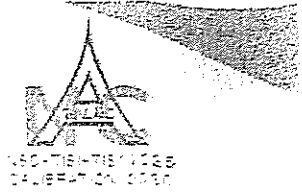


เอกสารสอบเทียบเครื่องมือตรวจวัด



Calibratech Co., Ltd.

1. 101/101 Subhachulalongkornrajavidyalaya Building, Bangkok 10110
 2. 101/101 Subhachulalongkornrajavidyalaya Building, Bangkok 10110



Certificate No. : 64-400532-1

Page : 1 of 2

Submitted by : Special Lab. Envt and Consultant Co., Ltd.
 47/20 Moo 3 Thonburi Thak-Pakdee, Nonthaburi 11120

Equipment : Water Bath
 Manufacturer : Memmert Model : WNB11
 Range : 0.4 °C Resolution : 0.1 °C
 Serial No. : 152060201 ID No. : LB-Eq-041

Environment : On site calibration was carried out at the Laboratory, Special Lab Envt and Consultant Co., Ltd.
 Ambient Temperature : (29.0 to 31.0) °C
 Relative Humidity : (55 to 60) %
 Line Voltage : (226.0 to 226.5)V

Date of Received : 14 October 2021

Date of Calibration : 14 October 2021

Date of Issue : 16 October 2021

Calibrated by : Pannop Champa

Calibration Method : This instrument was calibrated by In-house method CAL-M4004 based on ASTM E715-99.
 The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units
 Standard Digital Thermometer with RTD probe

ID No.	Cert. No.	Due Date	Traceability
400019 & 40003	64-400433-1	07 Apr 2022	National Institute of Metrology Thailand (NIMT)

Approved by :
 (Bunjerd Masri)
 Supervisor

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

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Ozeratech Co., Ltd.

100000, Sakuragaoka 1-1-1, Bunkyo-ku, Tokyo 112-8554, Japan

Tel: +81-3-5361-4000 Fax: +81-3-5361-4001 E-mail: ozeratech@ozeratech.co.jp ozeratech.calibration@ozeratech.co.jp

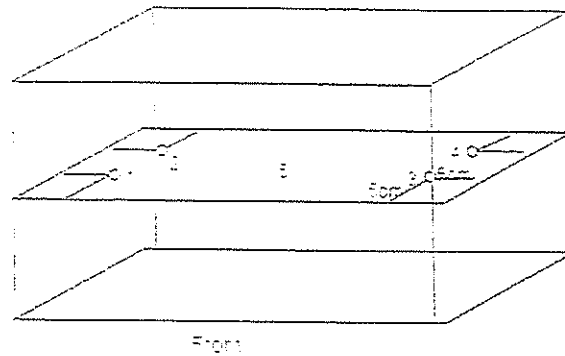
Certificate No. : 04-400582-1

Page : 2 of 2

Result of Calibration : A (Good) (Reference)

UIC Condition As-Received : Good

Function : Temperature Measurement



Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (CHG Sensor)					Uncertainty (± °C)	Measured Uniformity (°C)	Measured Stability (°C)
			1	2	3	4	5			
+2	+2	+2	+1.92	+1.91	+1.91	+1.92	+1.92	± 0.1	0.02	0.02
+25	+25	+25	+24.97	+24.98	+24.94	+24.92	+24.97	± 0.1	0.02	0.02
+50	+50	+50	+49.98	+49.98	+49.92	+49.90	+49.85	± 0.1	0.02	0.04
100.0	100	100.2	100.06	100.04	100.68	100.02	100.60	± 0.24	0.07	0.14

Remark The uncertainty is not contain uniformity of the water bath

The result of calibration is valid and accurate as shown on date and place of calibration only.

This reported uncertainty of measurement is based on a standard uncertainty multiplied by a coverage factor $k = 2$

assuming a level of confidence is approximately 95 %

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— *Journal of the American Medical Association*, 1967, 201: 1031-1032.

Certificate No. : 64-210596-1

Page : 1 of 2

Submitted By : Special Lec Engr And Consultant Co., Ltd.

2793 May 1, Tazaki Taka-It. Falcater. Nonthabun 11120

Equipment : Virgin

Verfasser: 18

Answer : Question No.:

1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 26

ID No. 1E-HQ-025

Assumed density of weight : 7950 kg · m⁻³

Assumed Air density, 1.2 kg/m^3

Environment : Ambient Temperature : (20 ± 2) °C

Relative Humidity: (50 = 100) %

Air Pressure : 1007.7 mbar

Date of Received : 24 August 2021

Date of Calibration : 28 August 2001

Date of Issue : 25 August 2021

Calibrated by : Wutichai Saeetphong

Calibration Method : In-house method CAL-M2101 based on OIML R 111-1 : 2004(E)

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Weights

<u>ID No.</u>	<u>Revision</u>	<u>Due Date</u>	<u>Traceability</u>
EC413-E2-25	1.00-0000-00	07 Mar 2020	National Institute of Metrology (Thailand), (NIMT)

Approved by _____

: Surachai Promthong :

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 55%.

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CAL

Calibratech Co., Ltd.

107 Moo 2 Subdprachuen Rd. Bangnae Padma, Bangkok 11110

Tel: 064-0211 Fax: 0211-047173 Email: calibratech.co@caltech.com calibratech.co@hotmail.com

Item Name of Calibration

Certificate No. : 64-210396-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

No.	Nominal Value	IE Mark	Conventional mass Value	Measuring Uncertainty
1	g	none	g	-1000 mg
				= 0.003 mg

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

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

- o O o -

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Calibratech Co., Ltd.

47/91 Moo 3, Tambol Tha-Ha, Paldara, Nonthaburi 11120

Tel: 02-0452111 Fax: 02-0452112 E-mail: calibratech.co@gmail.com, calibratech.co@calibratech.com



NSO-TIS-17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-210396-2

Page : 1 of 2

Submitted by : Special Lab Equip And Consultant Co., Ltd.
47/91 Moo 3, Tambol Tha-Ha, Paldara, Nonthaburi 11120

Equipment : Weight
Manufacturer : LS Material : Stainless Steel
Weight size : 100 g
ID No. : LB-Eq-055
Assumed density of weight : 7950 kg/m³
Assumed Air density : 1.2 kg/m³

Environment : Ambient Temperature : (20 ± 2) °C
Relative Humidity : (50 ± 10) %
Air Pressure : 1005.1 mbar

Date of Received : 14 August 2021

Date of Calibration : 16 August 2021

Date of Issue : 18 August 2021

Calibrated by : Wuttichai Swainhong

Calibration Method : In-house method CAL-MC101 based on OIML R 111-1 : 2004(E)

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Weights

ID No.	Serial No.	Due Date	Traceability
E2413-E2415	M14-0006-1,0	17 Mar 2022	National Institute of Metrology (Thailand) - NIMT

Approved by :

Surachai Promthong
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Calibratech Co., Ltd.

110/11/1 Subhachon 201 Road, Bangkok, Thailand 10110

Tel: 02-0101-10101-10101 Fax: 02-0101-10101 E-mail: cal@calibratech.co.th, info@calibratech.co.th

Certificate of Calibration

Certificate No. : 64-210396-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition as-Received : Good

No.	Nominal Value (Id Mark)	Conventional mass Value	Measuring Uncertainty
1	100 g	100 g	± 0.1 mg

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

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

- o O o -

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Calibratech Co.,Ltd.

110/11010 11 Subhramachon 3 Rd, Bangkok 11 Pakkret, Nonthaburi 11120

Tel: 02-944-6111 Fax: 02-944-6115 Email: calibratech@calibratech.co.th & info@cal.com



NSQ-TS1-TS17025
LABORATORY 0290

Certificate of Calibration

Certificate No. : 64-210396-3

Page : 1 of 2

Submitted by : Special Lab Envs And Consultant Co.,Ltd.
47/91 Moo 3, Tantiel Tho-It, Pakkret, Nonthaburi 11120

Equipment : Weight
Manufacturer : LS Material : Stainless Steel
Weight size : 200 g
ID No. : LB-Eq-036

Assumed density of weight : 7950 kg/m³

Assumed Air density : 1.2 kg/m³

Environment : Ambient Temperature : (20 ± 2) °C

Relative Humidity : (50 ± 10) %

Air Pressure 1005.0 mbar

Date of Received : 14 August 2021

Date of Calibration : 18 August 2021

Date of Issue : 18 August 2021

Calibrated by : Worachon Promthong

Calibration Method : In-house method CAL-M2101 based on OIML R 111-1 : 2004(E)

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Weight

ID No.	Serial No.	Due Date	Traceability
E2419-E2425	6426-6440-11	07 Mar 2022	National Institute of Metrology (Thailand), (NIMT)

Approved by :

Sorachai Promthong :
Laboratory Manager

The Uncertainty are for a confidence probability of approximately 95%

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CAL-F0021-05





Calibratech Co., Ltd.

7/100, Main 2 Subdistrict 1 Rd., Bangpoo Subdistrict, Bangkok 10120
Tel: 02-211-2111 Fax: 02-211-2112 E-mail: calibratech.co@nec.com calibratech.co@gmail.com

1. Certificate of Calibration

Page : 2 of 2

Certificate No. : 04-210396-3

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

No.	Nominal Value	Is Mark	Conventional mass Value		Measuring Uncertainty
1	200 g	none	200 g	- 0.20 mg	± 0.17 mg

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

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

- o O o -

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<u>Index</u>	<u>Gen. N.</u>	<u>Exp. Date</u>	<u>Traceability</u>
Form 1	DE 145	1 Jan 2020	decentralized - Technology Thailand - NMT
Form 2	DE 148	1 Jan 2021	decentralized - Technology Thailand - NMT



CAL

Metratex Co. Ltd.

100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000

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Certificate No. : 05-400224-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement with Thermocouple probe Type K

Model : Type K Sheath Material : 700um
Diameter : 1.5 mm Length : 1500 mm
Serial No. : 1.4 ID No. : SL-10

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
150	200.0	199.8	-0.2	0.15
300	200.0	199.8	-0.2	0.15
450	200.0	199.8	-0.2	0.15
600	200.0	199.8	-0.2	0.15
750	200.0	199.8	-0.2	0.15

Model : AUC-DIN-25 Sheath Material : Stainless
Diameter : 1.5 mm Length : 2500 mm
Serial No. : 1.4 ID No. : SL-40

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
125	200.0	199.8	-0.2	0.15
250	200.0	199.8	-0.2	0.15

Remarks

UUC - Under Calibration

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

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





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES: EQUIPMENT CALIBRATION AND TESTING SERVICES
104/111, VACHIRAPORN RD., SIANSAI AND SUANLAI AND BANGKOK, 10300
TEL.: 02-261-0011 FAX: 02-261-0012



Cert.No.: 21CH1146

Page.: 1 of 3

Certificate of Calibration

Equipment :	pH Meter
Manufacturer :	Eutech
Model :	pH 700
Serial No. :	3856489
ID No. :	LB-Eq-027
Condition As-Received:	Used Item
Received Date :	23 August 2021
Calibration Date :	9 September 2021
Reference :	2108-0663WH-1
Submitted by :	Special Lab Envi And Consultant Co.,Ltd 47/51-93 Moo 3 Tambon The-ri, Pakkret Nonthaburi 11120
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure :	In-house method - CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
Calibrated by :	Saithip Meangmai
Approved by :	 Approved Signatory
-/- Malee Butkrusee	
-/- Saithip Meangmai	
-/- Warakorn Lemgagwetakul	
Issue Date :	9 September 2021

The Uncertainties are for a confidence probability of approximately 95%

This certificate is only valid after the installation and training procedures
regarding the use of the equipment. For Equipment Calibration and Testing Services

A 0031764



Cert. No.: 21CH1146

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
Document Process Calibrator	43160086	130RO092	21E1223/1	27 Apr 2022

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

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

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	754028	28 June 2023
pH 6.866	CPA chem	679462	12 Mar 2022
pH 9.181	CPA chem	754031	20 July 2022

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

Calibration ResultsFunction : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,9)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode S/N: 3034419	4.008	4.01	169.2	0.0071	2.00
	6.866	6.87	0.5	0.0062	2.00
	9.181	9.18	-134.9	0.013	2.00

Date

a 1070596



Cert.No.: 21CH1148

Page.: 3 of 3

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4.7,9)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N: 2358459	0.00	414.12	414	0.02	0.58	2.00
	1.00	354.98	355	1.02	0.58	2.00
	2.00	295.80	296	2.02	0.58	2.00
	3.00	236.64	237	3.01	0.58	2.00
	4.00	177.48	177.4	4.01	0.058	2.00
	5.00	118.32	118.3	5.01	0.058	2.00
	6.00	59.16	59.1	6.00	0.058	2.00
	6.86	8.28	8.3	6.86	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	8.00	-59.16	-59.1	8.00	0.058	2.00
	9.00	-118.32	-118.3	9.00	0.058	2.00
	9.18	-128.97	-129.0	9.18	0.058	2.00
	10.00	-177.48	-177.5	10.00	0.058	2.00
	11.00	-236.64	-237	11.00	0.58	2.00
	12.00	-295.80	-296	12.00	0.58	2.00
	13.00	-354.98	-355	13.00	0.58	2.00
	14.00	-414.12	-414	14.00	0.58	2.00

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

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a 1070595



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES, EQUIPMENT CALIBRATION AND TESTING SERVICES
47/91-93 Moo 3 Tambon Tha-It, Pakkret,
Nonthaburi 11120
TEL : 02-5096117 FAX: 02746966



Cert. No.: 21TM1547

Page: 1 of 2

Certificate of Calibration

Equipment : pH Meter with Sensor
Manufacturer : Eutech
Model : pH 700
Serial No. : 2858459
ID No. : LB-Eq-027
Submitted by : Special Lab Envi And Consultant Co.,Ltd.
47/91-93 Moo 3 Tambon Tha-It,
Pakkret,
Nonthaburi 11120
Location : TPA Chemistry Calibration Laboratory
Received Order : 25 August 2021
Calibrated Date : 27 August 2021
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
AC Line Voltage : $(220 \pm 22) \text{V}$
Calibrated by : Kunchit Promprat

Approved by :

Approved Signatory

Mr. Pornthipha Tameyakul

Mr. Malee Butkruea

Mr. Suwit Injai

Issue Date :

31 August 2021

The Uncertainties are for a confidence probability of approximately 95%

This certificate is provided for information only and does not constitute a contract.
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Corporate Services, Equipment Calibration and Testing Services

A 0031535



Equipment: pH Meter with Sensor

Cert. No.: 21TM1547

Condition As-Received: Used Item

Page: 2 of 2

Reference: 2108-0663/M42

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.

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) Digital Thermometer	1623	2168060	2011389	20 Nov 2021

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 :- (°) Without Adjustment

Purpose of Calibration: Temperature measurement.

This instrument was connected with temperature sensor, ID No.: SL-33/1

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
25.0	100	25.0	25.000	0.000	0.16	2.00

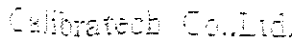
UUC*: Unit Under Calibration

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

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Signature

a 1069519



1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.



Certificate No. : 65-400213-3

Submitted by : Special Lab Exam and Consultant Co., Ltd.
47/91 Moo 3 Tambol Tha-Ni Pakkret Nonthaburi 11120

Equipment :	Ice Chamber (Refrigerator)	
Manufacturer :	Frozen	Model : CC-250C
Range :	-10 to -15 °C	Resolution : 0.1 °C
Serial No. :	1001107016	ID No. : LB-Ec-006

Environment : On site calibration was carried out at the Laboratory,
Special Lab Envt and Consultant Co. Ltd.
Ambient Temperature : (29.5 to 30.8) °C
Relative Humidity : (54 to 60) %
Line Voltage : (226.0 to 226.5) V

Date of Received : 27 April 2022

Date of Calibration : 27 April 2022

Date of Issue : 10 April 2021

Calibrated by : Barbara Mason

Calibration Method : CAL-METHOD LAS G-20

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Digital Thermometer with RTD Probe

<u>ID No.</u>	<u>Gen. No.</u>	<u>Due Date</u>	<u>Traceability</u>
400046 & 400047	-5-(2004)-1	28 Jul 2022	National Institute of Metrology Thailand (NIMT)

CAI

Calibratech Co., Ltd.

1. This is a standard ISO 9001 Registered Calibration Lab.
2. This is a standard ISO 17025 Registered Calibration Laboratory for Calibration of Measurement Equipment

Lab. No. : CAI/001/17025/2017

Certificate No. : 65-460213-3

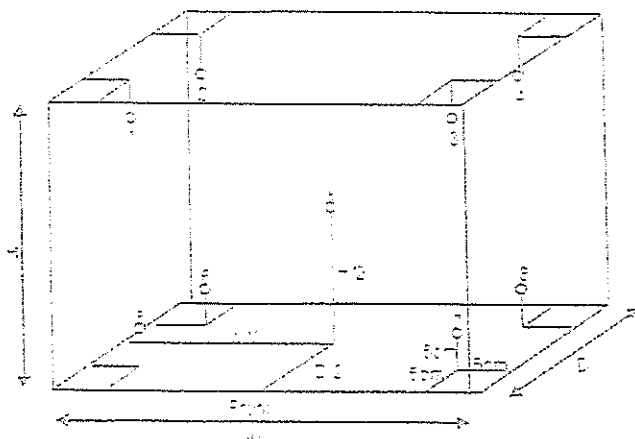
Page : 2 of 2

Result of Calibration : Without Adjustment

UIC Condition as Received : OK

Function : Temperature measurement

Test : Uniformity and stability test (calibration as per ISO 17025)



Inside of Chamber

W = 1.40 m

D = 0.47 m

H = 1.48 m

Capacity = 0.71 m³

Test Point	Setting Temperature	Indicating Temperature	Measured Temperature (°C) @ Sensor No.										Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9		
10	20	22.5	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	±0.05

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
20	20	22.5	0.10	0.04	0.0

Remark : The uncertainty is for uniformity of the air chamber

This result of calibration was found accurate at time and place of calibration only

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

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PinAAcle 900F Preventive Maintenance Report

Company Name: SPECIAL LAB ENVI & CONSULTANT


Instrument Location: PAKKRET NONTHABURI 11120

Instrument Serial No.: PFBS17082303

Date: 03-Sep-2021

PinAAcle 900F Preventive Maintenance (PM)

Company Name:	SPECIAL LAB ENVI & CONSULTANT		
Address (Instrument Location):	PAKKRET NONTHABURI 11120		
Serial Number:	PFBS17082303	PM Number:	1 of 1
Customer Name (if applicable):	K. Phattha	Telephone Number:	(092) 283-9064
Customer Support Engineer Name:	K. Weerayoot Keedpon	Service Order Number:	WO-00925451
Date PM Performed: (DD-MM-YYYY)	03-Sep-2021	Next PM Due Date: (DD-MM-YYYY)	03-Sep-2022
Standard Labor Hours to Complete PM :		5 hours	

Part Number	Release	Publication Date	 PerkinElmer
09570145 Rev.9	4	January 2018	

Scope

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

The customer should save their method before the PM begins.

General Instructions:

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

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

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

Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501656	Fan Filters	1
N2160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
N2100127	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	2
N5501714	Replacement Acetylene Filter Cartridge	1
TH001022	Replacement Air Filter Cartridge	2

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9500183	1000 mg/L Copper Standard	AR	25-200UY1	30-Jan-2022

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

Additional Tools Required for PM

Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.24 Neutral density filter	1	5503550856
N1013002	1.0A Neutral density filter	1	5503552491
CS050997	System 2 EDL Driver	1	03030997
NB050605	As System 2 EDL	1	16148
NB050121	Cu Lumina HCL	1	021913-020070
NB050109	Ba Lumina HCL	1	102416-040160
NB050189	R Lumina HCL	1	110716-010060
NB050151	Ni Lumina HCL	1	100516-030190

Procedure Checklist

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

1. General:

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

2. PC Instrument Software:

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

3. Mechanical:

- ☐ Inspect and clean all fans and filters. Replace filters if necessary.
- ☐ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☐ Clean exterior of the instrument.
- ☐ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☐ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking slot width. Replace if out of specification.
- ☐ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☐ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☐ Visually check for proper flame conditions when igniting the Air-C₂H₂ and N₂O-C₂H₂ flames (if applicable).

4. Electrical:

- ☐ Inspect PC boards. Clean if necessary.
- ☐ Carefully check all internal and external cable connections.
- ☐ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☐ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ☐ Inspect and clean the sample compartment windows, if needed.
- ☐ Inspect optics. Clean or replace if necessary.

6. Gasses:

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

7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
C ₂ H ₂ Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

8. After PM Performance tests:

8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 558.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	0.9798	0.9766	Passed
0.2 A ND Filter	± 5% from Cert.	0.2042	0.1989	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0015	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0002	Passed

8.4 D: Background Compensation with Copper

Description: Verifies the instrument's ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0079	Passed

8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0004	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0011	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
3 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	NA	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3221	Passed

10. Review:

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

Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for PinAAcie 900F have been completed.

This PinAAcie 900F Passes ☒ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:

W. J. J. J.

Date:

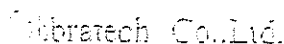
03-Sep-2021

(DD-MM-YYYY)

Authorized Customer Representative:

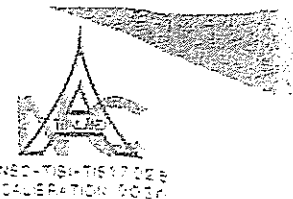
Date:

(DD-MM-YYYY)



1. The following information is being furnished to you for your information:

1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.



1. *Chlorophyll a* (Chl *a*)

Certificate No. : 65-200126-1

Page : 1 of 2

Submitted by : Special Lab. Envt and Consulation Co., Ltd.
- 791 Moo 3, Tambol Thak-H, Paldrei, Nonthaburi 11120

Equipment : Electronic Balance

Manufacturer . . . AND

Model GR-100

Serial No. 142512

ID No. : LB-Lg-016

Capacity: 1 1/2 cu. ft.

Resolution : 0.0001 g

Environment :

On site calibration was carried out at the Laboratory, Special Lab Eng and Consultants Co., Ltd.

Ambient Temperature : (26.8 to 27.0) °C

Relative Humidity : 53.6 to 55.7 %

Air Pressure mbar

Date of Received : 27 April 2022

Date of Calibration : 17 Apr. 2012

Date of Issue : 13 May 2022

Calibrated by : -Jaredath Thirupichel

Calibration Method : In-house method CAL-M2001 based on UKAS Publication ref. LAB 14
Edition 6, July 2015

Reference Standard Instruments : Calibration is traceable to an International System of Units.

Standard Weights

<u>ID No.</u>	<u>Serial</u>	<u>Doc Date</u>	<u>Transcriber</u>
EE-000004	00000000	1962-09-22	National Institute of Metrology (English) (NIST)

Approved by _____

Secretary, Planning &
Laboratory Manager

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

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Certificate No. : 65-200126-1

Page : 2 of 2

Result of Calibration : Without Adjustment

U/C Condition As-Received : Good

Exposure of Indication from nominal value

Nominal Value	Correction	Uncertainty
(g)	(g)	± (g)
0.1	+0.000	±0.001
0.2	+0.000	±0.001
0.3	+0.000	±0.001
0.5	+0.000	±0.001
1.0	+0.000	±0.001
2.0	+0.000	±0.002
3.0	+0.000	±0.002
5.0	+0.000	±0.002
10	+0.000	±0.003
20	+0.000	±0.005

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

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

Economic error

Load test : 500 g
A B C D E
Result : 500 g



Repeatability

Load test : 500 g
Result : 500 g

- 000 -

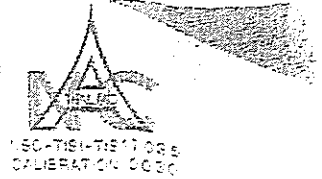


CAL

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101/101-1 Sukhaphiban 1 Rd., Bang Phai Suburb, Bangkok 10320

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Calibratech Co., Ltd. (Calibratech Co., Ltd.)

Certificate No. : 65-400213-1

Page : 1 of 2

Submitted by : Special Lab. Eng. and Consultant Co., Ltd.
47/91 Mon 3 Tambol Tha-ni, Paldet, Nonthaburi 11120

Equipment : Air Chamber (Incubator)
Manufacturer : Lombond Model : FKU 1800
Range : 4 °C to 37 °C Resolution : 0.1 °C
Serial No. : 0925481-19 ID No. : LB-Eq-005

Environment : On site calibration was carried out at the Laboratory.
Special Lab. Eng. and Consultant Co., Ltd.
Ambient Temperature : (29.0 to 30.0) °C
Relative Humidity : (45 to 50) %
Line Voltage : (226.0 to 226.5) V

Date of Received : 17 April 2022

Date of Calibration : 17 April 2022

Date of Issue : 10 April 2022

Calibrated by : Permpon Channu

Calibration Method : CAL-M4004, TLAS G-10

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Digital Thermometer with Thermocouple probe

ID No.	Cert. No.	Due Date	Traceability
400029 & 400030	64-400567-	23 May 2022	National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03



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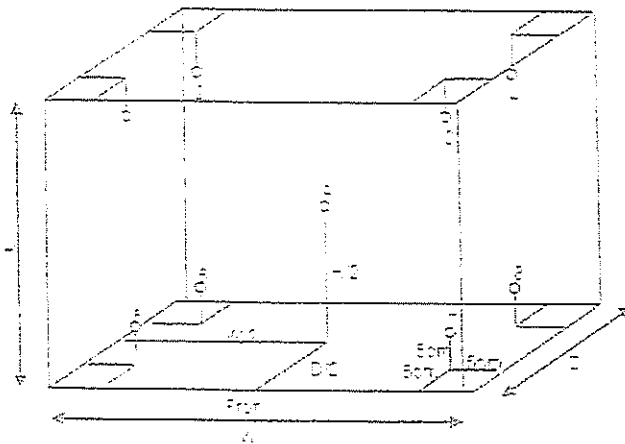
Page : 2 of 2

Block of Calibration : Without Adjustment

UC Condition 44-Received : 6-0-03

Function : Temperature measurement

The following are the names of the persons who have been



inside of Chamber

9 = 455 77

$D = 1.2 \times 10^3$ m

[illegible]

Capacity = 0.20 m³

Test Point	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.										Uncertainty (°C)
1	2	3	4	5	6	7	8	9	10	11	12	13	
25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	0.55
35.0	35.0	35.0	34.9	34.9	35.0	35.1	35.0	35.0	35.1	35.1	35.0	35.0	0.54
37.0	37.0	37.0	36.7	36.7	36.9	36.9	36.9	36.9	37.0	37.0	37.0	37.0	0.55

Test Point	Setting Temperature (°C)	Indirect Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
100	100	99.5	0.5	0.1	0.5
200	200	199.8	0.2	0.1	0.3
300	300	299.2	0.8	0.1	0.8

Remark. The uncertainty is not constant uniformly of the air chamber

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

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

- ၁၀၁ -





BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY

303 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2929 Fax: +66 2615-2950-1
E-mail: bkk@becthai.com Website: www.becthai.com



Certificate No. CAL-22-284

Page 1 of 3

CERTIFICATE OF CALIBRATION

Equipment	Spectrophotometer
Manufacturer	Thermo Scientific
Model	Genesys 20
Serial No.	3SGT041007
ID No.	LB-Eq-029
Customer	Special Lab Envi And Consultant Co., Ltd. 47/91-93 Moo 3 Tambol Taik, Amphur Pakred Nonthaburi, 11120
Location	Becthai Laboratory
Date of Receipt	5 May 2022
Date of Calibration	5 May 2022
Date of Issue	5 May 2022
Ambient Temperature	(25±10) °C
Relative Humidity	(60±20) %
Condition As-Received	Used Item

Calibrated by

(Mr. Somphon Duangsuwan)
Calibration Engineer

Approved by

(Ms. Jintana Sangthajarnlap)
Calibration Manager

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

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Indicated values are valid for the state of the spectrophotometer at the time of calibration only.



BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD. CALIBRATION LABORATORY

208 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2929 Fax: +66 2615-2350-1
E-mail: bld@becthai.com Website: www.becthai.com



Certificate No : GAL-22-264

Page : 2 of 3

CALIBRATION REPORT

Conditions of this result of calibration

1. Reference Standard Material

<u>Material</u>	<u>Model</u>	<u>Serial No</u>	<u>Cert No</u>	<u>Due date</u>
Holmium Glass Filter	FM-H-3	24568	90316	1 Mar 23
Dysprosium Glass Filter	FM-D-3	24562	90317	1 Mar 23
Neutra Density Filter	FM-N12130	24568	90324	3 Mar 23

2. Traceability: This certification is traceable to the International System of Unit maintained at
The National Scientific and Technological Calibration Laboratory No. 0689

3. Method of calibration

The calibration procedure was carried out according to the Guide to GPM-CAL-12 based on ASTM E275-09 (2013) and
ASTM E298-09 (2014)

4. Result of calibration

before adjustment

after adjustment

5. Equipment Specifications

Spectral Bandwidth	5	nm
Data points	5	nm
Scan Speed	N/A	nm/min



BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD. CALIBRATION LABORATORY

300 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-1929 Fax: +66 2615-2350-1
E-mail: bkk@becthai.com Website: www.becthai.com



Certificate No. CAL-22-284

Page 3 of 3

CALIBRATION REPORT

Wave Length Calibration

Certified Values of Reference Material (nm)	Nominal value (nm)	UUC Reading (nm)	Error (nm)	Uncertainty of Measurement (\pm nm)
486.13	486	486	0.60	0.69
589.00	589	587	0.30	0.69
656.30	656	656	0.30	0.69

Photometer Calibration for Visible

Wavelength (nm)	Certified Values of Reference Material (A)	UUC Reading (A)	Error (A)	Uncertainty of Measurement (\pm A)
450.0	Zero	0.000	0.0000	0.0008
	0.5824	0.583	0.0006	0.0042
	0.7038	0.706	+0.0006	0.0040
	0.9177	0.936	+0.0017	0.0040
500.0	Zero	0.000	0.0000	0.0008
	0.5669	0.566	-0.0007	0.0042
	0.7126	0.710	-0.0026	0.0037
	0.9174	0.914	-0.0034	0.0037
555.0	Zero	0.000	0.0000	0.0008
	0.5056	0.507	0.0014	0.0044
	0.6708	0.670	-0.0008	0.0038
	0.8683	0.866	-0.0023	0.0034
546.1 (546.0)	Zero	0.000	0.0000	0.0008
	0.5038	0.504	0.0004	0.0008
	0.6960	0.696	+0.0000	0.0031
	0.8903	0.894	0.0037	0.0032
590.0	Zero	0.000	0.0000	0.0008
	0.5578	0.559	0.0012	0.0008
	0.7613	0.762	+0.0003	0.0031
	0.9147	0.918	0.0003	0.0032
656.0	Zero	0.000	0.0000	0.0008
	0.5666	0.568	0.0025	0.0008
	0.7307	0.734	0.0033	0.0031
	0.9424	0.947	0.0046	0.0031

Remark: Each individual filter is measured against the empty filter holder (blank) used to zero the Spectrophotometer

Note

UUC: Unit Under Calibration

- End of Report -

Signature



ที่ อก ๐๓๑๐(๑)/๒ ๑ ๘

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๒ เขตราชเทวี
กรุงเทพมหานคร ๑๐๔๐๐

๒๕ มกราคม ๒๕๖๔

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท สเปเชียล แล็บ เอ็นไว แอนด์ คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๓ พฤศจิกายน ๒๕๖๓

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท สเปเชียล แล็บ เอ็นไว แอนด์ คอนซัลแตนท์ จำกัด จำนวน ๒ แผ่น

ตามหนังสือที่อ้างถึง บริษัท สเปเชียล แล็บ เอ็นไว แอนด์ คอนซัลแตนท์ จำกัด ขอต่ออายุ
หนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๑๓๓ สถานที่ตั้งเลขที่ ๔๗/๔๑-๔๓ หมู่ที่ ๓
ตำบลท่าอิฐ อำเภอปากเกร็ด จังหวัดนนทบุรี ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท สเปเชียล แล็บ เอ็นไว แอนด์ คอนซัลแตนท์ จำกัด
ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์

- | | |
|----------------------------|----------------------------|
| ๑) นายนิธิตัน นิเมะ | ทะเบียนเลขที่ ว-๑๓๓-ค-๕๒๗๗ |
| ๒) นายมะปารี อาแวก็อจิ | ทะเบียนเลขที่ ว-๑๓๓-ค-๕๕๗๐ |
| ๓) นางสาวสุวิมล หมวกหม๊ะ | ทะเบียนเลขที่ ว-๑๓๓-ค-๕๑๔๒ |
| ๔) นางสาวอาสมะ แสงเลาะ | ทะเบียนเลขที่ ว-๑๓๓-ค-๕๑๔๓ |
| ๕) นางสาวกัญญาภัทร แสงเต็น | ทะเบียนเลขที่ ว-๑๓๓-ค-๕๑๔๔ |

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์

- | | |
|--------------------------------|----------------------------|
| ๑) นางสาวฟาติฮะห์ สุหลง | ทะเบียนเลขที่ ว-๑๓๓-จ-๕๑๔๕ |
| ๒) นางสาวอัสวากนี-ยูโซะ | ทะเบียนเลขที่ ว-๑๓๓-จ-๕๑๔๖ |
| ๓) นางสาวสุไมยะห์ ดือราแม็ง | ทะเบียนเลขที่ ว-๑๓๓-จ-๕๑๔๗ |
| ๔) นางสาวนุรโหมะห์ โสลาภา | ทะเบียนเลขที่ ว-๑๓๓-จ-๕๑๔๘ |
| ๕) นายเสรี จันทวี | ทะเบียนเลขที่ ว-๑๓๓-จ-๕๑๔๙ |
| ๖) นางสาวอรุณรัตน์ เขียวน้ำชุม | ทะเบียนเลขที่ ว-๑๓๓-จ-๕๑๕๐ |
| ๗) นางสาวณภัสภรณ์ ธนะอัมมัส | ทะเบียนเลขที่ ว-๑๓๓-จ-๕๑๕๑ |

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๒๖ รายการ

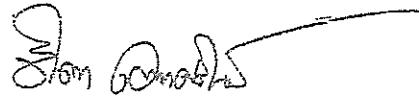
ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้...

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒๕ มกราคม ๒๕๖๗ หากประสงค์จะต่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อ
กรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นสุดอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ซึ่งคำขอต่ออายุทั้งกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



(นางจันทา เตชะศรีนทุ)
ผู้อำนวยการกองวิจัยและเชื่อมกับมลพิษ
ปฏิบัติการควบคุมมลพิษกรมโรงงานอุตสาหกรรม

กองวิจัยและเชื่อมกับมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๔๐๐๒ ๐ ๒๒๐๒ ๔๑๔๖

โทรสาร ๐ ๒๓๕๔ ๓๒๐๘ ๐ ๒๓๕๔ ๓๔๑๕

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท สเปเชียล แล็บ เอ็นไว แอนด์ คอนซัลแตนท์ จำกัด เลขทะเบียน ว-๑๓๓

ที่ ออก ๐๓๑๐(๑)/ ๒ ๕ ๘

ลงวันที่ ๐๕ มกราคม ๒๕๖๔

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๖ รายการ

น้ำเสีย จำนวน 26 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Arsenic	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[2]
2	Barium	Digestion, Direct Nitrous Oxide-Acetylene Flame Method ^[2]
3	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method ^[2] 2) 5-Day BOD Test, Membrane Electrode Method ^[2]
4	Cadmium	Digestion, Direct Air-Acetylene Flame Method ^[2]
5	Chemical Oxygen Demand	Closed Reflux, Colorimetric Method ^[2]
6	Color	ADMI Weighted-Ordinate Spectrophotometric Method ^[2]
7	Copper	Digestion, Direct Air-Acetylene Flame Method ^[2]
8	Cyanide	Distillation, Colorimetric Method ^[2]
9	Formaldehyde	Distillation, Colorimetric Method ^[1]
10	Free Chlorine	DPD Colorimetric Method ^[2]
11	Hexavalent Chromium	Colorimetric Method ^[2]
12	Lead	Digestion, Direct Air-Acetylene Flame Method ^[2]
13	Manganese	Digestion, Direct Air-Acetylene Flame Method ^[2]
14	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[2]
15	Nickel	Digestion, Direct Air-Acetylene Flame Method ^[2]
16	Oil & Grease	Liquid-Liquid, Partition-Gravimetric Method ^[2]
17	pH	Electrometric Method ^[2]
18	Phenols	1) Distillation, Chloroform Extraction Method ^[2] 2) Distillation, Direct Photometric Method ^[2]
19	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[2]
20	Sulfide	ZnS Precipitation, Iodometric Method ^[2]
21	Temperature	Laboratory and Field Methods ^[2]
22	Total Dissolved Solids	Dried at 180 °C ^[2]
23	Total Kjeldahl Nitrogen	Macro Kjeldahl Method ^[2]
24	Total Suspended Solids	Dried at 103-105 °C ^[2]
25	Trivalent Chromium	Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ^[2]
26	Zinc	Digestion, Direct Air-Acetylene Flame Method ^[2]

วิภาดา

(นางวิภาดาญ์ อัครสกุลวิไล)

ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

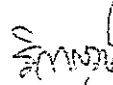
และทะเบียนห้องปฏิบัติการ

เอกสารอ้างอิง...

เอกสารอ้างอิง

1. สมาคมวิศวกรรมสิ่งแวดล้อมแห่งประเทศไทย. คู่มือวิเคราะห์น้ำเสีย. พิมพ์ครั้งที่ 4. กรุงเทพฯ: เรือนแก้วการพิมพ์, 2547.

2. APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 23rd ed. Washington, DC: APHA, 2017.



(นางริกาญจน์ ฉัตรสกุลไชย)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ



Calibratech Co., Ltd.

1. 111/11 Sukhumvit Road, Bangkok 10110
 2. 111/11 Sukhumvit Road, Bangkok 10110



NIST-715-715-1028
 CALIBRATION 0000

Certificate No. : 64-400532-1

Page : 1 of 2

Submitted by : Special Lab Env and Consultant Co., Ltd.
 47/91 Moo 3 Tambon Tha-hi, Pathum, Nonthaburi 11120

Equipment : Water Bath
 Manufacturer : Memmert Model : WB22
 Range : 0.1 C Resolution 0.1 C
 Serial No. : L520.0201 ID No. : LB-Eq-041

Environment : On site calibration was carried out at the Laboratory, Special Lab Env and Consultant Co., Ltd.
 Ambient Temperature : (29.0 to 31.0) C
 Relative Humidity : (55 to 60) %
 Line Voltage : (226.0 to 226.5) V

Date of Received : 10 October 2021

Date of Calibration : 10 October 2021


Date of Issue : 10 October 2021

Calibrated by : Permpon Chanpa

Calibration Method : This instrument was calibrated by In-house method CAL-M4006 based on ASTM E715-80
 The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units
 Standard Digital Thermometer with RTD probe

ID No.	Cert. No.	Due Date	Traceability
400029 & 400031	64-400433-1	07 Apr 2022	National Institute of Metrology Thailand (NIMT)

Approved by : 
 (Bunjerd Masri)
 Supervisor

The Uncertainty are for a confidence probability of approximately 95%

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CAL-F0031-03





Calibrarech Co. Ltd.

100/20 Sukhwarin Road, Bangkok, Thailand 10120

Tel : 02-2511 8811 Fax : 02-2511 8812 E-mail : calibrarech@calibrarech.com

Calibration Certificate

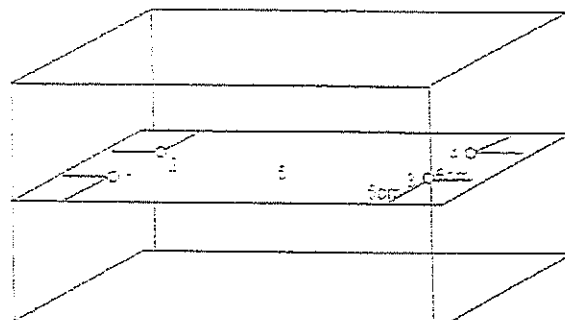
Certificate No. : 64-400632-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



Front

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (C1-5 Sensor No)					Uncertainty (± °C)	Measured Uniformity (°C)	Measured Stability (°C)
			1	2	3	4	5			
20	20.0	20.0	20.03	20.01	20.01	20.02	20.02	0.03	0.02	0.04
25	25.0	25	24.95	24.93	24.94	24.92	24.97	0.03	0.01	0.05
35.0	35.0	35.0	34.96	34.93	34.92	34.90	34.95	0.03	0.01	0.04
100.0	100	100.2	100.55	100.72	100.65	100.72	100.69	0.24	0.27	0.14

Remark : The uncertainty is not combine uniformity of the water bath

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

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

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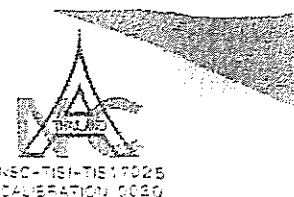




Calibratech Co., Ltd.

111/11 Moo 2, Subhommachulalongkornrajavidyalaya, Nonthaburi 11120

Tel: 02-945-2111 Fax: 02-945-2155 E-mail: cal@caltech.co.th, cal@caltech.co.th@gmail.com



Certificate of Calibration

Certificate No. : 64-210396-1

Page : 1 of 2

Submitted by : Special Lab Eng. And Consultant Co., Ltd.

47/91 Moo 3, Tambol Tha-It, Pakkret, Nonthaburi 11120

Equipment : Weight

Manufacturer : LS

Material : Stainless Steel

Weight size : 1 g

ID No. : LB-Eq-034

Assumed density of weight : 7950 kg/m³

Assumed Air density : 1.2 kg/m³

Environment : Ambient Temperature : (20 ± 2) °C

Relative Humidity : (50 ± 10) %

Air Pressure : 1003.7 mbar

Date of Received : 14 August 2021

Date of Calibration : 18 August 2021

Date of Issue : 18 August 2021

Calibrated by : Wutichai Swasphong

Calibration Method : In-house method CAL-M2101 based on OIML R 111-1 : 2004(E)

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Weights

ID No.	Serial No.	Due Date	Traceability
EE413-E2-25	1111-0111-14	27 Mar 2022	National Institute of Metrology (Thailand), (NIMT)

Approved by

(Surachai Promthong)

Laboratory Manager

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

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Calibratech Co., Ltd.

100 Moo 2, Sukhprachuen Rd. Bangpoo, Pailin, Nakhon Phanom 11120

Tel: 094-0211 Fax: 021104-7110 E-mail: calibratech.co@ yahoo.com, calibratech.co@ hotmail.com

Leaf Plate of Calibration

Certificate No. : 64-210396-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

No.	Nominal Value	Id Mark	Conventional mass Value	Measuring Uncertainty
1	g	none	1 g -0.041 mg	= 0.023 mg

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

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

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10/11





Calibratech Co.,Ltd.

47 Moo 3, Subhapanichan 3 Rd, Bangkrod, Paddret, Nonthaburi 11120

Tel : 094452111 Fax : 02-594-1115 E-mail : calibratech.co.th@nonthaburi.com, calibratech.co.th@nonthaburi.com



NSG-TIS-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 64-210396-2

Page : 1 of 2

Submitted by : Special Lab Equip And Consultant Co.,Ltd.

47-91 Moo 3, Tambol Tha-lu, Paddret, Nonthaburi 11120

Equipment : Weight

Manufacturer : LS

Material : Stainless Steel

Weight size : 100 g

ID No. : LB-Bq-035

Assumed density of weight : 7950 kg/m³

Assumed Air density : 1.2 kg/m³

Environment : Ambient Temperature : (20 ± 2) °C

Relative Humidity : (50 ± 10) %

Air Pressure : 1005.1 mbar

Date of Received : 14 August 2021

Date of Calibration : 15 August 2021

Date of Issue : 18 August 2021

Calibrated by : Wutthichai Srisophon

Calibration Method : In-house method CAL-M2101 based on OIML R 111-1 : 2004(E)

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E2413-E2435	6414-0050-10	17 Mar 2022	National Institute of Metrology (Thailand), (NIMT)

Approved by :

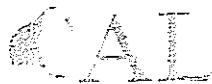
Surachai Promthong
Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03





Calibratech Co., Ltd.

7/11 Moo 2, Subhansri, 3 Rd., Bangpoo, District Nonthaburi 11120

Tel: 06-410211 Fax: 06-494-8155 e-mail: calibratech.co.ltd@yahoo.com, calibratech.co.ltd@hotmail.com

Certificate of Calibration

Certificate No. : 64-210396-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

No.	Nominal Value	Id Mark	Conventional mass Value	Measuring Uncertainty
1	100 g	none	100 g -0.17 mg	± 0.11 mg

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

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

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100



CAL

Calibratech Co., Ltd.

7/10, Mon 2, Subharpur Road, Burigadda, Dhaka-11025
Phone: 02-2211 8400, 02-2211 8401, e-mail: calibratech.co@gmail.com, calibratech.ltd@gmail.com

Certificate of Calibration

Page : 2 of 2

Certificate No. : 04-210396-3

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

No.	Nominal Value	In Mark	Conventional mass Value	Measuring Uncertainty
1	200 g	none	200 g -0.26 mg	± 0.17 mg

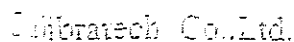
This result of calibration was found accurate as shown on date and place of calibration only.

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

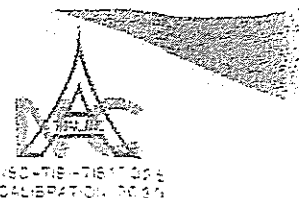
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2000-01-01

Certificate No. : 65-400224-1

Page : 1 of 2

Submitted by : Special Lab Engineering Consultants Co., Ltd.

¹⁷ A. K. M. J. Tenzel Thon, *Palmer, Nondetour* (1950).

Equipment : Digital Thermometer with TC probe

Temperature Indicator

Manufacturer : Thomas Scientific

Model : TEMP 100

Range : -50 to 1572 C

Resolution = 0.1 C

Serial No. 448988

ID No. : LB-Eg-013

Environment : Ambient Temperature : (23 ± 2) °C

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

Line Voltage (230) = 231 VAC

Date of Received : 27 April 2021

Date of Calibration : 19 May 2022

Date of Issue : 16 Nov 2022

Calibrated by : Chang S. Chen

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4003 by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90.

Reference Standard Instruments : This certification is traceable to the International System of Units

1 Platinum Resistance Thermometer (PRT)

<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>	<u>Traceability</u>
400004	TT-0004-01	01 Feb 2024	National Institute of Metrology, Thailand (NIMT)
400006	TT-0006-01	02 Jun 2023	National Institute of Metrology, Thailand (NIMT)

2. Standard Digital Thermometer:

<u>ID No.</u>	<u>Cart. No.</u>	<u>Doc. Date</u>	<u>Traceability</u>
2000-1	01E195-1	14-Jun-2000	National Institute of Metrology, Thailand (NIMT)
2000-2	01E195-2	14-Jun-2000	National Institute of Metrology, Thailand (NIMT)

Approved by _____

Bernard Vassil

Supervision

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

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Libratech Co., Ltd.

100, 118, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000

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Certificate No. : 05-400224-1

Page : 2 of 2

Result of Calibration : Without Adjustment

U/C Condition As-Received : Good

Function : Temperature measurement with Thermocouple probe Type K

Model : Type K Sheath Material : Titanium
Diameter : 2 mm Length : 1500 mm
Serial No. : 10-A ID No. : SL-10

Immersion Depth (mm)	Standard Reading (°C)	U/C Reading (°C)	Correction (°C)	Uncertainty (± °C)
150	100.0	99.8	-0.2	0.18
50	100.0	99.8	-0.2	0.18
50	100.0	100.2	0.2	0.45
50	500.0	499.2	-0.8	0.58
50	500.0	499.8	-0.2	0.65

Model : AD-21X-25 Sheath Material : Stainless
Diameter : 2.5 mm Length : 250 mm
Serial No. : 10-A ID No. : SL-20

Immersion Depth (mm)	Standard Reading (°C)	U/C Reading (°C)	Correction (°C)	Uncertainty (± °C)
125	100.0	99.8	-0.2	0.5
125	100.0	99.8	-0.2	0.5

Remark

U/C Limit Under Calibration

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

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





Cert. No.: 21CH1146

Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument :-

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	43180088	130RC092	21E1223/1	27 Apr 2022

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

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

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.
ANSI-ASQ National Accreditation Board, Accredited No. AR-1838

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	754028	28 June 2023
pH 6.866	CPA chem	679462	12 Mar 2022
pH 9.181	CPA chem	754031	20 July 2022

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

Calibration ResultsFunction : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,9)

<u>Unit Under Calibration</u>	<u>Standard pH Buffer Solution</u>	<u>Actual pH Reading</u>	<u>Actual mV Reading (mV)</u>	<u>Uncertainty of pH measurement (\pm)</u>	<u>Coverage factor k</u>
pH Electrode S/N: 3034419	4.008	4.01	169.2	0.0071	2.00
	6.866	6.87	0.6	0.0082	2.00
	9.181	9.18	-184.9	0.018	2.00

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Cert.No.: 21CH1146

Page.: 3 of 3

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,9)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: 2558459	0.00	414.12	414	0.02	0.58	2.00
	1.00	354.96	355	1.02	0.58	2.00
	2.00	295.80	296	2.02	0.58	2.00
	3.00	236.64	237	3.01	0.58	2.00
	4.00	177.48	177.4	4.01	0.058	2.00
	5.00	118.32	118.3	5.01	0.058	2.00
	6.00	59.16	59.1	6.00	0.058	2.00
	6.86	8.28	8.3	6.86	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	8.00	-59.16	-59.1	8.00	0.058	2.00
	9.00	-118.32	-118.3	9.00	0.058	2.00
	9.18	-128.97	-129.0	9.18	0.058	2.00
	10.00	-177.48	-177.5	10.00	0.058	2.00
	11.00	-236.64	-237	11.00	0.58	2.00
	12.00	-295.80	-296	12.00	0.58	2.00
	13.00	-354.96	-355	13.00	0.58	2.00
	14.00	-414.12	-414	14.00	0.58	2.00

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

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Note:

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
44/101 CHANGKONG ROAD, SUKHUMVIT 23, BANGKOK 10110
TEL: 02-26164444 FAX: 02-26164444




Cert. No.: 24TM1547
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter with Sensor
Manufacturer : Eutech
Model : pH 700
Serial No. : 2858459
ID No. : LB-Eq-027
Submitted by : Special Lab Envi And Consultant Co.,Ltd.
47/21-23 Moo 3 Tambon Tha-It,
Pakkret,
Nonthaburi 11120
Location : TPA Chemistry Calibration Laboratory
Received Order : 23 August 2021
Calibrated Date : 27 August 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Kunchit Promprai

Approved by :


Approved Signatory

() Pornthipha Tameyakul

() Malee Butkruea

() Suwit Imjai

Issue Date : 31 August 2021

The Uncertainties are for a confidence probability of approximately 95%

This certificate is provided under the condition that it is not to be used for any other purpose.
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A 0031535



Equipment : pH Meter with Sensor

Condition As-Received : Used Item

Reference : 2106-0663WIN-2

Cert. No.: 21TM1547

Page.: 2 of 2

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.

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) Digital Thermometer	1523	2186080	2011389	20 Nov 2021

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 :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, ID No.: SL-33/1

<u>Calibration Point</u> (°C)	<u>Immersion Depth</u> (mm)	<u>Standard Temperature</u> (°C)	<u>UUC* Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (± °C)	<u>Coverage Factor</u> <i>k</i>
25.0	100	25.0	25.000	0.000	0.16	2.00

UUC* : Unit Under Calibration

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 %.

-o-o-

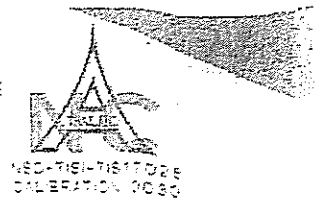
Signature

a 1069519

CAL

Calibratech Co., Ltd.

100/105-106, Pongpatanasarakul Road, Bangkok, Thailand 10260
Tel: 02-012-1212, Fax: 02-012-1213, Email: info@calibratech.com, calibratech.com@gmail.com



Certificate of Calibration

Certificate No. : 65-400213-3

Page : 1 of 2

Submitted by : Special Lab Env (and Consultant Co., Ltd.
47/91 Moo 3 Tambon Tha-It Pailin Nonthaburi 11120

Equipment : Air Chamber (Refrigerator)
Manufacturer : Frozen
Model : CC-250C
Range : N/A °C
Resolution : 0.1 °C
Serial No. : 1081307016
ID No. : LB-Eq-006

Environment : On site calibration was carried out at the Laboratory.
Special Lab Env (and Consultant Co., Ltd.
Ambient Temperature : (29.5 to 30.8) °C
Relative Humidity : (54 to 60) %
Line Voltage : (226.0 to 226.5) V

Date of Received : 27 April 2022

Date of Calibration : 27 April 2022

Date of Issue : 30 April 2022

Calibrated by : Bunjerd Masri

Calibration Method : CAL-M4004, TLAS G-10

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Digital Thermometer with RTD Probe

ID No.	Cert. No.	Due Date	Traceability
400046 & 400042	65-400213-1	28 Jul 2022	National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL

Calibratech Co., Ltd.

Office : 2, Srinagar Road, 3rd Km, Bangalore Road, Chittoor-751002.

Calibratech Pvt. Ltd. Email : calibratech@calibratech.com, calibratech@gmail.com

Phone : 0864-2222222, 0864-2222223, 0864-2222224

Certificate No. : 65-400213-3

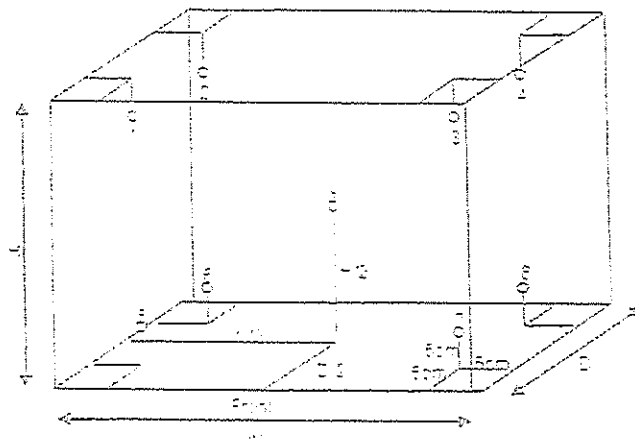
Page : 2 of 2

Result of Calibration : Without Adjustment

U/C Condition As-Received : Good

Function : Temperature measurement

This instrument was kept at constant internal position (1) (Close)



Inside of Chamber

W = 1.02 m

D = 0.47 m

H = 1.48 m

Capacity = 0.71 m³

Test Point	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
10	20	22	21.99	21.99	21.96	21.97	21.96	21.95	21.94	21.92	21.97	±0.39

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
10	20	22	1.10	0.04	1.0

Remark : The uncertainty does not comprise uniformity of the air chamber

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

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

- (05) -





PinAAcle 900F Preventive Maintenance Report

Company Name: SPECIAL LAB ENVI & CONSULTANT


Instrument Location: PAKKRET NONTHABURI 11120

Instrument Serial No.: PFBS17082303

Date: 03-Sep-2021

PinAAcle 900F Preventive Maintenance (PM)

Company Name:	SPECIAL LAB ENVI & CONSULTANT		
Address (Instrument Location):	PAKKRET NONTABURI 11120		
Serial Number:	PFBS17082303	PM Number:	1 of 1
Customer Name (if applicable):	K. Fhathe	Telephone Number:	(092) 263-9554
Customer Support Engineer Name:	K. Weerayoot leadpon	Service Order Number:	WO-00925451
Date PM Performed: (DD-MMM-YYYY)	03-Sep-2021	Next PM Due Date: (DD-MMM-YYYY)	03-Sep-2022
Standard Labor Hours to Complete PM :		5 hours	

Part Number	Release	Publication Date	
09870145 Rev.9	4	January 2018	PerkinElmer

Scope

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

The customer should save their method before the PM begins.

General Instructions:

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

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

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

Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
80501696	Fan Filters	1
NS160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
NS100157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	2
NS501714	Replacement Acetylene Filter Cartridge	1
TH001022	Replacement Air Filter Cartridge	2

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
49600169	1000 mg/L Copper Standard	AR	25-200UY1	30-Jan-2022

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

Additional Tools Required for PM

Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	5503530856
N1013002	2.0A Neutral density filter	1	5503532491
03030997	System 2 EDL Driver	1	03030997
N3050609	Ar System 2 EDL	1	16148
N3050603	Cl Lumina HCL	1	021913-020070
N3050609	Ba Lumina HCL	1	102416-040160
N3050609	K Lumina HCL	1	119716-010060
N3050603	Ni Lumina HCL	1	100516-030190

Procedure Checklist

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

1. General:

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

2. PC Instrument Software:

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

3. Mechanical:

- ☐ Inspect and clean all fans and filters. Replace filters if necessary.
- ☐ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☐ Clean exterior of the instrument.
- ☐ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☐ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking slot width. Replace if out of specification.
- ☐ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☐ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☐ Visually check for proper flame conditions when igniting the Air-C₂H₂ and N₂O-C₂H₂ flames (if applicable).

4. Electrical:

- ☐ Inspect PC boards. Clean if necessary.
- ☐ Carefully check all internal and external cable connections.
- ☐ Check instrument firmware revisions upgrade to current levels (if necessary).
- ☐ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ☐ Inspect and clean the sample compartment windows, if needed.
- ☐ Inspect optics. Clean or replace if necessary.

6. Gases:

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

7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
C ₂ H ₂ Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

8. After PM Performance tests:

8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 558.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	0.9798	0.9766	Passed
0.2 A ND Filter	± 5% from Cert.	0.2042	0.1989	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0015	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0002	Passed

8.4 D₂ Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0079	Passed

8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0004	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0011	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	NA	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3221	Passed

10. Review:

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

Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.

This PinAAcle 900F Passes ☒ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:

W. A. J. J.

Date:

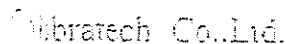
03-Sep-2021

(DD-MM-YYYY)

Authorized Customer Representative:

Date:

(DD-MM-YYYY)



1. 100 = 100% = 100%

[illegible]

C. C. H. & Co., Ltd.

Certificate No. : 65-200126-1

Page : 1 of 2

Submitted by : Special Loan Error and Consultant Co., Ltd.
 - 91 Mon A. Lumbel Tha-lt. Peldron, Nonthabun 11120

Equipment :	Electronic Balance		
Manufacturer :	AND	Model :	OR-100
Serial No. :	14245322	ID No. :	LB-Lg-016
Capacity :	110 g	Resolution :	0.0001 g

Environment : On site calibration was carried out at the Laboratory, Special Lab Eng and Consultant Co., Ltd.

Ambient Temperature : (26.8 to 27.0) °C

Relative Humidity : (53.6 to 55.7) %

Air Pressure : () mbar

Date of Received : 17 April 2022

Date of Calibration : 27-07-2022

Date of Issue : 13 May, 2022

Calibrated by: Jaredath Thompson

Calibration Method : In-house method CAL-M2001 based on UKAS Publication ref. LAB 14
Edition 5 July 2015

Reference Standard Instruments: 10. All verification is traceable to the International System of Units.

Standard Weights

<u>ID No.</u>	<u>Version</u>	<u>Doc Date</u>	<u>Traceability</u>
SCM-ED-004	0002 2010	15 Jan 2022	National Institute of Metrology (Tindalo, C.) (NMI)

Approved by _____

Select Printing:

Production Manager

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

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Calibratech Co., Ltd.

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Certificate No. : 65-200126-1

Page : 2 of 2

Result of Calibration : ☐ Under Adjustment

UNC Condition 4a-Received : ☐ ☐

Deviation of indication from nominal value

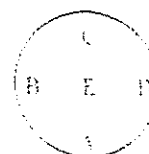
Nominal Value	Correction	Uncertainty
(g)	(g)	± (g)
0.0	+0.0000	0.00001
0.1	+0.0000	0.00001
0.2	+0.0000	0.00001
0.5	+0.0000	0.00001
1.0	+0.0000	0.00001
2.0	+0.0000	0.00001
5.0	+0.0000	0.00001
10.0	+0.0000	0.00001
20.0	+0.0000	0.00001
50.0	+0.0000	0.00001
100.0	+0.0000	0.00001
200.0	+0.0000	0.00001

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

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

Eccentric error

Load test: 0.0000 g
A B C D E
0.0000 g 0.0000 g 0.0000 g 0.0000 g 0.0000 g



Repeatability

Load test: 0.0000 g
Short: 0.0000 g

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CAL

Calibratech Co., Ltd.

101/101-1 Sukhaphetrachulalongkorn Road, Bangkok, Thailand 10120

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ISO 15189:2013
CERTIFICATION

Certificate of Calibration

Certificate No. : 65-400215-1

Page : 1 of 2

Submitted by : Special Lab Eng and Consultant Co., Ltd.
47/91 Moo 3 Tambon Tha-Ni, Paddura, Nonthaburi 11120

Equipment : Air Chamber (Incubator)
Manufacturer : Lovibond
Model : FKU 1800
Range : 0.1 °C
Resolution : 0.1 °C
Serial No. : 0925481-19
ID No. : LB-Eq-005

Environment : On site calibration was carried out at the Laboratory,
Special Lab Eng and Consultant Co., Ltd.

Ambient Temperature : (29.0 to 30.0) °C

Relative Humidity : (45 to 50) %

Line Voltage : (226.0 to 226.5) V

Date of Received : 17 April 2022

Date of Calibration : 17 April 2022

Date of Issue : 30 April 2022

Calibrated by : Permpon Chantana

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Digital Thermometer with Thermocouple probe

ID No.	Cert. No.	Due Date	Traceability
400029 & 400030	64-400567-1	23 May 2022	National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Calibration Certificate No. 65-400213-1

Certificate No. : 65-400213-1

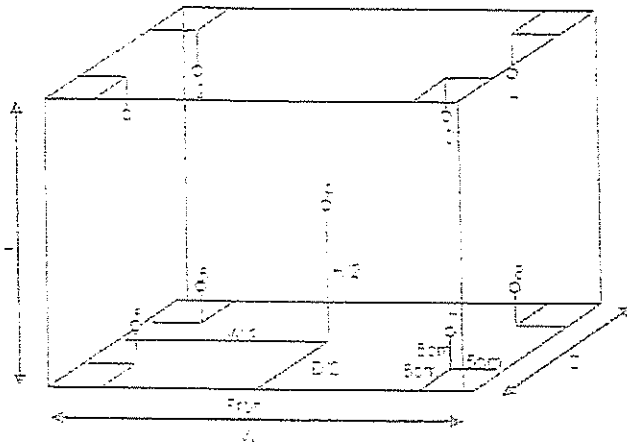
Page : 2 of 2

Result of Calibration : Without Adjustment

UIC Condition 46-Received : Good

Function : Temperature measurement

The instrument was set up in a position of position (reference)



Inside of Chamber

L = 0.55 m

D = 0.73 m

H = 0.50 m

Capacity = 0.20 m³

Test Point	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) Sensor No.										Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9		
30.0	30.0	30.0	30.0	29.9	30.1	30.0	29.9	29.9	30.1	30.1	30.0	0.55	
35.0	35.0	35.0	34.9	34.9	35.0	35.1	35.0	35.0	35.1	35.1	35.0	0.54	
37.0	37.0	37.0	36.9	36.9	36.9	36.9	36.9	36.9	37.0	37.0	37.0	0.55	

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
30.0	30.0	30.0	0.3	0.1	0.5
35.0	35.0	35.0	0.3	0.1	0.5
37.0	37.0	37.0	0.4	0.1	0.5

Remark: The uncertainty is not combine uniformity of the air chamber

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

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

- 000 -





BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY

399 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2929 Fax: +66 2615-2950-1
E-mail: bkk@becthai.com Website: www.becthai.com



Certificate No. CAL-22-284

Page 1 of 3

CERTIFICATE OF CALIBRATION

Equipment	:	Spectrophotometer
Manufacturer	:	Thermo Scientific
Model	:	Genesys 20
Serial No.	:	3SGT041007
ID No.	:	LB-Eq-029
Customer	:	Special Lab Envi And Consultant Co., Ltd.
	:	47/91-93 Moo 3 Tambol Taik, Amphur Pakred
	:	Nonthaburi, 11120
Location	:	Becthai Laboratory
Date of Receipt	:	5 May 2022
Date of Calibration	:	5 May 2022
Date of Issue	:	5 May 2022
Ambient Temperature	:	(26±10) °C
Relative Humidity	:	(60±20) %
Condition As-Received	:	Used Item

Calibrated by

Mr. Somphon Duangquani

Calibration Engineer

Approved by

Ms. Jintana Sangthajardeniap

Calibration Manager

The reported expanded uncertainty of the measurement was based on a combined standard uncertainty multiplied by a coverage factor of 2, providing a level of confidence in approximately 95%.

This certificate may not be reproduced or otherwise used, except with the prior written approval of the head of Calibration Laboratory.

Indicated values are valid for the state of the Spectrophotometer at the time of calibration only.



BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY

300 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2929 Fax: +66 2615-2550-1
 E-mail: bld@becthai.com Web site: www.becthai.com



Certificate No. : CAL-22-264

Page : 2 of 3

CALIBRATION REPORT

Conditions of this result of calibration

1. Reference Standard Material

<u>Material</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert No.</u>	<u>Due date</u>
Hydrium Gas Filter	FM-4-B	24568	90313	1 Mar 23
Dryum Gas Filter	FM-4-B	24562	90311	1 Mar 23
Neutral Dry Filter	FM-4112101	24568	90324	3 Mar 23

2. Traceability: This certification is traceable to the International System of Unit maintained at:
 The Standard for the Unit: Accredited Calibration Laboratory No. 0659

3. Method of calibration

The calibration procedure was carried out according to the Guide to GPM-CAL-02 based on ASTM E276-03 (2013) and
 ASTM E290-03 (2014)

4. Result of calibration



Before adjustment

After adjustment

5. Equipment Specifications

Spectre Band Width	8	nm
Data Rate	1	nm
Scan Speed	N/A	nm/min

[Signature]



BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY

300 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2925 Fax: +66 2615-2350-1
 E-mail: bkh@becthai.com Web site: www.becthai.com



Certificate No. : CAL-22-234

Page : 3 of 3

CALIBRATION REPORT

Wave length Calibration

Certified Values of Reference Material (nm)	Nominal value (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty of Measurement (\pm nm)
486.13	486	486	0.60	0.69
537.00	537	537	0.00	0.69
635.00	635	635	0.00	0.69

Photometric Calibration for Visible

Wavelength (nm)	Certified Values of Reference Material (A)	UUC* Reading (A)	Error (A)	Uncertainty of Measurement (\pm A)
407.1	Zero	0.000	0.0000	0.0028
	0.5624	0.583	0.0006	0.0042
	0.7136	0.738	+0.0006	0.0040
	0.9177	1.036	+0.0017	0.0040
447.1	Zero	0.000	0.0000	0.0028
	0.5659	0.586	0.0007	0.0042
	0.7126	0.719	+0.0006	0.0037
	0.9174	1.014	+0.0005	0.0037
486.1	Zero	0.000	0.0000	0.0028
	0.5659	0.587	0.0014	0.0044
	0.7128	0.670	-0.0008	0.0038
	0.9183	0.956	-0.0002	0.0034
546.1	Zero	0.000	0.0000	0.0028
	0.5638	0.584	0.0004	0.0038
	0.6960	0.696	+0.0000	0.0031
	0.9113	0.994	0.0007	0.0032
589.0	Zero	0.000	0.0000	0.0028
	0.5676	0.589	0.0012	0.0036
	0.7613	0.750	-0.0005	0.0031
	0.9147	1.075	0.0008	0.0062
635.0	Zero	0.000	0.0000	0.0028
	0.5666	0.585	0.0005	0.0035
	0.7307	0.734	0.0010	0.0037
	0.9154	1.047	0.0016	0.0031

Remark : Each individual filter is measured against the empty filter holder (blank) used to zero the Spectrophotometer

Note

UUC* : Unit Under Calibration

- End of Report -