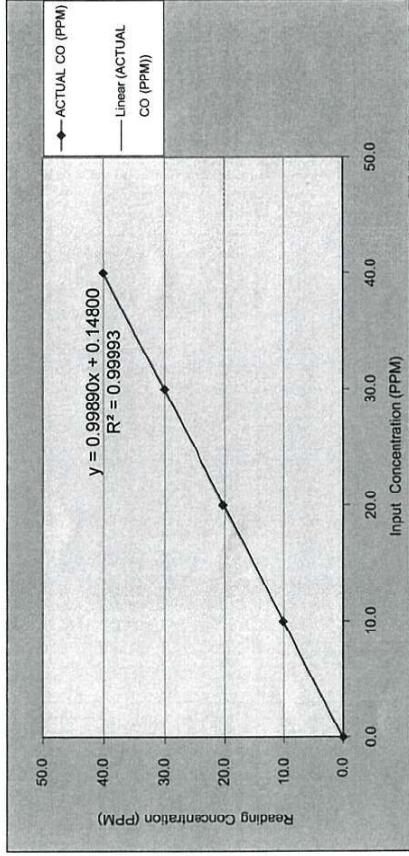
STANDARD GAS CONCENTRATION (PPM) : 4512 CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1750 CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.00	0.01	0.01	-
1	10.00	10.21	0.21	2.10
2	20.00	20.31	0.31	1.55
3	30.00	30.08	0.08	0.27
4	40.00	40.02	0.02	0.05
AVERAGE (%)				0.99



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

CALIBRATED BY : คุณพรชัย ภาติวนากัษ์

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย ภาติวนากัษ์ โทรศัพท์ : 02-515-8987

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทน์เกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N199E15A0622
Cylinder Number: C0745169
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12021
Gas Code: CO,NO,NOX,SO2,BALN
Reference Number: 160-402045691-1
Cylinder Volume: 144.4 CF
Valve Pressure: 2015 PSIG
Valve Outlet: 680
Certification Date: Mar 10, 2021
Expiration Date: Mar 10, 2029

Certification performed in accordance with EPA Testability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)* document EPA 821-R-12-021, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole basis unless otherwise noted.

Do Not Use This Cylinder Below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NOX	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable
CARBON MONOXIDE	4800 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS			
Type	Lot ID	Cylinder No	Expiration Date
NTRM	07060227	EB0079116	Jul 23, 2023
PRM	12396	D885025	Feb 20, 2020
GMIS	12420689	CC323707	Aug 15, 2021
NTRM	16010203	KAL003087	Dec 23, 2021
NTRM	08012341	KAL004716	Jun 07, 2024
The SRM, PRM or RGM listed above is only in reference to the GMS used in the assay and not part of the analysis.			

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1K0579	NDIR	Feb 26, 2021
Nicohil ISO FTIR AUP2010243 NO	FTIR	Feb 11, 2021
Nicohil ISO FTIR AUP2010243 NO2	FTIR	Feb 22, 2021
Nicohil ISO FTIR AUP2010243 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

NOTES:
Gross Weight: 28.1 Kg
Net Weight: 4.6 Kg



รายงานผลการหาค่าและรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SSS (Thailand) Co., Ltd
วันที่ : 7 กุมภาพันธ์ 2565
รายชื่ออุปกรณ์ / เครื่องมือ : NOx Analyzer
หน่วยตรวจสอบ / เครื่องมือ : T200

TEST VALUES		
API MODEL T200	BEFORE	AFTER
1 RANGE	50 - 20,000 PPB	500
2 STABILITY	≤ 1 PPB	0.10
3 SAMPLE FLOW	500 ± 10% cc/min	491
4 OZONE FLOW	80 ± 10% cc/min	84
5 PMT	mV	34.2
6 NORM PMT	mV	14.4
7 A ZERO	-20 To 150 MV	23.4
8 HPVS	400 - 800 V	626
9 RX CELL TEMP	50 ± 1 °C	50.3
10 BOX TEMP	AMBIENT ± 5 °C	33.9
11 PMT TEMP	7 ± 2 °C	6.8
12 MOLY TEMP	315 ± 5 °C	315.6
13 RX CELL PRESSURE	<10 in - Hg-A	4.7
14 SAMPLE PRESSURE	25 - 35 in - Hg-A	28.6
15 NOX SLOPE	1.0 ± 0.3	1.001
16 NOX OFFSET	-50 To 150	-0.4
17 NO SLOPE	1.0 ± 0.3	0.980
18 NO OFFSET	-50 To 150	-1.2
19 NO SAMPLE READING	PPB	-0.6
20 NO2 SAMPLE READING	PPB	11.5
21 NOX SAMPLE READING	PPB	5.5
22 OPTIC TEST	2000 ± 1000 mV	2198.4
23 ELECTRICAL TEST	2000 ± 1000 mV	2063.3
24 VOLTAGE TEST	+5 V +12 V +15 V -15 V	-
25 ZERO GAS	NO/NOx	0.00/0.00 PPB
26 SPAN GAS	NO/NOx	400.00/400.00 PPB

หมายเหตุ



Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
Address : 100 Nanginchree Road, Chongnonsi, Yannawa Bangkok
10120

Certificate No : 22-ACT-164
Request No : Req-2022-0420

Unit Under Calibration Details

Measurement item : Acoustic Calibrator
Manufacturer : Cirrus
Model : CR-515
Serial Number : 80400
ID : -
Class : 1
Range : 94 dB / 1000 Hz
Instrument Status : Used

Calibration Environment and Details

Temperature : (23 ± 2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ± 10.0 hPa)
Received Date : 23 February 2022
Calibration Date : 7 March 2022
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEL	14 May 2022
THD Multimeter	2015	1047765	NIMT	2 February 2023

Traceability : This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

Note

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.



Certificate No : 22-ACT-164

Request No : Req-2022-0420

Calibration Results : Without Adjustment

Sound pressure level

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)	Uncertainty (± %)	Acceptance limit Class 1 (± dB)
	Measured	Error			
94 dB / 1000 Hz	93.96	-0.04	-	0.11	0.25

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment	Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (Hz)	Error (%)			
94 dB / 1000 Hz	1000.00	0.00	-	0.10	0.70

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment		Adjustment	Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (%)	Error (%)			
94 dB / 1000 Hz	0.12	-	-	0.40	2.5

Note

- Acceptance limit was IEC 60942:2017 Class 1
- The calibration results exclude the calibrator pressure correction
- The calibration results exclude the microphone volume correction

End of Calibration

Certificate of Calibration

Customer
Name : SGS (Thailand) Limited.
Address : 100 Nanglinches Road, Chongnonsi, Yamaawa Bangkok 10120

Certificate No : 22-ACT-290
Request No : Req-2022-0736

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : Cirrus
Model : CR171B
Serial Number : G078137
ID : -
Resolution : 0.1 dB
Calibration Environment and Details
Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 20 April 2022
Calibrated Date : 29 April 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Microphone Class : 1
Microphone Model : MK224
Microphone SN : 2099300
Preamplifier Model : MK170
Preamplifier SN : 0777
Instrument Status : Used

Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	14 June 2022	TSI
Audio Generator	Svanick	Svan401	131	18 October 2022	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

1. Indication at the calibration check frequency

UUC Setting	Nominal Level (dB)	Before Adjust		Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
FAST / A / 20-140							
Calibrator Setting							
1000 Hz 94.00 dB	93.85	93.9	+0.05	93.7	-0.15	0.20	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 20-140		
UUC Weighting		
A	16.5	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 20-140		
UUC Weighting		
A	-	0.10
C	16.2	0.10
Z	27.9	0.10

4. Acoustic signal test of frequency weightings

UUC Setting	Deviation from various Frequency Weighting Response curve				UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A	C	Z			
FAST / 20-140						
STD Setting						
125 Hz	0.5	0.2	0.2		0.50	1.0
1000 Hz	0.0	0.0	0.0		0.60	0.7
4000 Hz	-0.9	-0.8	-0.5		0.60	1.0
8000 Hz	-1.0	-0.9	-0.5		0.70	+1.5 -2.5

Certificate No : 22-ACT-290
 Request No : Req-2022-0736

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency				UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A (dB)	C (dB)	Z (dB)			
FAST / 20-140						
STD Setting						
63 Hz	0.3	0.0	0.1			1.0
125 Hz	0.2	0.0	0.0			1.0
250 Hz	0.2	0.0	0.0			1.0
500 Hz	0.1	0.0	0.0			1.0
1000 Hz	0.0	0.0	0.0			0.7
2000 Hz	-0.2	0.0	0.0			1.0
4000 Hz	-0.4	-0.2	0.0			1.0
8000 Hz	-0.5	-0.4	-0.1			+1.5, -2.5
16000 Hz	0.2	0.3	-0.3			+2.5, -16.0

5. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
FAST / 20-140	REF				
UUC Weighting	(dB)				
A	114.00	114.0	0.0		0.2
C	114.00	114.0	0.0	0.2	0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
20-140 / A	REF				
UUC Time Response	(dB)				
Fast	114.00	114.0	0.0		0.1
Slow	114.00	114.0	0.0	0.2	0.1
Leq	114.00	114.0	0.0		0.1

7. Long Term Stability

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 20-140			
STD Setting			
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.1

8. Level linearity on the reference level range

UUC Setting	Anticipated REF (dB)	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
FAST / A / 20-140					
STD dB					
139.00	139	139.0	0.0		0.8
134.00	134	134.0	0.0		0.8
129.00	129	129.0	0.0		0.8
124.00	124	124.0	0.0		0.8
119.00	119	119.0	0.0		0.8
114.00	114	114.0	0.0		0.8
109.00	109	109.0	0.0		0.8
104.00	104	104.0	0.0		0.8
99.00	99	99.0	0.0		0.8
94.00	94	94.0	0.0		0.8
89.00	89	89.0	0.0		0.8
84.00	84	84.0	0.0		0.8
79.00	79	79.0	0.0		0.8
74.00	74	74.0	0.0		0.8
69.00	69	69.0	0.0		0.8
64.00	64	64.0	0.0		0.8
59.00	59	59.0	0.0		0.8
54.00	54	54.0	0.0		0.8
49.00	49	49.0	0.0		0.8
44.00	44	44.0	0.0		0.8
39.00	39	39.0	0.0		0.8
34.00	34	34.0	0.0		0.8
29.00	29	29.1	0.1		0.8
24.00	24	24.2	0.2		0.8

Certificate No : 22-ACT-290
Request No : Req-2022-0736

9. Level linearity including the level range control

UUC Setting	STD REF (dB)	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
FAST / A	28.8	28.9	0.1	0.3	0.8
	114	114.0	0.0		

10. Tone burst response

UUC Setting	STD Tonburst (ms)	Anticipated Ref (dB)	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
			UUC (dB)	ERR (dB)		
UUC Time Response	200	136.0	136.0	0.0	0.5	+1.0, -1.5
	2	119.0	118.9	-0.1		
	0.25	110.0	109.9	-0.1		
Slow	200	129.6	129.6	0.0	0.3	+1.0, -3.0
	2	110.0	110.0	0.0		
	200	130.0	130.0	0.0		
SEL	2	110.0	110.0	0.0	0.5	+1.0, -1.5
	0.25	101.0	100.9	-0.1		

11. Peak C Sound level

UUC Setting	Anticipated REF (dB)	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
FAST / C / 20-140	135.4	135.5	+0.10	0.2	2.0
	134.4	134.2	-0.20		
	134.4	134.2	-0.20		

Certificate No : 22-ACT-290
Request No : Req-2022-0736

12. Overload indication

UUC Setting	Measured UUC (dB)	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 20-140	141.6	0.2	1.5
STD Setting			
Positive one-half cycle			
Negative one-half cycle			
Deviated	141.8	0.2	1.5

13. High Level Stability

UUC Setting	Measured UUC (dB)	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 20-140	139.0	0.1	0.1
STD Setting			
Initial			
Final			
Deviated	0.0	0.1	0.1

End of Certificate

Certificate of Calibration

Customer
Name : SGS (Thailand) Limited.
Address : 100 Nanglinchee Road, Chongnonsi, Yancawa Bangkok 10120

Unit Under Calibration Details
Measurement item : Sound Level Meter
Manufacturer : Cirrus
Model : CR161B
Serial Number : G080132
ID : -
Resolution : 0.1 dB
Calibration Environment and Details
Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 4 February 2022
Calibrated Date : 25 February 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-1:2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard
Instrument : Model : Brand : SN : Due calibration : Traceability :
Standard Microphone : 40AN : GRAS : 188273 : 15 September 2022 : GRAS
Multifrequency Calibrator : Quest : Quest : EF400024 : 14 June 2022 : TSI
Audio Generator : Svanek : Svan401 : 131 : 18 October 2022 : WK Electric

Note
The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Certificate No : 22-ACT-138
Request No : Req-2022-0293

Microphone Class : 1
Microphone Model : MK224
Microphone SN : 2100400
Preamplifier Model : MK170
Preamplifier SN : 0907
Instrument Status : Used

1. Indication at the calibration check frequency

UUC Setting	Nominal		Before Adjust		Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	Level (dB)		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
FAST / A / 20-140								
Calibrator Setting								
1000 Hz 114.00 dB	113.85		117.2	-3.35	113.7	-0.15	0.20	0.3

Note: Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTER, Model SV 35A, SN: 58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY (± dB)
FAST / 20-140		
UUC Weighting		
A	16.8	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY (± dB)
FAST / 20-140		
UUC Weighting		
A	-	0.10
C	16.3	0.10
Z	29.0	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve				UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A	C	Z			
FAST / 20-140						
STD Setting						
125 Hz	0.2	0.0	-0.1		0.50	1.0
1000 Hz	0.0	0.0	0.0		0.60	0.7
4000 Hz	-0.3	-0.2	0.0		0.60	1.0
8000 Hz	-0.3	-0.1	0.1		0.70	+1.5 -2.5

Certificate No : 22-ACT-138
Request No : Req-2022-0293

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting		Deviation from various Frequency			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		Weighting Response curve				
		A (dB)	C (dB)	Z (dB)		
FAST / 20-140						
STD Setting						
63 Hz		0.3	0.0	0.0		1.0
125 Hz		0.2	0.0	0.0		1.0
250 Hz		0.2	0.0	0.0		1.0
500 Hz		0.1	0.0	0.0		1.0
1000 Hz		0.0	0.0	0.0	0.2	1.0
2000 Hz		-0.1	0.0	0.0		0.7
4000 Hz		-0.3	-0.2	0.0		1.0
8000 Hz		-0.5	-0.3	-0.1		1.0
16000 Hz		0.2	0.3	-0.2		+1.5, -2.5 +2.5, -16.0

6. Frequency and time weightings at 1kHz

UUC Setting	STD REF (dB)	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
FAST / 20-140					
UUC Weighting					
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0	0.2	0.2
Z	114.00	114.0	0.0	0.2	0.2

UUC Setting	STD REF (dB)	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
20-140 / A					
UUC Time Response					
Fast	114.00	114.0	0.0	0.1	0.1
Slow	114.00	114.0	0.0	0.1	0.1
Leq	114.00	114.0	0.0	0.1	0.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-SL34-01 Rev.0 Issue date 01/07/19

Certificate No : 22-ACT-138
Request No : Req-2022-0293

7. Long Term Stability

UUC Setting	Measured UUC (dB)	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 20-140			
STD Setting			
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.1

8. Level linearity on the reference level range

UUC Setting	Anticipated REF (dB)	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
FAST / A / 20-140					
STD dB					
139.00	139	139.0	0.0	0.8	0.8
134.00	134	134.0	0.0	0.8	0.8
129.00	129	129.0	0.0	0.8	0.8
124.00	124	124.0	0.0	0.8	0.8
119.00	119	119.0	0.0	0.8	0.8
114.00	114	114.0	0.0	0.8	0.8
109.00	109	109.0	0.0	0.8	0.8
104.00	104	104.0	0.0	0.8	0.8
99.00	99	99.0	0.0	0.8	0.8
94.00	94	94.0	0.0	0.8	0.8
89.00	89	89.1	0.1	0.8	0.8
84.00	84	84.0	0.0	0.8	0.8
79.00	79	79.1	0.1	0.8	0.8
74.00	74	74.1	0.1	0.8	0.8
69.00	69	69.1	0.1	0.8	0.8
64.00	64	64.1	0.1	0.8	0.8
59.00	59	59.1	0.1	0.8	0.8
54.00	54	54.1	0.1	0.8	0.8
49.00	49	49.1	0.1	0.8	0.8
44.00	44	44.1	0.1	0.8	0.8
39.00	39	39.1	0.1	0.8	0.8
34.00	34	34.1	0.1	0.8	0.8
29.00	29	29.1	0.1	0.8	0.8
24.00	24	24.2	0.2	0.8	0.8

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-SL34-01 Rev.0 Issue date 01/07/19

12. Overload indication		Measured	UNCERTAINTY	Acceptance Limit
		UUC	(\pm dB)	(\pm dB)
FAST / A / 20-140				
STD Setting		143.3		
Positive one-half cycle		143.3		
Negative one-half cycle				
Detected		0.0	0.2	1.5

13. High Level Stability		Measured	UNCERTAINTY	Acceptance
UUC Setting		UUC		Limit
FAST / A	20-140		(\pm dB)	(\pm dB)
STD Setting		139.0		
	Initial			
	Final	139.0		
Deviated		0.0	0.1	0.1

End of Certificate

9. Level linearity including the level range control					UNCERTAINTY (± dB)	Acceptance Limit (± dB)
UUC Setting		STD REF (dB)	Measured			
FAST / A			UUC (dB)	ERR (dB)		
UUC Range		25.0	25.2	0.2	0.3	0.8
20-140		11.4	114.0	0.0		0.8

... including the level range control

10. Tone burst response				Acceptance Limit (\pm dB)		
UUC Setting		STD Toneburst (ms)	Anticipated Ref (dB)	Measured		UNCERTAINTY (\pm dB)
				UUC (dB)	ERR (dB)	
A / 20-40		200	136.0	136.0	0.0	0.5
		2	119.0	118.8	-0.2	$\pm 1.0, -1.5$
		0.25	110.0	109.8	-0.2	$\pm 1.0, -3.0$
Fast		200	129.6	129.5	-0.1	0.5
		2	110.0	109.9	-0.1	$\pm 1.0, -3.0$
		0.25	101.0	100.9	-0.1	0.5
Slow		200	130.0	130.0	0.0	$\pm 1.0, -1.5$
		2	110.0	109.0	0.0	$\pm 1.0, -3.0$
		0.25	101.0	100.9	-0.1	
SEL						

10 Tone burst response

11. Peak C Sound level		Anticipated REF (dB)	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
	UUC Setting		UUC (dB)	ERR (dB)		
	FAST / C / 20-140					
	STD Setting	135.4	135.6	+0.20		2.0
	Complete cycle					
	Positive half cycle	134.4	134.2	-0.20	0.2	1.0
	Negative half cycle	134.4	134.2	-0.20		1.0

11 peak C Sound level

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co.
FM-708-57

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
FM-708-SL-M-01 Rev.0 (Issue date: 01/07/19)

CERTIFICATE OF CALIBRATION

Certificate No.: CO-2403016/22 Page 1 of total 2 pages

Customer SGS (THAILAND) LIMITED
100 Nanglinchee Road, Chongnonsee,
Yannawa, Bangkok 10120 Thailand

Equipment pH Meter
Manufacturer HANNA
Serial No. 06160189101
Description Range : 0 - 14 pH, Resolution : 0.01 pH

Environmental Conditions Ambient Temperature: (20 ± 2) °C
Relative Humidity: (50 ± 10) %

Calibration Location Atmospheric Pressure: -
Received Date Jayhawk Laboratory (CL&GL)
24 March 2022
Calibration Date 25 March 2022



() (Krisyosl K.) () (Sakda Y.) (Dr. Ekachai Puttitwong)
() (Patiphan K.) () (Onnapa P.)
() (Pongsak H.) () (Nitiphong K.)
() (Kanung C.) () (Nonthachai K.)
() (Pramong P.) () (Noppol P.)

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FE-169 REV.02 02/24/21

Certificate No.: CO-2403016/22 Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-178 based on an in-house method.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard:

Type	pH Value	Lot No.	Due Date	Traceability
pH Standard Solution	4.01	081020	Aug. 11, 2022	NIMT
	7.01	020221	Sep. 14, 2022	
	10.00	091020	Aug. 11, 2022	

Type	Model	Serial No.	Certificate No.	Due Date	Traceability
Digital Thermometer with Sensor	1523 / 5622	1709138 /	10-1006001/21	Jun. 10, 2022	THC
		4605984-005			

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- NIMT, National Institute of Metrology (Thailand).
- THC, Thai Heart Calibration Co., Ltd.

Measurement Results:

Calibration of pH Electrode

pH Standard Solution (pH)	Measured Value		Uncertainty (± pH)
	(pH)	(mV)	
4.01	3.99	-	0.013
7.01	7.00	-	0.013
7.01	7.02	-	0.013
10.00	10.03	-	0.013

Note : Adjust Curve to Buffer Solution pH (7.4), (7.10)
Temperature stability of micro bath : 25 ± 0.2°C

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

Calibrated by Kitiipong
REV.02 02/24/21

CERTIFICATE OF CALIBRATION

Certificate No.:

TO-2403055/22

Customer

SGS (THAILAND) LIMITED

100 Nanglinchee Road, Chongnonsee,
Yannawa, Bangkok 10120 Thailand

Equipment

pH Meter (Digital Thermometer with Probe)

Manufacturer

HANNA HI98129

Serial No.

05160189101 ID No. ENWA 21135

Description

Temperature range : 20 °C to 50 °C, Resolution of UUC : 0.1 °C

Environmental Conditions

Ambient Temperature: (23 ± 3) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: -

Calibration Location

Blue Devils Laboratory (TL)

Received Date

24 March 2022

Calibration Date

26 March 2022

() (Krisyosl K.) () (Sakda Y.) (Dr. Ekachai Puttitwong)
() (Patiphan K.) () (Onnapa P.)
() (Pongsak H.) () (Nitiphong K.)
() (Kanung C.) () (Nonthachai K.)
() (Pramong P.) () (Noppol P.)

This calibration certificate shall not be reproduced other than in full except with the prior written approval of the Thai Heart Calibration Co., Ltd.

FE-169

REV.02 02/24/21

Certificate No.:

TO-2403055/22

Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-096 based on an in-house method.
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Thermometer Readout	1529-R	B7C853	10-1011001/21	Nov. 10, 2022	THC
Platinum Resistance Thermometer	5626	4854	C0A30047	Oct. 22, 2023	FLUKE
Liquid Bath	XORTS-40A	XO111019	10-0306002/21	Jun. 3, 2023	THC

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- THC, Thai Heart Calibration Co., Ltd.
- FLUKE, Fluke Corporation, U.S.A.

Measurement Results:

(X) Without Adjustment

Dimension of probe : Diameter 3 mm. Sensor Type : RTD (PT100)

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
70	20.00	19.9	0.10	0.058
70	30.00	29.8	0.20	0.058
70	50.00	49.5	0.50	0.058

UUC : Unit Under Calibration

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -

FE-169

REV.02 02/24/21

Calibrated by

Pongsak



Smart Cap™ Quality Certificate

Cap:	HI764113-1	Factory Cal. date:	2021-04-14
Parameter:	Dissolved Oxygen		
Serial No:	223F788F500104E0	Compatibility:	HI764113/Hi7698494-S probes

Description: Smart Cap™ for Optical Dissolved Oxygen probe

Hanna Instruments certifies that this probe has been produced, calibrated and tested to meet all applicable Hanna Procedures using standards and reference instruments whose accuracy is traceable to the National Institute of Standards (NIST) in the USA or to internationally acceptable national physical standards. The standards and reference instruments used in calibration and testing are supported by a calibration system which meets requirements of ISO9001.

Test	Specification	Measured	Pass
Measurement at 100% saturated *	100% ±3%	101.4	✓
Measurement in N ₂ (0% Saturated)*	0 ±2%	0.6	✓
Mechanical Inspection			✓
Digital Communication			✓

*tested with "Master factory" HI764113



WHEN YOU NEED TO BE SURE

