



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	05 January 2022	Brand :	API	Model :	300E
No.	CO-B01			Serial No.	782
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 20 September 2021			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D824478		
Certified Date : 15 April 2020		Expired Date : 14 April 2022		Cylinder Conc. : 4,740 ppm	
Calibrating Condition					
Pressure	1011	mmbar	Temp.	24.6	°C
				% RH	48
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.10	-	0	
CO Span	40.00	40.09	0.225	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4015.1	mV	2500-4800 mV		
CO Reference	3948.3	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.4	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	806	CC/Min	800 ± 10%		
Sample Temperature	48.4	°C	48 ± 4		
Bench Temperature	48.2	°C	48 ± 2		
Wheel Temperature	68.3	°C	68 ± 2		
Box Temperature	30.5	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3020.9	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :

Phakhinai Khongkomnerd

(Mr. Phakhinai Khongkomnerd)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	01 February 2022	Brand :	API	Model :	300E
No.	CO-B01			Serial No.	782
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 20 September 2021			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D824478		
Certified Date : 15 April 2020		Expired Date : 14 April 2022		Cylinder Conc. : 4,740 ppm	
Calibrating Condition					
Pressure : 1011 mmbar		Temp. : 24.6 °C		% RH : 48	
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.11	-	0	
CO Span	40.00	39.92	-0.200	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4014.4	mV	2500-4800 mV		
CO Reference	3947.8	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.5	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	808	CC/Min	800 ± 10%		
Sample Temperature	48.2	°C	48 ± 4		
Bench Temperature	48.1	°C	48 ± 2		
Wheel Temperature	68.5	°C	68 ± 2		
Box Temperature	30.8	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3023.2	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :

Phakhinai Khongkomnerd

(Mr. Phakhinai Khongkomnerd)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



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Calibration Report							
Non-Dispersive Infrared CO Analyzer							
Date :	02 March 2022	Brand :	API	Model :	300E		
No.	CO-B02			Serial No.	965		
Calibrator (Dilution System)							
Brand : API		Model : 700					
Last Cal. Date : 20 September 2021		Serial No. : 421					
Reference Standard Gas							
Standard Gas : Carbon Monoxide (CO)		Cylinder No. : D824478					
Certified Date : 15 April 2020	Expired Date : 14 April 2022		Cylinder Conc. : 4,740 ppm				
Calibrating Condition							
Pressure	1011	mmbar	Temp.	24.5	°C	% RH	49
Calibration Setting							
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM			
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response			
Zero	0	-0.10	-	0			
CO Span	40.00	40.07	0.175	40.00			
API Model 300E CO Analyzer Check List							
Parameter	Observed Value	Units	Nominal Range				
Range	50	PPM	0-1000 ppm				
Stability	0.10	PPM	< 1 ppm With Zero Air				
CO Measure	4014.1	mV	2500-4800 mV				
CO Reference	3948.5	mV	2500-4800 mV				
Measure/Reference Ratio	1.179	-	1.1-1.3 W/Zero Air				
Sample Pressure	28.5	In-Hg-A	~2" < Ambient Absolute Pressure				
Sample Flow	803	CC/Min	800 ± 10%				
Sample Temperature	48.4	°C	48 ± 4				
Bench Temperature	48.1	°C	48 ± 2				
Wheel Temperature	68.5	°C	68 ± 2				
Box Temperature	30.8	°C	Ambient Temp + 7 ± 10				
Photo-Drive	3005.9	mV	250 mV to 4750 mV				
Slope	1.017	-	1.0 ± 0.3				
Offset	0.2	-	0 ± 0.3				

Phakhinai Khongkomnerd

Calibrated by :

(Mr. Phakhinai Khongkomnerd)

Peera Detudom

Approved by :

(Mr. Peera Detudom)



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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	01 April 2022	Brand :	API	Model :	300E
No.	CO-B02			Serial No.	965
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 20 September 2021		Serial No.	: 421	
Reference Standard Gas					
Standard Gas	: Carbon Monoxide (CO)		Cylinder No.	: D824478	
Certified Date	: 15 April 2020		Expired Date	: 14 April 2022	
			Cylinder Conc.	: 4,740 ppm	
Calibrating Condition					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	49	
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response	% Dif	Analyzer Response	
Zero	0	0.10	-	0	
CO Span	40.00	39.97	-0.075	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4016.2	mV	2500-4800 mV		
CO Reference	3949.8	mV	2500-4800 mV		
Measure/Reference Ratio	1.160	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.6	In-Hg-A	-2" < Ambient Absolute Pressure		
Sample Flow	808	CC/Min	800 ± 10%		
Sample Temperature	48.2	°C	48 ± 4		
Bench Temperature	48.0	°C	48 ± 2		
Wheel Temperature	68.4	°C	68 ± 2		
Box Temperature	30.7	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3008.9	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by : Phakthinai Khongkomnead
(Mr. Phakthinai Khongkomnead)

Approved by : Peera Detudom
(Mr. Peera Detudom)



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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	05 May 2022	Brand :	API	Model :	300E
No.	CO-B01			Serial No.	782
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 20 September 2021			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D196045		
Certified Date : 16 April 2022			Expired Date : 15 April 2024		
			Cylinder Conc. : 4,570 ppm		
Calibrating Condition					
Pressure : 1011 mmbar		Temp. : 24.5 °C		% RH : 48	
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	-0.10	-	0	
CO Span	40.00	39.94	-0.150	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4014.4	mV	2500-4800 mV		
CO Reference	3947.8	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.5	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	808	CC/Min	800 ± 10%		
Sample Temperature	48.2	°C	48 ± 4		
Bench Temperature	48.1	°C	48 ± 2		
Wheel Temperature	68.5	°C	68 ± 2		
Box Temperature	30.8	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3023.2	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Phakhirai Khongkomnerd

Calibrated by :

(Mr. Phakhirai Khongkomnerd)

Approved by :

(Mr. Peera Detudom)



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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	01 June 2022	Brand :	API	Model :	300E
No.	CO-B01			Serial No.	782
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 20 September 2021		Serial No.	: 421	
Reference Standard Gas					
Standard Gas	: Carbon Monoxide (CO)		Cylinder No.	: D196045	
Certified Date	: 16 April 2022		Expired Date	: 15 April 2024	
			Cylinder Conc.	: 4,570 ppm	
Calibrating Condition					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	49	
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.11	-	0	
CO Span	40.00	40.08	0.200	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4015.5	mV	2500-4800 mV		
CO Reference	3948.2	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.7	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	811	CC/Min	800 ± 10%		
Sample Temperature	48.5	°C	48 ± 4		
Bench Temperature	48.2	°C	48 ± 2		
Wheel Temperature	68.3	°C	68 ± 2		
Box Temperature	30.9	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3021.7	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :

Phakhinai Khongkomnerd

(Mr. Phakhinai Khongkomnerd)

Approved by :

Peeru Detudom

(Mr. Peeru Detudom)



Certificate of Calibration

Aquion : Anion (ID#894)

This certificate is to verify that instrument below are calibrated
by Archemica Lab Co.,Ltd.

AQUION S/N : 190840059

AS-DV S/N : 190915235

for

S.P.S. Consulting Service Co., Ltd.

ARCHEMICA LAB

บริษัท อาร์เคมีคา แล็บ จำกัด
ARCHEMICA LAB CO.,LTD

Operator Signature : K.CHANNARONG

Date : Jul 5, 2021

(Mr. Channarong Khiao-Un)

Test Engineer



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Calibration Report			
Total Hydrocarbon Analyzer			
Date :	05 January 2022	Brand :	HORIBA
		Model :	APHA-360CE
No.	B01	Serial No.	4211954001
Calibrator (Dilution System)			
Brand :	API	Model :	700
Last Cal. Date :	05 August 2021	Serial No.	911
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	Cylinder No.	D595075
Certified Date :	17 March 2015	Expired Date :	17 March 2023
		Cylinder Conc.	456 ppm
Calibrating Condition			
Pressure	1011 mmbar	Temp.	24.6 °C
		% RH	48
		Start Time :	2:00 PM
Pre-Calibration Checks			
Change Particulate Filter	Yes	Station Temp :	25.0 °C
Leak Test	Yes		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	0.10	0
Span	10	10.02	10
Calibration Setting (Final)			
Span Instrument Gain:	0.997	Finish Time:	3:00 PM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	911.2	mV	800-1,350
Signal (THC)	916.1	mV	800-1,350
Detector	78.1	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.0	kPa	8 - 25
NMC	258.6	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

Phakhinai Khongkonnerd
(Mr. Phakhinai Khongkonnerd)

Approved by :


(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Calibration Report Total Hydrocarbon Analyzer			
Date : 02 February 2022		Brand : HORIBA	Model : APHA-360CE
No. B01		Serial No. 4211954001	
Calibrator (Dilution System)			
Brand : API		Model : 700	
Last Cal. Date : 05 August 2021		Serial No. : 911	
Reference Standard Gas			
Standard Gas : Methane (CH ₄)		Cylinder No. : D595075	
Certified Date : 17 March 2015	Expired Date : 17 March 2023	Cylinder Conc. : 456 ppm	
Calibrating Condition			
Pressure : 1011 mmbar	Temp. : 24.5 °C	% RH : 48	Start Time : 10:00 AM
Pre-Calibration Checks			
Change Particulate Filter : Yes	Station Temp : 25.0 °C		
Leak Test : Yes			
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	0.11	0
Span	10	10.05	10
Calibration Setting (Final)			
Span Instrument Gain: 0.999	Finish Time: 11:00 AM		
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	910.2	mV	800-1,350
Signal (THC)	915.6	mV	800-1,350
Detector	77.8	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.1	kPa	8 - 25
NMC	258.9	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

Phakhinai Khongkomnerd
(Mr. Phakhinai Khongkomnerd)

Approved by :


(Mr. Peera Detudom)



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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Calibration Report Total Hydrocarbon Analyzer			
Date :	07 March 2022	Brand :	HORIBA
		Model :	APHA-360CE
No.	B01	Serial No.	4211954001
Calibrator (Dilution System)			
Brand :	API	Model :	700
Last Cal. Date :	05 August 2021	Serial No. :	911
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	Cylinder No. :	D595075
Certified Date :	17 March 2015	Expired Date :	17 March 2023
		Cylinder Conc. :	456 ppm
Calibrating Condition			
Pressure	1011 mmbar	Temp.	24.5 °C
		% RH	48
		Start Time :	1:00 PM
Pre-Calibration Checks			
Change Particulate Filter	Yes	Station Temp :	25.0 °C
Leak Test	Yes		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	0.10	0
Span	10	10.02	10
Calibration Setting (Final)			
Span Instrument Gain:	0.999	Finish Time:	2:00 PM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	910.3	mV	800-1,350
Signal (THC)	915.7	mV	800-1,350
Detector	77.9	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.0	kPa	8 - 25
NMC	259.8	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

Phakhinai Khongkomnerd
(Mr. Phakhinai Khongkomnerd)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
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Calibration Report Total Hydrocarbon Analyzer			
Date :	05 April 2022	Brand :	HORIBA
No.	B01	Model :	APHA-360CE
		Serial No.	4211954001
Calibrator (Dilution System)			
Brand :	API	Model :	700
Last Cal. Date :	05 August 2021	Serial No.	911
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	Cylinder No.	D595075
Certified Date :	17 March 2015	Expired Date :	17 March 2023
		Cylinder Conc.	456 ppm
Calibrating Condition			
Pressure	1011 mmbar	Temp.	24.6 °C
		% RH	48
		Start Time :	2:00 PM
Pre-Calibration Checks			
Change Particulate Filter	Yes	Station Temp :	25.0 °C
Leak Test	Yes		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	0.10	0
Span	10	10.05	10
Calibration Setting (Final)			
Span Instrument Gain:	0.995	Finish Time:	3:00 PM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	911.3	mV	800-1,350
Signal (THC)	916.7	mV	800-1,350
Detector	78.1	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.3	kPa	8 - 25
NMC	259.6	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

Phakhinai Khongkorned
(Mr. Phakhinai Khongkorned)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Tel : (662) 939-4370-72 Fax : (662) 513-4221 E-mail : sale@spsscon.com, www.spsscon.com

Calibration Report Total Hydrocarbon Analyzer			
Date :	02 May 2022	Brand :	HORIBA
No.	B01	Model :	APHA-860CE
		Serial No.	4211954001
Calibrator (Dilution System)			
Brand :	API	Model :	700
Last Cal. Date :	05 August 2021	Serial No.	911
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	Cylinder No.	D595075
Certified Date :	17 March 2015	Expired Date :	17 March 2023
		Cylinder Conc.	456 ppm
Calibrating Condition			
Pressure	1011 mmbar	Temp.	24.5 °C
		% RH	48
		Start Time :	10:00 AM
Pre-Calibration Checks			
Change Particulate Filter	Yes	Station Temp :	25.0 °C
Leak Test	Yes		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	-0.10	0
Span	10	10.02	10
Calibration Setting (Final)			
Span Instrument Gain:	0.998	Finish Time:	11:00 AM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	912.4	mV	800-1,350
Signal (THC)	917.2	mV	800-1,350
Detector	78.2	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.0	kPa	8 - 25
NMC	259.1	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

Phakhinai Khongkomnerd
(Mr. Phakhinai Khongkomnerd)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

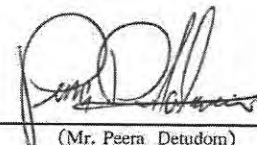
Tel : (662) 939-4370-72. Fax : (662) 513-4221. E-mail : sale@spscon.com, www.spscon.com

Calibration Report			
Total Hydrocarbon Analyzer			
Date :	02 June 2022	Brand :	HORIBA
		Model :	APHA-360CE
No.	B01	Serial No.	4211954001
Calibrator (Dilution System)			
Brand :	API	Model :	700
Last Cal. Date :	05 August 2021	Serial No.	911
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	Cylinder No.	D595075
Certified Date :	17 March 2015	Expired Date :	17 March 2023
		Cylinder Conc.	456 ppm
Calibrating Condition			
Pressure	1011 mmbar	Temp.	24.6 °C
		% RH	48
		Start Time :	2:00 PM
Pre-Calibration Checks			
Change Particulate Filter	Yes	Station Temp :	25.0 °C
Leak Test	Yes		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	0.10	0
Span	10	10.04	10
Calibration Setting (Final)			
Span Instrument Gain:	0.995	Finish Time:	3:00 PM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	911.5	mV	800-1,350
Signal (THC)	916.7	mV	800-1,350
Detector	77.8	kPa	((Pressure Air/1013)×100)-20 ± 4 kPa
Purifier	19.1	kPa	8 - 25
NMC	258.9	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

Phakhinai Khongkhamerd
(Mr. Phakhinai Khongkhamerd)

Approved by :


(Mr. Peera Detudom)



WO-01513756/2022

MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

Customer : <u>S.P.S.Consulting Service Co.,Ltd</u>	Date Tested: <u>January 12, 2022</u>	
	Recommendation Recertification	
Address : <u>7 Soi Phaholyothin 24</u>	Period <u>6</u> Months	
<u>Paholyothin Road</u>	Recertification Due: <u>July 12, 2022</u>	
<u>Jompol Chatuchak, Bangkok 1090</u>	Date Last Certified: <u>July 14, 2021</u>	
User Name: <u>K.Phenpha Vipasthawatt</u>	Visit Number: <u>2 of 2</u>	
Phone: <u>083-9269252</u>	PerkinElmer Phone: <u>02-719-6420 ext 206</u>	
Fax: <u>02-513-4221</u>	PerkinElmer Fax: <u>02-318-5597</u>	

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
MODEL	SERIAL NUMBER	
<u>OPTIMA 5300DV</u>	<u>077C7042401</u>	
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
<u>IPV Methods</u>		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
<u>Multielement Standard</u>	<u>N069-1579</u>	<u>August 30, 2022</u>
<u>Wavecal Solution</u>	<u>N058-2152</u>	<u>January 30, 2022</u>
<u>VIS Wavecal solution</u>	<u>N930-2946</u>	<u>June 30, 2022</u>
<u>Instrument Cal. STD4</u>	<u>N930-0221</u>	<u>August 30, 2022</u>
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
<u>2 % HNO3</u>		
<u>10 % HNO3</u>		



MAINTENANCE AND TEST CERTIFICATE MODEL OPTIMA 5300DV

SERIAL NUMBER	<u>077C8011701</u>	DATE TESTED	<u>January 12, 2022</u>
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1. MECHANICAL CHECKS	
A. Inspect and clean all fans and filters.	<input type="checkbox"/> OK
B. Inspect and replace as necessary, all torch components including the RF coil.	<input type="checkbox"/> OK
C. Inspect all tubing for sign of clacking or leaking.	<input type="checkbox"/> OK
D. Adjust water and gas pressure regulator settings.	<input type="checkbox"/> OK
E. Inspect and leak check pneumatics drawers.	<input type="checkbox"/> OK
F. Clean the exterior of the instrument.	<input type="checkbox"/> OK
2. OPTICAL CHECKS	
A. Inspect and clean all optical components.	<input type="checkbox"/> OK
B. As required, check and replace all purgefilters.	<input type="checkbox"/> OK
C. Recheck optical alignment.	<input type="checkbox"/> OK
3. COOLING SYSTEM CHECKS	
A. Perform preventive maintenance on chiller.	<input type="checkbox"/> OK
B. Flush out the chiller every year.	<input type="checkbox"/> N/A
4. PERFORMANCE CHECKS	
A. Torch View Alignment.	<input type="checkbox"/> OK
B. Wavelength Calibration.	<input type="checkbox"/> OK



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER : 077C8011701		DATE TESTED : January 12, 2022	
PARAMETER	SPECIFICATION		FINAL VALUE
Spectral Resolution : UV	As 193.696 nm	≤ 0.007	0.00554
	Ni 231.604 nm	≤ 0.008	0.00725
	Ni 341.476 nm	≤ 0.012	0.00752
Spectral Resolution : VIS	La 408.672 nm	≤ 0.020	0.01616
	Ba 455.403 nm	≤ 0.025	0.02416
Precision			
	As 193.656 nm	% RSD < 1.0	0.34 %
	Zn 213.856 nm	% RSD < 1.0	0.27 %
	Mn 257.610 nm	% RSD < 1.0	0.41 %
	La 379.478 nm	% RSD < 1.0	0.57 %
	Ba 455.403 nm	% RSD < 1.0	0.33 %
	Ba 493.408 nm	% RSD < 1.0	0.26 %
Detection Limits : Axial	Tl 190.080 nm	3(sd)	5.51 ppb
	As 193.696 nm	3(sd)	8.59 ppb
	Pb 220.353 nm	3(sd)	0.50 ppb
Detection Limits : Radial	As 193.696 nm	3(sd)	21.00 ppb
	Zn 213.856 nm	3(sd)	0.32 ppb
	Mn 257.610 nm	3(sd)	0.18 ppb
	La 379.478 nm	3(sd)	0.44 ppb
	Ba 455.403 nm	3(sd)	0.17 ppb
	Ba 493.408 nm	3(sd)	0.12 ppb
BEC : Axial (IB X 500)/(IS-IB)	Cd 226.502 nm	≤ 150 ppb	12.46
BEC : Radial (IB X 1000)/(IS-IB)	Mn 257.610 nm	≤ 45 ppb	30.82



MAINTENANCE AND TEST CERTIFICATE MODEL
OPTIMA 5300DV

SERIAL NUMBER 077C8011701DATE TESTED January 12, 2022

Remarks :

Commissioning follow as commissioning performance sheets.

This is to certify that the above tests have been performed and the configuration tested



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale,
including warranty terms.

Service Department PerkinElmer Ltd.


Authorized Representative: _____

(Mr. Wiphan Promlumda)

Service Engineer

PinAAcle 900Z Preventive Maintenance (PM)

Company Name:	S.P.S. CONSULTING SERVICE CO., LTD		
Address (Instrument Location):	7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10		
Serial Number:	PZAS19090402	PM Number:	2/2
Customer Name (if applicable):	K. PHENPHA	Telephone Number:	083-926-9252
Customer Support Engineer Name:	K. DUANG	Service Order Number:	WO-01473846
Date PM Performed: (DD-MMM-YYYY)	01-Dec-2021	Next PM Due Date: (DD-MMM-YYYY)	01-Jun-2022
Standard Labor Hours to Complete PM :		5 hours	

Part Number	Release	Publication Date	
09370144 Rev.9	A	January 2018	

Scope

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900Z by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	N/A
B3002013	THGA Contact Cylinders	N/A
B3141064	Glycerol for THGA Cooling	N/A

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300244	GFAAS Mixed Standard	AR	53-255CRY1	28-Feb-2022

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 ml.	AR	AR
N/A	0.5% HNO ₃	250 ml.	AR	AR

Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
B3100652 Or N9307029	Electronic Flow Meter	1	NA
B0505495	Test Jig	1	NA
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	092216-010130
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190
N3050119	Cr Lumina HCL	1	091911-020150

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas and water lines for leaks and/or wear. Replace if needed. Thoroughly inspect all quick connects. Replace the Y connector, P/N 09921079, if needed.
- ☒ Clean exterior of the instrument.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Inspect the pole pieces and clean where the pole pieces contact the furnace. Replace the pole piece p-rings as needed, P/N's B0501018 & B0501250. Grease the O-rings as needed with Apiezon L grease, P/N 09905148
- ☒ Inspect the four insulation pads on the front contact housing of the THGA in furnace. If the pads are missing replace the THGA furnace or replace the insulator pads on the furnace.
- ☒ Inspect the graphite tube and clean the contact cylinders. Replace if necessary.
- ☒ Check internal and external gas flows with the Electronic Gas Flow Meter and the Gas Flow Test Probe as described in the Service Manual. Correct if necessary.
- ☒ Check furnace open/close function.
- ☒ Verify the operation of the GFTV Camera for proper operation and viewing alignment in the furnace camera Tube View window. Align if needed.
- ☒ Check the operation of the Halogen Light ASSY for the GFTV Camera. Replace if needed.
- ☒ Check the water level/quality in the recirculation (if applicable). Add distilled water if necessary.
- ☒ Check the cooling system fluid flow rate with the FCS In-Line Flow Meter for proper levels if needed. Refer to SDB# COSY008.STN
- ☒ Perform Cooling System maintenance if needed per SDB# COSY005.STN.
- ☒ Check auto sampler operation.
- ☒ Perform an auto sampler check valve test as described in the Service Manual.
- ☒ Lubricate the spindles of the auto sampler pumps and all moving parts of the tray mechanics as described in the Service Manual.
- ☒ Inspect the auto sampler sampling capillary as described in the Service Manual. Replace if necessary.
- ☒ Inspect the four insulation pads on the front contact housing of the THGA in furnace. If the pads are missing replace the THGA furnace or replace the insulator pads on the furnace.
- ☒ Inspect the graphite tube and clean the contact cylinders. Replace if necessary.
- ☒ Check internal and external gas flows with the Electronic Gas Flow Meter and the Gas Flow Test Probe as described in the Service Manual. Correct if necessary.
- ☒ Check furnace open/close function

4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect and clean the furnace windows, if needed.
- ☒ Inspect and clean the GFTV camera lens, if needed.
- ☒ Inspect optics. Clean or replace if necessary,

6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the air filter element is dry. Replace if necessary.

7. After PM Performance tests [THGA]:

7.1 Furnace Gas Flows

Description: Ensures the flow rates are within specification.

Parameter	Specification	Test Results	Pass/Fail
Internal Flow Rate	250 mL/min \pm 25 mL/min	250	Passed
External Flow Rate	100 mL/min \pm 10 mL/min	100	Passed

7.2 Chromium Baseline Noise

Description: Signal to noise check.

Parameter	Specification	Results	Pass/Fail
Baseline Noise	\leq 0.005 Abs.	0.0001	Passed
Standard Deviation	\leq 0.005	0.0001	Passed

7.3 Chromium Characteristic Mass and Precision

Description: Calculate the characteristic mass using the characteristic mass tool and precision from the integrated absorbance values.

Parameter	Specification	Results	Pass/Fail
Cr m_0 Results	\leq 7.0 pg/0.0044 A-s	3.8	Passed
Precision	\leq 2.0 %	1.64	Passed

7.4 Copper Characteristic Mass and Zeeman Ratio

Description: Calculate the characteristic mass using the characteristic mass tool and check the Zeeman Ratio.

Parameter	Specification	Results	Pass/Fail
Cu m ₀ Result	≤ 16.5 pg/0.0044 A-s	13.9	Passed
Zeeman Ratio	0.52 ± 0.04	0.52	Passed


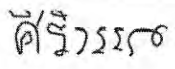
8. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments


Additional Comments Regarding the PM	
Zeeman Ratio	$= \frac{\text{Atomic Signal (Peak area)}}{\text{Atomic Signal (Peak area)} + \text{Background Signal (Peak area)}}$ $= \frac{0.1593}{0.1593 + 0.1414}$ $= 0.52$

Review

<i>The preventive maintenance checks and if applicable performance tests for PinAAcle 900Z have been completed.</i>	
<i>This PinAAcle 900Z Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.</i>	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative: <div style="text-align: center; margin-top: 10px;">  </div>	Date: 01-Dec-2021 <small>(DD-MMM-YYYY)</small>
Authorized Customer Representative: <div style="text-align: center; margin-top: 10px;">  </div>	Date: 01-Dec-2021 <small>(DD-MMM-YYYY)</small>

PinAAcle 900Z Preventive Maintenance (PM)

Company Name:	S.P.S. CONSULTING SERVICE CO., LTD		
Address (Instrument Location):	7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10110		
Serial Number:	PZAS19090402	PM Number:	2/2
Customer Name (if applicable):	K. PHENPHA	Telephone Number:	083-926-9252
Customer Support Engineer Name:	K. DUANG	Service Order Number:	WO-01473846
Date PM Performed: (DD-MMM-YYYY)	01-Dec-2021	Next PM Due Date: (DD-MMM-YYYY)	01-Jun-2022
Standard Labor Hours to Complete PM :		5 hours	

Part Number	Release	Publication Date	
09370144 Rev.9	A	January 2018	

Scope

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Component List

Component / Specific Model	Serial #	Configuration Notes

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	N/A
B3002013	THGA Contact Cylinders	N/A
B3141064	Glycerol for THGA Cooling	N/A

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300244	GFAAS Mixed Standard	AR	53-255CRY1	28-Feb-2022

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 ml.	AR	AR
N/A	0.5% HNO ₃	250 ml.	AR	AR

Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
B3100652 Or N9307029	Electronic Flow Meter	1	NA
B0505495	Test Jig	1	NA
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	092216-010130
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190
N3050119	Cr Lumina HCL	1	091911-020150

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

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- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas and water lines for leaks and/or wear. Replace if needed. Thoroughly inspect all quick connects. Replace the Y connector, P/N 09921079, if needed.
- ☒ Clean exterior of the instrument.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Inspect the pole pieces and clean where the pole pieces contact the furnace. Replace the pole piece p-rings as needed, P/N's B0501018 & B0501250. Grease the O-rings as needed with Apiezon L grease, P/N 09905148
- ☒ Inspect the four insulation pads on the front contact housing of the THGA in furnace. If the pads are missing replace the THGA furnace or replace the insulator pads on the furnace.
- ☒ Inspect the graphite tube and clean the contact cylinders. Replace if necessary.
- ☒ Check internal and external gas flows with the Electronic Gas Flow Meter and the Gas Flow Test Probe as described in the Service Manual. Correct if necessary.
- ☒ Check furnace open/close function.
- ☒ Verify the operation of the GFTV Camera for proper operation and viewing alignment in the furnace camera Tube View window. Align if needed.
- ☒ Check the operation of the Halogen Light ASSY for the GFTV Camera. Replace if needed.
- ☒ Check the water level/quality in the recirculation (if applicable). Add distilled water if necessary.
- ☒ Check the cooling system fluid flow rate with the FCS In-Line Flow Meter for proper levels if needed. Refer to SDB# COSY008.STN
- ☒ Perform Cooling System maintenance if needed per SDB# COSY005.STN.
- ☒ Check auto sampler operation.
- ☒ Perform an auto sampler check valve test as described in the Service Manual.
- ☒ Lubricate the spindles of the auto sampler pumps and all moving parts of the tray mechanics as described in the Service Manual.
- ☒ Inspect the auto sampler sampling capillary as described in the Service Manual. Replace if necessary.
- ☒ Inspect the four insulation pads on the front contact housing of the THGA in furnace. If the pads are missing replace the THGA furnace or replace the insulator pads on the furnace.
- ☒ Inspect the graphite tube and clean the contact cylinders. Replace if necessary.
- ☒ Check internal and external gas flows with the Electronic Gas Flow Meter and the Gas Flow Test Probe as described in the Service Manual. Correct if necessary.
- ☒ Check furnace open/close function

4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect and clean the furnace windows, if needed.
- ☒ Inspect and clean the GFTV camera lens, if needed.
- ☒ Inspect optics. Clean or replace if necessary,

6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the air filter element is dry. Replace if necessary.

7. After PM Performance tests [THGA]:

7.1 Furnace Gas Flows

Description: Ensures the flow rates are within specification.

Parameter	Specification	Test Results	Pass/Fail
Internal Flow Rate	250 mL/min \pm 25 mL/min	250	Passed
External Flow Rate	100 mL/min \pm 10 mL/min	100	Passed

7.2 Chromium Baseline Noise

Description: Signal to noise check.

Parameter	Specification	Results	Pass/Fail
Baseline Noise	\leq 0.005 Abs.	0.0001	Passed
Standard Deviation	\leq 0.005	0.0001	Passed

7.3 Chromium Characteristic Mass and Precision

Description: Calculate the characteristic mass using the characteristic mass tool and precision from the integrated absorbance values.

Parameter	Specification	Results	Pass/Fail
Cr m ₀ Results	\leq 7.0 pg/0.0044 A-s	3.8	Passed
Precision	\leq 2.0 %	1.64	Passed

7.4 Copper Characteristic Mass and Zeeman Ratio

Description: Calculate the characteristic mass using the characteristic mass tool and check the Zeeman Ratio.

Parameter	Specification	Results	Pass/Fail
Cu m ₀ Result	≤ 16.5 pg/0.0044 A-s	13.9	Passed
Zeeman Ratio	0.52 ± 0.04	0.52	Passed


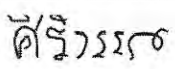
8. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments


Additional Comments Regarding the PM	
Zeeman Ratio	$= \frac{\text{Atomic Signal (Peak area)}}{\text{Atomic Signal (Peak area)} + \text{Background Signal (Peak area)}}$ $= \frac{0.1593}{0.1593+0.1414}$ $= 0.52$

Review

<i>The preventive maintenance checks and if applicable performance tests for PinAAcle 900Z have been completed.</i>	
<i>This PinAAcle 900Z Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.</i>	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative: <div style="text-align: center; margin-top: 10px;">  </div>	Date: 01-Dec-2021 <small>(DD-MMM-YYYY)</small>
Authorized Customer Representative: <div style="text-align: center; margin-top: 10px;">  </div>	Date: 01-Dec-2021 <small>(DD-MMM-YYYY)</small>

PinAAcle 900Z Preventive Maintenance (PM)

Company Name:	S.P.S.CONSULTING SERVICE CO.,LTD.		
Address (Instrument Location):	PHAHOLYOTHIN RD, JOMPON, BANGKOK, 51, TH, 10900		
Serial Number:	PZAS19090402	PM Number:	1/2
Customer Name (if applicable):	K. PHENPHA	Telephone Number:	083-926-9252
Customer Support Engineer Name:	K. DUANG	Service Order Number:	WO-01473846
Date PM Performed: (DD-MMM-YYYY)	01-Jun-2022	Next PM Due Date: (DD-MMM-YYYY)	01-Dec-2022
Standard Labor Hours to Complete PM :		5 hours	

Part Number	Release	Publication Date	
09370144 Rev.9	A	January 2018	

Scope

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900Z by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
AS900	AS9419052359	Syngistix 3.1

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	2
B3002013	THGA Contact Cylinders	1
B3141064	Glycerol for THGA Cooling	N/A

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300244	GFAAS Mixed Standard	AR	56-021CRY1	30-Jun-2023

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 ml.	AR	AR
N/A	0.5% HNO ₃	250 ml.	AR	AR

Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
B3100652 Or N9307029	Electronic Flow Meter	1	NA
B0505495	Test Jig	1	NA
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	092216-010130
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190
N3050119	Cr Lumina HCL	1	091911-020150

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas and water lines for leaks and/or wear. Replace if needed. Thoroughly inspect all quick connects. Replace the Y connector, P/N 09921079, if needed.
- ☒ Clean exterior of the instrument.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Inspect the pole pieces and clean where the pole pieces contact the furnace. Replace the pole piece p-rings as needed, P/N's B0501018 & B0501250. Grease the O-rings as needed with Apiezon L grease, P/N 09905148
- ☒ Inspect the four insulation pads on the front contact housing of the THGA in furnace. If the pads are missing replace the THGA furnace or replace the insulator pads on the furnace.
- ☒ Inspect the graphite tube and clean the contact cylinders. Replace if necessary.
- ☒ Check internal and external gas flows with the Electronic Gas Flow Meter and the Gas Flow Test Probe as described in the Service Manual. Correct if necessary.
- ☒ Check furnace open/close function.
- ☒ Verify the operation of the GFTV Camera for proper operation and viewing alignment in the furnace camera Tube View window. Align if needed.
- ☒ Check the operation of the Halogen Light ASSY for the GFTV Camera. Replace if needed.
- ☒ Check the water level/quality in the recirculation (if applicable). Add distilled water if necessary.
- ☒ Check the cooling system fluid flow rate with the FCS In-Line Flow Meter for proper levels if needed. Refer to SDB# COSY008.STN
- ☒ Perform Cooling System maintenance if needed per SDB# COSY005.STN.
- ☒ Check auto sampler operation.
- ☒ Perform an auto sampler check valve test as described in the Service Manual.
- ☒ Lubricate the spindles of the auto sampler pumps and all moving parts of the tray mechanics as described in the Service Manual.
- ☒ Inspect the auto sampler sampling capillary as described in the Service Manual. Replace if necessary.
- ☒ Inspect the four insulation pads on the front contact housing of the THGA in furnace. If the pads are missing replace the THGA furnace or replace the insulator pads on the furnace.
- ☒ Inspect the graphite tube and clean the contact cylinders. Replace if necessary.
- ☒ Check internal and external gas flows with the Electronic Gas Flow Meter and the Gas Flow Test Probe as described in the Service Manual. Correct if necessary.
- ☒ Check furnace open/close function

4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect and clean the furnace windows, if needed.
- ☒ Inspect and clean the GFTV camera lens, if needed.
- ☒ Inspect optics. Clean or replace if necessary,

6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the air filter element is dry. Replace if necessary.

7. After PM Performance tests [THGA]:

7.1 Furnace Gas Flows

Description: Ensures the flow rates are within specification.

Parameter	Specification	Test Results	Pass/Fail
Internal Flow Rate	250 mL/min \pm 25 mL/min	255	Passed
External Flow Rate	100 mL/min \pm 10 mL/min	105	Passed

7.2 Chromium Baseline Noise

Description: Signal to noise check.

Parameter	Specification	Results	Pass/Fail
Baseline Noise	\leq 0.005 Abs.	0.0001	Passed
Standard Deviation	\leq 0.005	0.0002	Passed

7.3 Chromium Characteristic Mass and Precision

Description: Calculate the characteristic mass using the characteristic mass tool and precision from the integrated absorbance values.

Parameter	Specification	Results	Pass/Fail
Cr m_0 Results	\leq 7.0 pg/0.0044 A-s	5.6	Passed
Precision	\leq 2.0 %	0.56	Passed

7.4 Copper Characteristic Mass and Zeeman Ratio

Description: Calculate the characteristic mass using the characteristic mass tool and check the Zeeman Ratio.

Parameter	Specification	Results	Pass/Fail
Cu m ₀ Result	≤ 16.5 pg/0.0044 A-s	14.1	Passed
Zeeman Ratio	0.52 ± 0.04	0.53	Passed

8. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM	
<p>Zeeman Ratio =</p> <p style="text-align: center;">0.1609</p> <p>=</p> <p style="text-align: center;">0.1609+0.1377</p> <p>=</p> <p style="text-align: center;">0.53</p>	$\frac{\text{Atomic Signal (Peak area)}}{\text{Atomic Signal (Peak area) + Background Signal (Peak area)}}$ <p style="text-align: center;">REPLACE PM KIT FOR PinAAcle900Z</p>

Review

<p><i>The preventive maintenance checks and if applicable performance tests for PinAAcle 900Z have been completed.</i></p>	
<p><i>This PinAAcle 900Z Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.</i></p>	
<p>Review of Preventive Maintenance:</p>	
<p>Authorized PerkinElmer Representative:</p> <div style="text-align: center; margin-top: 10px;"> </div>	<p>Date:</p> <p style="text-align: center;">01-Jun-2022</p> <p style="text-align: center; font-size: small;">(DD-MMM-YYYY)</p>
<p>Authorized Customer Representative:</p> <div style="text-align: center; margin-top: 10px;"> </div>	<p>Date:</p> <p style="text-align: center;">01-Jun-2022</p> <p style="text-align: center; font-size: small;">(DD-MMM-YYYY)</p>

Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GC/MS
Organization Name: S.P.S. Consulting service
Organization Location: 7 Soi Phaholyothin Road, Ladyao, Khet Jatujak, Bangkok, 10900
Date: March 22, 2021 10:41:18 AM
EQP Name: AgilentRecommended , AgilentRecommended
EQP Revision: GC.02.51, GCMS.02.51
Overall Qualification Status: Pass

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 7890

Front SSL

Setpoint Status: Pass

	Setpoint	Actual
Inlet Pressure:	25.0 psi	24.9 psi

Accuracy: 0.1 psi

Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Decay

Date: March 22, 2021 10:41:18 AM
System ID: GC/MS

Name: 7890
Back SSL

Setpoint Status: Pass

Pressure: 25.0 psi

Pressure Change: -0.1 psi /5 minutes

Agilent Recommended: \geq -2.0 and \leq 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Back SSL

Setpoint Status: Pass

	Setpoint		Actual
Inlet Pressure:	25.0 psi		24.9 psi

Accuracy: 0.1 psi

Agilent Recommended: \leq 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Front FID

Setpoint Status: Pass

Flow Type: Fuel

Setpoint: 30.0 mL/min Measured Flow: 29.9 mL/min

Accuracy: 0.1 mL/min

Agilent Recommended: \leq 10.0 % setpoint (3.0 mL/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Date: March 22, 2021 10:41:18 AM
System ID: GC/MS

Setpoint Status:

Pass

Flow Type:

Oxidizer

Setpoint:

400.0

mL/min

Measured Flow:

399.8

mL/min

Accuracy:

0.2

mL/min

Agilent Recommended:

<=

10.0

% setpoint

(

40.0

ml/min

)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status:

Pass

Flow Type:

Makeup

Setpoint:

25.0

mL/min

Measured Flow:

24.9

mL/min

Accuracy:

0.1

mL/min

Agilent Recommended:

<=

10.0

% setpoint

(

2.5

ml/min

)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name:

7890

Setpoint Status:

Pass

Zone:

Oven

Setpoint/Actual

Temperature:

230.0

230.0

°C

Accuracy:

0.0

°C

Agilent Recommended:

>=

-1.0

% setpoint in K

(

-5.0

°C

)

<=

1.0

% setpoint in K

(

5.0

°C

)

Date:

March 22, 2021 10:41:18 AM

System ID:

GC/MS

Setpoint Status:

Pass

Zone:

Oven

Setpoint/Actual

Temperature:

100.0

100.0

°C

Accuracy:

0.0

°C

Agilent Recommended:

>=

-1.0

% setpoint in K

(

-3.7

°C

)

<=

1.0

% setpoint in K

(

3.7

°C

)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name:

7890

Setpoint Status:

Pass

Setpoint/Average

Temperature:

100.0

100.05

°C

Stability:

0.1

°C

Agilent Recommended:

<=

0.5

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination2

Back

SSL

/ Front

FID

Manual Injection

Name:

Not applicable

Setpoint Status:

Completed

Injection Volume on Column:

1.0

uL

Overall Scouting Run Status

Completed

Signal to Noise

Tested Combination2

Back

SSL

/ Front

FID

Date:

March 22, 2021 10:41:18 AM

System ID:

GC/MS

Manual Injection

Name:

7890

Setpoint Status:

Pass

Signal to Noise:

1711991

Agilent Recommended:

>=

300000

Overall Signal to Noise Test Status

Pass

Noise and Drift

Tested Combination2

Back

SSL

/ Front

FID

Name:

7890

Setpoint Status:

Pass

Base Signal:

14.0

pA

ASTM Noise

counts

384.56

<=

768.00

Drift

counts/Hr

178.79

<=

19200.00

Agilent Recommended:

Status:

Pass

Pass

Overall Noise and Drift Test Status

Pass

Log Amp

Tested Combination1

Front

SSL

/ External

SQ

Name:

5975C inert XL with TAD

Setpoint Status:

Pass

Overall Log Amp Test Status

Pass

RFPA

Date:

March 22, 2021 10:41:18 AM

System ID:

GC/MS

Tested Combination1 Front SSL / External SQ
Name: 5975C inert XL with TAD

Setpoint Status: Pass

Amu: 1050 m/z Drift After Five Minutes: 4 mV RFPV Voltage: 485 mV
Agilent Recommended: >= -100 and <= 100 <= 1100

Overall RFPV Test Status

Pass

Tune EI

Tested Combination1 Front SSL / External SQ
Name: 5975C inert XL with TAD

Setpoint Status: Pass

Filament: 1

Setpoint Status: Pass

Filament: 2

Overall Tune EI Test Status

Pass

Signal to Noise EI

Tested Combination1 Front SSL / External SQ
Name: 5975C inert XL with TAD

Source: EI - Standard (Stainless Steel) Filament: 1

Setpoint Status: Pass

Signal to Noise: 925

Agilent Recommended: >= 320

Date: March 22, 2021 10:41:18 AM
System ID: GC/MS

Source: Filament:

Setpoint Status:

Signal to Noise:

Agilent Recommended:

Overall Signal to Noise EI Test Status

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GC/MS
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Manual Injection
Sampler Identifier	Sampler 1
Inlet	Front
Detector	External
LTM Included?	No

Tested Combination2

Injection Technique	Manual Injection
Sampler Identifier	Sampler 2
Inlet	Back
Detector	Front
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Manual Injection
Usage	Sample Injection
Syringe Volume (µL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Manual Injection
Usage	Sample Injection
Syringe Volume (µL)	10

Date: March 22, 2021 10:41:18 AM
System ID: GC/MS

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN10925120
Firmware Revision	A.01.10.3
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Inlet 2

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Back
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

Detector 2

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	SQ
Name	5975C inert XL with TAD
Serial Number	US91732743
Firmware Revision	Not applicable
High Vacuum System	Turbo Pump
Scouting Run Standard	OFN Std

MS EI Source 1

Manufacturer	Agilent Technologies
Source Type	EI - Standard (Stainless Steel)
Number of filaments	2

Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and logon to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Details

Full Name of Signer:	Nattapat Hengcharoen
Logged On User Name:	nattapat.hengcharoen@agilent.com
Signature Creation Date:	March 22, 2021
Reason for Signature:	Executed protocol and published this original version of document

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Date:	March 22, 2021 10:41:18 AM
System ID:	GC/MS

User Name: nattapat.hengcharoen
 Hostname: 5CG70212Y1

System Id: GC/MS
 Print Date: March 22, 2021 10:41:24 AM

OQ_SPS_GC-MS Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 19, 2021 12:15:46 PM	Audit	SessionCreated	Session	None
March 19, 2021 12:15:46 PM	Start	Configuration	Session	None
March 19, 2021 12:15:46 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
March 19, 2021 12:21:07 PM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.51/Gc.02.51.eqp], EQP File Name: [Gc.02.51.eqp], EQP Name: [AgilentRecommended] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Configurations/02.51/GcMs.02.51.eqp], EQP File Name: [GcMs.02.51.eqp], EQP Name: [AgilentRecommended]
March 19, 2021 12:21:16 PM	End	Configuration	Session	None
March 19, 2021 12:21:22 PM	Start	Qualification	Session	OQ
March 19, 2021 12:21:22 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None

User Name: natlapat.hengcharoen
 Hostname: 5CG70212Y1

System Id: GC/MS
 Print Date: March 22, 2021 10:41:24 AM

OQ_SPS_GC-MS Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 19, 2021 1:38:58 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None
March 19, 2021 1:39:56 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None
March 19, 2021 1:40:12 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count : 1
March 19, 2021 1:40:14 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
March 19, 2021 1:40:21 PM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
March 19, 2021 1:40:24 PM	Start	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
March 19, 2021 1:40:34 PM	End	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
March 19, 2021 1:40:36 PM	Start	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
March 19, 2021 1:40:41 PM	End	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1

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Date: March 22, 2021 10:41:18 AM
 System ID: GC/MS

User Name: nattapat.hengcharoen
 Hostname: 5CG70212Y1

System Id: GC/MS
 Print Date: March 22, 2021 10:41:24 AM

QQ_SPS_GC-MS Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 19, 2021 1:40:42 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
March 19, 2021 1:41:20 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
March 19, 2021 1:41:22 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
March 19, 2021 1:41:24 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
March 19, 2021 1:41:37 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
March 19, 2021 1:41:40 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
March 19, 2021 1:41:42 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
March 19, 2021 1:41:55 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
March 19, 2021 1:41:56 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
March 19, 2021 1:41:59 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None

User Name: nattapat.hengcharoen
 Hostname: 5CG70212Y1

System Id: GC/MS
 Print Date: March 22, 2021 10:41:24 AM

OQ_SPS_GC-MS Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 19, 2021 1:42:27 PM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
March 19, 2021 1:43:21 PM	Audit	Data	DataManager	DataManager was in a data verification state but the user chose to start over.
March 19, 2021 1:43:55 PM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
March 19, 2021 1:43:57 PM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
March 19, 2021 1:43:59 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
March 19, 2021 1:44:12 PM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
March 19, 2021 1:44:14 PM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
March 19, 2021 1:44:17 PM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
March 19, 2021 1:45:12 PM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry

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Date: March 22, 2021 10:41:18 AM
 System ID: GC/MS

User Name: nattapat.hengcharoen
 Hostname: SCG70212Y1

System Id: GC/MS
 Print Date: March 22, 2021 10:41:24 AM

OQ_SPS_GC-MS Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 19, 2021 1:45:19 PM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
March 19, 2021 1:54:29 PM	Start	Execution	GC Scouting Run - Manual Injection, Back SSL, Front FID: - Part of System Preparation - No limits associated	None
March 19, 2021 2:33:24 PM	Start	Execution	GC Scouting Run - Manual Injection, Back SSL, Front FID: - Part of System Preparation - No limits associated	None
March 19, 2021 2:35:01 PM	Audit	AceClosed	Session	None
March 19, 2021 2:35:37 PM	Audit	AceRestarted	Session	None
March 19, 2021 2:35:38 PM	Audit	SessionReloaded	Session	None
March 19, 2021 2:35:41 PM	Start	Qualification	Session	OQ
March 19, 2021 2:35:41 PM	Start	Execution	GC Scouting Run - Manual Injection, Back SSL, Front FID: - Part of System Preparation - No limits associated	None
March 19, 2021 2:36:12 PM	Audit	Data	GC Scouting Run - Manual Injection, Back SSL, Front FID: - Part of System Preparation - No limits associated	Data files Path : E:\SPS\SCOUNT_FID.D\FID 1A.ch
March 19, 2021 2:36:32 PM	End	Execution	GC Scouting Run - Manual Injection, Back SSL, Front FID: - Part of System Preparation - No limits associated	Run Count : 1
March 19, 2021 2:36:36 PM	Start	Execution	Signal to Noise - Manual Injection, Back SSL, Front FID: - Detector FID - L: >= 300000	None

User Name: nattapat.hongcharoen
 Hostname: 5CG70212Y1

System Id: GC/MS
 Print Date: March 22, 2021 10:41:24 AM

OQ_SPS_GC-MS Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 19, 2021 2:36:46 PM	Audit	Data	Signal to Noise - Manual Injection, Back SSL, Front FID: - Detector FID - L: >= 300000	Data files Path : E:\SPS\SN_FID.D\FID1A.ch
March 19, 2021 2:37:00 PM	End	Execution	Signal to Noise - Manual Injection, Back SSL, Front FID: - Detector FID - L: >= 300000	Run Count : 1
March 19, 2021 2:37:06 PM	Start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
March 19, 2021 3:46:48 PM	Start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
March 19, 2021 3:47:08 PM	Audit	Data	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : E:\SPS\ND_FID.D\FID1A.ch
March 19, 2021 3:47:30 PM	End	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count : 1
March 19, 2021 3:47:32 PM	Start	Execution	Log Amp - 5975C inert XL with TAD SQ: - Source: EI - Standard (Stainless Steel)	None
March 19, 2021 3:49:54 PM	Start	Execution	RFPA - 5975C inert XL with TAD SQ: - Source: EI - Standard (Stainless Steel)	None
March 19, 2021 3:52:45 PM	Start	Execution	Log Amp - 5975C inert XL with TAD SQ: - Source: EI - Standard (Stainless Steel)	None

User Name: nallapat.hengcharden
 Hostname: SCG70212Y1

System Id: GC/MS
 Print Date: March 22, 2021 10:41:24 AM

OQ_SPS_GC-MS Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 19, 2021 3:53:18 PM	End	Execution	Log Amp - 5975C inert XL with TAD SQ: - Source: EI - Standard (Stainless Steel)	Run Count : 1
March 19, 2021 3:53:19 PM	Start	Execution	RFPA - 5975C inert XL with TAD SQ: - Source: EI - Standard (Stainless Steel)	None
March 19, 2021 3:58:14 PM	End	Execution	RFPA - 5975C inert XL with TAD SQ: - Source: EI - Standard (Stainless Steel)	Run Count : 1
March 19, 2021 3:59:01 PM	Start	Execution	Tune EI - 5975C inert XL with TAD SQ: - Source: - EI - Standard (Stainless Steel) Filament 1 (Qualitative - No setpoints associated)	None
March 19, 2021 3:59:37 PM	End	Execution	Tune EI - 5975C inert XL with TAD SQ: - Source: - EI - Standard (Stainless Steel) Filament 1 (Qualitative - No setpoints associated)	Run Count : 1
March 19, 2021 3:59:39 PM	Start	Execution	Tune EI - 5975C inert XL with TAD SQ: - Source: - EI - Standard (Stainless Steel) Filament 2 (Qualitative - No setpoints associated)	None
March 19, 2021 4:00:01 PM	End	Execution	Tune EI - 5975C inert XL with TAD SQ: - Source: - EI - Standard (Stainless Steel) Filament 2 (Qualitative - No setpoints associated)	Run Count : 1
March 19, 2021 4:00:05 PM	Audit	AceClosed	Session	None
March 22, 2021 9:39:45 AM	Audit	AceRestarted	Session	None
March 22, 2021 9:39:49 AM	Audit	SessionReloaded	Session	None
March 22, 2021 9:40:02 AM	Start	Qualification	Session	OQ

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Date: March 22, 2021 10:41:18 AM
 System ID: GC/MS

User Name: nattapat.hengcharoen
 Hostname: 5CG70212Y1

System Id: GC/MS
 Print Date: March 22, 2021 10:41:24 AM

OQ_SPS_GC-MS Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 22, 2021 9:40:26 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Standard (Stainless Steel) using Filament 1 - L: >= 320	None
March 22, 2021 9:41:14 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Standard (Stainless Steel) using Filament 1 - L: >= 320	None
March 22, 2021 9:41:58 AM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Standard (Stainless Steel) using Filament 1 - L: >= 320	Data files Path : E:\SPS\SN_F1.D\DATA.MS
March 22, 2021 9:43:36 AM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Standard (Stainless Steel) using Filament 1 - L: >= 320	Run Count : 1
March 22, 2021 9:43:44 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Standard (Stainless Steel) using Filament 2 - L: >= 320	None
March 22, 2021 9:44:03 AM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Standard (Stainless Steel) using Filament 2 - L: >= 320	Data files Path : E:\SPS\SN_F2.D\DATA.MS
March 22, 2021 9:44:34 AM	End	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ: - Source: EI - Standard (Stainless Steel) using Filament 2 - L: >= 320	Run Count : 1

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Date: March 22, 2021 10:41:18 AM
 System ID: GC/MS

User Name: nattapat.hengcharoen

System ID: GC/MS

Hostname: 5CG70212Y1

Print Date: March 22, 2021 10:41:24 AM

OQ_SPS_GC-MS Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
March 22, 2021 9:44:37 AM	End	Qualification	Session	OQ
March 22, 2021 9:44:37 AM	Start	Reporting	Session	None
March 22, 2021 10:40:26 AM	Audit	Reporting	Session	Report Generated : Certificate



GC Clarus 600/680 Preventive Maintenance (PM)

Company Name:	S.P.S. Consulting Service Co.,Ltd		
Address (Instrument Location):	7 Soi Phaholyothin24 Phaholyothin Road, Jompol, Chatuchak, Bangkok, 10900.		
Serial Number:	680S14042502	Service Tag:	N68APSSFEMP
Customer Name (if applicable):	Ms.Sujinda	PM number:	1 of 2
Service Engineer Name:	Pramote Chaisorn	Service Order Number:	WO-01624977
Date PM Performed: (DD-MMM-YYYY)	04-Mar-2022	Next PM Due Date: (DD-MMM-YYYY)	04-Sep-2022

Part Number	Release	Publication Date	
TH09370070	C	August 2016	

Scope

The purpose of this PM is to ensure the continued functionality of the Clarus 600 and Clarus 680 GC by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM. Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Software Version	Configuration Notes
Clarus680	680S14042502	Totalchrom6.3.2	
Clarus SQ8T	648N4050804	Turbomass 6.4	
AtomX	US14113002	Tekma AtomX	

Parts Lists

Additional Tools Required for PM				
Part Number (if applicable)	Description	Quantity	Serial #	Calibration Due Date (MM/YY)
LF21-0503	Fluke179 multimeter	1	22460228	04-Nov-2022
Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A				

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.

- ☒ Check incoming AC line voltage for proper levels and grounding.

L-N 220 Volt

L-G 220 Volt

N-G 0.35 Volt

**Neutral to ground not more than 0.5 volts peak to peak*

- ☒ Inspect all gas line filters and traps; Replace if necessary with customer supplied spares.

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

- ☒ Inspect the customer log book and make any appropriate PM entries.

- ☒ Leak check all fittings from the gas source to instrument.

Gas leakage ☒ Pass ☐ Fail Comment _____

- ☒ Perform general inspection of system for cleanliness.

- ☒ Inspect for functional and clean electronic cooling and oven vent fans

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.
Oven temperature set point 150 °C ☒ Pass ☐ Fail

- ☐ Check sub-ambient option. (If installed).
Oven temperature set point 5 °C ☐ Pass ☐ Fail

- ☒ Perform routine maintenance on detector/injector. Replace parts as necessary with customer supplied spares.



- ☒ Check flows, including split flows if applicable. Calibrate if necessary.

Carrier flow Pass

Split flow Pass

- ☒ Check detector gas flows and adjust if necessary.

Detector flow Pass

- ☒ Autosampler installed ☒ Yes ☐ No

Check autosampler sensor for wear and replace if necessary.

Vial sensor Pass

Door sensor Pass

Tower sensor Pass

Plunger sensor Pass

Elevator sensor Pass

- ☒ Remove syringe, manually flush. Replace with customer supplied spare if necessary.

- ☒ Check firmware version. Upgrade to current levels if necessary.

Firmware version 6.5

- ☒ Measure all accessible power supply voltages.

5 Volt Pass

+15 Volt Pass

-15 Volt Pass

24 Volt Pass

- ☒ Record all detector voltage signal.

Detector Channel A 0.91 mV.

Detector Channel B NA mV.

3. Diagnostics Tests:

- ☒ Run instrument diagnostics.

☒ BRAM Pass

☒ EPROM Pass

- ☒ Run Autosampler diagnostics.

☒ BRAM Pass

☒ EPROM Pass

4. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer-supplied materials to have on hand
- ☒ Attach PM sticker.
- ☒ Update Logbook.



Additional Comments

Additional Comments Regarding the PM

Review

<i>The preventive maintenance checks and if applicable performance tests for Clarus600/680 GC have been completed.</i>	
<i>This Clarus600/680 GC Pass the preventive maintenance.</i>	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative: Pramote Chaisorn	Date: 04-Mar-2022 (DD-MMM-YYYY)
Authorized Customer Representative:	Date: 04-Mar-2022 (DD-MMM-YYYY)



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.: 21CH1216

Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter
Manufacturer : HANNA
Model : HI 3512
Serial No. : 08685754
ID No. : -
Condition As-Received: Used Item
Received Date : 14 September 2021
Calibration Date : 16 September 2021
Reference : 2109-0508WN-1
Submitted by : S.P.S. Consulting Service Co.,Ltd.
7 Phaholyothin 24, Phaholyothin Road,
Jompol, Chatuchak, Bangkok10900
Ambient Temperature : (25 \pm 2.5) °C
Relative Humidity : (50 \pm 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement
with certified reference material (CRM)

Calibrated by : Walalak Sirithean

Approved by :

Approved Signatory

- (☒) Malee Butkruea
() Saithip Meangmai
() Warakorn Lerngagtrakul

Issue Date : 22 September 2021

The Uncertainties are for a confidence probability of approximately 95 %

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.

A 0032410



Cert. No.: 21CH1216

Page.: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	46530031	130RC098	20E3666	14 Oct 2021

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

- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	754028	28 June 2023
pH 6.985	CPA chem	725927	12 Jan 2022
pH 10.015	CPA chem	761018	02 Aug 2022

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results**Function : mV Measurement**

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: 08685754	4.000	177.48	177.9	4.000	0.058	2.00
	7.000	0.00	0.4	7.000	0.058	2.00
	10.000	-177.48	-177.2	10.000	0.058	2.00

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor <i>k</i>
pH Electrode S/N.: 061416CM	4.008	4.008	169.2	0.0046	2.00
	6.985	6.985	-4.4	0.0075	2.00
	10.015	10.013	-178.9	0.013	2.05

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-

male.

a 1072797



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

www.qcalibration.com



CERTIFICATE No : 22M2569

REFERENCE No : 64386-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843

ID No : BA 09/61

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : TETNITHI W.

CALIBRATION DATE : 11-Mar-22

APPROVED BY : PONGSAK J.

ISSUED DATE : 17-Mar-22

RECEIVED DATE : 11-Mar-22

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF QUALITY CALIBRATION CO., LTD.



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

www.qcalibration.com

CERTIFICATE No : 22M2569

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : BSA224S-CW
MANUFACTURER : SARTORIUS S/N : 36591843
ID No : BA 09/61 RECEIVED DATE : 11-Mar-22
AIR PRESSURE : 1008mbar \pm 1mbar CALIBRATION DATE : 11-Mar-22
AMBIENT TEMPERATURE : 22°C \pm 1°C RELATIVE HUMIDITY : 51 %RH \pm 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS ADJUSTED USING WEIGHT OF QUALITY CALIBRATION TO ADJUST. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT

MODEL

SERIAL No

CERTIFICATE No

DUE DATE

1) STANDARD WEIGHT SET

E2

QK-I-151

C02210415

09-Feb-23

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

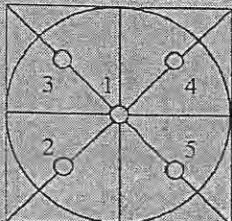
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000048 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.0000	0.0000	0.000078
0.10	0.1000	0.0000	0.000078
0.20	0.2000	0.0000	0.000078
0.50	0.5000	0.0000	0.000079
1.00	1.0000	0.0000	0.000079
2.00	2.0000	0.0000	0.000080
5.00	5.0000	0.0000	0.000081
10.00	10.0000	0.0000	0.000084
20.00	20.0000	0.0000	0.000089
50.00	50.0000	0.0000	0.00011
100.00	100.0000	0.0000	0.00019
200.00	199.9999	0.0001	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	99.9999
2	99.9999
3	100.0000
4	99.9999
5	99.9998
OFF-CENTER LOADING	0.0001

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT PRODUCTION AREA

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT