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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Stack	Oxides of Nitrogen	Console Control Unit	BKK_FS0507	4-Jan-24	4-Jul-24	6
Stack	Oxides of Nitrogen	Console Control Unit	BKK_FS0485	4-Jan-24	4-Jul-24	6
Stack	Oxides of Nitrogen	Pitot Tube	BKK_FS0512	4-Jan-24	4-Jul-24	6
Stack	Oxides of Nitrogen	Pitot Tube	BKK_FS0511	4-Jan-24	4-Jul-24	6
Stack	Oxides of Nitrogen	Pitot Tube	BKK_FS1105	3-Jan-24	3-Jul-24	6
Stack	Oxides of Nitrogen	Flue gas Analyzer	BKK_FS1158	9-Jan-24	8-Jan-25	12
Stack	Oxides of Nitrogen	Flue gas Analyzer	BKK_FS1156	10-Jan-24	9-Jan-25	12
Stack	Oxides of Nitrogen	Flue gas Analyzer	BKK_FS1095	11-Dec-23	10-Dec-24	12
Stack	Oxides of Nitrogen	Vacuum Gauge	BKK_FS0483	14-Feb-23	14-Aug-24	18
Stack	Oxides of Nitrogen	Vacuum Gauge	BKK_FS0437	1-Mar-23	1-Sep-24	18
Stack	Oxides of Nitrogen	Vacuum Gauge	BKK_FS0422	3-Jan-24	3-Jul-25	18
Stack	Oxides of Nitrogen	Spectrophotometer	BKK_EN0018	15-Sep-23	15-Sep-24	12
Stack	Sulfur Dioxide	Console Control Unit	BKK_FS0507	4-Jan-24	4-Jul-24	6
Stack	Sulfur Dioxide	Console Control Unit	BKK_FS0485	4-Jan-24	4-Jul-24	6
Stack	Sulfur Dioxide	Pitot Tube	BKK_FS0512	4-Jan-24	4-Jul-24	6
Stack	Sulfur Dioxide	Pitot Tube	BKK_FS0511	4-Jan-24	4-Jul-24	6
Stack	Sulfur Dioxide	Pitot Tube	BKK_FS1105	3-Jan-24	3-Jul-24	6
Stack	Sulfur Dioxide	Flue gas Analyzer	BKK_FS1158	9-Jan-24	8-Jan-25	12
Stack	Sulfur Dioxide	Flue gas Analyzer	BKK_FS1156	10-Jan-24	9-Jan-25	12
Stack	Sulfur Dioxide	Flue gas Analyzer	BKK_FS1095	11-Dec-23	10-Dec-24	12
Stack	Sulfur Dioxide	Dry Gas	BKK_FS0543	3-Jan-24	3-Jul-24	6
Stack	Sulfur Dioxide	Dry Gas	BKK_FS0554	5-Jan-24	5-Jul-24	6
Stack	Sulfur Dioxide	Dry Gas	BKK_FS0424	4-Apr-24	3-Oct-24	6
Stack	Total Suspended Particulate	Console Control Unit	BKK_FS0507	4-Jan-24	4-Jul-24	6
Stack	Total Suspended Particulate	Console Control Unit	BKK_FS0485	4-Jan-24	4-Jul-24	6
Stack	Total Suspended Particulate	Pitot Tube	BKK_FS0512	4-Jan-24	4-Jul-24	6
Stack	Total Suspended Particulate	Pitot Tube	BKK_FS0511	4-Jan-24	4-Jul-24	6
Stack	Total Suspended Particulate	Pitot Tube	BKK_FS1105	3-Jan-24	3-Jul-24	6
Stack	Total Suspended Particulate	Flue gas Analyzer	BKK_FS1158	9-Jan-24	8-Jan-25	12
Stack	Total Suspended Particulate	Flue gas Analyzer	BKK_FS1156	10-Jan-24	9-Jan-25	12
Stack	Total Suspended Particulate	Flue gas Analyzer	BKK_FS1095	11-Dec-23	10-Dec-24	12
Stack	Total Suspended Particulate	Digital Balance	BKK_EN0309	30-Nov-23	30-Nov-24	12
Ambient	Particulate Matter (PM-10)	High Volume	NKH_FS0048	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	NKH_FS0047	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	NKH_FS0045	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	NKH_FS0046	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	NKH_FS0047	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	NKH_FS0046	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	NKH_FS0048	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	NKH_FS0045	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	NKH_FS0047	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	NKH_FS0045	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	NKH_FS0048	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	NKH_FS0046	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0381	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0384	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0387	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0375	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	Digital Balance	BKK_EN0403	8-Jun-23	8-Jun-24	12



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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Total Suspended Particulate	High Volume	NKH_FS0050	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	NKH_FS0052	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	NKH_FS0051	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	NKH_FS0049	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	NKH_FS0052	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	NKH_FS0051	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	NKH_FS0050	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	NKH_FS0049	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	NKH_FS0052	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	NKH_FS0050	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	NKH_FS0049	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	NKH_FS0051	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0369	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0358	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0366	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS1375	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	BKK_EN0403	8-Jun-23	8-Jun-24	12
Ambient	Sulfur Dioxide	SO ₂ Analyzer	NKH_FS0081	5-Jan-24	5-Jul-24	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	NKH_FS0079	5-Jan-24	5-Jul-24	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	NKH_FS0085	5-Jan-24	5-Jul-24	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	NKH_FS0083	5-Jan-24	5-Jul-24	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	NKH_FS0085	5-Jan-24	5-Jul-24	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	NKH_FS0079	5-Jan-24	5-Jul-24	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	NKH_FS0081	5-Jan-24	5-Jul-24	6
Ambient	Sulfur Dioxide	SO ₂ Analyzer	NKH_FS0083	5-Jan-24	5-Jul-24	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	NKH_FS0080	5-Jan-24	5-Jul-24	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	NKH_FS0078	5-Jan-24	5-Jul-24	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	NKH_FS0084	5-Jan-24	5-Jul-24	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	NKH_FS0082	5-Jan-24	5-Jul-24	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	NKH_FS0084	5-Jan-24	5-Jul-24	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	NKH_FS0078	5-Jan-24	5-Jul-24	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	NKH_FS0080	5-Jan-24	5-Jul-24	6
Ambient	Nitrogen Dioxide	NO ₂ Analyzer	NKH_FS0082	5-Jan-24	5-Jul-24	6
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	NKH_FS0055	20-Dec-22	19-Jun-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	NKH_FS0054	11-Jan-23	11-Jul-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	NKH_FS0054	11-Jan-23	11-Jul-24	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	NKH_FS0053	11-Jan-23	11-Jul-24	18
Indoor Air	Aerobic Plate Count	MAS-100 Microbial Air Sampler	BKK_ML0116	1-Jun-23	31-May-24	12
Indoor Air	Aerobic Plate Count	Autoclave	BKK_ML0037	17-Jul-23	17-Jan-25	18
Indoor Air	Aerobic Plate Count	Incubator	BKK_ML0010	17-Jul-23	17-Jan-25	18
Indoor Air	Aerobic Plate Count	Oven	BKK_ML0013	21-Nov-22	21-May-24	18
Indoor Air	Yeast and Mold	MAS-100 Microbial Air Sampler	BKK_ML0116	1-Jun-23	31-May-24	12
Indoor Air	Yeast and Mold	Autoclave	BKK_ML0037	17-Jul-23	17-Jan-25	18
Indoor Air	Yeast and Mold	Incubator	BKK_ML0011	22-Nov-22	21-May-24	18
Indoor Air	Yeast and Mold	Oven	BKK_ML0013	21-Nov-22	21-May-24	18
Workplace	Total Dust	DRYCAL FLOWMETER	BKK_FS1347	18-Aug-23	18-Aug-24	12
Workplace	Total Dust	Digital Balance	BKK_EN0403	8-Jun-23	8-Jun-24	12
Workplace	Respirable Dust	DRYCAL FLOWMETER	BKK_FS1347	18-Aug-23	18-Aug-24	12
Workplace	Respirable Dust	Digital Balance	BKK_EN0403	8-Jun-23	8-Jun-24	12



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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Noise	Leq 24 hrs	Sound Calibrator	NKH_FS0019	20-Sep-23	20-Sep-24	12
Noise	Leq 24 hrs	Sound Level Meter	NKH_FS0008	6-Sep-23	6-Sep-24	12
Noise	Leq 24 hrs	Sound Level Meter	NKH_FS0001	10-May-23	10-May-24	12
Noise	Leq 24 hrs	Sound Level Meter	NKH_FS0004	10-May-23	10-May-24	12
Noise	Leq 24 hrs	Sound Level Meter	NKH_FS0027	6-Sep-23	6-Sep-24	12
Noise	Leq 24 hrs	Sound Calibrator	NKH_FS0019	20-Sep-23	20-Sep-24	12
Noise	Leq 24 hrs	Sound Level Meter	NNG_FS0014	29-Jan-24	28-Jan-25	12
Noise	Leq 24 hrs	Sound Level Meter	NKH_FS0027	6-Sep-23	6-Sep-24	12
Noise	Leq 24 hrs	Sound Level Meter	NKH_FS0005	2-May-24	1-May-25	12
Noise	Leq 24 hrs	Sound Level Meter	NKH_FS0006	6-Sep-23	6-Sep-24	12
Noise	Noise Annoyance	Sound Calibrator	NKH_FS0019	20-Sep-23	20-Sep-24	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0008	6-Sep-23	6-Sep-24	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0001	10-May-23	10-May-24	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0004	10-May-23	10-May-24	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0027	6-Sep-23	6-Sep-24	12
Noise	Noise Annoyance	Sound Calibrator	NKH_FS0019	20-Sep-23	20-Sep-24	12
Noise	Noise Annoyance	Sound Level Meter	NNG_FS0014	29-Jan-24	28-Jan-25	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0027	6-Sep-23	6-Sep-24	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0005	2-May-24	1-May-25	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0006	6-Sep-23	6-Sep-24	12
Noise	Noise Annoyance	Sound Calibrator	NKH_FS0019	20-Sep-23	20-Sep-24	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0007	6-Sep-23	6-Sep-24	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0116	1-Nov-23	1-Nov-24	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0006	6-Sep-23	6-Sep-24	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0114	1-Nov-23	1-Nov-24	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0005	10-May-23	10-May-24	12
Noise	Noise Annoyance	Sound Calibrator	NKH_FS0019	20-Sep-23	20-Sep-24	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0007	6-Sep-23	6-Sep-24	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0129	4-Jul-23	4-Jul-24	12
Noise	Noise Annoyance	Sound Level Meter	NKH_FS0130	4-Jul-23	4-Jul-24	12
Noise	Noise Dose, TWA	Dose Badge Reader	NKH_FS0063	22-May-23	22-May-24	12
Noise	Noise Dose, TWA	Dose Badge Reader	NKH_FS0029	10-Nov-23	9-Nov-24	12
Heat	Heat Stress	Heat Stress Monitor	NKH_FS0108	5-Jul-23	5-Jul-24	12
Heat	Heat Stress	Heat Stress Monitor	NKH_FS0102	5-Jun-23	5-Jun-24	12
Heat	Heat Stress	Heat Stress Monitor	NKH_FS0032	9-Aug-23	9-Aug-24	12
Heat	Heat Stress	Heat Stress Monitor	NKH_FS0031	9-Aug-23	9-Aug-24	12
Illuminance	Illuminance	Lux Meter	NNG_FS0015	6-Feb-23	6-Feb-24	12
Illuminance	Illuminance	Lux Meter	NKH_FS0086	16-Jan-24	15-Jan-25	12
Water Lab	pH at 25 °C	pH meter	BKK_EN0342	27-Oct-23	27-Oct-24	12
Water Lab	Ammonia Nitrogen	Discrete analyzer	BKK_EN0037	12-Jul-23	12-Jul-24	12
Water Lab	Nitrate	Discrete analyzer	BKK_EN0037	12-Jul-23	12-Jul-24	12
Water Lab	Nitrate	Ion Chromatography	BKK_EN0069	12-Jan-24	12-Jan-25	12
Water Lab	Chloride	Ion Chromatography	BKK_EN0069	12-Jan-24	12-Jan-25	12
Water Lab	Total Kjeldahl Nitrogen	Digestion Unit	BKK_EN0366	21-Apr-24	21-Apr-25	12
Water Lab	Total Kjeldahl Nitrogen	Discrete analyzer	BKK_EN0037	12-Jul-23	12-Jul-24	12
Water Lab	Total Suspended Solids	Electronic Top-Loading Balance	BKK_EN0003	9-Aug-23	9-Aug-24	12
Water Lab	Total Suspended Solids	Oven	BKK_EN0425	6-Nov-23	6-Nov-24	12
Water Lab	Total Dissolved Solids 180°C	Electronic Top-Loading Balance	BKK_EN0003	9-Aug-23	9-Aug-24	12
Water Lab	Total Dissolved Solids 180°C	Oven	BKK_EN0425	6-Nov-23	6-Nov-24	12



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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Water Lab	Conductivity	Conductivity meter	BKK_EN0373	25-Dec-23	25-Dec-24	12
Water Lab	Dissolved Oxygen	Burette	BKK_EN0171	27-Feb-24	27-Aug-25	18
Water Lab	Dissolved Oxygen	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Water Lab	BOD	DO Meter	BKK_EN0017	16-Nov-23	16-May-25	18
Water Lab	BOD	Incubator	BKK_EN0304	20-Mar-24	20-Mar-25	12
Water Lab	COD	Hot Block	BKK_EN0370	6-Dec-23	6-Dec-24	12
Water Lab	COD	Spectrophotometer	BKK_EN0018	15-Sep-23	15-Sep-24	12
Water Lab	Temperature	pH meter	NKH_FS0028	26-Sep-23	26-Sep-24	12
Water Lab	Calcium	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Water Lab	Calcium	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	Calcium	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Water Lab	Magnesium	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Water Lab	Magnesium	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	Magnesium	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Water Lab	Sodium	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Water Lab	Sodium	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	Sodium	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Water Lab	Lead	ICP-MS	BKK_EL0043	6-Apr-23	6-Oct-24	18
Water Lab	Lead	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	Lead	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Water Lab	Chromium	ICP-MS	BKK_EL0043	6-Apr-23	6-Oct-24	18
Water Lab	Chromium	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	Chromium	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Water Lab	Arsenic	ICP-MS	BKK_EL0043	6-Apr-23	6-Oct-24	18
Water Lab	Arsenic	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	Arsenic	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Water Lab	Cadmium	ICP-MS	BKK_EL0043	6-Apr-23	6-Oct-24	18
Water Lab	Cadmium	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	Cadmium	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Water Lab	Manganese	ICP-MS	BKK_EL0043	6-Apr-23	6-Oct-24	18
Water Lab	Manganese	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	Manganese	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Water Lab	SAR	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Water Lab	SAR	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	SAR	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Water Lab	Mercury	Mercury Analyzer	BKK_EL0128	6-Dec-23	6-Dec-24	12
Water Lab	Sulfide	Burette	BKK_EN0171	27-Feb-24	27-Aug-25	18
Water Lab	Sulfide	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Water Lab	Sulfate	Ion Chromatography	BKK_EN0069	12-Jan-24	12-Jan-25	12
Water Lab	Total Hardness	Burette	BKK_EN0171	27-Feb-24	27-Aug-25	18
Water Lab	Iron	ICP-MS	BKK_EL0043	6-Apr-23	6-Oct-24	18
Water Lab	Iron	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	Iron	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Water Lab	Copper	ICP-MS	BKK_EL0043	6-Apr-23	6-Oct-24	18
Water Lab	Copper	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	Copper	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Water Lab	Total Solids	Electronic Top-Loading Balance	BKK_EN0003	9-Aug-23	9-Aug-24	12
Water Lab	Total Solids	Oven	BKK_EN0425	6-Nov-23	6-Nov-24	12



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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Water Lab	Selenium	ICP-MS	BKK_EL0043	6-Apr-23	6-Oct-24	18
Water Lab	Selenium	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	Selenium	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Water Lab	Zinc	ICP-MS	BKK_EL0043	6-Apr-23	6-Oct-24	18
Water Lab	Zinc	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	Zinc	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Water Lab	Nickel	ICP-MS	BKK_EL0043	6-Apr-23	6-Oct-24	18
Water Lab	Nickel	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Water Lab	Nickel	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Ash	pH aqueous phase 50% (w/v)	pH meter	BKK_EN0342	27-Oct-23	27-Oct-24	12
Ash	Conductivity aqueous phase 20%	Conductivity meter	BKK_EN0373	25-Dec-23	25-Dec-24	12
Ash	Lead	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Ash	Lead	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Ash	Lead	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Ash	Mercury	Mercury Analyzer	BKK_EL0128	6-Dec-23	6-Dec-24	12
Ash	Manganese	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Ash	Manganese	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Ash	Manganese	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Ash	Arsenic	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Ash	Arsenic	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Ash	Arsenic	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Ash	Cadmium	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Ash	Cadmium	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Ash	Cadmium	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Ash	Chromium	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Ash	Chromium	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Ash	Chromium	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Ash	Copper	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Ash	Copper	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Ash	Copper	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Ash	Potassium Oxide (K ₂ O)	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Ash	Potassium Oxide (K ₂ O)	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Ash	Potassium Oxide (K ₂ O)	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Ash	Phosphorus pentoxide (P ₂ O ₅)	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Ash	Phosphorus pentoxide (P ₂ O ₅)	Hot Block	BKK_EL0054	22-Sep-23	22-Mar-25	18
Ash	Phosphorus pentoxide (P ₂ O ₅)	Chamber (Cooling Room)	BKK_EN0167	6-Dec-23	6-Jun-25	18
Ash	Total Nitrogen	Digestion Unit	BKK_EN0366	21-Apr-24	21-Apr-25	12
Ash	Total Nitrogen	Discrete analyzer	BKK_EN0037	12-Jul-23	12-Jul-24	12
Bagasse	Arsenic	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Bagasse	Cadmium	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Bagasse	Chromium	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Bagasse	Lead	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Bagasse	Copper	ICP-OES	BKK_EL0037	20-Mar-23	19-Sep-24	18
Bagasse	Mercury	Mercury Analyzer	BKK_EL0128	6-Dec-23	6-Dec-24	12
Bagasse	Chloride	Discrete analyzer	BKK_EN0037	12-Jul-23	12-Jul-24	12

CONSOLE CONTROL UNIT CALIBRATION TEST REPORT



Calibration of Date : 4 Jan 24
Next Cal. Date : 4 Jul 24

Barometric Pressure (mmHg) : 760
Relative Humidity (%) : 67.0
Temperature (C°) : 31.0

Console Control Meter Data

Calibration No. : C-040124-BKK_FS0507
Dry Gas Meter ID : BKK_FS0507
Serial No. : 1503017
Model No. : XC-572-V

Reference Dry Gas Meter ID : BKK_FS0629
Serial No. : 1607009
Correction Factor (Y) : 1.0000
Next Calibration Date : 9 Jun 24

ΔH (mm.H ₂ O)	⊕ Minutes	Reference Dry Gas Meter Calibration					Console Control ; Drygas Meter						Dry Gas Meter Correction Factor (Y)	Orifice Calibration Factor ΔH@
		Vr (Liters)			Tr (°C)	Vm (Liters)			Ti (°C)	To (°C)	Avg. Tm (°C)			
		Final	Initial	Total		Final	Initial	Total						
15	12.22	150.00	0.00	150.00	31.0	1248666.0	1248516.0	150.00	32.0	32.0	32.0	1.0018	45.6836	
25	9.27	150.00	0.00	150.00	31.0	1248826.0	1248675.0	151.00	33.0	33.0	33.0	0.9975	43.6721	
50	6.48	150.00	0.00	150.00	32.0	1248997.0	1248845.0	152.00	34.0	34.0	34.0	0.9885	42.8214	
80	5.13	150.00	0.00	150.00	32.0	1249157.0	1249005.0	152.00	34.0	34.0	34.0	0.9857	42.9403	
120	4.17	150.00	0.00	150.00	32.0	1249317.0	1249165.0	152.00	35.0	35.0	35.0	0.9851	42.4211	
												Avg.	0.9917	43.5077

Y : Ratio of reading of reference to dry gas meter : tolerance for individual values ± 0.02 from average .

ΔH@ : Office pressure differential that equates to 21.24 lm of air @ 25 C and 760 mm of mercury , mmH2O ; tolerance for individual values ± 5.08 from average .

Procedure: 40 CFR 60,APP A,METH ,SEC 5.3 & 7

Calibrated by:

Navaphut S

(Mr.Navaphut Srivinya)

Approved by:

Sa-P

(Mr.Samart Roo-ngan)

Field Scientist(2)

Field Specialist(1)



Stopwatch Calibration Test Report

Calibration Date : 4 Jan 24

Next Cal. Date : 4 Jul 24

Barometric Pressure (mmHg) : 760

Temperature (°C) : 31.0

Relative Humidity (%) : 67.0

Reference Stopwatch Data

Stopwatch ID No. : RYG_FS0540

Model : F808

Serial No. : E18061

Calibration Date : 9 Dec 22

Certificate No. : E-2009018

Console Control Meter Data

Dry Gas Meter No. : BKK_FS0507

Model : XC-572-V

Serial No. : 1503017

Run No.	Time Actual (m:ss.ms)	Time Reading (m:ss)	Diff. (ms)	Diff. (min)
1	5:00:10	5:00	10	0.00017
2	5:00:11	5:00	11	0.00018
3	5:00:11	5:00	11	0.00018
4	5:00:07	5:00	7	0.00012
5	5:00:07	5:00	7	0.00012
6	5:00:09	5:00	9	0.00015
7	5:00:11	5:00	11	0.00018
8	5:00:09	5:00	9	0.00015
9	5:00:10	5:00	10	0.00017
10	5:00:09	5:00	9	0.00015
			Average	0.00016
			SD	0.00003

Calibrate by :

Mr.Navaphut Sriviriya

Field Scientist (2)

Approved by :

Mr. Samart Roo-ngan

Specialist (1)




DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	4 Jan 24	Ambient Temperature (°C)	31
Calibration sheet No. :	C-040124-BKK_FS0508	Relative Humidity (%) :	67
Digital Temperature ID :	BKK_FS0508	Reference Temperature ID	BKK_FS1144
Serial No. :	1503017	Serial No. :	201090006013
Model :	XC-572-V	Model :	Digicon-CC-VT-MS
		Next Calibrate :	14 Aug 24

Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Stack	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass
	100	100	0	±3	Pass
	150	150	0	±3	Pass
	200	200	0	±3	Pass
	250	249	-1	±3	Pass
	300	299	-1	±3	Pass
	500	498	-2	±3	Pass
Probe	100	100	0	±3	Pass
	120	120	0	±3	Pass
	140	140	0	±3	Pass
Oven	100	100	0	±3	Pass
	120	120	0	±3	Pass
	140	140	0	±3	Pass
Filter	100	100	0	±3	Pass
	120	120	0	±3	Pass
	140	140	0	±3	Pass
Exit	0	0	0	±3	Pass
	10	10	0	±3	Pass
	20	20	0	±3	Pass
Meter	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass
AUX	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass

MPE : (Maximum permissible error of measurement) ค่าความผิดพลาดสูงสุดของการวัดที่ยอมรับได้

Calibrated by :


(Mr.Navaphut Sriviriya)
Field Scientist (2)

Approved by :


(Mr.Samart Roo-ngan)
Specialist (1)



PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

Calibration Date : 4 Jan 24	Nozzle Set ID. : BKK_FS0513
Calibration Sheet No. : C-040124-BKK_FS0513	Vernier Caliper ID.: RYG_FS0539

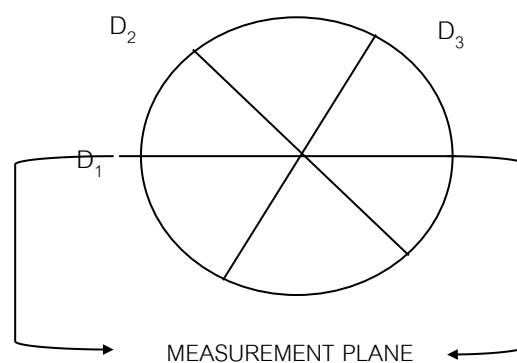
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo	$(D_1 + D_2 + D_3) / 3$
	D_1	D_2	D_3	ΔD	D_{avg}
1	0.315	0.315	0.315	0.000	0.315
2	0.475	0.475	0.475	0.000	0.475
3	0.530	0.530	0.530	0.000	0.530
4	0.635	0.635	0.635	0.000	0.635
5	0.790	0.790	0.790	0.000	0.790
6	0.950	0.950	0.950	0.000	0.950
7	1.110	1.110	1.110	0.000	1.110
8	1.270	1.270	1.270	0.000	1.270
9	1.600	1.600	1.600	0.000	1.600

Where :

D_1, D_2, D_3 = There different nozzle diameters at 60 degrees to each other, each measured the nearest 0.025 mm.

ΔD = Maximum distance between any two diameters, must be ≤ 0.100 mm.

D_{avg} = $(D_1 + D_2 + D_3) / 3$



Calibrated by : Navaphut S.

(Mr.Navaphut Sriviriya)

Field Scientist (2)

Approved by : Sa P.

(Mr.Samart Roo-ngan)

Field Specialist (1)

CONSOLE CONTROL UNIT CALIBRATION TEST REPORT



Calibration of Date : 4 Jan 24

Next Cal. Date : 4 Jul 24

Barometric Pressure (mmHg) : 760

Relative Humidity (%) : 48.0

Temperature (C°) : 29.0

Console Control Meter Data

Calibration No. C-040124-BKK_FS0485

Dry Gas Meter ID : BKK_FS0485

Serial No. : 1310055

Model No. : XC-572-V

Reference Dry Gas Meter ID : BKK_FS0629

Serial No. : 1607009

Correction Factor (Y) : 1.0000

Next Calibration Date : 9 Jun 24

Reference Dry Gas Meter Data

ΔH (mm.H ₂ O)	⊕ Minutes	Reference Dry Gas Meter Calibration					Console Control ; Drygas Meter					Dry Gas Meter Correction Factor (Y)	Orifice Calibration Factor ΔH@
		Vr (Liters)			Tr (°C)	Vm (Liters)			Ti (°C)	To (°C)	Avg.Tm (°C)		
		Final	Initial	Total		Final	Initial	Total					
15	12.65	150.13	0.00	150.13	29.0	1113284.4	1113140.0	144.40	30.0	30.0	30.0	1.0416	48.5479
25	9.68	150.21	0.00	150.21	29.0	1113284.8	1113140.0	144.80	31.0	31.0	31.0	1.0417	47.1732
50	6.78	150.30	0.00	150.30	30.0	1113436.4	1113290.0	146.40	32.0	32.0	32.0	1.0284	46.3830
80	5.26	150.36	0.00	150.36	30.0	1113758.6	1113610.0	148.60	33.0	33.0	33.0	1.0140	44.4859
120	4.26	150.47	0.00	150.47	31.0	1113913.6	1113765.0	148.60	33.0	33.0	33.0	1.0075	43.9935
Avg.												1.0267	46.1167

Y : Ratio of reading of reference to dry gas meter : tolerance for individual values ± 0.02 from average .

ΔH@ : Office pressure differential that equates to 21.24 lm of air @ 25 C and 760 mm of mercury , mmH2O ; tolerance for individual values ± 5.08 from average .

Procedure; 40 CFR 60,APP A,METH ,SEC 5.3 & 7

Calibrated by:

chawalit

(Mr.chawalit Wongchan)

Approved by:

Sa-Pr

(Mr.Samart Roo-ngan)



Stopwatch Calibration Test Report

Calibration Date : 4 Jan 24

Next Cal. Date : 4 Jul 24

Barometric Pressure (mmHg) : 760

Temperature (°C) : 29.0

Relative Humidity (%) : 48.0

Reference Stopwatch Data

Stopwatch ID No. : E18061

Model : F808

Serial No. : -

Calibration Date : 8 Sep 20

Certificate No. : E-2009018

Console Control Meter Data

Dry Gas Meter No. : BKK_FS0485

Model : XC-572-V

Serial No. : 1310055

Run No.	Time Actual (m:ss.ms)	Time Reading (m:ss)	Diff. (ms)	Diff. (min)
1	5:00:10	5:00	10	0.00017
2	5:00:11	5:00	11	0.00018
3	5:00:09	5:00	9	0.00015
4	5:00:11	5:00	11	0.00018
5	5:00:10	5:00	10	0.00017
6	5:00:10	5:00	10	0.00017
7	5:00:10	5:00	10	0.00017
8	5:00:11	5:00	11	0.00018
9	5:00:10	5:00	10	0.00017
10	5:00:10	5:00	10	0.00017
			Average	0.00017
			SD	0.00001

Calibrate by :

Mr. Prasert Surakhan

Field Scientist (3)

Approved by :

Mr. Samart Roo-ngan

Specialist (1)





DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	4 Jan 24	Ambient Temperature (°C)	29
Calibration sheet No. :	C-040124-BKK_FS0486	Relative Humidity (%) :	48
Digital Temperature ID :	BKK_FS0486	Reference Temperature ID	BKK_FS1144
Serial No. :	1310055	Serial No. :	201090006013
Model :	XC-572-V	Model :	Digicon-CC-VT-MS
		Next Calibrate :	14 Aug 24

Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Stack	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass
	100	99	-1	±3	Pass
	150	149	-1	±3	Pass
	200	199	-1	±3	Pass
	250	248	-2	±3	Pass
	300	298	-2	±3	Pass
	500	498	-2	±3	Pass
Probe	100	99	-1	±3	Pass
	120	119	-1	±3	Pass
	140	139	-1	±3	Pass
Oven	100	99	-1	±3	Pass
	120	119	-1	±3	Pass
	140	139	-1	±3	Pass
Filter	100	99	-1	±3	Pass
	120	119	-1	±3	Pass
	140	139	-1	±3	Pass
Exit	0	1	1	±3	Pass
	10	10	0	±3	Pass
	20	20	0	±3	Pass
Meter	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass
AUX	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass

MPE : (Maximum permissible error of measurement) ค่าความผิดพลาดสูงสุดของการวัดที่ยอมรับได้

Calibrated by : 
(Mr.Prasert Surakhan)
Field Scientist (3)

Approved by : 
(Mr.Samart Roo-ngan)
Specialist (1)



PROBE NOZZLE DIAMETER
CALIBRATION DATA SHEET

Calibration Date : 4 Jan 24	Nozzle Set ID. : BKK_FS0485
Calibration Sheet No. : C-040124-BKK_FS0485	Vernier Caliper ID.: RYG_FS0539

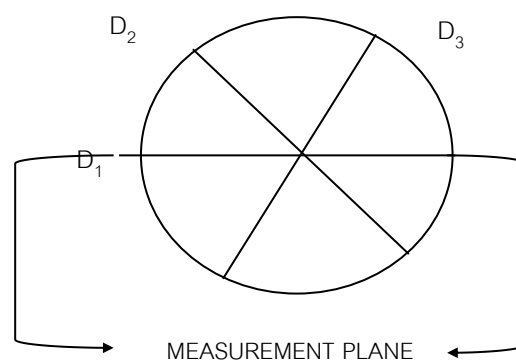
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo	$(D_1 + D_2 + D_3) / 3$
	D_1	D_2	D_3	ΔD	D_{avg}
1	0.315	0.315	0.315	0.000	0.315
2	0.475	0.475	0.475	0.000	0.475
3	0.530	0.530	0.530	0.000	0.530
4	0.635	0.635	0.635	0.000	0.635
5	0.790	0.790	0.790	0.000	0.790
6	0.950	0.950	0.950	0.000	0.950
7	1.110	1.110	1.110	0.000	1.110
8	1.270	1.270	1.270	0.000	1.270
9	1.600	1.600	1.600	0.000	1.600

Where :

D_1, D_2, D_3 = There different nozzle diameters at 60 degrees to each other, each measured the nearest 0.025 mm.

ΔD = Maximum distance between any two diameters, must be ≤ 0.100 mm.

D_{avg} = $(D_1 + D_2 + D_3) / 3$



Calibrated by : 

(Mr. Worawich Tongpoom)

Field Scientist (2)

Approved by : 

(Mr.Samart Roo-ngan)

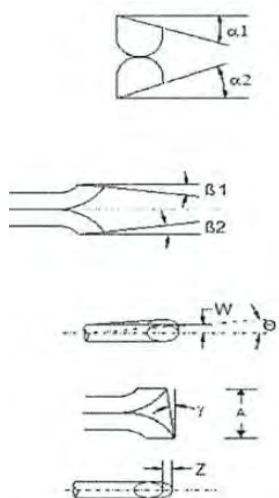
Field Specialist (1)



Type S Pitot Tube Calibration

Date Calibration 4-Jan-24
Pitot ID BKK_FS0512
Pitot SN -

Due Date 4-Jul-24
Inclinometer ID BKK_FS1131
Vernier ID SGK_FS0113



Parameter	Value	Allowable Range	Check
$\alpha 1$	-0.2	$-10^\circ < \alpha 1 < +10^\circ$	OK
$\alpha 2$	2.4	$-10^\circ < \alpha 2 < +10^\circ$	OK
$\beta 1$	-1.2	$-5^\circ < \beta 1 < +5^\circ$	OK
$\beta 2$	-1.6	$-5^\circ < \beta 2 < +5^\circ$	OK
γ	-1.1	-	-
θ	0.2	-	-
$Z = A \tan \gamma$	-0.018	$Z \leq 0.125''$	OK
$W = A \tan \theta$	0.003	$W \leq 0.031''$	OK
Dt	0.308	0.188" to 0.375"	OK
$A/2Dt$	1.494	$1.05 \leq PA/Dt \leq 1.5$	OK
A	0.92	$2.1Dt \leq A \leq 3Dt$	OK

Certify that pitot tube/porbe meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification fact of 0.84 . See 40 CFR Pt. 60, App. A,EPA Method 2.

Calibrated by : Prasert S.
 (Mr.Prasert.Surakhan)
 Enviro Field Services Scientist (3)

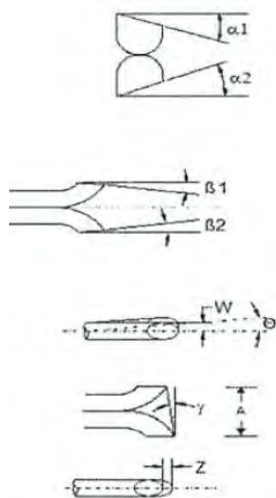
Approved By : Samart.
 (Mr.Samart Roo-ngan)
 Enviro Field Services Specialist (1)



Type S Pitot Tube Calibration

Date Calibration 4-Jan-24
Pitot ID BKK_FS0511
Pitot SN _

Due Date 4-Jul-24
Inclinometer ID BKK_FS1131
Vernier ID SGK_FS0113



Parameter	Value	Allowable Range	Check
$\alpha 1$	-1.8	$-10^{\circ} < \alpha 1 < +10^{\circ}$	OK
$\alpha 2$	-1.4	$-10^{\circ} < \alpha 2 < +10^{\circ}$	OK
$\beta 1$	-1.7	$-5^{\circ} < \beta 1 < +5^{\circ}$	OK
$\beta 2$	-2	$-5^{\circ} < \beta 2 < +5^{\circ}$	OK
γ	-1.3	-	-
θ	-0.4	-	-
$Z = A \tan \gamma$	-0.021	$Z \leq 0.125''$	OK
$W = A \tan \theta$	-0.006	$W \leq 0.031''$	OK
Dt	0.330	0.188" to 0.375"	OK
$A/2Dt$	1.394	$1.05 \leq PA/Dt \leq 1.5$	OK
A	0.92	$2.1Dt \leq A \leq 3Dt$	OK

Certify that pitot tube/probe meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84 . See 40 CFR Pt. 60, App. A, EPA Method 2.

Calibrated by : Prasert S.
 (Mr.Prasert.Surakhan)
 Enviro Field Services Scientist (3)

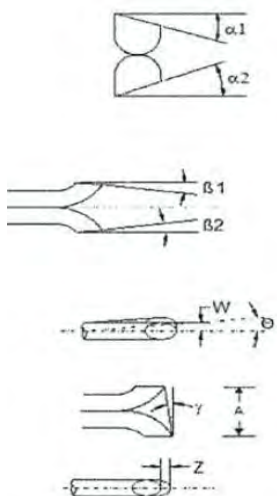
Approved By : Samart P.
 (Mr.Samart Roo-ngan)
 Enviro Field Services Specialist (1)



Type S Pitot Tube Calibration

Date Calibration 3-Jan-24
Pitot ID BKK_FS1105
Pitot SN _

Due Date 3-Jul-24
Inclinometer ID BKK_FS1131
Vernier ID SGK_FS0113



Parameter	Value	Allowable Range	Check
$\alpha 1$	2.2	$-10^{\circ} < \alpha 1 < +10^{\circ}$	OK
$\alpha 2$	-2.4	$-10^{\circ} < \alpha 2 < +10^{\circ}$	OK
$\beta 1$	-1.7	$-5^{\circ} < \beta 1 < +5^{\circ}$	OK
$\beta 2$	-0.1	$-5^{\circ} < \beta 2 < +5^{\circ}$	OK
γ	1.6	-	-
θ	-0.4	-	-
$Z = A \tan \gamma$	0.026	$Z \leq 0.125''$	OK
$W = A \tan \theta$	-0.006	$W \leq 0.031''$	OK
Dt	0.310	0.188" to 0.375"	OK
$A/2Dt$	1.484	$1.05 \leq PA/Dt \leq 1.5$	OK
A	0.92	$2.1Dt \leq A \leq 3Dt$	OK

Certify that pitot tube/probe meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84 . See 40 CFR Pt. 60, App. A, EPA Method 2.

Calibrated by : Prasert S.
 (Mr. Prasert. Surakhan)
 Enviro Field Services Scientist (3)

Approved By : Samart P.
 (Mr. Samart Roo-ngan)
 Enviro Field Services Specialist (1)

Certificate No: G 670022

Date of issue : 10-Jan-24

Instrument description : Flue Gas Analyzer
Instrument model : Testo 340
Control unit serial no. : -
Instrument serial no. : 63119029
ID no. or control no. : BKK_FS1158
Manufacturer : Testo SE & Co. KGaA
Probe description : -
Probe model : -
Probe serial no. : -
Customer name : ALS LABORATORY GROUP (THAILAND) CO.,LTD.
Customer address : 104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250 Thailand
Total pages of certificate : 2 Pages
Receiving no. : L-240105
Receiving date. : 08-Jan-24
Parameter of calibration : Gas Calibration(Oxygen 2.50,10.04,21.02 %vol, Carbon Monoxide 80.14,302,1003 ppm, Nitric Oxide 30.01,151.5,322.5 ppm, Sulphur Dioxide 50.36,100.8,600.8 ppm)
Condition of UUC. : Used
Ambient condition : All of the Measurment ware caried out the stabilized labotary
Temperature : 23 ±5 °C
Humidity : 55 ± 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210
Calibration procedure no. : This instrument was calibrated by comparison with Standard gas mixture according to calibration Work Instruction no. WI-CL-28-C

REVIEW BY	<i>Manakorn P.</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL. DATE	8/1/25

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurent Multiplied by coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. This certificate is applied only to item under test Environmental condition. This Calibration Certificate may not be reporduced other than in full except with the permission of the Issuing laboratory. Calibration certificates without signature and seal not valid and The results relate only to the items tested/calibrated. This calibration certificate documents are tracebility to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 09-Jan-24

Kwanchai K.

Mr. Kwanchai Khamdoun
Calibration Tecnician

[Signature]

Mrs. Nongluck Wongsettee
Technical Manager

Certificate No.: G 670022

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.50 % Vol	2412/23	Linde	27-Aug-27
Oxygen (O ₂) 10.04 % Vol	CG-0153-21	Nimt	18-Nov-26
Oxygen (O ₂) 21.02 % Vol	CG-0041-22	Nimt	10-Feb-27
Carbon monoxide (CO) 80.14 ppm	CG-0040-22	Nimt	14-Feb-27
Carbon monoxide (CO) 302 ppm	1915/23	Linde	16-Jun-25
Carbon monoxide (CO) 1003 ppm	2584/23	Linde	10-Sep-25
Nitric Oxide (NO) 30.01 ppm	CG-0014-23	Nimt	19-Feb-25
Nitric Oxide (NO) 151.5 ppm	0161/23	Linde	22-Jan-25
Nitric Oxide (NO) 322.5 ppm	1974/23	Linde	17-Jul-25
Sulphur Dioxide (SO ₂) 50.36 ppm	2004/23	Linde	17-Jul-25
Sulphur Dioxide (SO ₂) 100.8 ppm	3507/22	Linde	09-Nov-24
Sulphur Dioxide (SO ₂) 600.8 ppm	2003/23	Linde	17-Jul-25

Measured room conditions

Temperature : 23.2 °C Humidity : 58.3 %RH Pressure : 1010.6 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 600 ml/min Gas pressure : 1015.2 mbar

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.50	2.47	-0.03	0.15
O ₂ (%Vol)	10.04	9.93	-0.11	0.20
O ₂ (%Vol)	21.02	21.09	0.07	0.30
CO (ppm)	80.14	80	-0.14	3.0
CO (ppm)	302	301	-1	6.0
CO (ppm)	1003	1000	-3	12
NO (ppm)	30.01	32	1.99	8.0
NO (ppm)	151.5	153	1.5	8.0
NO (ppm)	322.5	320	-2.5	12
SO ₂ (ppm)	50.36	53	2.64	6.0
SO ₂ (ppm)	100.8	103	2.2	6.0
SO ₂ (ppm)	600.8	604	3.2	13

Remark : 1 cmol/mol = 1 %vol. 1 μmol/mol = 1 ppm.

End of Report

Certificate No: G 670023

Date of issue : 10-Jan-24

Instrument description : Flue Gas Analyzer
Instrument model : Testo 350 New
Control unit serial no. : 03580090/1121
Instrument serial no. : 62985022/1121
ID no. or control no. : BKK_FS1156
Manufacturer : Testo SE & Co. KGaA
Probe description : -
Probe model : -
Probe serial no. : -
Customer name : ALS LABORATORY GROUP (THAILAND) CO.,LTD.
Customer address : 104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250 Thailand
Total pages of certificate : 2 Pages
Receiving no. : L-240106
Receiving date. : 08-Jan-24
Parameter of calibration : Gas Calibration(Oxygen 2.50,10.04,21.02 %vol, Carbon Monoxide 80.14,302,1003 ppm) Nitrogen Dioxide 30.34,80.96,201.9 ppm, Nitric Oxide 30.01,151.5,322.5 ppm, Sulphur Dioxide 50.36,100.8,600.8 ppm)
Condition of UUC. : Used
Ambient condition : All of the Measurment ware caried out the stabilized labotary
 Temperature : 23 ±5 °C
 Humidity : 55 ± 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210
Calibration procedure no. : This instrument was calibrated by comparison with Standard gas mixture according to calibration Work Instruction no. WI-CL-28-C

REVIEW BY *Naraborn P*
 APPROVED BY *[Signature]*
 NEXT CAL. DATE *9/1/25*

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurent Multiplied by coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. This certificate is applied only to item under test Environmental condition. This Calibration Certificate may not be reporduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature and seal not valid and The results relate only to the items tested/calibrated. This calibration certificate documents are tracebility to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 10-Jan-24

Kwanchoi K

Mr. Kwanchai Khamdoun

Calibration Tecnician

[Signature]

Mrs. Nongluck Wongsettee

Technical Manager

Certificate No.: G 670023

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.50 % Vol	2412/23	Linde	27-Aug-27
Oxygen (O ₂) 10.04 % Vol	CG-0153-21	Nimt	18-Nov-26
Oxygen (O ₂) 21.02 % Vol	CG-0041-22	Nimt	10-Feb-27
Carbon monoxide (CO) 80.14 ppm	CG-0040-22	Nimt	14-Feb-27
Carbon monoxide (CO) 302 ppm	1915/23	Linde	16-Jun-25
Carbon monoxide (CO) 1003 ppm	2584/23	Linde	10-Sep-25
Nitrogen Dioxide (NO ₂) 30.34 ppm	2703/22	Linde	22-Aug-24
Nitrogen Dioxide (NO ₂) 80.96 ppm	3240/21	Linde	26-Jun-24
Nitrogen Dioxide (NO ₂) 201.9 ppm	1975/23	Linde	17-Jul-25
Nitric Oxide (NO) 30.01 ppm	CG-0014-23	Nimt	19-Feb-25
Nitric Oxide (NO) 151.5 ppm	0161/23	Linde	22-Jan-25
Nitric Oxide (NO) 322.5 ppm	1974/23	Linde	17-Jul-25
Sulphur Dioxide (SO ₂) 50.36 ppm	2004/23	Linde	17-Jul-25
Sulphur Dioxide (SO ₂) 100.8 ppm	3507/22	Linde	09-Nov-24
Sulphur Dioxide (SO ₂) 600.8 ppm	2003/23	Linde	17-Jul-25

Measured room conditions

Temperature : 23.3 °C Humidity : 59.1 %RH Pressure : 1012.4 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 1,200 ml/min Gas pressure : 1018.5 mbar

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.50	2.44	-0.06	0.15
O ₂ (%Vol)	10.04	9.93	-0.11	0.20
O ₂ (%Vol)	21.02	21.11	0.09	0.30
CO (ppm)	80.14	82	1.86	3.0
CO (ppm)	302	305	3	6.0
CO (ppm)	1003	1008	5	12
NO ₂ (ppm)	30.34	28.6	-1.74	8.0
NO ₂ (ppm)	80.96	81.2	0.24	8.0
NO ₂ (ppm)	201.9	202.7	0.8	12
NO (ppm)	30.01	30	-0.01	8.0
NO (ppm)	151.5	152	0.5	8.0
NO (ppm)	322.5	321	-1.5	12
SO ₂ (ppm)	50.36	51	0.64	6.0
SO ₂ (ppm)	100.8	101	0.2	6.0
SO ₂ (ppm)	600.8	599	-1.8	13

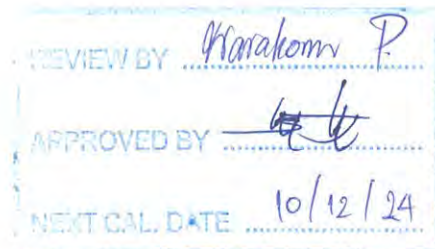
Remark : 1 cmol/mol = 1 %vol. 1 µmol/mol = 1 ppm.

End of Report

Certificate No: G 660790

Date of issue : 12-Dec-23

Instrument description : Flue Gas Analyzer
Instrument model : Testo 350 New
Control unit serial no. : 03404178/1119
Instrument serial no. : 62087398/1119
ID no. or control no. : BKK_FS1095
Manufacturer : Testo SE & Co. KGaA
Probe description : -
Probe model : -
Probe serial no. : -
Customer name : ALS LABORATORY GROUP (THAILAND) CO.,LTD.
Customer address : 104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan, Khet Suan Luang, Bangkok, 10250 Thailand
Total pages of certificate : 2 Pages
Receiving no. : L-234270
Receiving date. : 07-Dec-23
Parameter of calibration : Gas Calibration(Oxygen 2.50,10.04,21.02 %vol, Carbon Monoxide 80.14,302,1003 ppm, Nitrogen Dioxide 30.34,80.96, 201.9 ppm, Nitric Oxide 30.01, 151.5, 322.5 ppm, Sulphur Dioxide 50.36, 100.8, 600.8 ppm)
Condition of UUC. : Used
Ambient condition : All of the Measurment ware caried out the stabilized labotary
Temperature : 23 ±5 °C
Humidity : 55 ± 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210
Calibration procedure no. : This instrument was calibrated by comparison with Standard gas mixture according to calibration Work Instruction no. WI-CL-28-C



The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurent Multiplied by coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

This certificate is applied only to item under test Environmental condition.

This Calibration Certificate may not be reporduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature and seal not valid and The results relate only to the items tested/calibrated.

This calibration certificate documents are traceability to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 11-Dec-23

Kwanachai K.

Mr. Kwanchai Khamdoug

Calibration Technician

Nongluck W.

Mrs. Nongluck Wongsettee

Technical Manager

Certificate No.: G 660790

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.50 % Vol	2412/23	Linde	27-Aug-27
Oxygen (O ₂) 10.04 % Vol	CG-0153-21	Nimt	18-Nov-26
Oxygen (O ₂) 21.02 % Vol	CG-0041-22	Nimt	10-Feb-27
Carbon monoxide (CO) 80.14 ppm	CG-0040-22	Nimt	14-Feb-27
Carbon monoxide (CO) 302 ppm	1915/23	Linde	16-Jun-25
Carbon monoxide (CO) 1003 ppm	2584/23	Linde	10-Sep-25
Nitrogen Dioxide (NO ₂) 30.34 ppm	2703/22	Linde	22-Aug-24
Nitrogen Dioxide (NO ₂) 80.96 ppm	3240/21	Linde	26-Jun-24
Nitrogen Dioxide (NO ₂) 201.9 ppm	1975/23	Linde	17-Jul-25
Nitric Oxide (NO) 30.01 ppm	CG-0014-23	Nimt	19-Feb-25
Nitric Oxide (NO) 151.5 ppm	0161/23	Linde	22-Jan-25
Nitric Oxide (NO) 322.5 ppm	1974/23	Linde	17-Jul-25
Sulphur Dioxide (SO ₂) 50.36 ppm	2004/23	Linde	17-Jul-25
Sulphur Dioxide (SO ₂) 100.8 ppm	3507/22	Linde	09-Nov-24
Sulphur Dioxide (SO ₂) 600.8 ppm	2003/23	Linde	17-Jul-25

Measured room conditions

Temperature : 22.3 °C Humidity : 61.8 %RH Pressure : 1007.9 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 1,200 ml/min Gas pressure : 1018.2 mbar

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.50	2.55	0.05	0.15
O ₂ (%Vol)	10.04	10.10	0.06	0.20
O ₂ (%Vol)	21.02	21.12	0.10	0.30
CO (ppm)	80.14	79	-1.14	3.0
CO (ppm)	302	301	-1	6.0
CO (ppm)	1003	1000	-3	12
NO ₂ (ppm)	30.34	28.9	-1.44	8.0
NO ₂ (ppm)	80.96	80.1	-0.86	8.0
NO ₂ (ppm)	201.9	199.2	-2.7	12
NO (ppm)	30.01	30	-0.01	8.0
NO (ppm)	151.5	152	0.5	8.0
NO (ppm)	322.5	315	-7.5	12
SO ₂ (ppm)	50.36	51	0.64	6.0
SO ₂ (ppm)	100.8	100	-0.8	6.0
SO ₂ (ppm)	600.8	596	-4.8	13

Remark : 1 cmol/mol = 1 %vol. 1 µmol/mol = 1 ppm.

End of Report

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VACUUM GAUGE
MANUFACTURER : DWYER
MODEL / TYPE : DPGA-00
SERIAL NO. : DVG08[BKK_FS0483]
CLID. NO. : 212300280
JOB CONTROL NO. : 230211016392

REVIEW BY	<i>Nirakorn P</i>
APPROVED BY	<i>Hg</i>
NEXT CAL. DATE	14/8/24

CUSTOMER : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN RD.,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG, BANGKOK 10250, THAILAND

DATE OF RECEIVED : 11 February 2023

DATE OF ISSUED : 16 February 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Sittipong Pimdee
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
16 February 2023



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q23016392

F3-011-04/01-12

page 1 of 3



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VACUUM GAUGE
MANUFACTURER : DWYER
MODEL / TYPE : DPGA-00
SERIAL NO. : DVG08[BKK_FS0483]
DATE OF CALIBRATION : 14 February 2023

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$

Relative Humidity : $(55 \pm 10) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPPP-05** according to **DKD-R 6-1** as calibration guidelines.

The calibration was performed by direct measurement with Document Process Calibrator and Pressure Module which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Document Process Calibrator, Fluke Model 744 S/N. 9226007 with Pressure Module Model 700PV4 S/N. 19298401.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).
Certificate No. MP-0195-22, Due Date 18 November 2023.

UNCERTAINTY :

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of $k = 2$. It has been evaluated according to the "Calibration of Pressure Gauges (DKD-R 6-1)" which provides a level of confidence approximately 95%.

Certificate No. Q23016392

F3-011-04/01-12

page 2 of 3



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The DUC was exercised by applying a known pressure from its zero to full scale 1 times. Then 2 series of known gauge pressure were applied. The STD reading were recorded and the means value were reported in the table below.

CALIBRATION DATA

CORRECTION OF PRESSURE

DUC Test point (inHg)	STD Reading (inHg)		Correction (inHg)	
	Up	Down	Up	Down
0.00	0.000	0.000	0.000	0.000
-10.00	-9.961	-9.965	+0.039	+0.035
-20.00	-19.956	-19.959	+0.044	+0.041
-26.00	-25.951	-25.954	+0.049	+0.046
-27.00	-26.946	-26.948	+0.054	+0.052
-28.00	-27.939	-27.939	+0.061	+0.061

Uncertainty of measurement ± 0.007 inHg

Transmitting fluid : Air.

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 36 of 54

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q23016392

F3-011-04/01-12

page 3 of 3



@clccalibration

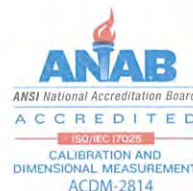


CLC
Accredited
ISO/IEC 17025

CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



Supplement to Calibration Certificate No. Q23022619A2

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VACUUM GAUGE
MANUFACTURER : DWYER
MODEL / TYPE : DPGA-00
SERIAL NO. : DVG04 [BKK_FS0437]
CLID. NO. : 212300353
JOB CONTROL NO. : 230228022619

REVIEW BY	<i>Narakorn P.</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL. DATE	1/9/24

CUSTOMER : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN RD.,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG, BANGKOK 10250, THAILAND

DATE OF RECEIVED : 28 February 2023

DATE OF ISSUED : 20 April 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Sittipong Pimdee
Calibration Engineer

[Signature]

Approved By : Mongkol Yotsoontorn
Authorized Signatory
20 April 2023



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q23022619A3

F3-012-04/01-12

page 1 of 3





CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



Supplement to Calibration Certificate No. Q23022619A2

REPORT OF CALIBRATION

FOR



NOMENCLATURE : VACUUM GAUGE
MANUFACTURER : DWYER
MODEL / TYPE : DPGA-00
SERIAL NO. : DVG04 [BKK_FS0437]
DATE OF CALIBRATION : 01 March 2023

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$

Relative Humidity : $(55 \pm 10) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPPP-05** according to **DKD-R 6-1** as calibration guidelines.

The calibration was performed by direct measurement with Document Process Calibrator and Pressure Module which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Document Process Calibrator, Fluke Model 744 S/N. 9226007 with Pressure Module Model 700PV4 S/N. 19298401.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).
Certificate No. MP-0195-22, Due Date 18 November 2023.

UNCERTAINTY :

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of $k = 2$. It has been evaluated according to the "Calibration of Pressure Gauges (DKD-R 6-1)" which provides a level of confidence approximately 95%.

Certificate No. Q23022619A3

F3-012-04/01-12

page 2 of 3





CLC
Accredited
ISO/IEC 17025

CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



21 MAR 2023

Supplement to Calibration Certificate No. Q23022619

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The DUC was exercised by applying a known pressure from its zero to full scale 1 times. Then 2 series of known gauge pressure were applied. The STD reading were recorded and the means value were reported in the table below.

CALIBRATION DATA

CORRECTION OF PRESSURE

DUC Test point (inHg)	STD Reading (inHg)		Correction (inHg)	
	Up	Down	Up	Down
0.00	0.000	0.000	0.000	0.000
-10.00	-9.883	-9.885	+0.117	+0.115
-20.00	-19.795	-19.798	+0.205	+0.202
-25.00	-24.735	-24.739	+0.265	+0.261
-26.00	-25.703	-25.706	+0.297	+0.294
-27.00	-26.674	-26.677	+0.326	+0.323
-28.00	-27.646	-27.646	+0.354	+0.354

Uncertainty of measurement ± 0.026 inHg

Transmitting fluid : Air.

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 36 of 54

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q23022619A1

F3-012-04/01-12

page 3 of 3



@clccalibration



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)
Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No. 23-67/0097

MTC.No. 23-67/0097-01

Number of Pages(S) 2

CALIBRATION CERTIFICATE

Nomenclature : "Dwyer" DIGITAL PRESSURE GAUGE

Manufactured by DWYER INSTRUMENTS, INC. U.S.A.

Model : DVGA-00

Serial No. : DVG02 ID. BKK_FS0422

Range : -30 in Hg to 0 in Hg

Resolution : 0.01 in Hg

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.

104 Phatthanakan 40, Phattanakan Rd.,

Khwaeng Phattanakan, Khet Suan Luang, Bangkok 10250, Thailand.

Calibration method : Normal

Received date : 31 October 2023

Calibration date : 3 January 2024

Standard : Reference Pressure Monitor, Serial 1950, Certificate no. 23-66/0721-05

Due Date 12 October 2024

The Standard used for the measurement is traceable to SI Unit through
Thailand Institute of Scientific and Technological Research (TISTR).

CALIBRATED BY : 

(Mr.Uthai Chaiyapat)

APPROVED BY : 

(Ms.Kirana Luanghirun)

Director

Mechanical Engineering Standards Laboratory

Ref. 20132661031043188001

Issued Date 4 January 2024

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9000
Fax. (66) 0 2577 9009
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

Office
196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Reques 23-67/0097

2 / 2

MTC.No. 23-67/0097-01

Calibration range : -28 in Hg to 0 in Hg

Calibration method : The Digital Pressure Gauge Under Calibration (UUC) was calibrated by comparison method followed DAkkS-DKD-R 6-1: Calibration of Pressure Gauge, edition 03/2014

Calibration condition : Temperature (24.5 ± 2) ° C , Relative Humidity (58 ± 10) %
Atmospheric pressure (1011 ± 10) hPa,
Local gravity (9.783003 ± 0.000050) m/s²

Measurement Data :

Gauge position : Vertical

Medium : Air

Reference level : Gauge inlet

Unit : in Hg

UUC Reading	Gauge Pressure	Error	(±) Uncertainty
0.00	0.000	0.000	0.090
-10.00	-9.962	-0.038	0.090
-20.00	-19.820	-0.180	0.090
-26.00	-25.758	-0.242	0.090
-27.00	-26.658	-0.342	0.096
-28.00	-27.747	-0.253	0.090

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

The End of Calibration Certificate



The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
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Tel. (66) 0 2577 9000
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Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-367/23
Equipment UV/Vis Spectrophotometer
Model UV-1800
Manufacturer Shimadzu
Serial No. A11454908533CD
ID No. BKK_EN0018
Date of receipt 15 September 2023
Date of calibration 15 September 2023
Date of issue 22 September 2023

REVIEW BY Sitluk P.
APPROVED BY LL AL
NEXT CAL. DATE 15/9/2024

Customer name ALS Laboratory Group (Thailand) Co., Ltd.

Address 104 Soi Phattanakan 40, Phattanakan Road, Phattanakan, Suan Luang, Bangkok 10250

Temperature (23.4 - 24.7) °C (On site)
Humidity (55.5 - 61.2) %RH (On site)

Equipment condition Good Operation

Calibration Location Organic Prep

Calibration Procedure In-house method WI-UV-702-01 based on ASTM E275-01

Traceability Wavelength Accuracy is traceable to certificate No. 95917 and 95918
Photometric Accuracy is traceable to certificate No. 95937 and 95924
Stray Light is traceable to certificate No. 95908
The above certificate are traceable to SI unit through Starna Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr.Wanchana Janloey

Approved by



Mr.Kanchit Choothep
Technical Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced
except in full, without written approval of the Bara Scientific Co., Ltd.

Certificate of Calibration

Certificate No.

BSCC-UV-367/23

Number of Page(s)

2 of 3

Calibration Results:

1.Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (\pm nm)
241.70	241.67	-0.03	0.18
334.02	334.03	0.01	0.18
418.53	418.59	0.06	0.18
572.99	573.14	0.15	0.18
879.41	879.21	-0.20	0.18

2.Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (\pm A)
235	0.0000	0.0000	0.0000	0.0075
	0.7467	0.7460	-0.0007	0.0075
257	0.0000	0.0000	0.0000	0.0075
	0.8662	0.8646	-0.0016	0.0075
313	0.0000	0.0000	0.0000	0.0075
	0.2904	0.2908	0.0004	0.0075
350	0.0000	0.0001	0.0001	0.0075
	0.6429	0.6415	-0.0014	0.0075

*CNR = Customer not request

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
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Certificate of Calibration

Certificate No. **BSCC-UV-367/23**

Number of Page(s)

3 of 3

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty ($\pm A$)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5783	0.5793	0.0010	0.0042
	0.7628	0.7624	-0.0004	0.0042
	1.0206	1.0216	0.0010	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5621	0.5625	0.0004	0.0042
	0.7455	0.7452	-0.0003	0.0042
	0.9985	0.9989	0.0004	0.0042
465.0	0.0000	0.0000	0.0000	0.0042
	0.5227	0.5229	0.0002	0.0042
	0.6880	0.6873	-0.0007	0.0042
	0.9487	0.9486	-0.0001	0.0042
546.1	0.0000	0.0000	0.0000	0.0042
	0.5207	0.5211	0.0004	0.0042
	0.6973	0.6960	-0.0013	0.0042
	0.9959	0.9944	-0.0015	0.0042
590.0	0.0000	0.0000	0.0000	0.0042
	0.5544	0.5538	-0.0006	0.0042
	0.7253	0.7236	-0.0017	0.0042
	1.0942	1.0925	-0.0017	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5616	0.5612	-0.0004	0.0042
	0.6927	0.6909	-0.0018	0.0042
	1.0881	1.0866	-0.0015	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)		
	Wavelength (nm)	Transmission (%T)	Absorbance (A)
200.96 \pm 0.11nm	200.55	0.9770	2.0104

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

*****End of Certificate*****

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd.



DRY GAS METER CALIBRATION TEST REPORT

Calibration of Date : 3 Jan 24

Next Calibration Date 3 Jul 24

Barometric Pressure (mm.Hg) : 760

Relative Humidity (%) 57.0

Temperature (°C) : 29.0

Dry Gas Meter Data

Calibration sheet No.: C-030124-BKK_FS0543

Dry Gas Meter No.: BKK_FS0543

Console Serial No.: 1509021

Model No.: XC-62-CV

Reference Dry Gas Meter Data

Reference Dry Gas Meter ID. : BKK_FS0629

Serial No. : 1607009

Correction Factor (Yr) : 1.0000

Next Calibration Date : 9 Jun 24

Reference Dry Gas Meter Calibration				Dry Gas Meter						Dry Gas Meter Correction
Vr (Liters)			Tr (°C)	Vm (Liters)			Ti (°C)	To (°C)	Avg. Tm (°C)	Factor (Y)
Final	Initial	Total		Final	Initial	Total				
30.02	0.00	30.02	30.0	29.01	0.00	29.01	30.0	30.0	30.0	1.0347
30.00	0.00	30.00	30.0	28.99	0.00	28.99	30.0	30.0	30.0	1.0349
60.00	0.00	60.00	31.0	57.86	0.00	57.86	31.0	31.0	31.0	1.0369
60.00	0.00	60.00	31.0	57.82	0.00	57.82	31.0	31.0	31.0	1.0377
90.00	0.00	90.00	31.0	87.23	0.00	87.23	32.0	32.0	32.0	1.0351
90.00	0.00	90.00	31.0	87.14	0.00	87.14	32.0	32.0	32.0	1.0362
									Avg.	1.0359

Y = Ratio of reading of reference dry gas meter to dry gas meter ; tolerance for individual ± 0.02 from average.

Calibrate by :

Approved by :

Mr. Prasert Surakhan
Field Scientist (3)

Mr. Samart Roo-ngan
Specialist (1)



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	3 Jan 24	Ambient Temperature (°C)	29
Calibration sheet No. :	C-030124-BKK_FS0543	Relative Humidity (%) :	57
Digital Temperature ID :	BKK_FS0543	Reference Temperature ID	BKK_FS1144
Serial No. :	1509021	Serial No. :	201090006013
Model :	XC-62-CV	Model :	Digicon-CC-VT-MS
		Next Calibrate :	14 Aug 24

Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Stack	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass
	100	100	0	±3	Pass
	150	150	0	±3	Pass
	200	200	0	±3	Pass
	250	248	-2	±3	Pass
	300	298	-2	±3	Pass
	500	499	-1	±3	Pass
Probe	100	100	0	±3	Pass
	120	121	1	±3	Pass
	140	141	1	±3	Pass
Oven	100	-	-	±3	-
	120	-	-	±3	-
	140	-	-	±3	-
Filter	100	100	0	±3	Pass
	120	119	-1	±3	Pass
	140	141	1	±3	Pass
Exit	0	0	0	±3	Pass
	10	9	-1	±3	Pass
	20	21	1	±3	Pass
Meter	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	49	-1	±3	Pass
AUX	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	51	1	±3	Pass

MPE : (Maximum permissible error of measurement) ค่าความผิดพลาดสูงสุดของการวัดที่ยอมรับได้

Calibrated by :

(Mr.Prasert Surakhan)

Field Scientist (3)

Approved by :

(Mr.Samart Roo-ngan)

Specialist (1)



DRY GAS METER CALIBRATION TEST REPORT

Calibration of Date : 5 Jan 24

Next Calibration Date 5 Jul 24

Barometric Pressure (mm.Hg) : 760

Relative Humidity (%) 48.0

Temperature (°C) : 30.0

Dry Gas Meter Data

Calibration sheet No.: C-050124-BKK_FS0554

Dry Gas Meter No.: BKK_FS0554

Console Serial No.: 1606011

Model No.: XC-62-CV

Reference Dry Gas Meter Data

Reference Dry Gas Meter ID. : BKK_FS0629

Serial No. : 1607009

Correction Factor (Yr) : 1.0000

Next Calibration Date : 9 Jun 24

Reference Dry Gas Meter Calibration				Dry Gas Meter						Dry Gas Meter
Vr (Liters)			Tr (°C)	Vm (Liters)			Ti (°C)	To (°C)	Avg. Tm (°C)	Correction Factor (Y)
Final	Initial	Total		Final	Initial	Total				
30.00	0.00	30.00	30.0	28.86	0.00	28.86	30.0	30.0	30.0	1.0394
30.00	0.00	30.00	30.0	28.92	0.00	28.92	30.0	30.0	30.0	1.0372
60.00	0.00	60.00	30.0	58.17	0.00	58.17	32.0	32.0	32.0	1.0384
60.00	0.00	60.00	30.0	58.38	0.00	58.38	32.0	32.0	32.0	1.0345
90.00	0.00	90.00	30.0	87.95	0.00	87.95	33.0	33.0	33.0	1.0335
90.00	0.00	90.00	30.0	88.27	0.00	88.27	33.0	33.0	33.0	1.0297
									Avg.	1.0354

Y = Ratio of reading of reference dry gas meter to dry gas meter ; tolerance for individual ± 0.02 from average.

Calibrate by :

Mr. Prasert Surakhan
Field Scientist (3)

Approved by :

Mr. Samart Roo-ngan
Specialist (1)



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	5 Jan 24	Ambient Temperature (°C)	30
Calibration sheet No. :	C-050124-BKK_FS0554	Relative Humidity (%) :	48
Digital Temperature ID :	BKK_FS0554	Reference Temperature ID	BKK_FS1144
Serial No. :	1606012	Serial No. :	201090006013
Model :	XC-62CV	Model :	Digicon-CC-VT-MS
		Next Calibrate :	14 Aug 24

Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Stack	0	0	0	±3	Pass
	25	25	0	±3	Pass
	50	50	0	±3	Pass
	100	101	1	±3	Pass
	150	151	1	±3	Pass
	200	201	1	±3	Pass
	250	252	2	±3	Pass
	300	302	2	±3	Pass
	500	502	2	±3	Pass
Probe	100	101	1	±3	Pass
	120	121	1	±3	Pass
	140	141	1	±3	Pass
Oven	100	-	-	±3	-
	120	-	-	±3	-
	140	-	-	±3	-
Filter	100	100	0	±3	Pass
	120	121	1	±3	Pass
	140	141	1	±3	Pass
Exit	0	1	1	±3	Pass
	10	11	1	±3	Pass
	20	21	1	±3	Pass
Meter	0	0	0	±3	Pass
	25	26	1	±3	Pass
	50	51	1	±3	Pass
AUX	0	0	0	±3	Pass
	25	26	1	±3	Pass
	50	51	1	±3	Pass

MPE : (Maximum permissible error of measurement) ค่าความผิดพลาดสูงสุดของการวัดที่ยอมรับได้

Calibrated by :

(Mr.Prasert Surakhan)

Field Scientist (3)

Approved by :

(Mr.Samart Roo-ngan)

Specialist (1)



DRY GAS METER CALIBRATION TEST REPORT

Calibration of Date : 4 Apr 24

Next Calibration Date 3 Oct 24

Barometric Pressure (mm.Hg) : 757

Relative Humidity (%) 35.0

Temperature (°C) : 32.0

Dry Gas Meter Data

Calibration sheet No.: C-040424-BKK_FS0424

Dry Gas Meter No.: BKK_FS0424

Console Serial No.: 5300

Model No.: XC-60B-V

Reference Dry Gas Meter Data

Reference Dry Gas Meter ID. : BKK_FS0629

Serial No. : 1607009

Correction Factor (Yr) : 1.0000

Next Calibration Date : 9 Jun 24

Reference Dry Gas Meter Calibration				Dry Gas Meter						Dry Gas Meter
Vr (Liters)			Tr (°C)	Vm (Liters)			Ti (°C)	To (°C)	Avg. Tm (°C)	Correction
Final	Initial	Total		Final	Initial	Total				Factor (Y)
90.02	0.00	90.02	33.0	11899.00	11804.00	95.00	34.0	34.0	34.0	0.9507
90.01	0.00	90.01	33.0	11996.80	11899.00	97.80	35.0	35.0	35.0	0.9264
60.01	0.00	60.01	34.0	12062.40	11997.00	65.40	38.0	38.0	38.0	0.9295
60.03	0.00	60.03	34.0	12128.60	12063.00	65.60	40.0	40.0	40.0	0.9330
30.01	0.00	30.01	36.0	12161.40	12129.00	32.40	38.0	38.0	38.0	0.9322
30.02	0.00	30.02	36.0	12194.40	12162.00	32.40	38.0	38.0	38.0	0.9325
									Avg.	0.9341

Y = Ratio of reading of reference dry gas meter to dry gas meter ; tolerance for individual ± 0.02 from average.

Calibrate by :

Mr.Apisit Sing-ha
Field Scientist (4)

Approved by :

Mr.Samart Roo-ngan
Specialist (1)



DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	4 Apr 24	Ambient Temperature (°C)	32
Calibration sheet No. :	C-040424-BKK_FS0424	Relative Humidity (%) :	35
Digital Temperature ID :	BKK_FS0424	Reference Temperature ID	BKK_FS1144
Serial No. :	6011003	Serial No. :	201090006013
Model :	XC-60B-V	Model :	Digicon-CC-VT-MS
		Next Calibrate :	14 Aug 24

Location	Reference Temperature °C	Digital Temperature °C	Error °C	MPE	Pass / Fail
Stack	0	0	0	±3	Pass
	25	24	-1	±3	Pass
	50	49	-1	±3	Pass
	100	100	0	±3	Pass
	150	150	0	±3	Pass
	200	199	-1	±3	Pass
	250	248	-2	±3	Pass
	300	299	-1	±3	Pass
	500	500	0	±3	Pass
Probe	100	100	0	±3	Pass
	120	120	0	±3	Pass
	140	140	0	±3	Pass
Oven	100	-	-	±3	-
	120	-	-	±3	-
	140	-	-	±3	-
Filter	100	100	0	±3	Pass
	120	120	0	±3	Pass
	140	140	0	±3	Pass
Exit	0	0	0	±3	Pass
	10	9	-1	±3	Pass
	20	19	-1	±3	Pass
Meter	0	0	0	±3	Pass
	25	24	-1	±3	Pass
	50	49	-1	±3	Pass
AUX	0	0	0	±3	Pass
	25	24	-1	±3	Pass
	50	49	-1	±3	Pass

MPE : (Maximum permissible error of measurement) ค่าความผิดพลาดสูงสุดของการวัดที่ยอมรับได้

Calibrated by :

(Mr.Apisit Sing-ha)

Field Scientist (4)

Approved by :

(Mr.Samart Roo-ngan)

Specialist (1)

Sartorius (Thailand) Co., Ltd.

129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310

Tel: +66 2643 8361-6, e-mail: service.thailand@sartorius.com

NSC-TISI-TIS 17025
CALIBRATION 0426**SARTORIUS**

Certificate of Calibration

REVIEW BY Kank AukAPPROVED BY Siriluk P.NEXT CAL. DATE 30/11/24Model Number : SECURA224-1SCertificate No. : 23BC10468Description : Analytical BalanceIssued Date : Friday, December 01, 2023Serial Number : 0038304165Reference No. : 223958ID No. : BKK_EN0309Manufacturer : SartoriusPage No. : 1 of 2Customer Name : ALS Laboratory Group (Thailand)Co., Ltd.104 Phatthanakan 40,Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250.Calibrated Place : Lab RoomCalibrated By : Mr.Chonchai InthanaCalibration Date : Thursday, November 30, 2023**Calibration**Procedure No. : This calibration was conducted byUsing in-house calibration procedure number (WI-003)Based on UKAS LAB 14 : 2019**Metrological data :**Capacity : 220 g Readability : 0.0001 g**Ambients Conditions:**Temperature : 21.1 °C ± 5.0 °CHumidity : 58.0 % RH ± 10.0 % RHPressure : - ± -**Reasons for calibration**☐ New Installation ☐ Service / Repaired ☒ Re-calibration/ Maintenance**Equipment Condition:** ☒ Good Operate ☐ Fair**Measurement Method UKAS Publication Ref :Lab 14**

The measurement uncertainty stated is the expended uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came form list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 5000g E2,YCS011-522-00	TCS	M2308197S	23-Aug-2025
MHB-382SD	Humidity/Barometer/Temp Lutron MHB-382SD	DKSH	C19231845	23-Aug-2024

This certificate relate and apply this equipment only.

This certificate may not be reproduced other than in full except with the prior written approval of the Verification Operation Division
Sartorius (Thailand) Co., Ltd.

Mr.chonchai Inthana(Technical Manager)

S
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Sartorius (Thailand) Co., Ltd.

129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310

Tel: +66 2643 8361-6 Fax: +66 2643-8367, e-mail: service.thailand@sartorius.com

SARTORIUS

Certificate of Calibration

Model Number : SECURA224-1S

Description : Analytical Balance

Serial Number : 0038304165

ID No. : BKK_EN0309

Manufacturer : Sartorius

Certificate No. : 23BCI0468

Issued Date : Friday, December 01, 2023

Reference No. : 223958

Page No. : 2 of 2

Calibration Results : Without Adjustment

Repeatability

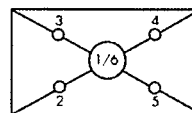
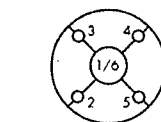
The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.

Nominal Value : (Low Load)	20.0000	199.9999
20 g	20.0000	200.0000
Tolerance	19.9999	200.0000
0.0001 g	19.9999	199.9999
	20.0000	200.0000
Nominal Value : (High Load)	19.9999	200.0000
200 g	19.9999	199.9999
Tolerance	20.0000	199.9999
0.0001 g	20.0000	199.9999
	20.0000	200.0000
Standard Deviation	0.00005	0.00005

Eccentricity (Off-center loading error)

The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R76).

Nominal value : 100 g
Tolerance 0.0004 g



Difference

1	—
2	0.0000
3	0.0000
4	-0.0001
5	-0.0001
6	-

Linearity

The linearity, also called linearity error. Describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Tolerance 0.0002 g

Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
0.01	0.0100	0.0100	0.0000	0.00014
0.05	0.0500	0.0500	0.0000	0.00014
0.1	0.1000	0.1000	0.0000	0.00014
0.5	0.5000	0.5000	0.0000	0.00014
1	1.0000	1.0000	0.0000	0.00014
2	2.0000	2.0000	0.0000	0.00014
5	5.0000	5.0000	0.0000	0.00014
10	10.0000	10.0000	0.0000	0.00014
20	20.0000	20.0000	0.0000	0.00014
200	200.0000	200.0000	0.0000	0.00029

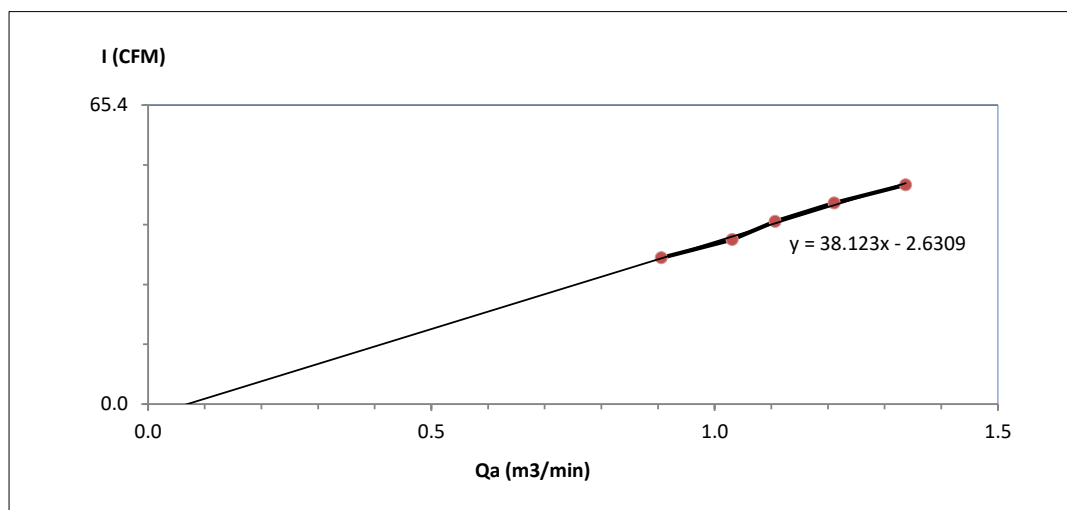
End of Report.



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	743
Calibrate Location :	วัดสามัคคีวนาราม	Temperature (°C) :	29
Calibrate Date :	22-Jan-24	High Volume ID :	NKH_FS0048
CalibrationSheet No.:	C-220124-NKH_FS0048	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	5849
Calibrator Model :	TE-5028A	Calibrator Slope :	1.00999
Calibrator S/N :	3681	Calibrator Intercept :	-0.01311

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.906	32	Slope : 38.1232 Intercept : -2.6309 Correlation Coefficient : 0.9968
2	2.6	1.031	36	
3	3.0	1.106	40	
4	3.6	1.211	44	
5	4.4	1.337	48	



Calibrated by

(Mr. Natthapon Kunasut)
Field Scientist(2)

Approved by :

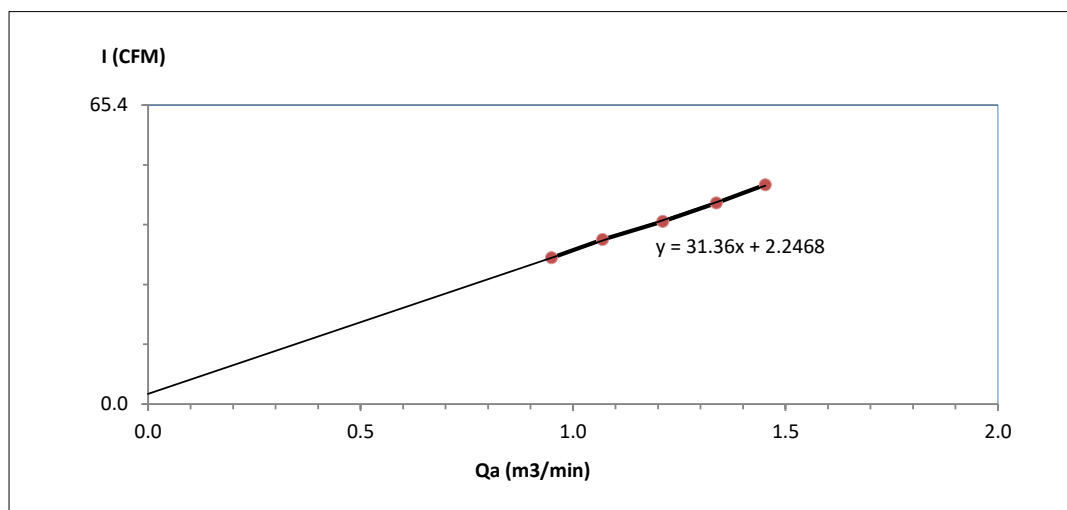
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	743
Calibrate Location :	โรงเรียนบ้านห้วยกองสี	Temperature (°C) :	29
Calibrate Date :	22-Jan-24	High Volume ID :	NKH_FS0047
CalibrationSheet No.:	C-220124-NKH_FS0047	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	5848
Calibrator Model :	TE-5028A	Calibrator Slope :	1.00999
Calibrator S/N :	3681	Calibrator Intercept :	-0.01311

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.2	0.949	32	Slope : 31.3601 Intercept : 2.2468 Correlation Coefficient : 0.9995
2	2.8	1.069	36	
3	3.6	1.211	40	
4	4.4	1.337	44	
5	5.2	1.453	48	



Calibrated by

(Mr. Natthapon Kunnasut)
Field Scientist(2)

Approved by

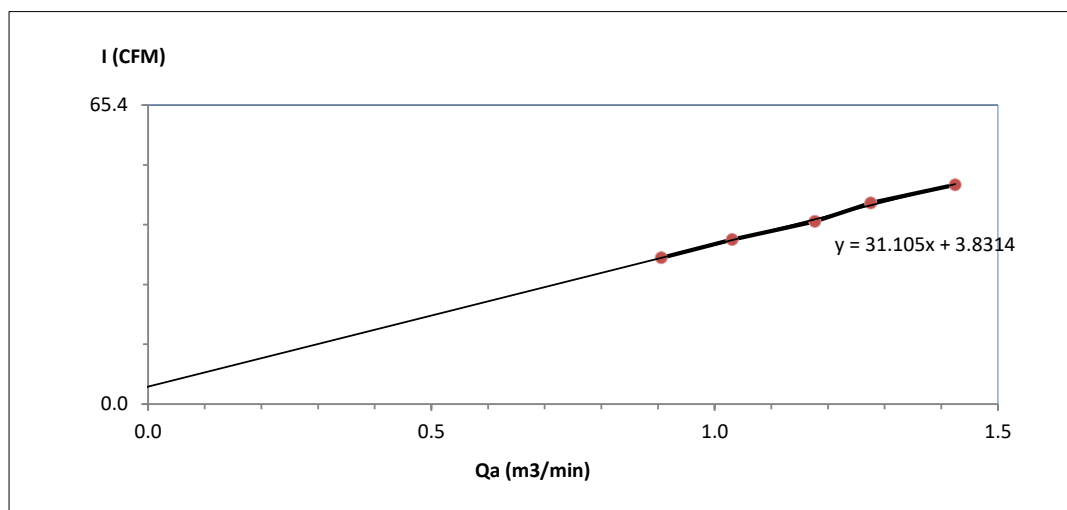
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	743
Calibrate Location :	วัดสระแก้ว	Temperature (°C) :	29
Calibrate Date :	22-Jan-24	High Volume ID :	NKH_FS0045
CalibrationSheet No.:	C-220124-NKH_FS0045	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	5846
Calibrator Model :	TE-5028A	Calibrator Slope :	1.00999
Calibrator S/N :	3681	Calibrator Intercept :	-0.01311

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.906	32	Slope : 31.1048 Intercept : 3.8314 Correlation Coefficient : 0.9985
2	2.6	1.031	36	
3	3.4	1.177	40	
4	4.0	1.276	44	
5	5.0	1.425	48	



Calibrated by

(Mr. Natthapon Kunasut)
Field Scientist(2)

Approved by :

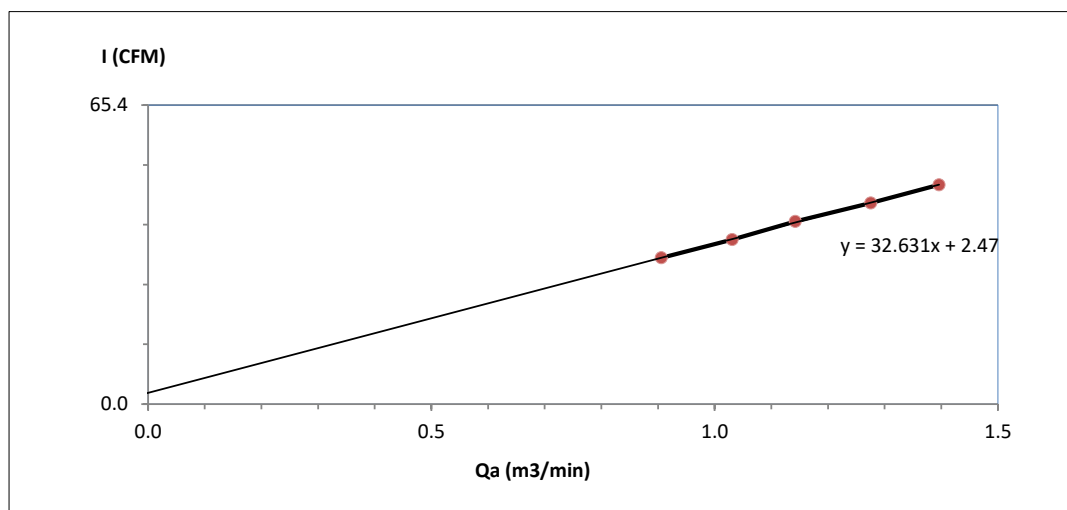
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	743
Calibrate Location :	วัดสระลำย	Temperature (°C) :	29
Calibrate Date :	22-Jan-24	High Volume ID :	NKH_FS0046
CalibrationSheet No.:	C-220124-NKH_FS0046	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	5847
Calibrator Model :	TE-5028A	Calibrator Slope :	1.00999
Calibrator S/N :	3681	Calibrator Intercept :	-0.01311

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.906	32	Slope : 32.6307 Intercept : 2.4700 Correlation Coefficient : 0.9997
2	2.6	1.031	36	
3	3.2	1.142	40	
4	4.0	1.276	44	
5	4.8	1.396	48	



Calibrated by

(Mr. Natthapon Kunnasut)
Field Scientist(2)

Approved by :

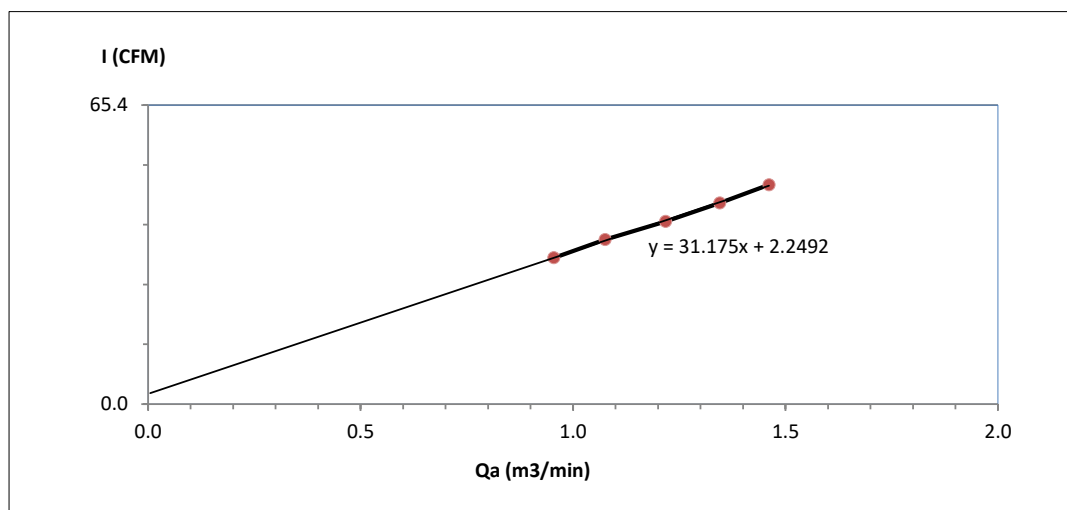
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd	Barometric Pressure (mm Hg) :	744
Calibrate Location :	ภายในตึกชายที่ล้อมรอบลานกองกาก อ้อยในแนวทิศทางลมพัดผ่านเหนือลม	Temperature (°C) :	33
Calibrate Date :	1-Feb-24	High Volume ID :	NKH_FS0047
CalibrationSheet No.:	C-010224-NKH_FS0047	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	5848
Calibrator Model :	TE-5028A	Calibrator Slope :	1.00999
Calibrator S/N :	3681	Calibrator Intercept :	-0.01311

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.2	0.955	32	Slope : 31.1754 Intercept : 2.2492 Correlation Coefficient : 0.9995
2	2.8	1.076	36	
3	3.6	1.218	40	
4	4.4	1.345	44	
5	5.2	1.461	48	



Calibrated by

(Mr. Natthapon Kunnasut)
Field Scientist(2)

Approved by :

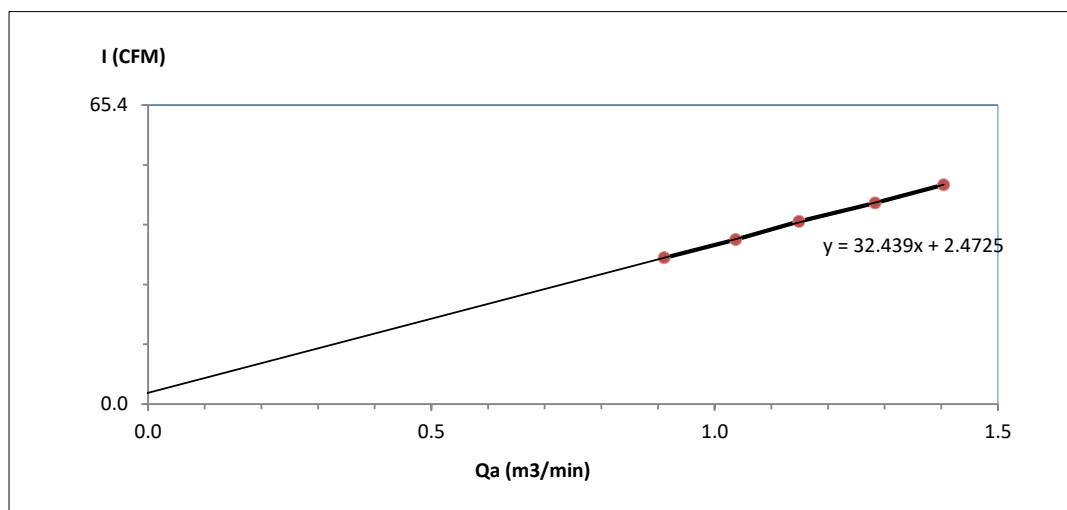
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd	Barometric Pressure (mm Hg) :	744
Calibrate Location :	ภายในตึกชายที่ล้อมรอบลานกองกาก อ้อยในแนวทิศทางลมพัดผ่านใต้ลม	Temperature (°C) :	33
Calibrate Date :	1-Feb-24	High Volume ID :	NKH_FS0046
CalibrationSheet No.:	C-010224-NKH_FS0046	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	5847
Calibrator Model :	TE-5028A	Calibrator Slope :	1.00999
Calibrator S/N :	3681	Calibrator Intercept :	-0.01311

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.911	32	Slope : 32.4385 Intercept : 2.4725 Correlation Coefficient : 0.9997
2	2.6	1.037	36	
3	3.2	1.149	40	
4	4.0	1.283	44	
5	4.8	1.404	48	



Calibrated by

(Mr. Natthapon Kunnasut)
Field Scientist(2)

Approved by :

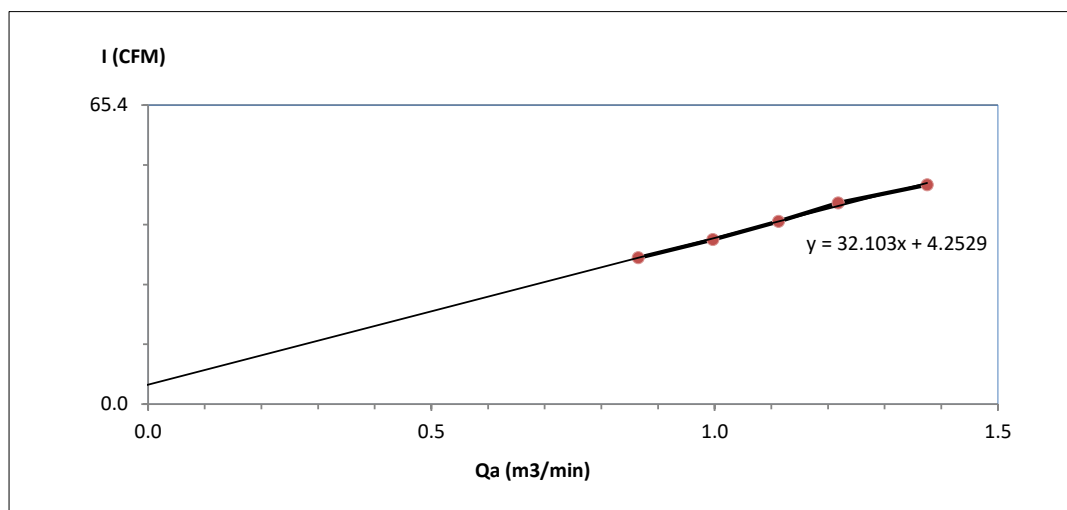
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd ภายนอกต่ายที่ล้อมรอบลานกองกาก อ้อยในแนวทิศทางลมพัดผ่านเหนือลม	Barometric Pressure (mm Hg) :	744
Calibrate Location :		Temperature (°C) :	33
Calibrate Date :	1-Feb-24	High Volume ID :	NKH_FS0048
CalibrationSheet No.:	C-010224-NKH_FS0048	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	5849
Calibrator Model :	TE-5028A	Calibrator Slope :	1.00999
Calibrator S/N :	3681	Calibrator Intercept :	-0.01311

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	1.8	0.865	32	Slope : 32.1027 Intercept : 4.2529 Correlation Coefficient : 0.9980
2	2.4	0.997	36	
3	3.0	1.113	40	
4	3.6	1.218	44	
5	4.6	1.375	48	



Calibrated by

(Mr. Natthapon Kunnasut)
Field Scientist(2)

Approved by :

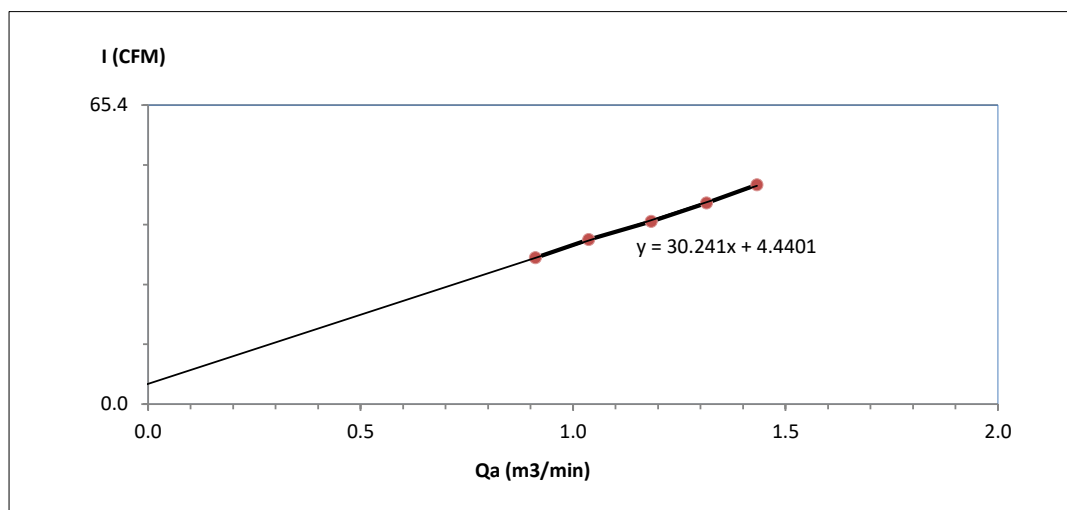
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd ภายนอกตึกสายที่ล้อมรอบลานกองกาก อ้อยในแนวทิศทางลมพัดผ่านใต้ลม	Barometric Pressure (mm Hg) :	744
Calibrate Location :		Temperature (°C) :	33
Calibrate Date :	1-Feb-24	High Volume ID :	NKH_FS0045
Calibration Sheet No.:	C-010224-NKH_FS0045	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	5846
Calibrator Model :	TE-5028A	Calibrator Slope :	1.00999
Calibrator S/N :	3681	Calibrator Intercept :	-0.01311

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.911	32	Slope : 30.2411 Intercept : 4.4401 Correlation Coefficient : 0.9994
2	2.6	1.037	36	
3	3.4	1.184	40	
4	4.2	1.314	44	
5	5.0	1.433	48	



Calibrated by

(Mr. Natthapon Kunnasut)
Field Scientist(2)

Approved by :

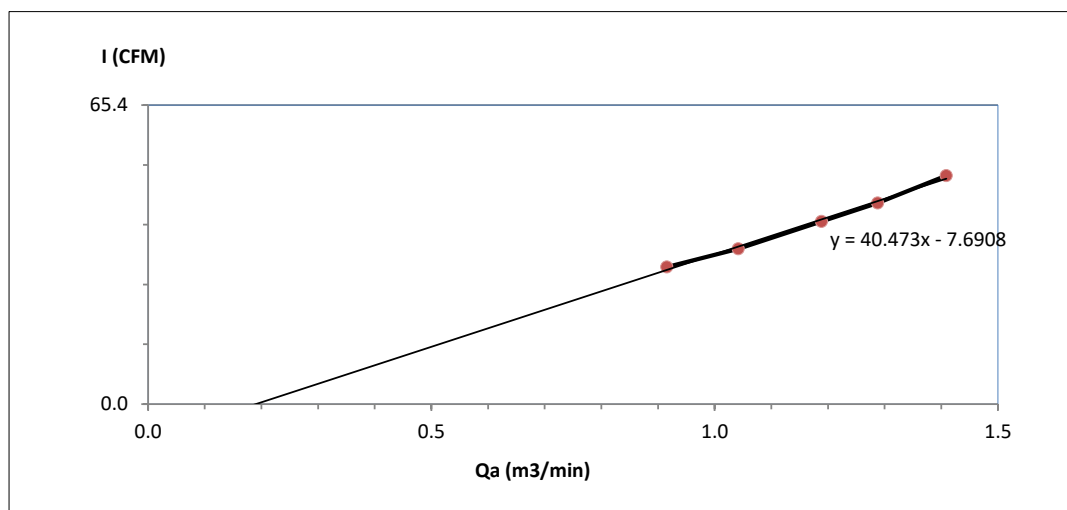
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	740.5
Calibrate Location :	วัดสามัคคีวนาราม	Temperature (°C) :	34.5
Calibrate Date :	24-May-24	High Volume ID :	NKH_FS0047
CalibrationSheet No.:	C-240524-NKH_FS0047	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	5848
Calibrator Model :	TE-5028A	Calibrator Slope :	1.01455
Calibrator S/N :	3681	Calibrator Intercept :	-0.01734

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.916	30	Slope : 40.4733 Intercept : -7.6908 Correlation Coefficient : 0.9972
2	2.6	1.042	34	
3	3.4	1.189	40	
4	4.0	1.288	44	
5	4.8	1.409	50	



Calibrated by Sangtawan N.
(Mr.Sangtawan Natasat)
Field Scientist(2)

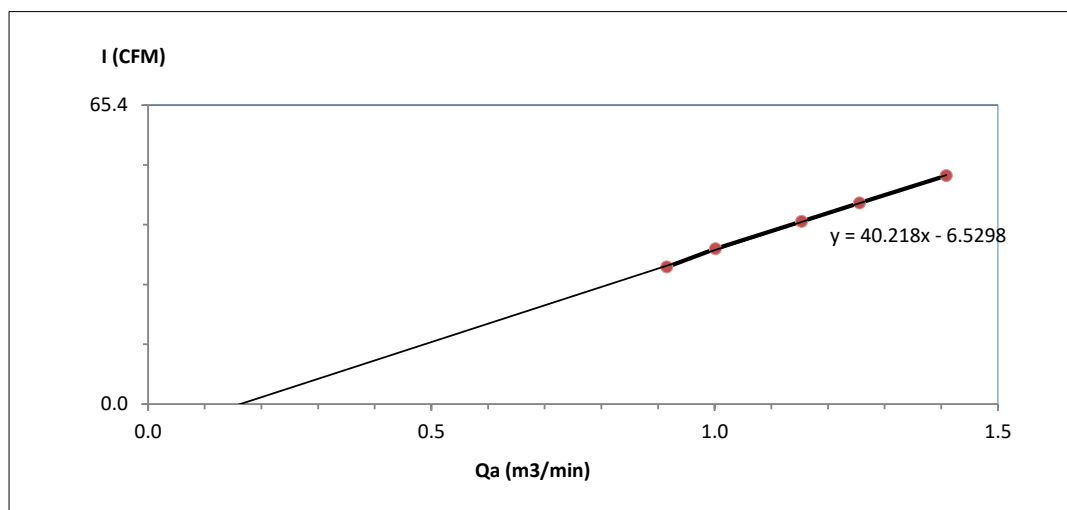
Approved by : Mr. Noppong Juntarupan
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	740.5
Calibrate Location :	โรงเรียนบ้านห้วยกองสี	Temperature (°C) :	34.5
Calibrate Date :	24-May-24	High Volume ID :	NKH_FS0045
CalibrationSheet No.:	C-240524-NKH_FS0045	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	5846
Calibrator Model :	TE-5028A	Calibrator Slope :	1.01455
Calibrator S/N :	3681	Calibrator Intercept :	-0.01734

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.916	30	Slope : 40.2184 Intercept : -6.5298 Correlation Coefficient : 0.9996
2	2.4	1.001	34	
3	3.2	1.154	40	
4	3.8	1.256	44	
5	4.8	1.409	50	



Calibrated by Sangtawan N.
(Mr.Sangtawan Natasat)
Field Scientist(2)

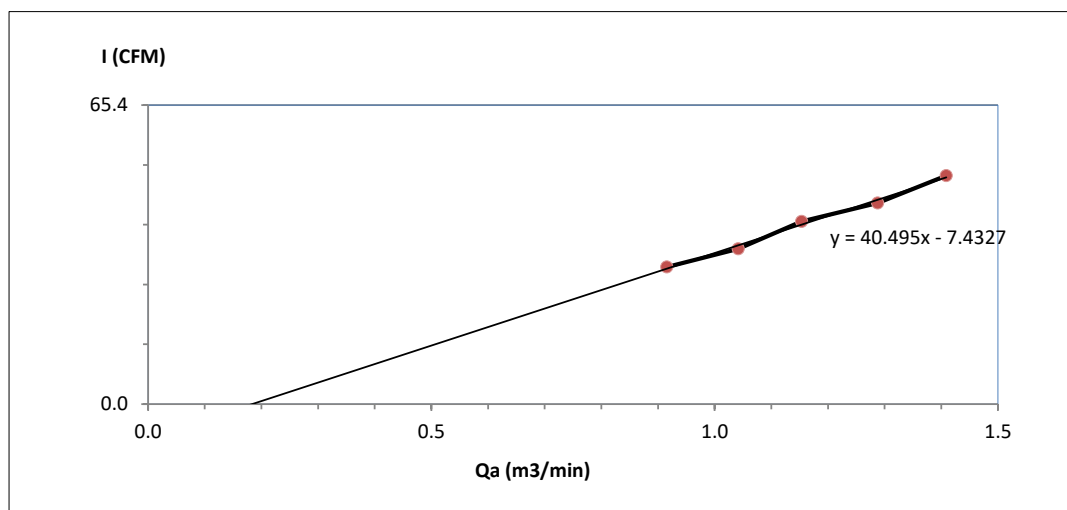
Approved by : 29. Pong
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	740.5
Calibrate Location :	วัดสระแก้ว	Temperature (°C) :	34.5
Calibrate Date :	24-May-24	High Volume ID :	NKH_FS0048
CalibrationSheet No.:	C-240524-NKH_FS0048	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	5849
Calibrator Model :	TE-5028A	Calibrator Slope :	1.01455
Calibrator S/N :	3681	Calibrator Intercept :	-0.01734

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.916	30	Slope : 40.4948 Intercept : -7.4327 Correlation Coefficient : 0.9963
2	2.6	1.042	34	
3	3.2	1.154	40	
4	4.0	1.288	44	
5	4.8	1.409	50	



Calibrated by Sangtawan N.
(Mr.Sangtawan Natasat)
Field Scientist(2)

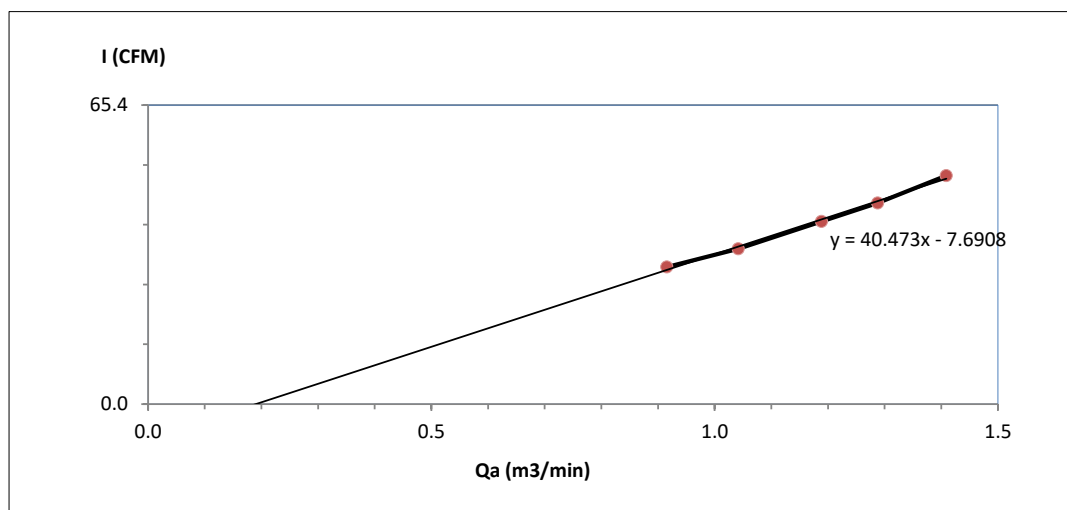
Approved by : N. Noppong Juntarupan
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	740.5
Calibrate Location :	วัดสระลำย	Temperature (°C) :	34.5
Calibrate Date :	24-May-24	High Volume ID :	NKH_FS0046
CalibrationSheet No.:	C-240524-NKH_FS0046	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	5847
Calibrator Model :	TE-5028A	Calibrator Slope :	1.01455
Calibrator S/N :	3681	Calibrator Intercept :	-0.01734

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.916	30	Slope : 40.4733 Intercept : -7.6908 Correlation Coefficient : 0.9972
2	2.6	1.042	34	
3	3.4	1.189	40	
4	4.0	1.288	44	
5	4.8	1.409	50	



Calibrated by Sangtawan N.
 (Mr.Sangtawan Natasat)
 Field Scientist(2)

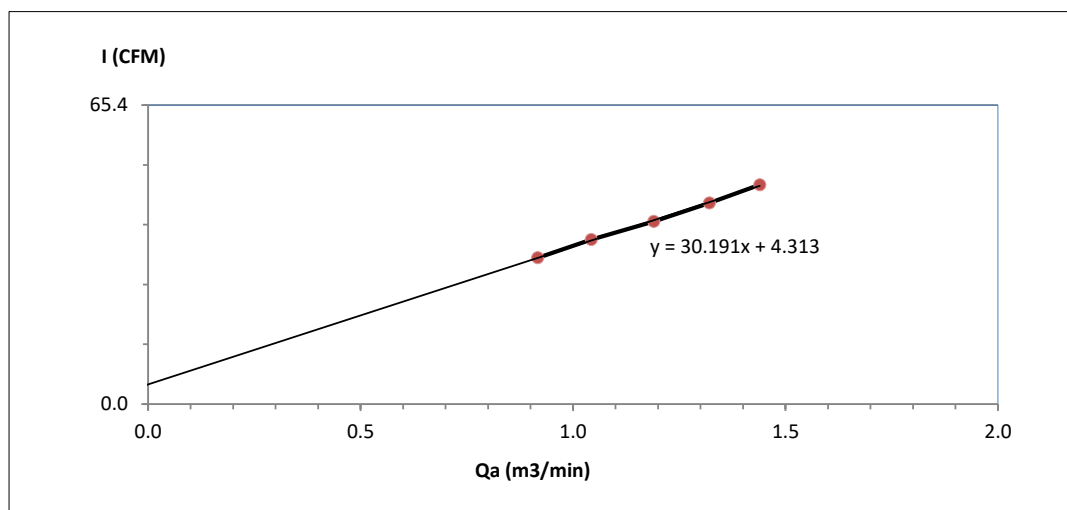
Approved by : Mr. Noppong Juntarupan
 (Mr. Noppong Juntarupan)
 Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co.,Ltd.	Barometric Pressure (mm Hg) :	738.5
Calibrate Location :	ภายในตึกชายที่ล้อมรอบลานกองกาก อ้อยในแนวทิศทางลมพัดผ่านเหนือลม	Temperature (°C) :	34.5
Calibrate Date :	28-May-24	High Volume ID :	BKK_FS0381
CalibrationSheet No.:	C-280524-BKK_FS0381	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	4161
Calibrator Model :	TE-5028A	Calibrator Slope :	1.01455
Calibrator S/N :	3681	Calibrator Intercept :	-0.01734

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.917	32	Slope : 30.1912 Intercept : 4.3130 Correlation Coefficient : 0.9994
2	2.6	1.043	36	
3	3.4	1.190	40	
4	4.2	1.321	44	
5	5.0	1.440	48	



Calibrated by

(Mr.Jessadin Kongsukdithai)
Field Scientist(2)

Approved by :

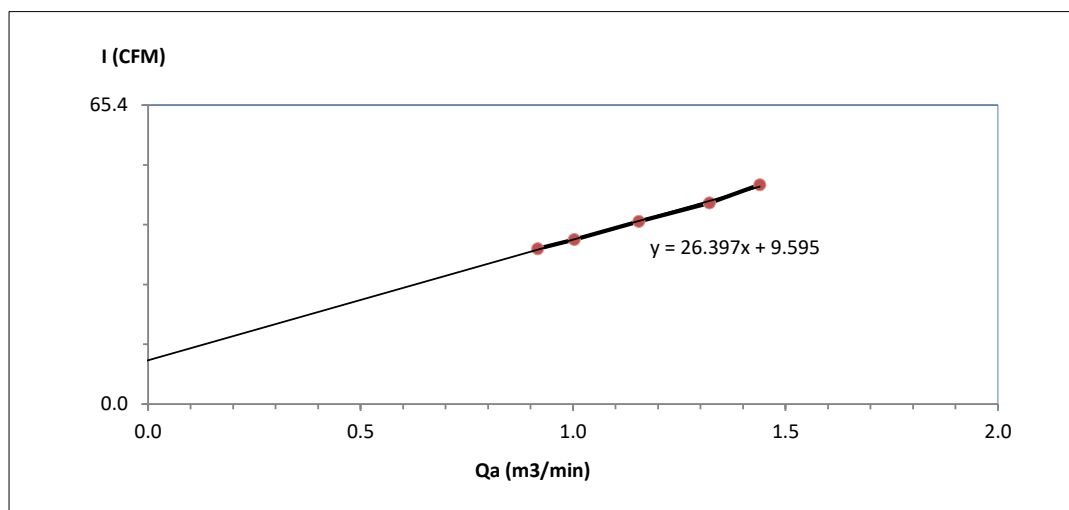
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co.,Ltd.	Barometric Pressure (mm Hg) :	738.5
Calibrate Location :	ภายในตึกชายที่ล้อมรอบลานกองกาก อ้อยในแนวทิศทางลมพัดผ่านใต้ลม	Temperature (°C) :	34.5
Calibrate Date :	28-May-24	High Volume ID :	BKK_FS0384
CalibrationSheet No.:	C-280524-BKK_FS0384	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	4788
Calibrator Model :	TE-5028A	Calibrator Slope :	1.01455
Calibrator S/N :	3681	Calibrator Intercept :	-0.01734

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.917	34	Slope : 26.3972 Intercept : 9.5950 Correlation Coefficient : 0.9984
2	2.4	1.003	36	
3	3.2	1.155	40	
4	4.2	1.321	44	
5	5.0	1.440	48	



Calibrated by

(Mr.Jessadin Kongsukdithai)
Field Scientist(2)

Approved by :

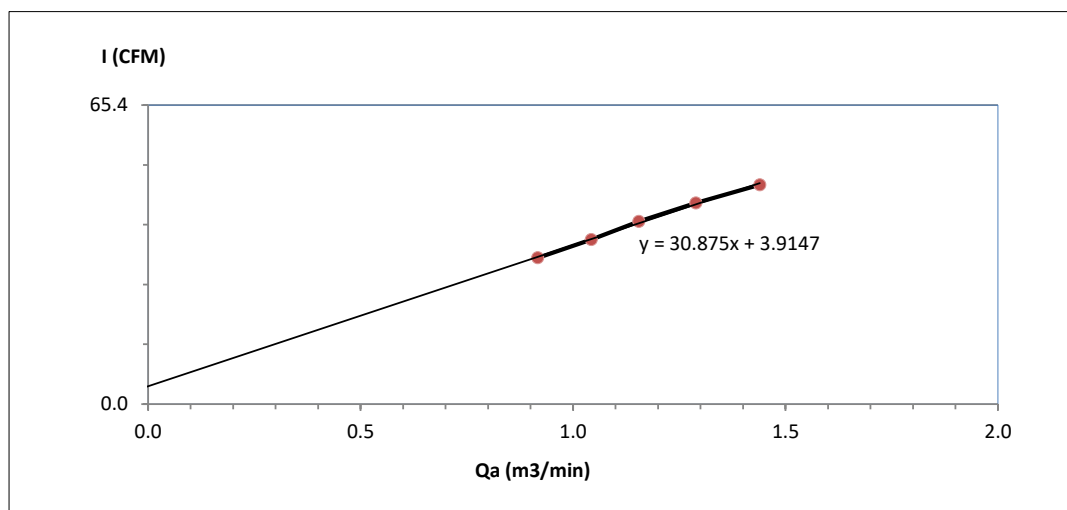
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)





High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co.,Ltd.	Barometric Pressure (mm Hg) :	738.5
Calibrate Location :	ภายนอกตึกชายที่ล้อมรอบลานกองกาก อ้อยในแนวทิศทางลมพัดผ่านเหนือลม	Temperature (°C) :	34.5
Calibrate Date :	28-May-24	High Volume ID :	BKK_FS0387
CalibrationSheet No.:	C-280524-BKK_FS0387	High Volume Model :	G1051
Calibrator ID:	NKH_FS0044	High Volume S/N :	1626
Calibrator Model :	TE-5028A	Calibrator Slope :	1.01455
Calibrator S/N :	3681	Calibrator Intercept :	-0.01734

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.917	32	Slope : 30.8752 Intercept : 3.9147 Correlation Coefficient : 0.9986
2	2.6	1.043	36	
3	3.2	1.155	40	
4	4.0	1.289	44	
5	5.0	1.440	48	



Calibrated by 
(Mr.Jessadin Kongsukdithai)
Field Scientist(2)

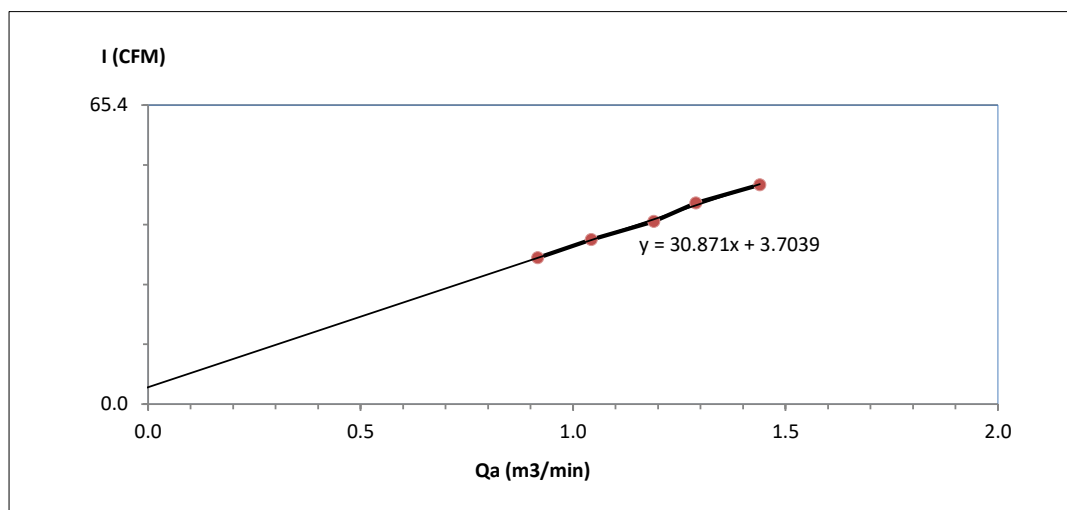
Approved by : 
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)





High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co.,Ltd.	Barometric Pressure (mm Hg) :	738.5
Calibrate Location :	ภายนอกตึกสายที่ล้อมรอบลานกองกาก อ้อยในแนวทิศทางลมพัดผ่านใต้ลม	Temperature (°C) :	34.5
Calibrate Date :	28-May-24	High Volume ID :	BKK_FS0375
CalibrationSheet No.:	C-280524-BKK_FS0375	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	5196
Calibrator Model :	TE-5028A	Calibrator Slope :	1.01455
Calibrator S/N :	3681	Calibrator Intercept :	-0.01734

Test No.	Delta H ₂ O (inch)	Qa (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.0	0.917	32	Slope : 30.8706 Intercept : 3.7039 Correlation Coefficient : 0.9985
2	2.6	1.043	36	
3	3.4	1.190	40	
4	4.0	1.289	44	
5	5.0	1.440	48	



Calibrated by 
(Mr.Jessadin Kongsukdithai)
Field Scientist(2)

Approved by : 
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)

CERTIFICATE OF CALIBRATION

Customer

Certificate no. PST-0120-23

Page no. 1 of 3

Company : ALS LABORATORY GROUP (THAILAND) CO., LTD.
Address : 104 Phatthanakan 40, Phatthanakan Road, Khwaeng Phatthanakan,
City / Province : Khet Suan Luang, Bangkok
Zip/Postal : 10250

Device

Equipment : Electronic Balance Capacity : 120 / 220 g
Manufacturer : OHAUS Readability : 0.00001 / 0.0001 g
Model : EX225D/AD ID No. : BKK_EN0403
Serial No. : C309774648

Environment Conditions

Location of Calibration : Environment Lab
Ambient Temperature : 21.9 (°C)
Relative Humidity : 61.3 (%RH)
Barometric Pressure : 1007.6 (mba)
Calibration Procedure : This Calibration was conducted by using In-House calibration procedure number CP-M-001 base on "UKAS LAB 14"
Comment :

Date of Receipt : June 8, 2023
Date of Calibration : June 8, 2023
Issue Date : June 8, 2023

Calibrated by : Mr. Kittichai Rattanatham
Calibrator

Approved by

(Mr. Kittichai Rattanatham)
Approved Signature

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%
The reported measurement result relates only to the measurand and applies only at the time of measurement.

This Certificate is issued in accordance with the conditions of accreditation granted by Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and is traceability to recognize national standards and to the unit of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval prior written approval of the calibration center, Play Solution Technology Co., Ltd

CERTIFICATE OF CALIBRATION

Result of Calibration : Without Adjustment

Certificate no. PST-0120-23

Page no. 2 of 3

1. Repeatability

Weighing Rang 1 (g)	Norminal Value (g)	Standard Deviation (g)
Max.capacity 200	50	0.000008
	200	0.000048

Weighing Rang 2 (g)	Norminal Value (g)	Standard Deviation (g)
Max.capacity		

2. Linearity, Departure of Indication from nominal value

Weighing Range 1

Norminal Value (g)	Standard Value (g)	Indication (g)	Error of Indication (g)	Expanded Uncertainty (g)	Factor k
0.01	0.01000	0.01000	-0.000001	0.000082	2.87
0.1	0.10001	0.10000	-0.000006	0.000082	2.87
0.5	0.50000	0.50000	0.000002	0.000083	2.87
1	1.00001	1.00000	-0.000007	0.000084	2.87
5	5.00002	5.00000	-0.000021	0.000078	2.52
10	9.99999	9.99997	-0.000021	0.000080	2.43
50	50.00001	49.99998	-0.000027	0.00010	2.08
100	100.00002	99.99998	-0.000036	0.00016	2.00
150	150.00002	150.0000	-0.000023	0.00023	2.00
200	200.00003	200.0000	-0.000032	0.00030	2.00

Weighing Range 2

Norminal Value (g)	Standard Value (g)	Indication (g)	Error of Indication (g)	Expanded Uncertainty (g)	Factor k

The given extended measurement uncertainty is the standard uncertainty of the measurement multiplied by cover factor ,k as per listed in table above, which corresponds to a confidene level of about 95%

CERTIFICATE OF CALIBRATION

Result of Calibration

Certificate no. PST-0120-23

Page no. 3 of 3

3. Eccentricity

Test load at least 1/3 of the maximum capacity, typically placed between 1/2 and 1/3 of the distance from the centre of the load receptor to the edge.



Weighing Range 1

Test Load : 100 (g)

Position	Indication (g)
1	99.99998
2	100.00000
3	99.99998
4	99.99997
5	99.99998
Max.Deviation	0.00000

Weighing Range 2

Test Load : (g)

Position	Indication (g)
Max.Deviation	

Standard method

The calibration was performed by using calibration laboratory's in-house calibration method : CP-M-001 based on "UKAS LAB 14 : Calibration of weighing machine" : edition 6 | October 2019

Reference standards instrument

Instrument	OIML Class	S/N	Certificate No.	Due Date
Standard Weight Set	E2	4000021952	22-128725	November 30, 2024
Standard Weight Set	-	-	-	-
Standard Weight Set	-	-	-	-
Standard Weight Set	-	-	-	-

Measurement Uncertainty

The given measurement uncertainty is the standard of the measurement multiplied by an extension factor k which corresponds to a confidence level of about 95% for a normal distribution. The standard uncertainty was calculated according to M3003

Traceability : The measurement is traceable to national standard, which realize the physical unit of measurement (SI)

- Through the reference calibration laboratory of Asia Medical and Agricultural Laboratory and Research Center Co.,Ltd

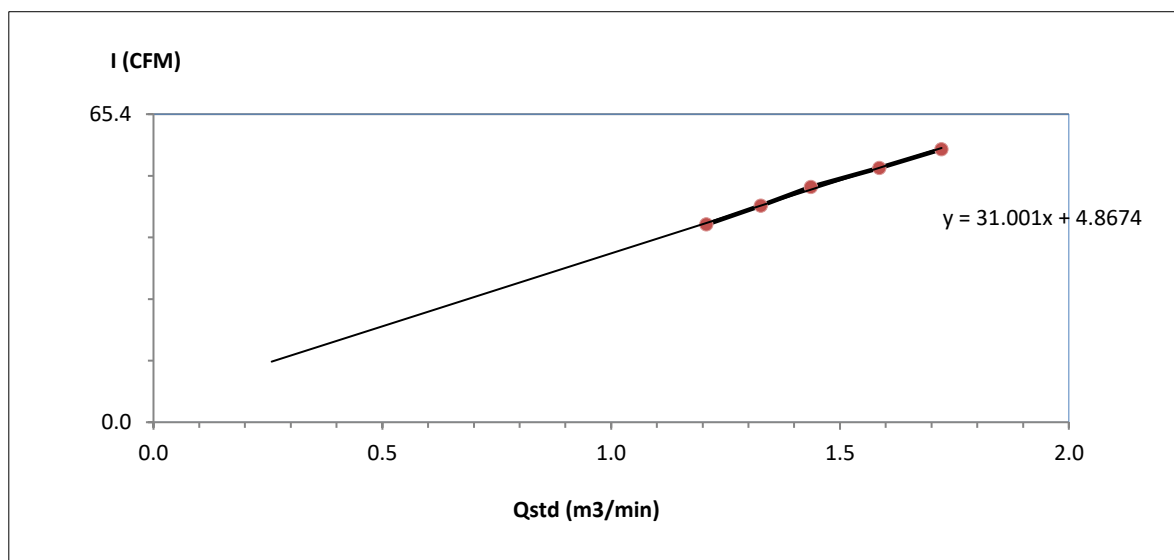
END OF REPORT



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	743
Calibrate Location :	วัดสามัคคีวนาราม	Temperature (°C) :	29
Calibrate Date :	22-Jan-24	High Volume ID :	NKH_FS0050
CalibrationSheet No.:	C-220124-NKH_FS0050	High Volume Model :	TE-5170D
Calibrator ID:	NKH_FS0044	High Volume S/N :	5853
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61252
Calibrator S/N :	3681	Calibrator Intercept :	-0.02084

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	3.8	1.2082	42	Slope : 31.0010 Intercept : 4.8674 Correlation Coefficient : 0.9983
2	4.6	1.3272	46	
3	5.4	1.4362	50	
4	6.6	1.5856	54	
5	7.8	1.7219	58	



Calibrated by _____

(Mr. Natthapon Kunasut)
Field Scientist(2)

Approved by : _____

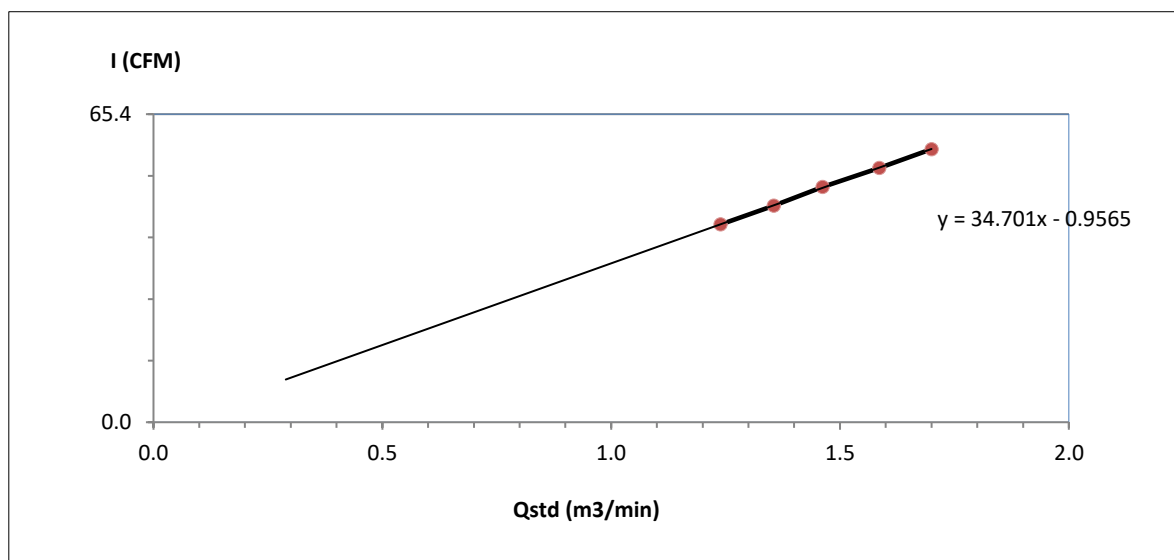
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	743
Calibrate Location :	โรงเรียนบ้านห้วยกองสี	Temperature (°C) :	29
Calibrate Date :	22-Jan-24	High Volume ID :	NKH_FS0052
CalibrationSheet No.:	C-220124-NKH_FS0052	High Volume Model :	TE-5170D
Calibrator ID:	NKH_FS0044	High Volume S/N :	5855
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61252
Calibrator S/N :	3681	Calibrator Intercept :	-0.02084

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	4.0	1.2390	42	Slope : 34.7013 Intercept : -0.9565 Correlation Coefficient : 0.9998
2	4.8	1.3553	46	
3	5.6	1.4622	50	
4	6.6	1.5856	54	
5	7.6	1.7000	58	



Calibrated by _____

(Mr. Natthapon Kunasut)
Field Scientist(2)

Approved by : _____

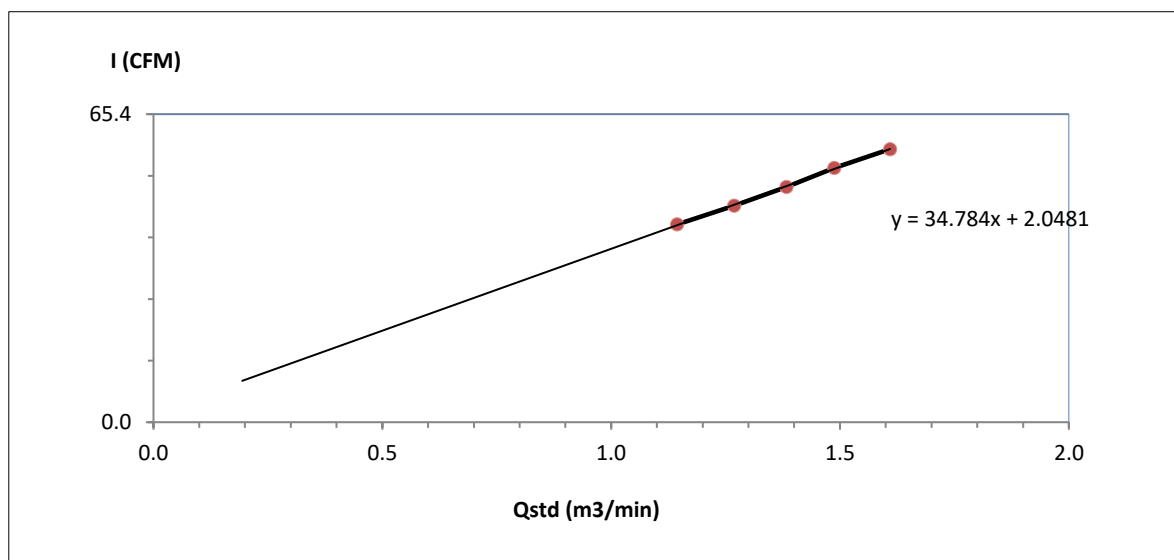
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	743
Calibrate Location :	วัดสระแก้ว	Temperature (°C) :	29
Calibrate Date :	22-Jan-24	High Volume ID :	NKH_FS0051
CalibrationSheet No.:	C-220124-NKH_FS0051	High Volume Model :	TE-5170D
Calibrator ID:	NKH_FS0044	High Volume S/N :	5854
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61252
Calibrator S/N :	3681	Calibrator Intercept :	-0.02084

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	3.4	1.1440	42	Slope : 34.7842 Intercept : 2.0481 Correlation Coefficient : 0.9996
2	4.2	1.2691	46	
3	5.0	1.3828	50	
4	5.8	1.4877	54	
5	6.8	1.6092	58	



Calibrated by _____

(Mr. Natthapon Kunasut)
Field Scientist(2)

Approved by : _____

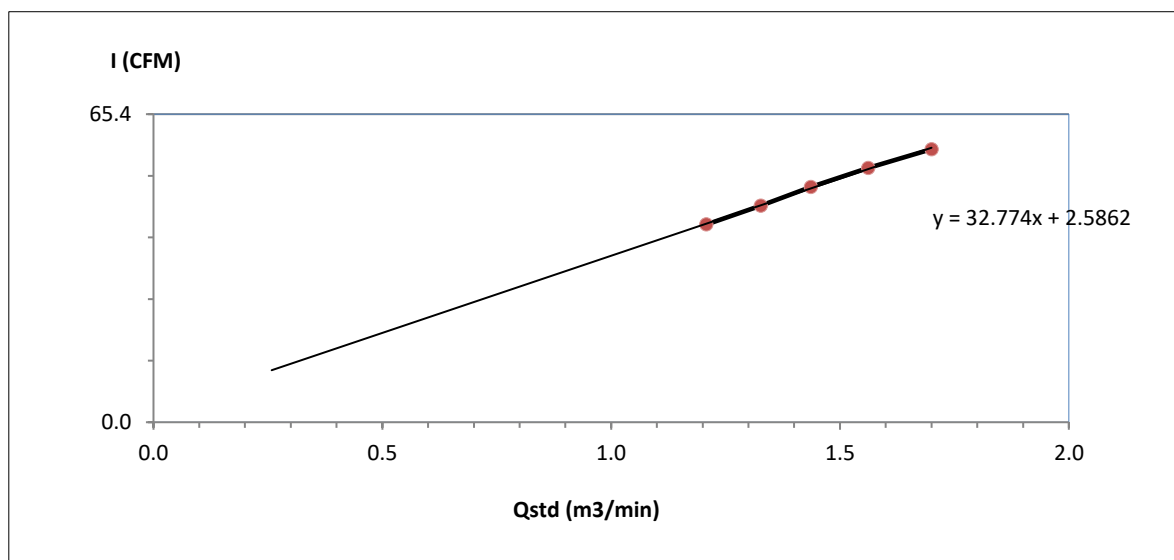
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	743
Calibrate Location :	วัดสุราลัย	Temperature (°C) :	29
Calibrate Date :	22-Jan-24	High Volume ID :	NKH_FS0049
CalibrationSheet No.:	C-220124-NKH_FS0049	High Volume Model :	TE-5170D
Calibrator ID:	NKH_FS0044	High Volume S/N :	5852
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61252
Calibrator S/N :	3681	Calibrator Intercept :	-0.02084

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	3.8	1.2082	42	Slope : 32.7744 Intercept : 2.5862 Correlation Coefficient : 0.9991
2	4.6	1.3272	46	
3	5.4	1.4362	50	
4	6.4	1.5617	54	
5	7.6	1.7000	58	



Calibrated by _____

(Mr. Natthapon Kunnasut)
Field Scientist(2)

Approved by : _____

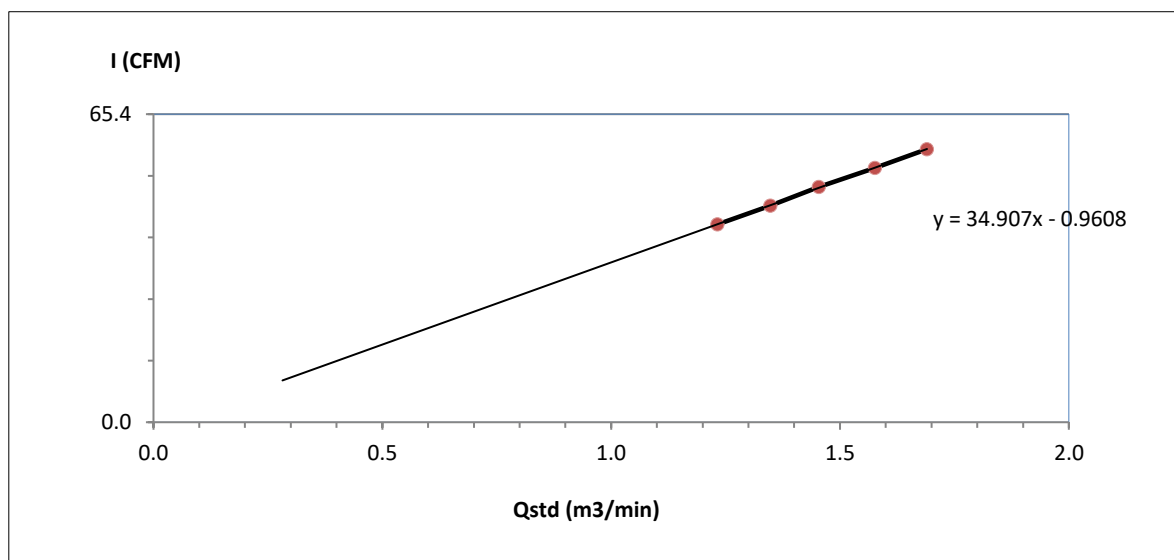
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd ภายในตาศายที่ล้อมรอบลานกองกาก อ้อยในแนวทิศทางลมพัดผ่านเหนือลม	Barometric Pressure (mm Hg) :	744
Calibrate Location :		Temperature (°C) :	33
Calibrate Date :	1-Feb-24	High Volume ID :	NKH_FS0052
CalibrationSheet No.:	C-010224-NKH_FS0052	High Volume Model :	TE-5170D
Calibrator ID:	NKH_FS0044	High Volume S/N :	5855
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61252
Calibrator S/N :	3681	Calibrator Intercept :	-0.02084

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	4.0	1.2319	42	Slope : 34.9068 Intercept : -0.9608 Correlation Coefficient : 0.9998
2	4.8	1.3474	46	
3	5.6	1.4537	50	
4	6.6	1.5764	54	
5	7.6	1.6901	58	



Calibrated by _____

(Mr. Natthapon Kunasut)
Field Scientist(2)

Approved by : _____

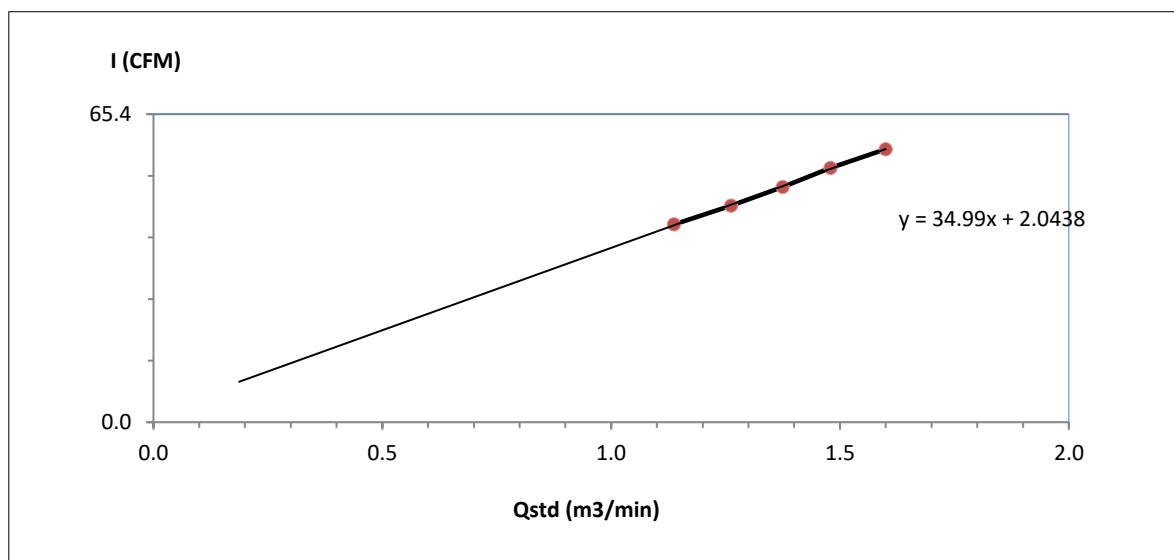
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd ภายในตาศายที่ล้อมรอบลานกองกาก อ้อยในแนวทิศทางลมพัดผ่านใต้ลม	Barometric Pressure (mm Hg) :	744
Calibrate Location :		Temperature (°C) :	33
Calibrate Date :	1-Feb-24	High Volume ID :	NKH_FS0051
CalibrationSheet No.:	C-010224-NKH_FS0051	High Volume Model :	TE-5170D
Calibrator ID:	NKH_FS0044	High Volume S/N :	5854
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61252
Calibrator S/N :	3681	Calibrator Intercept :	-0.02084

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	3.4	1.1373	42	Slope : 34.9903 Intercept : 2.0438 Correlation Coefficient : 0.9996
2	4.2	1.2618	46	
3	5.0	1.3748	50	
4	5.8	1.4791	54	
5	6.8	1.5998	58	



Calibrated by _____

(Mr. Natthapon Kunasut)
Field Scientist(2)

Approved by : _____

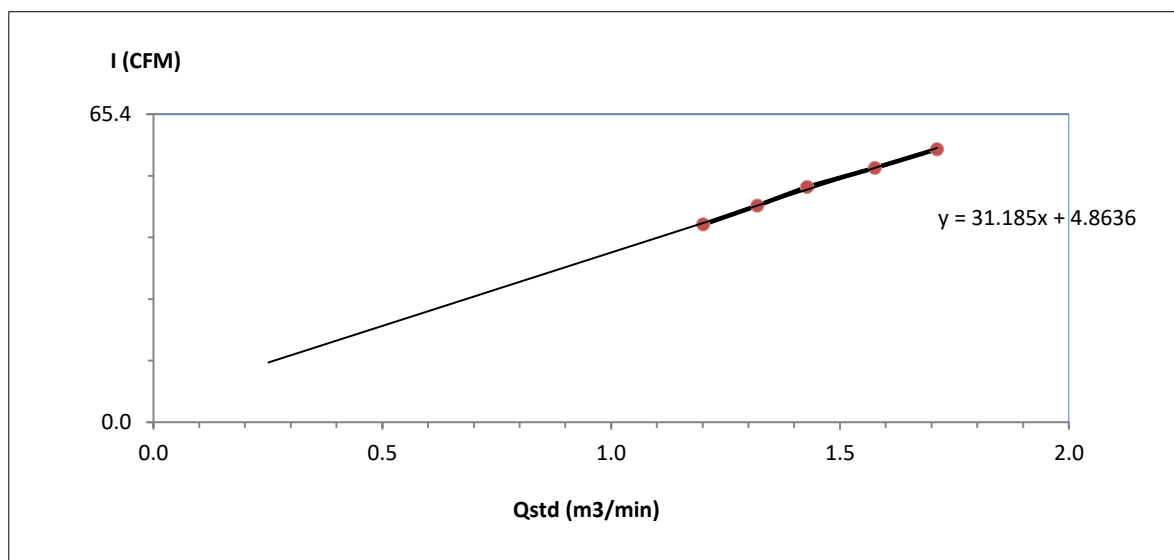
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd	Barometric Pressure (mm Hg) :	744
Calibrate Location :	ภายนอกตึกฝ่ายที่ล้อมรอบลานกองกาก อ้อยในแนวทิศทางลมพัดผ่านเหนือลม	Temperature (°C) :	33
Calibrate Date :	1-Feb-24	High Volume ID :	NKH_FS0050
CalibrationSheet No.:	C-010224-NKH_FS0050	High Volume Model :	TE-5170D
Calibrator ID:	NKH_FS0044	High Volume S/N :	5853
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61252
Calibrator S/N :	3681	Calibrator Intercept :	-0.02084

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	3.8	1.2012	42	Slope : 31.1847 Intercept : 4.8636 Correlation Coefficient : 0.9983
2	4.6	1.3195	46	
3	5.4	1.4279	50	
4	6.6	1.5764	54	
5	7.8	1.7119	58	



Calibrated by _____

(Mr. Natthapon Kunasut)
Field Scientist(2)

Approved by : _____

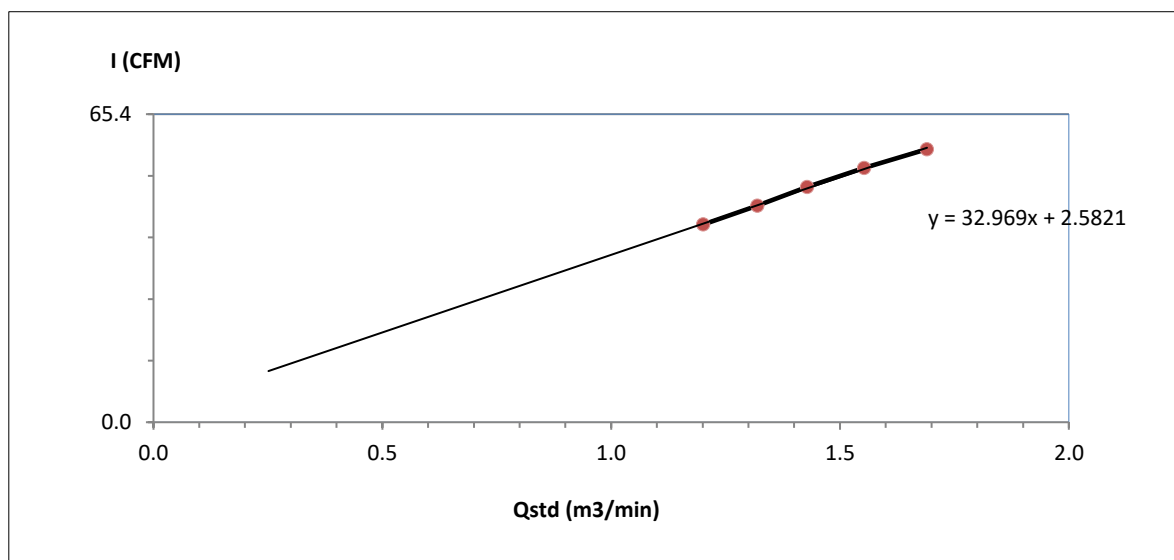
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd ภายนอกตึกสายที่ล้อมรอบลานกองกาก	Barometric Pressure (mm Hg) :	744
Calibrate Location :	อ้อยในแนวทิศทางลมพัดผ่านใต้ลม	Temperature (°C) :	33
Calibrate Date :	1-Feb-24	High Volume ID :	NKH_FS0049
CalibrationSheet No.:	C-010224-NKH_FS0049	High Volume Model :	TE-5170D
Calibrator ID:	NKH_FS0044	High Volume S/N :	5852
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61252
Calibrator S/N :	3681	Calibrator Intercept :	-0.02084

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	3.8	1.2012	42	Slope : 32.9686 Intercept : 2.5821 Correlation Coefficient : 0.9991
2	4.6	1.3195	46	
3	5.4	1.4279	50	
4	6.4	1.5527	54	
5	7.6	1.6901	58	



Calibrated by _____

(Mr. Natthapon Kunasut)
Field Scientist(2)

Approved by : _____

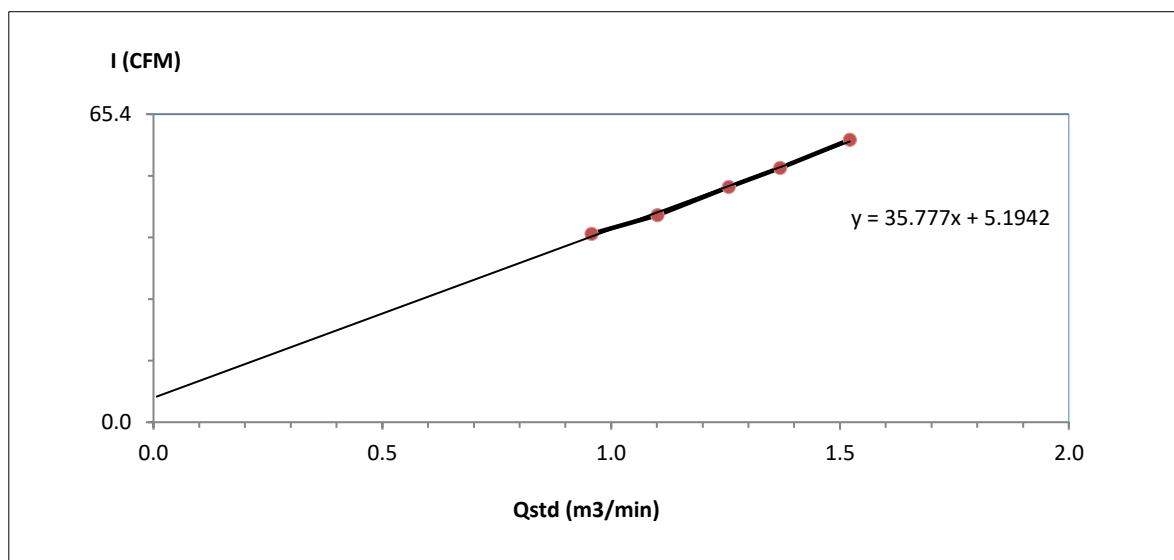
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	740.5
Calibrate Location :	วัดสามัคคีวนาราม	Temperature (°C) :	34.5
Calibrate Date :	24-May-24	High Volume ID :	NKH_FS0052
CalibrationSheet No.:	C-240524-NKH_FS0052	High Volume Model :	TE-5170D
Calibrator ID:	NKH_FS0044	High Volume S/N :	5855
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61979
Calibrator S/N :	3681	Calibrator Intercept :	-0.02778

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.4	0.9571	40	Slope : 35.7766 Intercept : 5.1942 Correlation Coefficient : 0.9983
2	3.2	1.1009	44	
3	4.2	1.2572	50	
4	5.0	1.3692	54	
5	6.2	1.5215	60	



Calibrated by Sangtawan N.
(Mr.Sangtawan Natasat)
Field Scientist(2)

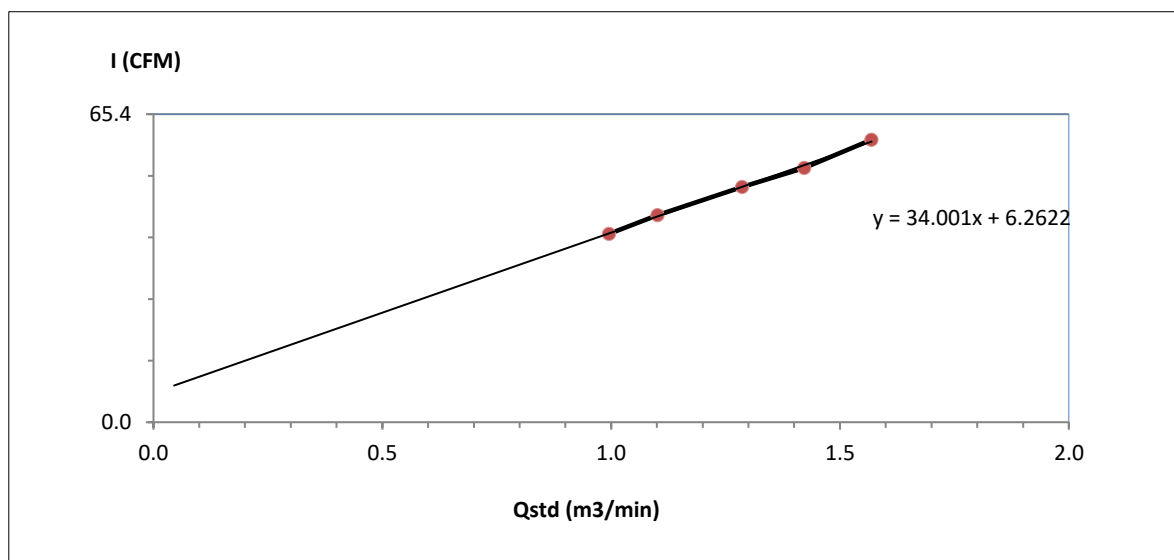
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(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	740.5
Calibrate Location :	โรงเรียนบ้านห้วยกองสี	Temperature (°C) :	34.5
Calibrate Date :	24-May-24	High Volume ID :	NKH_FS0050
CalibrationSheet No.:	C-240524-NKH_FS0050	High Volume Model :	TE-5170D
Calibrator ID:	NKH_FS0044	High Volume S/N :	5853
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61979
Calibrator S/N :	3681	Calibrator Intercept :	-0.02778

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.6	0.9951	40	Slope : 34.0014 Intercept : 6.2622 Correlation Coefficient : 0.9988
2	3.2	1.1009	44	
3	4.4	1.2861	50	
4	5.4	1.4218	54	
5	6.6	1.5690	60	



Calibrated by Sangtawan N.
(Mr.Sangtawan Natasat)
Field Scientist(2)

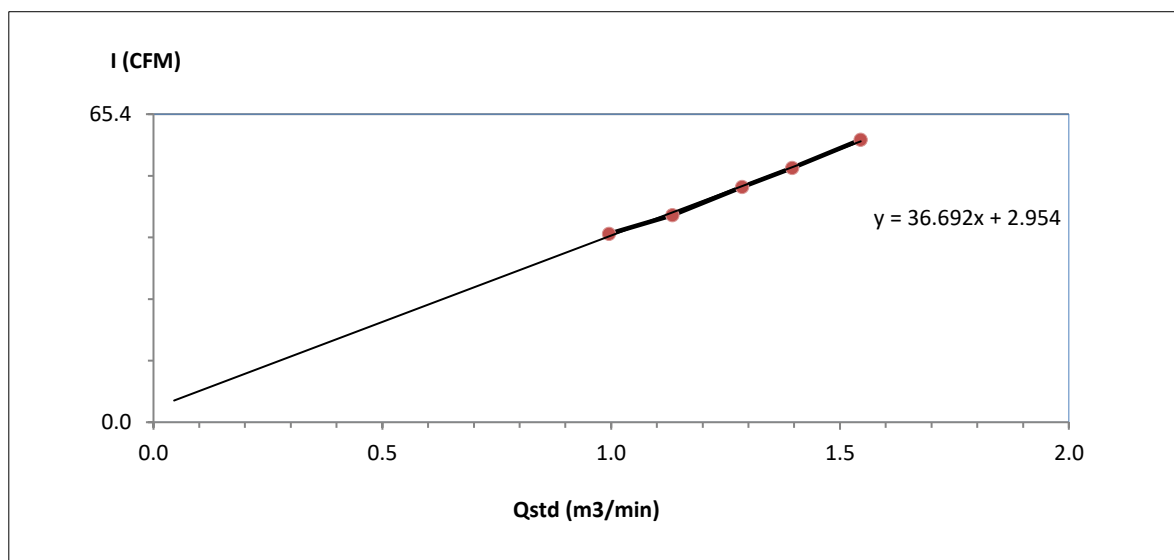
Approved by : [Signature]
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	740.5
Calibrate Location :	วัดสระแก้ว	Temperature (°C) :	34.5
Calibrate Date :	24-May-24	High Volume ID :	NKH_FS0049
CalibrationSheet No.:	C-240524-NKH_FS0049	High Volume Model :	TE-5170D
Calibrator ID:	NKH_FS0044	High Volume S/N :	5852
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61979
Calibrator S/N :	3681	Calibrator Intercept :	-0.02778

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.6	0.9951	40	Slope : 36.6923 Intercept : 2.9540 Correlation Coefficient : 0.9985
2	3.4	1.1339	44	
3	4.4	1.2861	50	
4	5.2	1.3958	54	
5	6.4	1.5454	60	



Calibrated by Sangtawan N.
(Mr.Sangtawan Natasat)
Field Scientist(2)

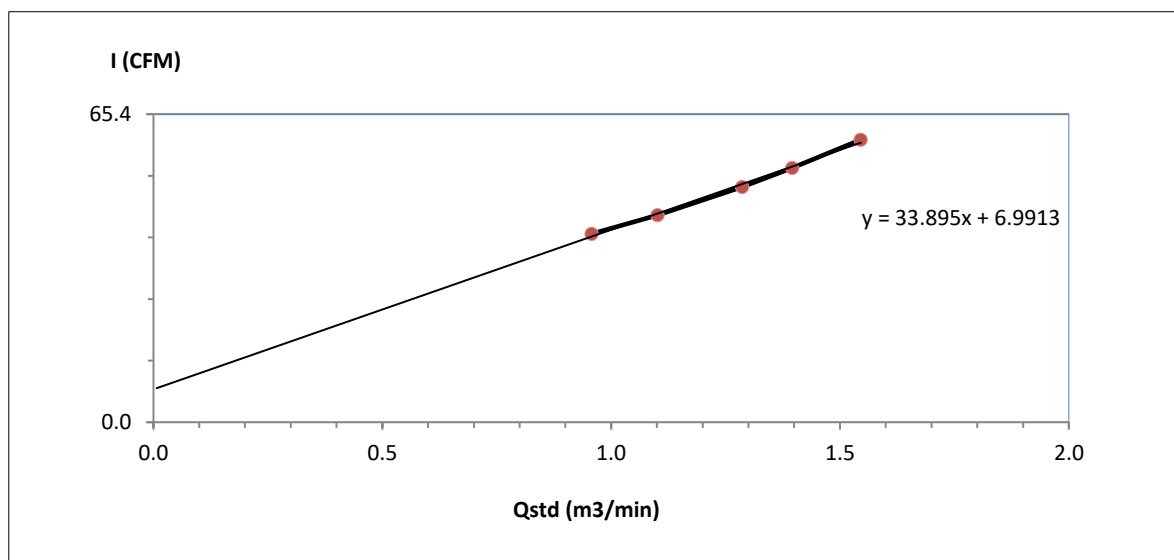
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(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co., Ltd.	Barometric Pressure (mm Hg) :	740.5
Calibrate Location :	วัดสุราลัย	Temperature (°C) :	34.5
Calibrate Date :	24-May-24	High Volume ID :	NKH_FS0051
CalibrationSheet No.:	C-240524-NKH_FS0051	High Volume Model :	TE-5170D
Calibrator ID:	NKH_FS0044	High Volume S/N :	5854
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61979
Calibrator S/N :	3681	Calibrator Intercept :	-0.02778

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	2.4	0.9571	40	Slope : 33.8950 Intercept : 6.9913 Correlation Coefficient : 0.9975
2	3.2	1.1009	44	
3	4.4	1.2861	50	
4	5.2	1.3958	54	
5	6.4	1.5454	60	



Calibrated by Sangtawan N.
(Mr.Sangtawan Natasat)
Field Scientist(2)

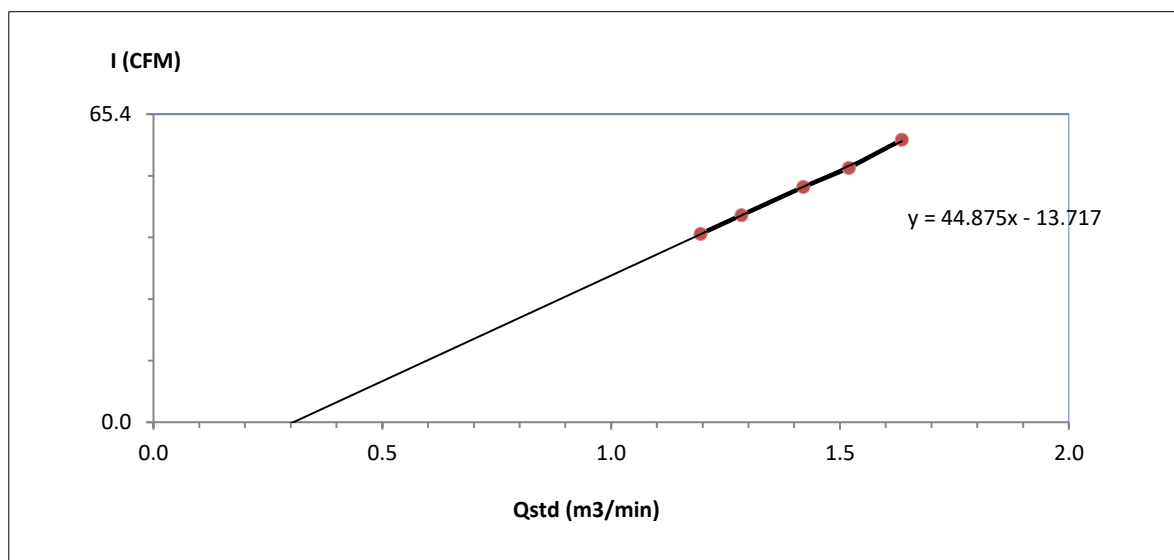
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(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)





High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co.,Ltd	Barometric Pressure (mm Hg) :	738.5
Calibrate Location :	ภายในตึกสายที่ล้อมรอบลานกองกาก อ้อยในแนวทิศทางลมพัดผ่านเหนือลม	Temperature (°C) :	34.5
Calibrate Date :	28-May-24	High Volume ID :	BKK_FS0369
CalibrationSheet No.:	C-280524-BKK_FS0369	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	4166
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61979
Calibrator S/N :	3681	Calibrator Intercept :	-0.02778

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	3.8	1.1956	40	Slope : 44.8750 Intercept : -13.7170 Correlation Coefficient : 0.9993
2	4.4	1.2844	44	
3	5.4	1.4199	50	
4	6.2	1.5195	54	
5	7.2	1.6353	60	



Calibrated by 
(Mr.Jessadin Kongsukdithai)
Field Scientist(2)

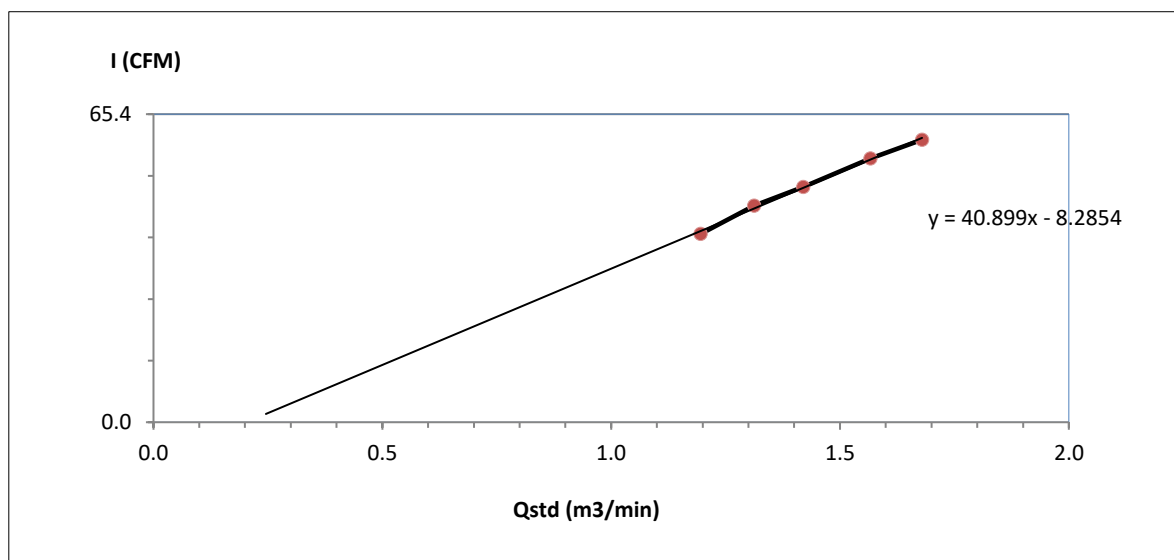
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(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)





High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co.,Ltd ภายในตาศายที่ล้อมรอบลานกองกาก อ้อยในแนวทิศทางลมพัดผ่านใต้ลม	Barometric Pressure (mm Hg) :	738.5
Calibrate Location :		Temperature (°C) :	34.5
Calibrate Date :	28-May-24	High Volume ID :	BKK_FS0358
CalibrationSheet No.:	C-280524-BKK_FS0358	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	5193
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61979
Calibrator S/N :	3681	Calibrator Intercept :	-0.02778

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	3.8	1.1956	40	Slope : 40.8988 Intercept : -8.2854 Correlation Coefficient : 0.9980
2	4.6	1.3127	46	
3	5.4	1.4199	50	
4	6.6	1.5669	56	
5	7.6	1.6794	60	



Calibrated by 
(Mr.Jessadin Kongsukdithai)
Field Scientist(2)

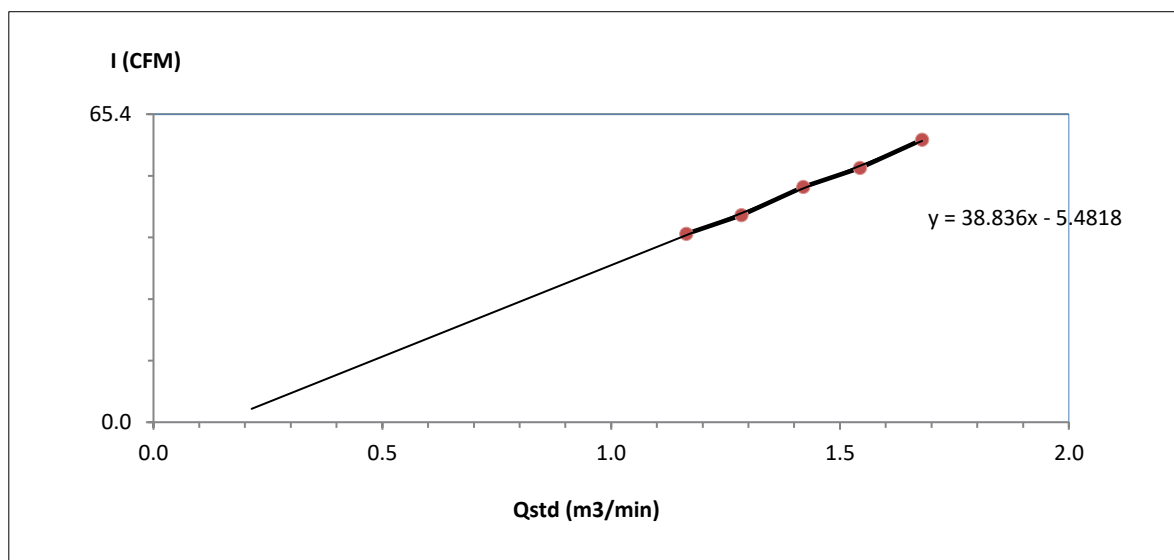
Approved by : 
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)





High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co.,Ltd	Barometric Pressure (mm Hg) :	738.5
Calibrate Location :	ภายนอกตึกสายที่ล้อมรอบลานกองกาก อ้อยในแนวทิศทางลมพัดผ่านเหนือลม	Temperature (°C) :	34.5
Calibrate Date :	28-May-24	High Volume ID :	BKK_FS0366
CalibrationSheet No.:	C-280524-BKK_FS0366	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	4156
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61979
Calibrator S/N :	3681	Calibrator Intercept :	-0.02778

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	3.6	1.1645	40	Slope : 38.8360 Intercept : -5.4818 Correlation Coefficient : 0.9988
2	4.4	1.2844	44	
3	5.4	1.4199	50	
4	6.4	1.5434	54	
5	7.6	1.6794	60	



Calibrated by 
(Mr.Jessadin Kongsukdithai)
Field Scientist(2)

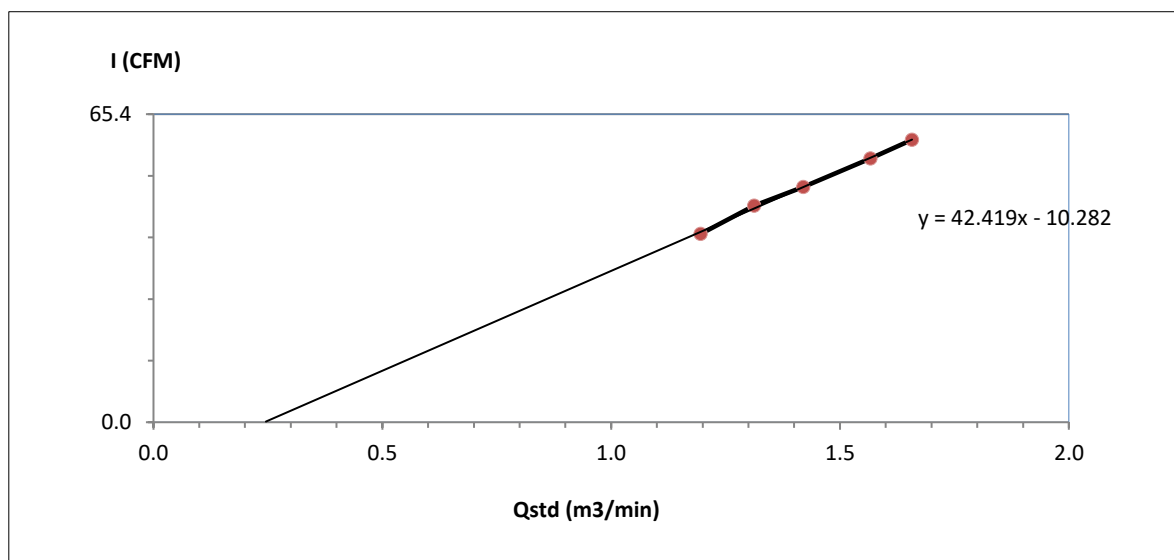
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(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)





High Volume Air Sampler Calibration Worksheet

Project Site :	Kaset Phol Power Plant Co.,Ltd	Barometric Pressure (mm Hg) :	738.5
Calibrate Location :	ภายนอกตึกสายที่ล้อมรอบลานกองกาก อ้อยในแนวทิศทางลมพัดผ่านใต้ลม	Temperature (°C) :	34.5
Calibrate Date :	28-May-24	High Volume ID :	BKK_FS1375
CalibrationSheet No.:	C-280524-BKK_FS1375	High Volume Model :	TE-5009X
Calibrator ID:	NKH_FS0044	High Volume S/N :	6256
Calibrator Model :	TE-5028A	Calibrator Slope :	1.61979
Calibrator S/N :	3681	Calibrator Intercept :	-0.02778

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I : Chart (CFM)	Linear Regression
1	3.8	1.1956	40	Slope : 42.4193 Intercept : -10.2817 Correlation Coefficient : 0.9988
2	4.6	1.3127	46	
3	5.4	1.4199	50	
4	6.6	1.5669	56	
5	7.4	1.6575	60	



Calibrated by 
(Mr.Jessadin Kongsukdithai)
Field Scientist(2)

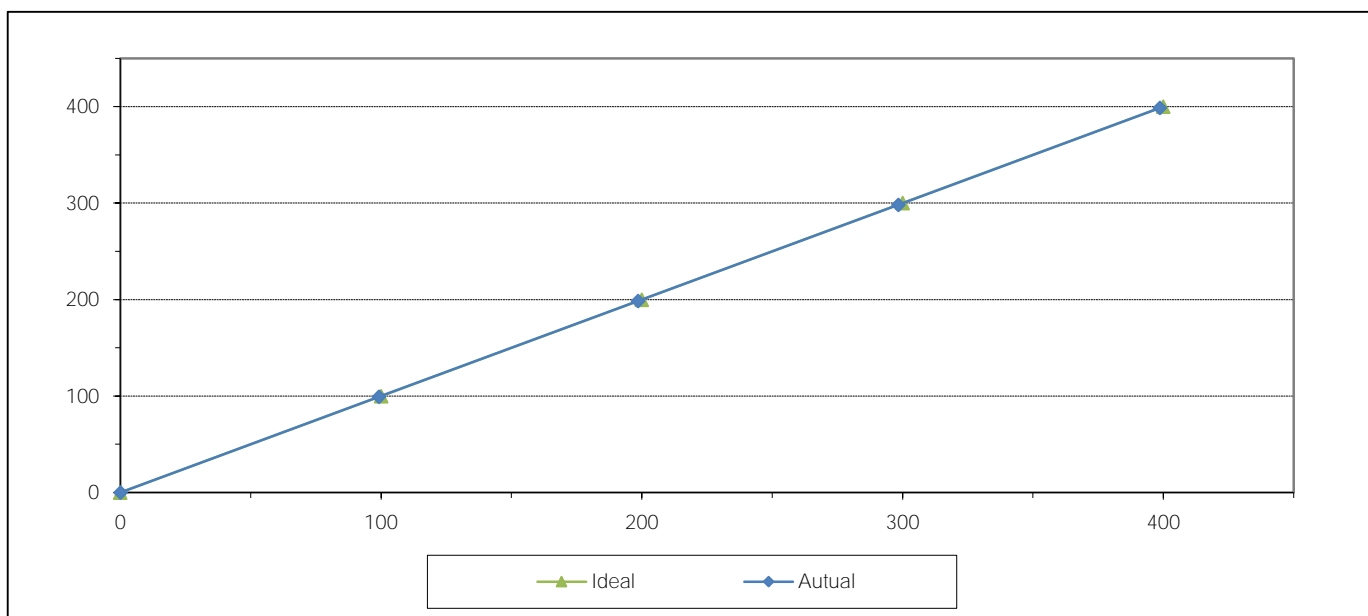
Approved by : 
(Mr. Noppong Juntarupan)
Enviro Field Coordinator Scientist (3)



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-24	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	JVU4R449	Equipment ID	NKH_FS0081
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Autual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.20	-0.80	-0.80
2	200.00	198.60	-1.40	-0.70
3	300.00	298.40	-1.60	-0.53
4	400.00	398.70	-1.30	-0.33
AVERAGE (%)				-0.45



Calibrated By

(Mr.Jirawut Sakarn)
Field Environmental Scientist (3)

Approved By

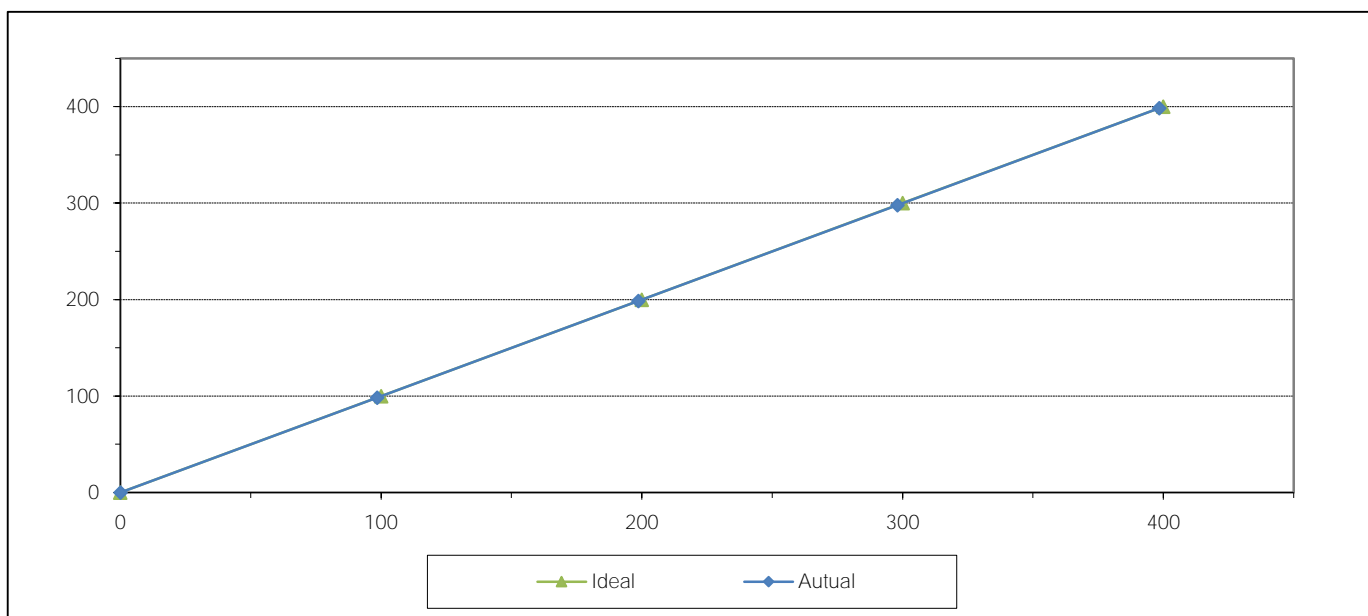
(Mr.Sarayuth Jittranont)
Assistant General Manager



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-24	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	C6GMRU6P	Equipment ID	NKH_FS0079
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Autual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.50	-1.50	-1.50
2	200.00	198.70	-1.30	-0.65
3	300.00	298.00	-2.00	-0.67
4	400.00	398.50	-1.50	-0.38
AVERAGE (%)				-0.62



Calibrated By

(Mr.Jirawut Sakarn)
Field Environmental Scientist (3)

Approved By

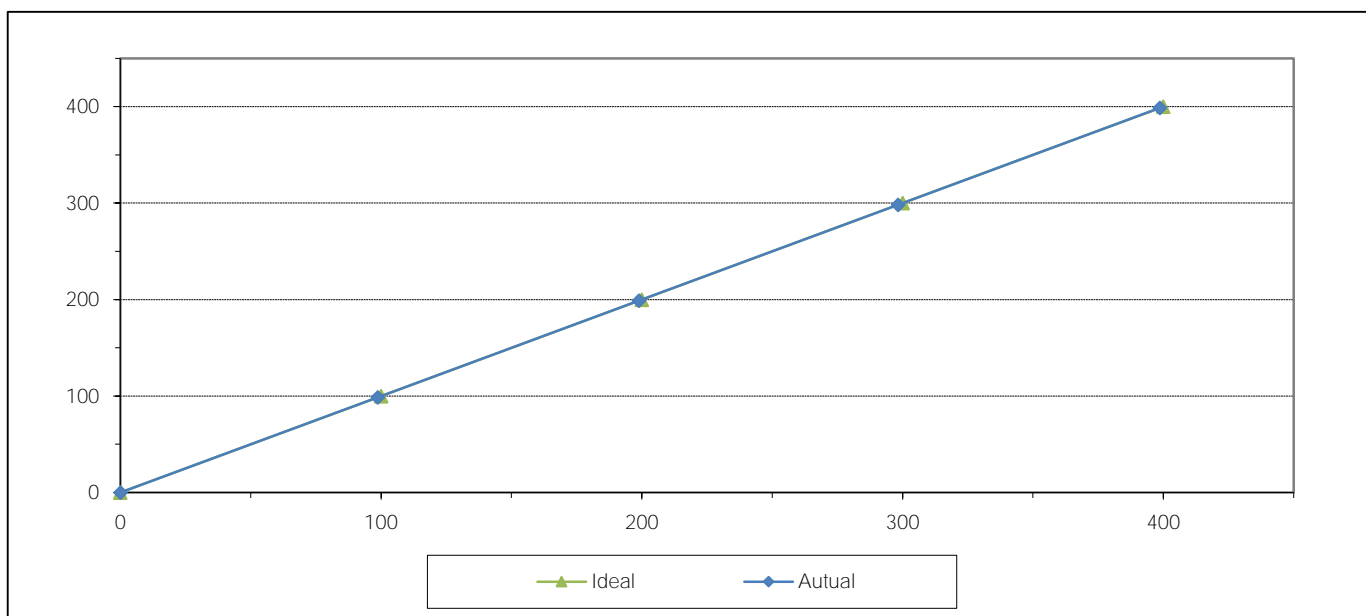
(Mr.Sarayuth Jittranont)
Assistant General Manager



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-24	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	YKKOE3MP	Equipment ID	NKH_FS0085
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Autual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.80	-1.20	-1.20
2	200.00	198.90	-1.10	-0.55
3	300.00	298.30	-1.70	-0.57
4	400.00	398.70	-1.30	-0.33
AVERAGE (%)				-0.51



Calibrated By

(Mr.Jirawut Sakarn)
Field Environmental Scientist (3)

Approved By

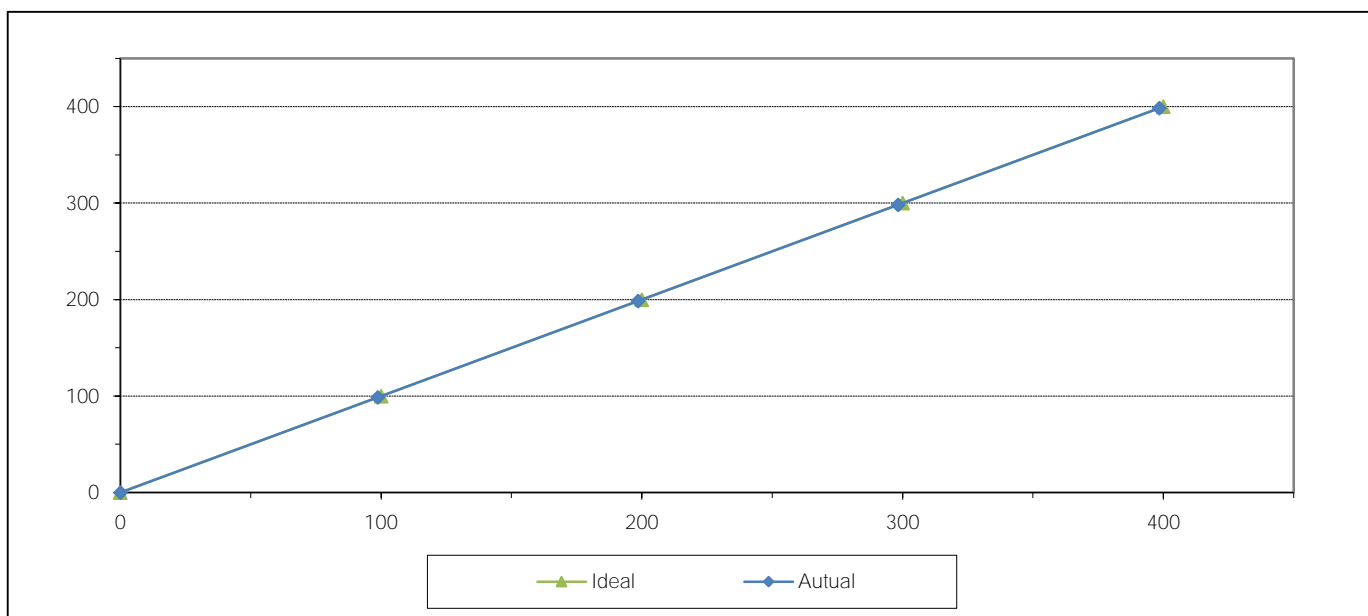
(Mr.Sarayuth Jittranont)
Assistant General Manager



MULTIPOINT CALIBRATION REPORT

Calibration Date	5-Jan-24	Equipment Name	SO2 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	SMWOLFJB	Equipment ID	NKH_FS0083
Calibrator Manufacturer	Teledyne API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN0027222
Cylinder Pressure (psi)	1800	Certified By	Airgas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	CALIBRATION RESULTS			
	Ideal	Autual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	98.80	-1.20	-1.20
2	200.00	198.60	-1.40	-0.70
3	300.00	298.30	-1.70	-0.57
4	400.00	398.50	-1.50	-0.38
AVERAGE (%)				-0.55



Calibrated By

(Mr.Jirawut Sakarn)
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jittranont)
Assistant General Manager

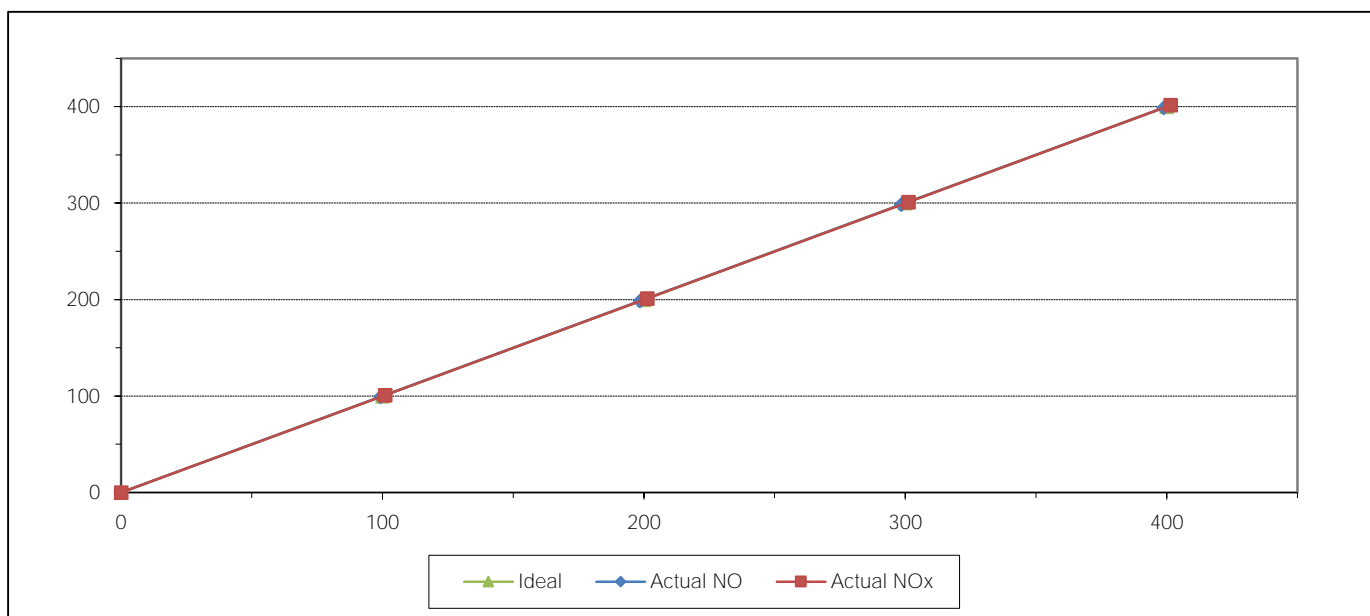


MULTIPOINT CALIBRATION REPORT

Calibration Date 5-Jan-24
Manufacturer HORIBA
Serial No. RCWXYMBS
Calibrator Manufacturer Teledyne API
Serial No. 947
Std. Gas Concentration (PPM) 55.88
Cylinder Pressure (psi) 1800
Certified Date 9-Feb-22

Equipment Name NOx Analyzer
Model APNA-370
Equipment ID NKH_FS0080
Model 700
Cylinder No. GN0027222
Certified By Airgas Inc.
Expired Date 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.30	-0.70	-0.70	101.00	1.00	1.00
2	200.00	198.50	-1.50	-0.75	201.30	1.30	0.65
3	300.00	298.50	-1.50	-0.50	301.20	1.20	0.40
4	400.00	398.80	-1.20	-0.30	401.50	1.50	0.38
AVERAGE (%)				-0.43			0.51



Calibrated By

(Mr.Jirawut Sakarn)
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jittranont)
Assistant General Manager

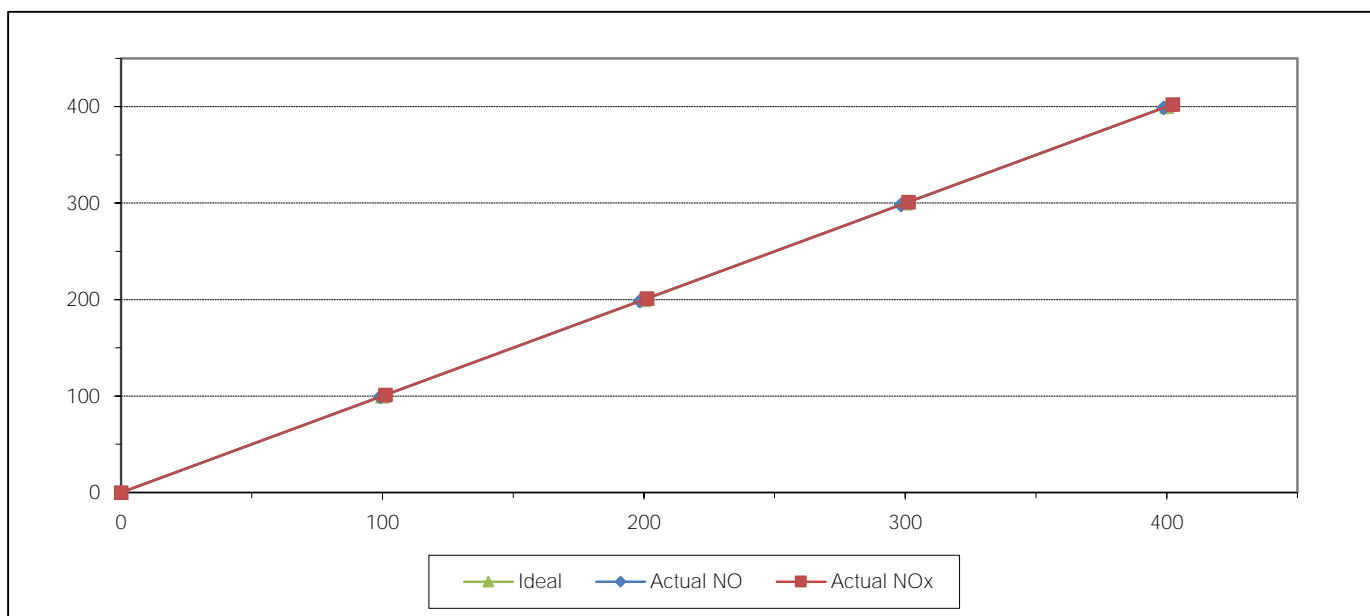


MULTIPOINT CALIBRATION REPORT

Calibration Date 5-Jan-24
Manufacturer HORIBA
Serial No. R2T8H8XTY
Calibrator Manufacturer Teledyne API
Serial No. 947
Std. Gas Concentration (PPM) 55.88
Cylinder Pressure (psi) 1800
Certified Date 9-Feb-22

Equipment Name NOx Analyzer
Model APNA-370
Equipment ID NKH_FS0078
Model 700
Cylinder No. GN0027222
Certified By Airgas Inc.
Expired Date 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.20	-0.80	-0.80	101.20	1.20	1.20
2	200.00	198.50	-1.50	-0.75	201.20	1.20	0.60
3	300.00	298.40	-1.60	-0.53	301.20	1.20	0.40
4	400.00	398.80	-1.20	-0.30	402.30	2.30	0.58
AVERAGE (%)				-0.46			0.57



Calibrated By

(Mr.Jirawut Sakarn)
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jittranont)
Assistant General Manager

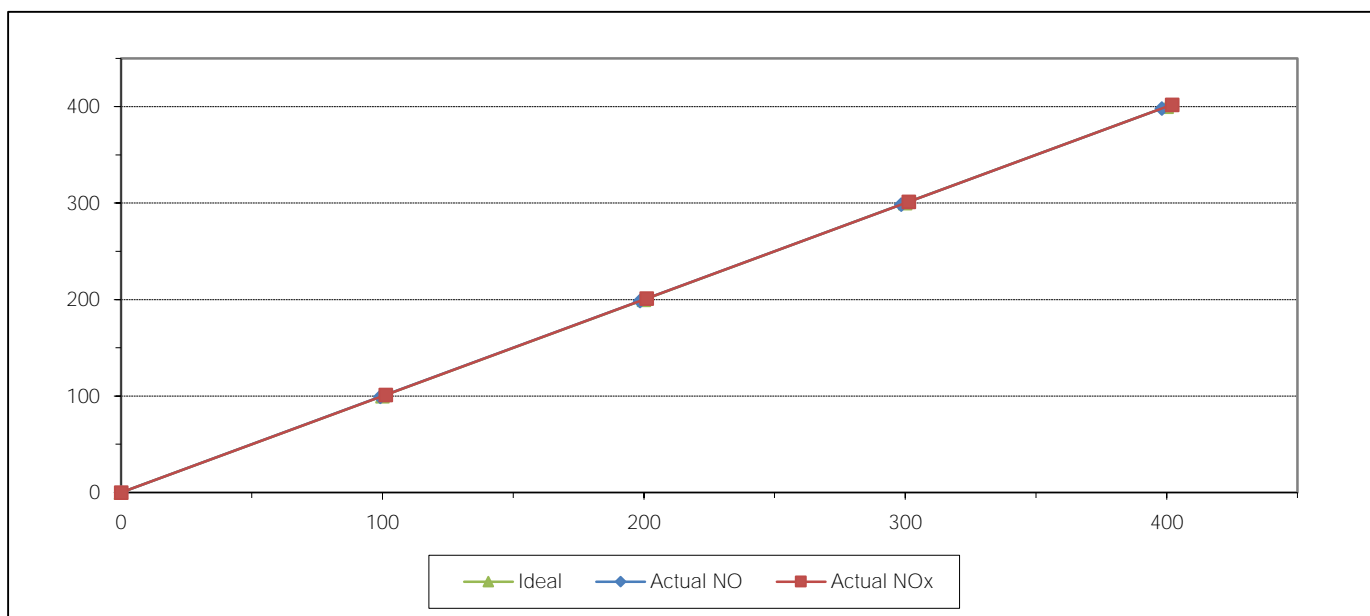


MULTIPOINT CALIBRATION REPORT

Calibration Date 5-Jan-24
Manufacturer HORIBA
Serial No. GE3G2AB
Calibrator Manufacturer Teledyne API
Serial No. 947
Std. Gas Concentration (PPM) 55.88
Cylinder Pressure (psi) 1800
Certified Date 9-Feb-22

Equipment Name NOx Analyzer
Model APNA-370
Equipment ID NKH_FS0084
Model 700
Cylinder No. GN0027222
Certified By Airgas Inc.
Expired Date 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.20	-0.80	-0.80	101.30	1.30	1.30
2	200.00	198.50	-1.50	-0.75	201.10	1.10	0.55
3	300.00	298.50	-1.50	-0.50	301.40	1.40	0.47
4	400.00	398.20	-1.80	-0.45	402.10	2.10	0.53
AVERAGE (%)				-0.48			0.59



Calibrated By

(Mr.Jirawut Sakarn)
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jittranont)
Assistant General Manager

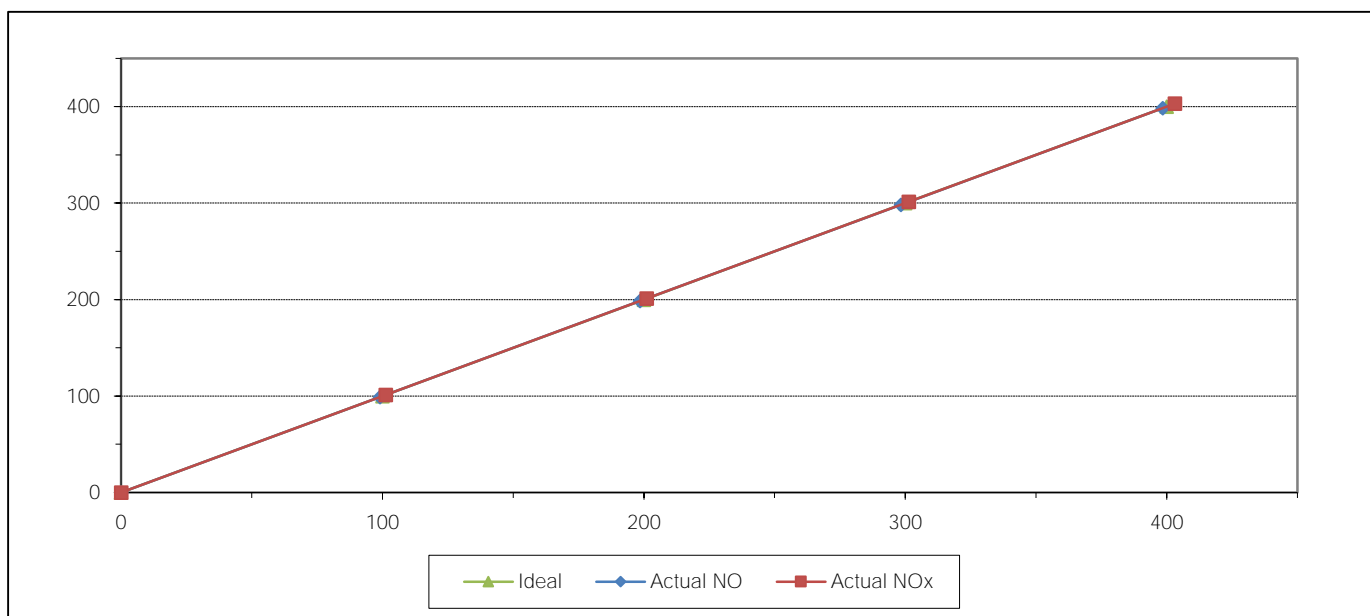


MULTIPOINT CALIBRATION REPORT

Calibration Date 5-Jan-24
Manufacturer HORIBA
Serial No. MB63MPX3
Calibrator Manufacturer Teledyne API
Serial No. 947
Std. Gas Concentration (PPM) 55.88
Cylinder Pressure (psi) 1800
Certified Date 9-Feb-22

Equipment Name NOx Analyzer
Model APNA-370
Equipment ID NKH_FS0082
Model 700
Cylinder No. GN0027222
Certified By Airgas Inc.
Expired Date 9-Feb-30

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.10	-0.90	-0.90	101.30	1.30	1.30
2	200.00	198.50	-1.50	-0.75	201.10	1.10	0.55
3	300.00	298.40	-1.60	-0.53	301.40	1.40	0.47
4	400.00	398.50	-1.50	-0.38	403.10	3.10	0.78
AVERAGE (%)				-0.49			0.64



Calibrated By

(Mr.Jirawut Sakarn)
Field Environmental Scientist (3)

Approved By

(Mr.Sarayuth Jittranont)
Assistant General Manager

Certificate Number
CL-020-65

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Cup anemometer
MANUFACTURER : Novalyx
MODEL/TYPE : Sensor: WS-02F
 Data logger: 110-WS-25DL-N
SERIAL NUMBER : Sensor: WSD-009
 Data logger: A5490
ID NUMBER : NKH_FS0055
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) co., Ltd.
 104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
 Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 15 Dec 2022
MEASUREMENT DATE : 20 Dec 2022
ISSUE DATE : 22 Dec 2022

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010 ± 10	hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS	: Wind tunnel cross-section area ¹	900	cm ²
	Win direction frontal area ²	100	cm ²
	Diameter of mounting pipe ³	-	mm
	Blockage ratio of test object ⁴	0.111	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.9) °C, (44.2) %RH and (1014.2) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

25/05
 Mr. Parinya Booncharoen
 Calibration Department Manager

Remark:

¹ Nozzle cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio ² to ¹

MEASUREMENT RESULTS ⁵

The cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer and above 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 40 mm and 300 mm respectively away from wind tunnel nozzle, UUC was installed at center of the test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

v_{std} ⁶ (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	v_{uuc} ⁷ (m/s)	Error (m/s)	$U (k=2)$ (m/s)
0.993	23.90	23.90	0.8	-0.2	0.15
2.041	23.98	23.90	1.8	-0.2	0.16
3.060	23.76	23.90	2.9	-0.1	0.17
4.146	23.90	23.90	3.9	-0.2	0.20
5.03	23.70	23.90	4.9	-0.2	0.17
6.01	24.00	23.90	5.9	-0.2	0.18
7.05	23.54	23.90	6.9	-0.1	0.18
8.16	23.90	23.90	8.0	-0.2	0.19
9.11	23.50	23.90	9.0	-0.1	0.19
10.09	24.00	23.90	10.0	-0.1	0.23
11.17	23.56	23.90	11.0	-0.1	0.20
12.15	23.94	23.90	12.0	-0.1	0.21
13.20	23.70	23.90	13.1	-0.1	0.25
14.27	23.82	23.90	14.0	-0.2	0.23
15.26	23.70	23.90	15.1	-0.2	0.27
16.30	23.76	23.90	16.0	-0.3	0.23

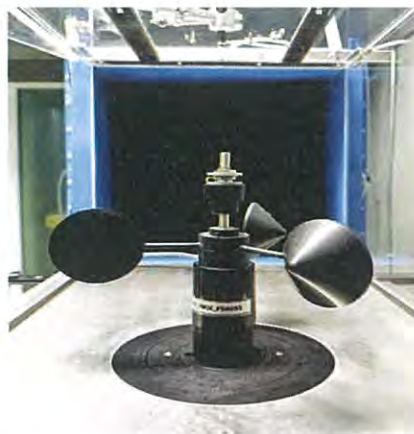
Remark:

⁵ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

⁶ Velocity of standard

⁷ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to imaging geometry.

Certificate Number

CL-020-65

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-N
SERIAL NUMBER : Sensor: WSD-009
Data logger: A5490
ID NUMBER : NKH_FS0055
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 15 Dec 2022
MEASUREMENT DATE : 20 Dec 2022
ISSUE DATE : 22 Dec 2022

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010 ± 10	hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION	: Wind tunnel cross-section area ¹	900	cm ²
	Win direction frontal area ²	129	cm ²
	Diameter of mounting pipe ³	-	mm
	Blockage ratio of test object ⁴	0.143	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.9)°C, (47.2) %RH and (1014.2) hPa.

TABULATION OF RESULTS:
The table on next page give the measured values.

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

- ¹ Nozzle cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio ² to ¹

Calibration procedure:

The wind direction sensor was calibrated against Standard Rotary Encoder model: AX4009TS-DM04-P3-S-U0 in an close test-section of Eiffel-type wind tunnel with 900 cm² cross test section area. The WI-CL-008 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

Traceability:

This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: DA-0043-22

Uncertainty of Measurement:

The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'

MEASUREMENT RESULTS⁵

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

Air speed m/s	D^6_{std} Degree (°)	D^7_{uuc} Degree (°)	Error Degree (°)	$U (k=2)$ Degree (°)
5.01	0.000	0	0	0.58
	45.000	41	-4	0.74
	90.001	87	-3	0.68
	135.000	133	-2	0.74
	180.001	180	0	0.74
	225.000	227	2	0.68
	270.001	274	4	0.74
	315.000	320	5	0.58

Remark:

⁵ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

⁶ Direction of standard

⁷ Direction of Unit Under Calibration



End of Certificate of Calibration

CERTIFICATE OF CALIBRATION

Calibration No. : RH-21122022

Page 1 of 1 Pages

Measurement Item : Relative humidity with data logger
Manufacturer : Novalynx
Model/Type : 110-WS-25DL-N
Serial Number : A5490
ID No. : NKH_FS0055
Customer : ALS laboratory group (Thailand) Co., Ltd.
: 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Environmental Condition:

The measurement was carried out in an ambient temperature of $(25\pm3)^{\circ}\text{C}$, and relative humidity of $(50\pm15)\%$.

Measurement Method:

Unit Under Calibration (UUC) was calibrated by comparison method with standard thermo hygrometer in the humidity generator chamber to determine the errors.

Traceability:

This instrument was calibrated using standard equipment whose accuracy is traceability through National Institute of Standards and Technology to the international system of units (SI) via MCS Calibration, Inc. Certificate number: 20314-101. Due date: Mar 14,2023.

Measurement Date : Dec 21, 2022

Issued Date : Dec 22, 2022

Measurement Results:

This equipment was connected with Indoor air quality probe and Displayed (UR) on display. Model: HMP60, Serial number: R3440767.

Calibration was performed in the range of 20%RH to 80%RH

The results of calibration are reported in table below.

Determined (%RH)	Standard (Reading) (%RH)	UUC (Reading) (%RH)	Error (%RH)	Uncertainty \pm (%RH)
20	20.04	18.8	-1.3	0.62
50	50.31	48.5	-1.8	0.62
80	80.24	78.4	-1.9	0.62

Performed by

- ☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved Signatory:

Mr. Parinya Booncharoen.
Calibration Department Manager

CERTIFICATE OF CALIBRATION

Certificate No.: CL-205-65
Page 1 of 2

Equipment Name: Data Logger with Temperature
Sensor

Manufacturer: Novalynx

Model: 110-WS-25DL-N

Serial No.: A5490

ID No.: NKH_FS0055

Customer

Name: ALS laboratory group (Thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 15 Dec 2022

Calibration date: 20 Dec 2022

Issue date: 22 Dec 2022

Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 23 Mar 2023
2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 22 July 2023

Calibration Condition

Temperature: $(23 \pm 3)^\circ\text{C}$
Relative Humidity: $(55 \pm 15)\%$

Calibration Procedure

The temperature calibration was done by In-House calibration method as WI-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use was based on ITS-90.

Traceability

The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0034-22, Certificate number: ER-0092-22

Calibrated by

- ☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved Signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Result of Calibration:- ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20-40 °C

Function:

This equipment was connected with temperature sensor Model: HMP60 S/N: R3440767.

Dimension : Diameter 12 mm. Length 80 mm.

<u>Immersion Depth (mm)</u>	<u>Standard Reading (°C)</u>	<u>UUC Reading (°C)</u>	<u>Error (°C)</u>	<u>Uncertainty (°C)</u>
80	20.064	19.8	-0.2	0.16
80	25.061	24.8	-0.3	0.099
80	30.048	29.7	-0.3	0.16
80	35.045	34.7	-0.3	0.099
80	40.039	39.7	-0.3	0.099

UUC*: Unit Under Calibration

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





JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd.
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Bangkok 10600 (Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TISI-TIS 17025
CALIBRATION 0367

Air speed measurement laboratory
Calibration services department.

REVIEW BY	<i>Warakorn P.</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL DATE	11/7/24

Certificate Number

CL-006-66

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Cup anemometer
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-N
SERIAL NUMBER : Sensor: WSD-008
Data logger: A5488
ID NUMBER : NKH_FS0054
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) co., ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 09 Jan 2023
MEASUREMENT DATE : 11 Jan 2023
ISSUE DATE : 13 Jan 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010 ± 10	hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS	: Wind tunnel cross-section area ¹	900	cm ²
	Win direction frontal area ²	100	cm ²
	Diameter of mounting pipe ³	-	mm
	Blockage ratio of test object ⁴	0.111	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.5) °C, (57.4) %RH and (1011.3) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jittraporn Lertsomphol



Approved signatory:

[Signature]
Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

- ¹ Nozzle cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio ² to ¹

MEASUREMENT RESULTS⁵

The cup anemometer, Unit Under Calibration (UUC) was exercised at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer and above 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 40 mm and 300 mm respectively away from wind tunnel nozzle, UUC was installed at center of the test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

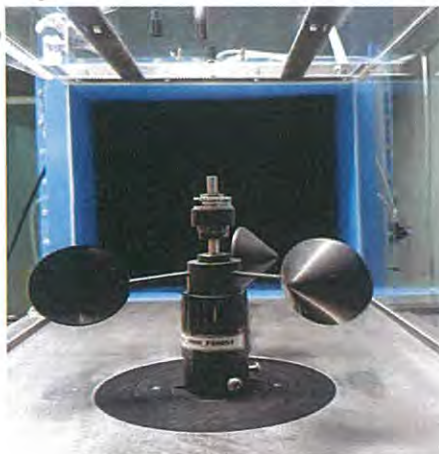
V_{std}^6 (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V_{UUC}^7 (m/s)	Error (m/s)	$U (k=2)$ (m/s)
0.981	23.36	23.45	0.8	-0.2	0.18
2.040	23.50	23.45	1.9	-0.2	0.16
3.049	23.30	23.45	2.9	-0.1	0.19
4.147	23.50	23.45	3.9	-0.2	0.20
4.99	23.30	23.45	4.9	-0.1	0.19
5.99	23.46	23.45	5.9	-0.1	0.18
7.03	23.16	23.45	6.9	-0.1	0.21
8.16	23.40	23.45	7.9	-0.2	0.19
9.09	23.10	23.45	8.9	-0.2	0.21
10.07	23.36	23.45	9.9	-0.1	0.19
11.14	23.14	23.45	11.0	-0.2	0.21
12.14	23.28	23.45	12.0	-0.1	0.22
13.20	23.28	23.45	13.0	-0.2	0.28
14.26	23.16	23.45	14.1	-0.2	0.35
15.24	23.14	23.45	15.0	-0.2	0.27
16.30	23.10	23.45	16.1	-0.2	0.44

Remark:

⁵ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

⁶ Velocity of standard

⁷ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP

Calibration set-up of the cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to imaging geometry.

End of Certificate of Calibration
JIRANATE ASSOCIATES CO., LTD.



JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd.
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600 (Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TISI-TIS 17025
CALIBRATION 0367

Air speed measurement laboratory
Calibration services department.

Certificate Number

CL-006-66

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-N
SERIAL NUMBER : Sensor: WSD-008
Data logger: A5488
ID NUMBER : NKH_FS0054
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 09 Jan 2023
MEASUREMENT DATE : 11 Jan 2023
ISSUE DATE : 13 Jan 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010 ± 10	hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION	: Wind tunnel cross-section area ¹	900	cm ²
	Win direction frontal area ²	129	cm ²
	Diameter of mounting pipe ³	-	mm
	Blockage ratio of test object ⁴	0.143	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.5)°C, (49.0) %RH and (1011.1) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory: _____

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

¹ Nozzle cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio ² to ¹

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED
IN WRITING FROM THE LABORATORY

MEASUREMENT RESULTS⁵

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

Air speed m/s	D^6_{std} Degree (°)	D^7_{uuc} Degree (°)	Error Degree (°)	$U (k=2)$ Degree (°)
4.99	0.000	0	0	0.58
	45.000	42	-3	0.74
	90.000	87	-3	0.74
	135.000	134	-1	0.74
	180.000	182	1	0.76
	225.000	228	3	0.74
	270.000	273	3	0.74
	315.000	319	4	0.74

Remark:

⁵ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

⁶ Direction of standard

⁷ Direction of Unit Under Calibration

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Calibration No. : RH-04012023

Page 1 of 1 Pages

Measurement Item : Relative humidity with data logger
Manufacturer : Novalynx
Model/Type : 110-WS-25DL-N
Serial Number : A5488
ID No. : NKH_FS0054
Customer : ALS laboratory group (Thailand) Co., Ltd.
: 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Environmental Condition:

The measurement was carried out in an ambient temperature of $(25 \pm 3)^{\circ}\text{C}$, and relative humidity of $(50 \pm 15)\%$.

Measurement Method:

Unit Under Calibration (UUC) was calibrated by comparison method with standard thermo hygrometer in the humidity generator chamber to determine the errors.

Traceability:

This instrument was calibrated using standard equipment whose accuracy is traceability through National Institute of Standards and Technology to the international system of units (SI) via MCS Calibration, Inc. Certificate number:

20314-101. Due date: Mar 14, 2023.

Measurement Date : Jan 13, 2023

Issued Date : Jan 13, 2023

Measurement Results:

This equipment was connected with Indoor air quality probe and Displayed (UR) on display. Model: HMP60, Serial number: R3140637.

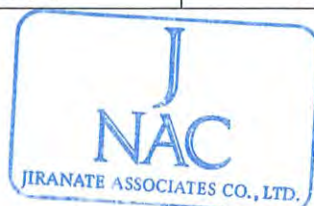
Calibration was performed in the range of 20%RH to 80%RH

The results of calibration are reported in table below.

Determined (%RH)	Standard (Reading) (%RH)	UUC (Reading) (%RH)	Error (%RH)	Uncertainty \pm (%RH)
20	20.05	18.9	-1.1	0.66
50	50.33	48.7	-1.6	0.66
80	80.26	79.7	-0.5	0.66

Performed by

- ☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol



Approved Signatory: 

Mr. Parinya Booncharoen.
Calibration Department Manager

CERTIFICATE OF CALIBRATION

Certificate No.: CL-003-66

Page 1 of 2

Equipment Name: Data Logger with Temperature
Sensor

Manufacturer: Novalynx

Model: 110-WS-25DL-N

Serial No.: A5488

ID No.: NKH_FS0054

Customer

Name: ALS laboratory group (Thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 09 Jan 2023

Calibration date: 13 Jan 2023

Issue date: 13 Jan 2023

Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 23 Mar 2023

2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 22 July 2023

Calibration Condition

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

Relative Humidity: $(55 \pm 15)\%$

Calibration Procedure

The temperature calibration was done by In-House
calibration method as WI-CL-001 according to
comparison method with standard digital temperature
indicator and standard temperature probe. The
temperature scale use was based on ITS-90.

Traceability

The measurement results are traceable to the
international system of units (SI) through National
Institute of Metrology Thailand (NIMT) Certificate
number: TT-0034-22, Certificate number: ER-0092-
22

Calibrated by

- ☐ Mr. Sorawit Thachalad
☒ Miss Jittraporn Lertsomphol



Approved Signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Certificate No.: CL-003-66
Page 2 of 2

Result of Calibration:- ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20-40 °C

Function:

This equipment was connected with temperature sensor Model: HMP60 S/N: R3140637.

Dimension : Diameter 12 mm. Length 80 mm.

<u>Immersion Depth (mm)</u>	<u>Standard Reading (°C)</u>	<u>UUC Reading (°C)</u>	<u>Error (°C)</u>	<u>Uncertainty (°C)</u>
60	20.067	20.1	0.0	0.099
60	25.058	25.1	0.0	0.099
60	30.052	30.0	-0.1	0.099
60	35.047	34.8	-0.2	0.099
60	40.038	39.6	-0.4	0.099

UUC*: Unit Under Calibration

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

* End of Certificate *



REVIEW BY	<i>Naragorn P.</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL. DATE	11/7/24

Certificate Number

CL-005-66

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Cup anemometer
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-N
SERIAL NUMBER : Sensor: WSD-007
Data logger: A5486
ID NUMBER : NKH_FS0053
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) co., ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

Calibration procedure:

The cup anemometer was calibrated against Standard air velocity transducer model: 8455-12 and pitot tube with precision differential pressure meter model: DPM2500 in an close test-section of Eiffel-type wind tunnel with 900 cm² cross test section area. The WI-CL-007 based on IEC 61400-12-1, Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines, March 2017 was used as a calibration guideline.

Traceability:

This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0052-21 and MW-0066-22

Uncertainty of Measurement:

The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'

RECEIVED DATE : 09 Jan 2023
MEASUREMENT DATE : 11 Jan 2023
ISSUE DATE : 13 Jan 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010 ± 10	hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITIONS	: Wind tunnel cross-section area ¹	900	cm ²
	Win direction frontal area ²	100	cm ²
	Diameter of mounting pipe ³	-	mm
	Blockage ratio of test object ⁴	0.111	[-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.6) °C, (48.9) %RH and (1015.0) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

[Signature]
Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

- ¹ Nozzle cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio ² to ¹

MEASUREMENT RESULTS⁵

The cup anemometer, Unit Under Calibration (UUC) was exercise at 10 m/s for 5 minutes prior to calibration being performed. The standard air velocity 0.5 m/s to 5 m/s was calculated by a standard air velocity transducer and above 5 m/s to 30 m/s was calculated by a pitot tube with precision differential pressure meter which was installed 40 mm and 300 mm respectively away from wind tunnel nozzle, UUC was installed at center of the test section. The calibration was carried out under both rising and falling air velocity in the range of 1 m/s to 16 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.

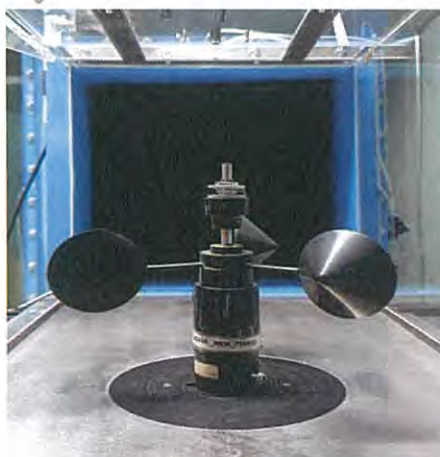
V_{std}^6 (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	V_{UUC}^7 (m/s)	Error (m/s)	$U (k=2)$ (m/s)
0.981	23.70	23.60	0.8	-0.2	0.15
2.030	23.56	23.60	1.9	-0.2	0.16
3.049	23.56	23.60	2.9	-0.2	0.18
4.127	23.50	23.60	4.0	-0.2	0.20
4.99	23.52	23.60	4.9	-0.1	0.20
5.98	23.64	23.60	5.9	-0.1	0.18
7.06	23.50	23.60	6.9	-0.2	0.18
8.18	23.54	23.60	8.1	-0.1	0.21
9.09	23.32	23.60	9.0	-0.1	0.20
10.08	23.60	23.60	10.0	-0.1	0.22
11.16	23.32	23.60	11.0	-0.1	0.22
12.15	23.60	23.60	12.0	-0.2	0.23
13.21	23.40	23.60	13.1	-0.1	0.23
14.26	23.60	23.60	14.2	-0.1	0.27
15.25	23.50	23.60	15.2	0.0	0.23
16.23	23.52	23.60	16.1	-0.1	0.55

Remark:

⁵ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

⁶ Velocity of standard

⁷ Velocity of Unit Under Calibration

PHOTO OF CALIBRATION SET-UP

Calibration set-up of the cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The cup anemometer shown may differ from the calibrated one. Remark: The proportion of the set-up is not true to scale due to imaging geometry.

End of Certificate of Calibration
JIRANATEE ASSOCIATES CO., LTD.

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

MEASUREMENT ITEM : Wind Direction Sensor
MANUFACTURER : Novalynx
MODEL/TYPE : Sensor: WS-02F
Data logger: 110-WS-25DL-N
SERIAL NUMBER : Sensor: WSD-007
Data logger: A5486
ID NUMBER : NKH_FS0053
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang,
Khet Suan Luang, Bangkok 10250 Thailand.

RECEIVED DATE : 09 Jan 2023
MEASUREMENT DATE : 11 Jan 2023
ISSUE DATE : 13 Jan 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

PLACE OF CALIBRATION : Eiffel-type wind tunnel of Jiranatee Associates Co., Ltd.

CALIBRATION CONDITION : Wind tunnel cross-section area¹ 900 cm²
Win direction frontal area² 129 cm²
Diameter of mounting pipe³ - mm
Blockage ratio of test object⁴ 0.143 [-]

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are (23.3)°C, (53.3) %RH and (1011.2) hPa.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:

☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

25/Jan

Mr. Parinya Booncharoen
Calibration Department Manager

Remark:

- ¹ Nozzle cross-section area of the wind tunnel
² Projected cross-section area of the tested object include mounting pipe
³ Diameter of mounting pipe
⁴ Ratio ² to ¹

MEASUREMENT RESULTS⁵

The wind direction sensor was calibrated against standard rotary encoder by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counterclockwise directions after offset adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is kept constant while the sensor is rotated around its vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

Air speed m/s	D°_{std} Degree (°)	D°_{uuc} Degree (°)	Error Degree (°)	$U (k=2)$ Degree (°)
5.01	0.000	0	0	0.58
	45.000	42	-3	0.68
	90.000	88	-2	0.74
	135.000	133	-2	0.74
	180.000	180	-1	0.76
	225.000	225	0	0.74
	270.000	272	2	0.74
	315.000	317	2	0.68

Remark:

⁵ Calibration results only count for the tested circumstances and environmental conditions during which calibration took place

⁶ Direction of standard

⁷ Direction of Unit Under Calibration

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Calibration No. : RH-03012023

Page 1 of 1 Pages

Measurement Item : Relative humidity with data logger
Manufacturer : Novalynx
Model/Type : 110-WS-25DL-N
Serial Number : A5486
ID No. : NKH_FS0053
Customer : ALS laboratory group (Thailand) Co., Ltd.
: 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Suan Luang, Khet, Suan Luang, Bangkok
10250 Thailand.

Environmental Condition:

The measurement was carried out in an ambient temperature of $(25\pm3)^{\circ}\text{C}$, and relative humidity of $(50\pm15)\%$.

Measurement Method:

Unit Under Calibration (UUC) was calibrated by comparison method with standard thermo hygrometer in the humidity generator chamber to determine the errors.

Traceability:

This instrument was calibrated using standard equipment whose accuracy is traceability through National Institute of Standards and Technology to the international system of units (SI) via MCS Calibration, Inc. Certificate number:

20314-101. Due date: Mar 14, 2023.

Measurement Date : Jan 13, 2023

Issued Date : Jan 13, 2023

Measurement Results:

This equipment was connected with Indoor air quality probe and Displayed (UR) on display. Model: HMP60, Serial number: R3140638.

Calibration was performed in the range of 20%RH to 80%RH

The results of calibration are reported in table below.

Determined (%RH)	Standard (Reading) (%RH)	UUC (Reading) (%RH)	Error (%RH)	Uncertainty \pm (%RH)
20	20.04	18.3	-1.7	0.69
50	50.29	48.5	-1.8	0.69
80	80.12	79.5	-0.6	0.71

Performed by

- ☐ Mr. Sorawit Thachalad
☒ Miss Jittraporn Lertsomphol



Approved Signatory:



Mr. Parinya Booncharoen.
Calibration Department Manager

CERTIFICATE OF CALIBRATION

Certificate No.: CL-002-66

Page 1 of 2

Equipment Name: Data Logger with Temperature
Sensor

Manufacturer: Novalynx

Model: 110-WS-25DL-N

Serial No.: A5486

ID No.: NKH_FS0053

Customer

Name: ALS laboratory group (Thailand) Co., Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Suan Luang, Khet Suan Luang, Bangkok
10250 Thailand.

Received date: 09 Jan 2023

Calibration date: 13 Jan 2023

Issue date: 13 Jan 2023

Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500,
Serial No.: 667682-09, Due date: 23 Mar 2023

2. Digital Temperature Indicator Model: DTI-1000-A MK
II, Serial No.: 671407-00591 Due date: 22 July 2023

Calibration Condition

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

Relative Humidity: $(55 \pm 15)\%$

Calibration Procedure

The temperature calibration was done by In-House
calibration method as WI-CL-001 according to
comparison method with standard digital temperature
indicator and standard temperature probe. The
temperature scale use was based on ITS-90.

Traceability

The measurement results are traceable to the
international system of units (SI) through National
Institute of Metrology Thailand (NIMT) Certificate
number: TT-0034-22, Certificate number: ER-0092-
22

Calibrated by

- ☐ Mr. Sorawit Thachalad
☒ Miss Jittraporn Lertsomphol



Approved Signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

Result of Calibration:- ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20-40 °C

Function:

This equipment was connected with temperature sensor Model: HMP60 S/N: R3140638.

Dimension : Diameter 12 mm. Length 80 mm.

<u>Immersion Depth (mm)</u>	<u>Standard Reading (°C)</u>	<u>UUC Reading (°C)</u>	<u>Error (°C)</u>	<u>Uncertainty (°C)</u>
60	20.067	19.9	-0.2	0.099
60	25.058	24.8	-0.3	0.099
60	30.052	29.7	-0.4	0.099
60	35.047	34.6	-0.4	0.099
60	40.038	39.5	-0.5	0.099

UUC*: Unit Under Calibration

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

* End of Certificate *



CALIBRATION REPORT

Calibration Number. : RG-01012023

Page 1 of 2 Pages

Measurement Item : Rain gauge with data logger.

Manufacturer : Data logger: Novalynx.
: Rain gauge: Novalynx.

Model/Type : Data logger: 110-WS-25DL-N
: Rain gauge: 110-WS-25RG

Serial Number : Data logger: A5486
: Rain gauge: RG-006

ID NO : NKH_PS0053

Customer : ALS laboratory group (Thailand) co., ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250, Thailand.

Environmental Condition:

The measurement was carried out in an ambient temperature of $(25 \pm 3)^{\circ}\text{C}$, and relative humidity of $(50 \pm 15)\%$.

Measurement Method:

The Rain gauge, Unit Under Calibration (UUC) was calibrated by Precision reference bottle with flow adjuster at low rate 0.6 mm per minute or 1 tipping every 20 seconds. The tipping number was determined by procedures below.

1. Obtain rain gauge inlet area:
Rain gauge precise diameter in cm = $\text{Diameter}/2 = R$ (radius)
Rain gauge area = $R^2 \times 3.14$ (UUC diameter = 20.3 cm, UUC radius = 10.15 cm)
Rain gauge area = 323.6 cm^2 .
2. Obtain theoretical correct rain gauge answer (number of tippings) using 323.6 cm^2 inlet area and 0.5 L of rain.
 - a) $10,000 \text{ cm}^3 / 323.6 \text{ cm}^2$ inlet area = 30.90 (rain gauge area = $1/30.90$ of square meter)
 - b) $30.90 \times 0.5 \text{ L volume} = 15.45 \text{ mm}$ (mm of rain over 1 m^2 surface) 500 ml of rain volume on the rain gauge area = 15.45 mm of rain.
 - c) Number of tipping = $15.45 / 0.25 \text{ mm} = 62$ tippings.

Note: Rain gauge is fully cleaned and leveling prior the calibration performed.


Measurement Date : Jan 13, 2023
Issued Date : Jan 13, 2023

Performed by

- ☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved Signatory: _____


Mr. Parinya Booncharoen.
Calibration Department Manager

Continuation of Calibration of Calibration Number

Calibration Number: RG-01012023

Page 2 of 2 Pages

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment.

The results of calibration are reported in table below.

Quantity of H ₂ O (ml)	Determined Tipping	Tipping count	Acceptable Tipping count
500	62	62	60 - 64
500	62	61	60 - 64
500	62	62	60 - 64
500	62	62	60 - 64
500	62	61	60 - 64

Remark: The procedure is made to verify the correct reading of the Unit under Calibration rain gauge when a precise volume of water falls into its cone. We suggest that the number of tipping should be within $\pm 2\%$ different from the 62 tipping (correct range: 60-64 tipping) it means that the rain gauge meets the manufacturer acceptable limit.

End of calibration report





JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd.
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Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
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Tel: +6608680812
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E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TISI-TIS 17025
CALIBRATION 0367

Pressure measurement laboratory
Calibration services department.



CERTIFICATE OF CALIBRATION

Certificate No. : CL-003-66

Page 1 of 2 Pages

MEASUREMENT ITEM : Digital barometer
MANUFACTURER : Novalynx
MODEL/TYPE : 110-WS-25BP
SERIAL NUMBER : A5486
ID NUMBER : NKH_FS0053
CONDITION AS-RECEIVED : Used item
CUSTOMER : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd,
Khwaeng Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.
RECEIVED DATE : 09 Jan 2023
MEASUREMENT DATE : 12 Jan 2023
ISSUE DATE : 13 Jan 2023

Calibration procedure:

The pressure calibration was done by in-house calibration method as WI-CL-003 according to comparison method with Digital pressure calibrator based on DKD-R 6-1

Traceability:

The measurement results are traceable to the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) which complies with the requirements of ISO/IEC 17025:2017, ANSI/NCSL Z540-1 via Certificate number: MP-0205-22

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

CONDITION OF THIS RESULT OF CALIBRATION:

1. Reference Standard Instrument:

Instrument	Model	Serial No.	Certificate No.	Due Date
Absolute Pressure Transducer	CPG2500	4100126P	MP-0205-22	02 Dec 2023

1. Calibration effort for calibration sequence A

2. The UUC* was installed in vertical orientation above reference standard instrument and center of UUC* was used as the reference level.

3. Calibration conditions:

4. Condition : ☒ Normal ☐ Abnormal
Pressure transmitting medium : Air
 ρ_{Fl} (20°C, 1 bar) : 1.19 kg/m³
 H_{amb} : (55±15) %
 t_{amb} : (23±3) °C
 p_{amb} : (1010±10) mbar

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

Calibrated by:

☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager



JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
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Tel: +6608680812
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Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TISI-TIS 17025
CALIBRATION 0367

Pressure measurement laboratory
Calibration services department.



CERTIFICATE OF CALIBRATION

Certificate No. : CL-003-66

Page 2 of 2 Pages

MEASUREMENT RESULTS : ☒ Without adjustment ☐ With adjustment

CALIBRATION IN THE RANGE OF : 950 – 1050 mbar

The results of calibration and associated measurement uncertainties are reported in the table below.

STD (mbar)	UUC* (mbar)	Error (mbar)	Uncertainty (k=2) (mbar)
950.08	950.5	0.5	0.67
970.08	970.4	0.3	0.54
990.11	990.2	0.1	0.39
1010.07	1009.9	-0.2	0.42
1030.06	1029.7	-0.4	0.60
1050.08	1049.4	-0.7	0.88

Note: UUC* Unit Under Calibration

: To convert the result in report unit to Pa should be multiply by 100

End of certificate





Calibration certificate (as left) #0000102679

Object	Instrument:	MAS-100 NT / NT Ex Microbial Air Sampler
	Serial number:	0000102679
	FW version:	1.4.0
	HW version:	4
	Name:	Head 1
	Department:	Location 1
	Perforated lid:	300 × 0.6 mm
	Calibration procedure:	MBV SOP / Version 1.6.31
Adjustment equipment	Serial number:	18180
	Adjustment date:	03-Aug-22
	Deviation:	0.0 [l/min]
Adjustment data	Adjustment date:	01-Jun-23
	Adjustment conditions:	Temp.: 27.5 [°C], Amb. Pressure: 1007 [mbar]
	ADC at 0 flow:	795 [mV]
	ADC at target flow:	3296 [mV]
	Gain:	86
Calibration equipment	Serial number:	18180
	Adjustment date:	03-Aug-22
	Deviation:	0.0 [l/min]
Calibration data	Calibration date:	01-Jun-23
	Calibration conditions:	Temp.: 27.1 [°C], Amb. Pressure: 1007 [mbar]

Calibration results:

		Sequence			Result
		1	2	3	
Target air flow	SLPM	100.0	100.0	100.0	100.0
Air flow	SLPM	99.9	99.9	99.9	NA
Flow deviation of the anemometer ¹	l/min	0.0	0.0	0.0	NA
Calibration result (corr. air flow of anemometer)	SLPM	99.9	99.9	99.9	99.9
Deviation from target air flow	%	-0.1	-0.1	-0.1	-0.1
Maximum allowable deviation: ± 2.5%					
Calibration check status:					Accepted

¹) For the DA-100 NT the deviation mentioned on the calibration certificate is not normalized to SLPM conditions (20°C; 1013 mbar) as it is not significant: The correction would be 0.34% per °C (1/293) and 0.09% (1/1013) per mbar difference to the SLPM standard conditions. E.g. a 0.2 l/min deviation measured at 25°C and 940 mbar leads to an error of 8.8% or 0.018 l/min.

Calibrated by: Phakhin P. Signature:

This report has been produced by an electronic system and is valid with a single signature of the calibrator.

Due date: 31-May-24

REVIEW BY	<u>Sithichok</u>
APPROVED BY	<u></u>
NEXT CAL. DATE	<u>01/5/24</u>

Calibration certificate (as found) #0000102679

Object	Instrument:	MAS-100 NT / NT Ex Microbial Air Sampler
	Serial number:	0000102679
	FW version:	1.4.0
	HW version:	4
	Name:	Head 1
	Department:	Location 1
	Perforated lid:	300 × 0.6 mm
	Calibration procedure:	MBV SOP / Version 1.6.31
Adjustment equipment	Serial number:	18179
	Adjustment date:	21-May-21
	Deviation:	0.0 [l/min]
Adjustment data	Adjustment date:	04-Jun-22
	Adjustment conditions:	Temp.: 25.1 [°C], Amb. Pressure: 1007 [mbar]
	ADC at 0 flow:	796 [mV]
	ADC at target flow:	3302 [mV]
	Gain:	74
Calibration equipment	Serial number:	18180
	Adjustment date:	03-Aug-22
	Deviation:	0.0 [l/min]
Calibration data	Calibration date:	01-Jun-23
	Calibration conditions:	Temp.: 28.0 [°C], Amb. Pressure: 1007 [mbar]

Calibration results:

		Sequence			Result
		1	2	3	
Target air flow	SLPM	100.0	100.0	100.0	100.0
Air flow	SLPM	99.9	99.8	99.9	NA
Flow deviation of the anemometer ¹	l/min	0.0	0.0	0.0	NA
Calibration result (corr. air flow of anemometer)	SLPM	99.9	99.8	99.9	99.9
Deviation from target air flow Maximum allowable deviation: ± 2.5%	%	-0.1	-0.2	-0.1	-0.1
Test result					Accepted

¹) For the DA-100 NT the deviation mentioned on the calibration certificate is not normalized to SLPM conditions (20°C; 1013 mbar) as it is not significant: The correction would be 0.34% per °C (1/293) and 0.09% (1/1013) per mbar difference to the SLPM standard conditions. E.g. a 0.2 l/min deviation measured at 25°C and 940 mbar leads to an error of 8.8% or 0.018 l/min.

Calibrated by: Phakhin P. Signature: 

This report has been produced by an electronic system and is valid with a single signature of the calibrator.



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TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM1103

Page : 1 of 3

Certificate of Calibration

Equipment : Autoclave

Manufacturer : Sanyo

Model : MLS-3781

Serial No. : 830167

ID No. : BKK_ML0037

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Location : Media Preparation Room

Received Order : 17 July 2023

Calibration Date : 17 July 2023

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib



Approved by :

[Signature]

Approved Signatory

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

Issue Date : 24 July 2023

The Uncertainties are for a confidence probability of approximately 95%

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

A 0053615



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2307-0285OC-3

Cert. No.: 23TM1103

Page : 2 of 3

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Data Acquisition	MY57013823	23LM66	TPA	25 Mar 2024

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

3. This certification is traceable to the International System of Unit.

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

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

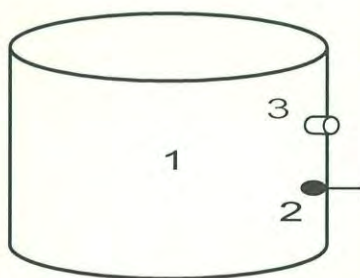
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

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

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source



	Environmental		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	22	53	220
Finished of Calibration	22	54	220

<u>Position</u>	<u>Description</u>	<u>Ref. Std. ID No.:</u>
1 =	Center of chamber	22-17TC-01
2 =	Temperature sensor	23-17TC-02
3 =	Exhaust port	19-17TC-03

Handwritten signature



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2307-0285OC-3

Cert. No.: 23TM1103

Page : 3 of 3

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Operating parameter Set : Temperature = 121 °C

Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor <i>k</i>
121	121	1	120.877	0.39	0.12	1.0	2
		2	120.870				
		3	120.866				

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

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

UUC* : Unit Under Calibration

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

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

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Yanik



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TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM1146

Page : 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : SHEL-LAB

Model : 1915A

Serial No. : 0200599

ID No. : BKK_ML0010

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthakan Rd.,
Khwawng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Location : Incubation & Micrological Reading

Received Order : 17 July 2023
Calibration Date : 17 July 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

REVIEW BY	Sithichok
APPROVED BY	[Signature]
NEXT CAL. DATE	17/01/25

Approved by :

Malu.

Approved Signatory

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

Issue Date :

24 July 2023

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 0056489



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2307-0285OC-1
Procedure Used :-

Cert. No.: 23TM1146

Page : 2 of 3

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49001451	23LM27	TPA	25 Feb 2024

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

3. This certification is traceable to the International System of Unit.

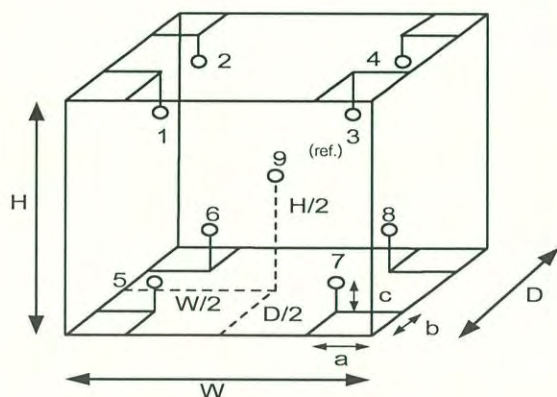
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	24
REL.Humid. (%)	54	56
AC Supply (Volt)	221	223



Position :	Ref. Std. ID No.:
1	19RTD-2/1
2	19RTD-2/2
3	19RTD-2/3
4	19RTD-2/4
5	19RTD-2/5
6	19RTD-2/6
7	19RTD-2/7
8	19RTD-2/8
9 (ref.)	19RTD-2/9

Probe Installation Details :

a = 10 cm
b = 10 cm
c = 10 cm

Dimension of Chamber :

D = 0.50 m
W = 0.75 m
H = 1.2 m
Capacity = 0.45 m³

Malu .



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2307-0285OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 23TM1146

Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor <i>k</i>
35.0	35.0	35.0	0.055	0.30	0.44	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	34.888	34.933	34.815	34.813	35.064	35.019	35.156	35.141	35.087	0.30

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

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

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

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

UUC* : Unit Under Calibration

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

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

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Malu.



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



Cert. No.: 22TM1571

Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven

Manufacturer : Binder

Model : ED 240/E2

Serial No. : 00-15533

ID No. : BKK_ML0013

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Location : Media Preparation Room

Received Order : 21 November 2022

Calibration Date : 21 November 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Krisda Malee

Approved by :

Malee

Approved Signatory

() Pornthippa Tameyakul

(✓) Malee Butkruea

() Suwit Imjai

Issue Date : 29 November 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0048150



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2211-0623OC-1

Cert. No.: 22TM1571

Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44067817	22LM121	22 Aug 2023

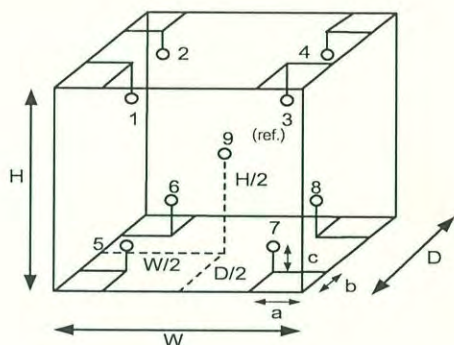
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) After Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Environment during calibration		
	Beginning	Finished
Temp. (°C)	26	26
REL.Humid. (%)	53	55
AC Supply (Volt)	219	220

Position :	Ref. Std. ID No.:
1	21-15TC-01
2	21-15TC-02
3	21-15TC-03
4	21-15TC-04
5	21-15TC-05
6	21-15TC-06
7	21-15TC-07
8	21-15TC-08
9 (ref.)	21-15TC-09

Probe Installation Details :

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

Dimension of Chamber :

D = 0.50 m
 W = 0.80 m
 H = 0.60 m
 Capacity = 0.24 m³

Malu.



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2211-0623OC-1
Result of Calibration :- (*) After Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 22TM1571

Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
180	180	180	0.70	1.5	2.9	1.4	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
180	179.520	180.585	178.855	179.482	178.827	179.938	179.074	180.199	180.068

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

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

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

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

UUC* : Unit Under Calibration

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

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

-o0o-

Malu



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Cert. No.: 22TM1583

Page : 1 of 3

Certificate of Calibration

Equipment : Low Temp. Incubator

Manufacturer : ShellLab

Model : 2020-2E

Serial No. : 0601299

ID No. : BKK_ML0011

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Location : Incubation & Microbiological Reading

Received Order : 21 November 2022

Calibration Date : 21 November 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Krisda Malee

REVIEW BY	Sithichok
APPROVED BY	
NEXT CAL. DATE	21/05/24

Approved by : Malee
Approved Signatory

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

Issue Date : 29 November 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0048153



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2211-0623OC-4

Cert. No.: 22TM1583

Page : 2 of 3

Procedure Used :-

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Data Acquisition	34970A	MY44067817	22LM121	22 Aug 2023

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

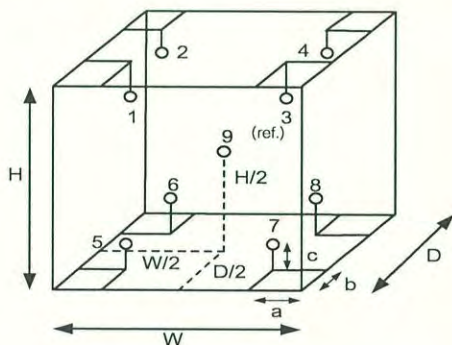
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) After Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	26	24
REL.Humid. (%)	50	54
AC Supply (Volt)	219	220



Position :	Ref. Std. ID No.:
1	19-15RTD-01
2	19-15RTD-02
3	19-15RTD-03
4	19-15RTD-04
5	19-15RTD-05
6	21-15RTD-06
7	19-15RTD-07
8	19-15RTD-08
9 (ref.)	19-15RTD-09

Probe Installation Details :

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

Dimension of Chamber :

D = 0.55 m
 W = 1.2 m
 H = 0.69 m
 Capacity = 0.46 m³

Maku



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2211-0623OC-4
Result of Calibration :- (*) After Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 22TM1583

Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
25.0	25.0	25.0	0.019	0.29	0.34	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
25.0	25.177	25.199	25.166	25.172	25.027	24.893	25.061	25.152	25.173

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

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

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

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

UUC* : Unit Under Calibration

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

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

-o0o-

Malu



Calibration Certificate

Certificate No. 551422
Product 200-510M Defender 510 Medium Flow
Serial No. 208345
Cal. Date 18-Aug-2023

Sold To:

All calibrations are performed in accordance with ISO 17025 at Mesa Laboratories, Inc., 12100 W. 6th Ave, Lakewood, CO 80228, an ISO 17025:2017 accredited laboratory through NVLAP. This report shall not be reproduced except in full without the written approval of the laboratory. Results only relate to the items calibrated. This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

As Received Calibration Data

Technician	Aaron Schwartz	Lab. Pressure	620.1 mmHg	
		Lab. Temperature	23.5 °C	
Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Received
4523.09 ccm	4519.02 ccm	0.09%	1.00%	In Tolerance
999.43 ccm	999.31 ccm	0.01%	1.00%	In Tolerance
245.22 ccm	245.88 ccm	-0.27%	1.00%	In tolerance

Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML_800_24	205307	25-May-2023	25-May-2024

REVIEW BY *Narokorn P*

APPROVED BY *[Signature]*

NEXT CAL. DATE *18/8/24*

As Shipped Calibration Data

Certificate No	551422	Lab. Pressure	618.8 mmHg
Technician	Xiem Ly	Lab. Temperature	24.2 °C

Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Shipped
4516.61 ccm	4515.56 ccm	0.02%	1.00%	In Tolerance
1000.87 ccm	1000.67 ccm	0.02%	1.00%	In Tolerance
249.84 ccm	249.93 ccm	-0.04%	1.00%	In Tolerance

Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML_800_24	100439	14-Sep-2022	14-Sep-2023

Calibration Notes

The expanded uncertainty of flow has a coverage factor of $k = 2$ for a confidence interval of approximately 95%.

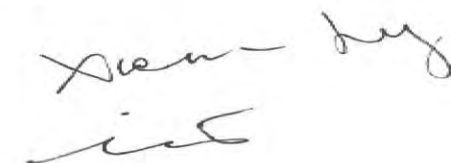
Flow testing is in accordance with our test number MP-00672 with an expanded uncertainty of 0.27% using high-purity nitrogen or filtered laboratory air.

Traceability to the International System of Units (SI) is verified by accreditation to ISO/IEC 17025 by NVLAP under NVLAP Code 200661-0.

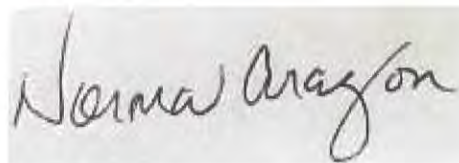
Technician Notes:

By:

Approved By:



Xiem Ly
Production Technician II



Norma Aragon
QC Inspector

Mesa Laboratories, Inc. certifies that the above instrument meets or exceeds published specifications, and that the calibration results in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). Calibration results are in compliance with ISO/IEC 17025:2017. Calibrations process has a Test Uncertainty Ratio (TUR) of 4:1 or greater. Any Pass/Fail determination is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only.

Calibration Certificate

Certificate No. 561587
Product 200-510L Defender 510 Low Flow
Serial No. 130026
Cal. Date 25-Sep-2023

Sold To:

All calibrations are performed in accordance with ISO 17025 at Mesa Laboratories, Inc., 12100 W. 6th Ave, Lakewood, CO 80228, an ISO 17025:2017 accredited laboratory through NVLAP. This report shall not be reproduced except in full without the written approval of the laboratory. Results only relate to the items calibrated. This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

As Received Calibration Data

Technician		Aaron Schwartz		Lab. Pressure	616.1 mmHg
				Lab. Temperature	24 °C
Instrument Reading	Lab Standard Reading	Deviation		Allowable Deviation	As Received
0 ccm	456.41 ccm	-100.0%		1.00%	Out of Tolerance
0 ccm	101.19 ccm	-100.0%		1.00%	Out of Tolerance
0 ccm	30.36 ccm	-100.0%		1.00%	Out of Tolerance

Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML_800_10	103743	25-Jan-2023	25-Jan-2024

REVIEW BY *Marakom P*

APPROVED BY *[Signature]*

NEXT CAL. DATE *27 30/9/24*

5/2/24

As Shipped Calibration Data

Certificate No	561587	Lab. Pressure	622.2 mmHg
Technician	Aaron Schwartz	Lab. Temperature	23.6 °C

Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Shipped
449.75 ccm	450.46 ccm	-0.16%	1.00%	In Tolerance
100.96 ccm	100.82 ccm	0.14%	1.00%	In Tolerance
30.63 ccm	30.38 ccm	0.82%	1.00%	In Tolerance

Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML_800_10	103743	25-Jan-2023	25-Jan-2024

Calibration Notes

The expanded uncertainty of flow has a coverage factor of $k = 2$ for a confidence interval of approximately 95%.

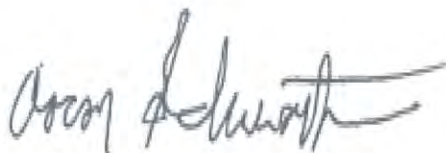
Flow testing is in accordance with our test number MP-00672 with an expanded uncertainty of 0.27% using high-purity nitrogen or filtered laboratory air.

Traceability to the International System of Units (SI) is verified by accreditation to ISO/IEC 17025 by NVLAP under NVLAP Code 200661-0.

Technician Notes:

By:

Approved By:



Aaron Schwartz
Assembler I



David Thomas
Quality Engineer

Mesa Laboratories, Inc. certifies that the above instrument meets or exceeds published specifications, and that the calibration results in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). Calibration results are in compliance with ISO/IEC 17025:2017. Calibrations process has a Test Uncertainty Ratio (TUR) of 4:1 or greater. Any Pass/Fail determination is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only.



Calibration Certificate

Certificate No. 561588
Product 200-510M Defender 510 Medium Flow
Serial No. 151114
Cal. Date 30-Sep-2023

Sold To:

All calibrations are performed in accordance with ISO 17025 at Mesa Laboratories, Inc., 12100 W. 6th Ave, Lakewood, CO 80228, an ISO 17025:2017 accredited laboratory through NVLAP. This report shall not be reproduced except in full without the written approval of the laboratory. Results only relate to the items calibrated. This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

As Received Calibration Data

Technician Xiem Ly
Lab. Pressure 616.8 mmHg
Lab. Temperature 25.8 °C

Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Received
0 ccm	4499.86 ccm	-100.0%	1.00%	Out of Tolerance
0 ccm	997.38 ccm	-100.0%	1.00%	Out of Tolerance
0 ccm	250.32 ccm	-100.0%	1.00%	Out of Tolerance

Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML_800_24	117991	16-Aug-2023	16-Aug-2024

REVIEW BY	<i>Norakorn P</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL. DATE	30/9/24

As Shipped Calibration Data

Certificate No 561588
Technician Xiem Ly

Lab. Pressure 616.2 mmHg
Lab. Temperature 26.1 °C

Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Shipped
4496.74 ccm	4494.43 ccm	0.05%	1.00%	In Tolerance
997.03 ccm	997.16 ccm	-0.01%	1.00%	In Tolerance
249.84 ccm	250.5 ccm	-0.26%	1.00%	In Tolerance

Mesa Laboratories Standards Used

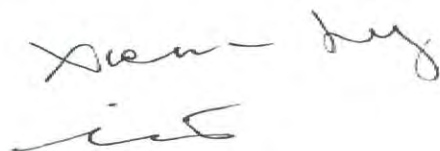
Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML_800_24	117991	05-Dec-2022	05-Dec-2023

Calibration Notes

The expanded uncertainty of flow has a coverage factor of $k = 2$ for a confidence interval of approximately 95%.
Flow testing is in accordance with our test number MP-00672 with an expanded uncertainty of 0.27% using high-purity nitrogen or filtered laboratory air.
Traceability to the International System of Units (SI) is verified by accreditation to ISO/IEC 17025 by NVLAP under NVLAP Code 200661-0.

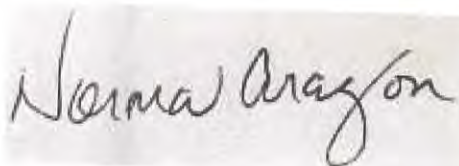
Technician Notes:

By:



Xiem Ly
Production Technician II

Approved By:



Norma Aragon
QC Inspector

Mesa Laboratories, Inc. certifies that the above instrument meets or exceeds published specifications, and that the calibration results in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). Calibration results are in compliance with ISO/IEC 17025:2017. Calibrations process has a Test Uncertainty Ratio (TUR) of 4:1 or greater. Any Pass/Fail determination is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only.

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok
10250

Certificate No : 24-AFM-018 Rev.1

Request No : Req-2024-0043

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : Bios
Model : Defender 510-L
Serial Number : 206895
ID : BKK_FS1346
Sensor Model : -
Sensor Serial Number : -

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 3 January 2024
Calibration Date : 29 January 2024

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qreborn	27 February 2024
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024


Traceability :


This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

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

This Certificate was issued to replace to Calibration Certificate No. 24-AFM-018

Calibration By : 
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 1 February 2024

Certificate No : 24-AFM-018 Rev.1

Request No : Req-2024-0043

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (ml/min)	UUC (ml/min)	Error (ml/min)	Uncertainty (ml/min)
25.00	101.66	20	20.148	0.1	1.3
25.00	101.67	100	99.409	-0.6	2.8
24.90	101.63	199	197.46	-1.5	5.6
25.00	101.61	300	298.15	-1.8	8.4
24.90	101.60	399	400.13	1	11
24.90	101.59	480	478.02	-2.0	6.8

Note

STD : Standard UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition

- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{\text{meas}} = Q_{\text{ref}} \times \frac{P_{\text{ref}}}{P_{\text{meas}}} \times \frac{T_{\text{meas}}}{T_{\text{ref}}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature

Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited

End of Certificate

Certificate of Calibration

Certificate No : 24-AFM-033

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok
10250

Request No : Req-2024-0241

Unit Under Calibration Details

Measurement Item : Primary Flow Calibrator
Manufacturer : Bios
Model : Defender 510-L
Serial Number : 130027
ID : RYG_FS0208
Location of Calibration : LAB 4 AIR VELOCITY METER

Sensor Model : -

Sensor Serial Number : -

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 31 January 2024
Calibration Date : 13 February 2024

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator



Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qreborn	27 February 2024
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

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

Calibration By : *me*
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : *Mr. Pacit*
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 13 February 2024

Certificate No : 24-AFM-033

Request No : Req-2024-0241

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
24.50	101.26	20	19.965	0.0	1.3
24.20	101.25	101	100.50	-0.5	2.8
24.00	101.31	200	199.13	-0.9	5.6
23.90	101.42	301	303.56	2.6	8.4
24.10	101.41	401	404.57	4	11
24.10	101.49	480	483.81	3.8	7.0

Note

STD : Standard

UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition

- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate

P = Absolute Pressure

T = Absolute Temperature

Meas = Measurement Condition

ref = Standard Condition

* Indicates non accredited

End of Certificate

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok
10250

Certificate No : 24-AFM-032

Request No : Req-2024-0240

Unit Under Calibration Details

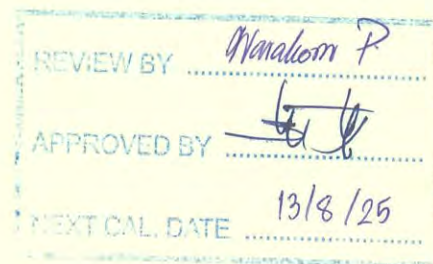
Measurement Item : Primary Flow Calibrator
Manufacturer : Bios
Model : Defender 510-M
Serial Number : 129958
ID : RYG_FS0209
Sensor Model : -
Sensor Serial Number : -

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 31 January 2024
Calibration Date : 13 February 2024

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator



Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qreborn	27 February 2024
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

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

Calibration By : *mc*
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : *Mr. Pacit Mathavorn*
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 13 February 2024

Certificate No : 24-AFM-032

Request No : Req-2024-0240

Result of Calibration : Without Adjustment

Temperature (^o C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
23.80	101.89	95	100.13	5.1	2.8
23.90	101.71	501	513.93	12.9	7.2
24.18	101.62	1006	1019.3	13	14
24.00	101.81	1997	2023.0	26	29
24.10	101.87	2999	3035.5	37	45
24.60	102.00	3944	3991.8	48	59
24.60	102.08	4739	4790.5	52	72

Note

STD : Standard

UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition

- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate

P = Absolute Pressure

T = Absolute Temperature

Meas = Measurement Condition

ref = Standard Condition

* Indicates non accredited

End of Certificate

SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY



451-451/1 Sirinthorn Rd., Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com

NSC-TISI-TIS 17025
CALIBRATION 0394

Cert. No. : ACC23028

Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-74
Serial No.: 34478385
ID No.: NKH_FS0019



Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWANG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 \pm 3) °C
Pressure : (101.3 \pm 3) kPa
Relative Humidity : (50.0 \pm 20) %

Received Date : 07 SEPTEMBER 2023
Calibration Date : 20 SEPTEMBER 2023
Date of Issue : 20 SEPTEMBER 2023

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Continuation of Calibration Certificate

Cert. No. : ACC23028

Job No. : VC66AC0100

Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by based on IEC-60942-2003 Standard.

The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

Condition of this result of calibration :

1. Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL.BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL.BP 30/0267	13-FEB-24
Digital Multimeter	33461A	MY60024273	EEL.BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24
Audio Analyzer	AVR-3360A	V744B6069	EF-0012-23	10-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Continuation of Calibration Certificate

Cert. No. : ACC23028
Job No. : VC66AC0100
Pages : 3 of 3

Result of calibration :**1. Sound pressure level**

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	94.13	0.13	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1002.3	0.2	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
1.41	0.10	3.0

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$
or any value following calculation, providing a level of confidence of approximately 95 %

————— End of Calibration Certificate —————

SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangumru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com



NSC-TISI-TIS 17025
CALIBRATION 0394

Cert. No. : ACL23283

Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00472124 / 172180 / 72458
ID No.: NKH_FS0008

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWANG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 \pm 3) °C
Pressure : (101.3 \pm 3) kPa
Relative Humidity : (50.0 \pm 20) %

Received Date : 28 AUGUST 2023
Calibration Date : 06 SEPTEMBER 2023
Date of Issue : 13 SEPTEMBER 2023

REVIEW BY	<i>Nathakorn P.</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL. DATE	6/9/24

Calibrated by : Nathakorn Pisutpaisan

Approved by :

[Signature]
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Continuation of Calibration Certificate

Cert. No. : ACL23283

Job No. : VC66AC0098

Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL.BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL.BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL.BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Continuation of Calibration Certificate

Cert. No. : ACL23283

Job No. : VC66AC0098

Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter,
will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

Continuation of Calibration Certificate

Cert. No. : ACL23283

Job No. : VC66AC0098

Pages : 4 of 8

Result of calibration :**1. Absolute sensitivity**

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Measured value (dB)
A - weight	11.3
C - weight	17.6
Flat	23.4

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.2	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	-0.4	-0.3	-0.3	±5.0

Continuation of Calibration Certificate

Cert. No. : ACL23283
Job No. : VC66AC0098
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.1	0.1	±1.5
250	0.1	0.1	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.1	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.1	0.1	± 0.3

Continuation of Calibration Certificate

Cert. No. : ACL23283

Job No. : VC66AC0098

Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.1	0.1	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

Continuation of Calibration Certificate

Cert. No. : ACL23283

Job No. : VC66AC0098

Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

Continuation of Calibration Certificate

Cert. No. : ACL23283
Job No. : VC66AC0098
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.6	0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangbumru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com



Cert. No. : ACL23152
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00371914 / 169100 / 72255
ID No.: NKH_FS0001

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWANG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 \pm 3) °C
Pressure : (101.3 \pm 3) kPa
Relative Humidity : (50.0 \pm 20) %

Received Date : 05 MAY 2023
Calibration Date : 10 -16 MAY 2023
Date of Issue : 17 MAY 2023

REVIEW BY	<i>Nathakorn P.</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL. DATE	10/5/24

Calibrated by : Nathakorn Pisutpaisan

Approved by :

[Signature]
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Continuation of Calibration Certificate

Cert. No. : ACL23152

Job No. : VC66AC0052

Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL.BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL.BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL.BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Continuation of Calibration Certificate

Cert. No. : ACL23152
Job No. : VC66AC0052
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter,
will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

Continuation of Calibration Certificate

Cert. No. : ACL23152

Job No. : VC66AC0052

Pages : 4 of 8

Result of calibration :**1. Absolute sensitivity**

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.2

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

Frequency Weighting	Measured value (dB)
A - weight	9.9
C - weight	16.1
Flat	21.9

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.4	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.8	-0.7	-0.7	±5.0

Continuation of Calibration Certificate

Cert. No. : ACL23152
Job No. : VC66AC0052
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

Continuation of Calibration Certificate

Cert. No. : ACL23152

Job No. : VC66AC0052

Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.1	0.1	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.1	0.1	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

Continuation of Calibration Certificate

Cert. No. : ACL23152

Job No. : VC66AC0052

Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

Continuation of Calibration Certificate

Cert. No. : ACL23152

Job No. : VC66AC0052

Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.5	-0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

————— **End of Calibration Certificate** —————

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd.,Bangbumru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiphorn.com http://www.sithiphorn.com



Cert. No. : ACL23155

Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 00371917 / 169101 / 72247
ID No.: NKH_FS0004

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWANG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 \pm 3) °C
Pressure : (101.3 \pm 3) kPa
Relative Humidity : (50.0 \pm 20) %

Received Date : 05 MAY 2023
Calibration Date : 10 -16 MAY 2023
Date of Issue : 17 MAY 2023

REVIEW BY	<i>Nathakorn P.</i>
APPROVED BY	<i>[Signature]</i>
NEXT CAL. DATE	10/15/24

Calibrated by :

Nathakorn Pisutpaisan

Approved by :

[Signature]
(Thanakul Petchurai)

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Continuation of Calibration Certificate

Cert. No. : ACL23155

Job No. : VC66AC0052

Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL.BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL.BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL.BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Continuation of Calibration Certificate

Cert. No. : ACL23155

Job No. : VC66AC0052

Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter,
will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

Continuation of Calibration Certificate

Cert. No. : ACL23155

Job No. : VC66AC0052

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Result of calibration :**1. Absolute sensitivity**

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.8

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

Frequency Weighting	Measured value (dB)
A - weight	11.6
C - weight	17.9
Flat	23.5

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.2	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.5	0.6	0.6	±5.0

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4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.1	0.1	± 1.1
136.0	136.1	0.1	± 1.1
135.0	135.1	0.1	± 1.1
134.0	134.1	0.1	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.1	0.1	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.1	0.1	± 1.1
109.0	109.1	0.1	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.1	0.1	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	29.0	0.0	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1