Report

PLUMIS AUTOMIST FIRE TEST JUDGEMENT REPORT

Baltic Fire Laboratory 18-Foot Fire Testing

PREPARED FOR

Yusuf Muhammad
Plumis Inc.
Unit 4, Phoenix Trading Estate
Bilton Road, Perivale, Greenford
Middlesex, UB6 7DZ United Kingdom
Yusuf@plumis.com
+44 020 7871 3899

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JENSEN HUGHES
Advancing the Science of Safety

Kelly Opert, PE
3610 Commerce Drive, Suite 820,
Baltimore, MD 21227

kelly.opert@jensenhughes.com
1 443-258-9828

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1.0 Introduction

This report serves as an engineering judgement concerning fire testing conducted by the Baltic Fire Laboratory for the Plumis Automist system in a room with 18-foot-high ceilings. The Plumis Automist system was tested by UL in accordance with UL 2167A, with a ceiling up to 8 feet high. The testing conducted by the Baltic Fire Laboratory was based on UL 2167A fire testing, with minor changes to room size.

The Baltic Fire Laboratory is accredited in accordance with PN EN ISO/IEC 17025:2018 by the Polish Centre for Accreditation (PCA) accreditation Reg. AB1792. It is accepted as an independent third-party fire testing laboratory for water mist systems by the International Maritime Organization (IMO) and the US Coast Guard (USCG), and is accepted for other fire testing by Underwriters Laboratory (UL) and VdS Schadenverhütung (VdS).

The Plumis Automist system utilizes targeted, electronically-operated automatic open water mist nozzles that are wall-mounted at 3.94–4.27 feet above finished floor (AFF). Each nozzle has an individual infrared camera used to target the fire. The nozzles do not continuously search for a fire, but instead a smoke detector, which is included as part of the system listing, triggers the scanning mode when activated. As the water mist nozzles are wall mounted at approximately 4 feet AFF, higher ceilings do not affect the ability of the nozzles to control a fire. Rather, higher ceilings impact the detection time of the smoke detectors used to trigger the scanning mode of the nozzles.

National Fire Protection Association (NFPA) 72, 2025 edition, Annex B has recommendations for how to update smoke detector spacing based on ceiling height and ceiling slope, which aligns with research done by Jensen Hughes on the effect of ceiling height on smoke detector activation time. The detector spacing used in the higher ceiling test was more stringent than that suggested by NFPA 72, and while the detection time was increased by approximately 30 seconds in the higher ceiling test, the temperatures measured were lower than the test with an 8-foot ceiling.

Based on this testing, higher ceilings affect the Plumis Automist system's time until detection, but the greater room volume and ceiling height help the space remain tenable for longer, and many of the UL fire tests still passed with longer times to nozzle discharge. Other solutions may be implemented at the site level apart from reducing smoke detector spacing that could reduce the time from ignition to nozzle discharge, though discussion of these is outside the scope of this report.

2.0 Product Description

The Plumis Automist System is a listed occupancy protection water mist system utilizing targeting electronically-operated automatic open nozzles each with individual infrared cameras used to target the fire. On detection of a fire by a smoke detector, the controller "wakes up" the nozzle(s) to scan for fire using their thermal sensors. Once the Automist controller's detection algorithm confirms a fire from the thermal sensor data, the high-pressure pump is activated and water is discharged from the nozzle best located to target the fire. If the thermal sensor on the nozzle senses the fire is traveling, it will pause the pump and relocate the angle of the nozzle to best target the new location of the fire. The nozzles are wall mounted 3.94–4.27 feet away from finished floor to avoid unwanted evaporation of the mist in the hot upper layer of air near the ceiling and to allow the infrared sensors to better detect the fire.

The Plumis Automist system is a listed, pre-calculated, engineered system. Any number of nozzles and fittings may be used up to the maximum included in the system calculations and testing involved in listing the product. As a listed integrated system, components of the system were required to be tested to certify

the system. Many of the components, including the pump, filters, and waterflow valves, are not typically required to be listed if used in one- and two-family dwellings in accordance with NFPA 750 Section 10.3.2.4.1, similar to NFPA 13D Section 5.1.2. These components were required to be tested to be included in the system listing. As part of the listing process, the system was put through fire testing comparable to the fire testing for sprinklers and basic water mist nozzles.

Figure 2-1 depicts the basic components of a standard Automist system, namely the pump, controller, smoke detectors, targeting nozzles, hydraulic lines, and electrical cabling. The system performance has been tested within and shall be installed within operational bounds outlined in Table 2-1 and depicted in Figure 2-2.

Plumis Automist has two model numbers listed in their UL listing [13], AP09 and AP12. AP09 is their 230V AC/50Hz system and AP12 is their 240V AC/60Hz system, which is what is typically installed in the United States. The system model numbers are the same as the pumps used within the system.

Table 2-1: Plumis Automist Operational Bounds [12]

Parameter	Operational Bound
Maximum number of water mist nozzles	10
Maximum number of smoke sensors in the system	10
Maximum number of smoke sensors in a series chain	2
Maximum number of scanning water mist nozzles at the same time	6
Maximum number of water mist nozzles per zone	3
Zones per sensor	2 zones
Maximum sensor cable length	90 m (295.27 ft)
Maximum data cable length	80 m (262.47 ft)
Maximum high-pressure water pipe length	60 m (196.85 ft)
Maximum high-pressure water pipe length from the pump to the furthest water mist nozzle	30 m (98.42 ft)
Maximum sounder cable length	90 m (295.27 ft)
Room Temperature	Above 4° C (39.2° F) and below 44° C (11.2° F)

1. Smoke sensor (EVCA-PY-PL)
2. Spray head (SH12)
3. Pump (AP09)
4. Controller (CT03)
5. High-pressure pipe ¼" BSPP connection
6. 2 Core Sensor cable
7. 5 Core Data cable
8. Pump to controller cables (power and solenoid)

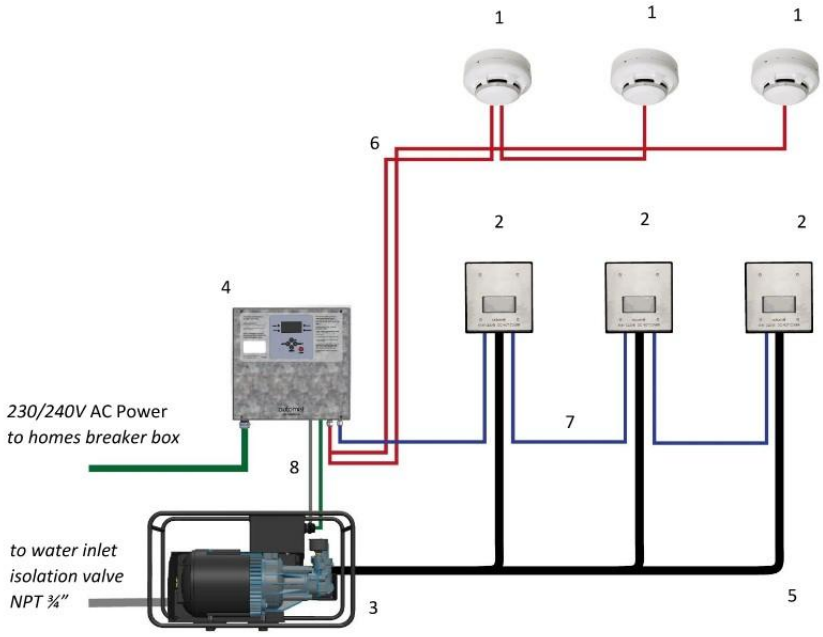


Figure 2-1: Plumis Automist System Diagram [12]

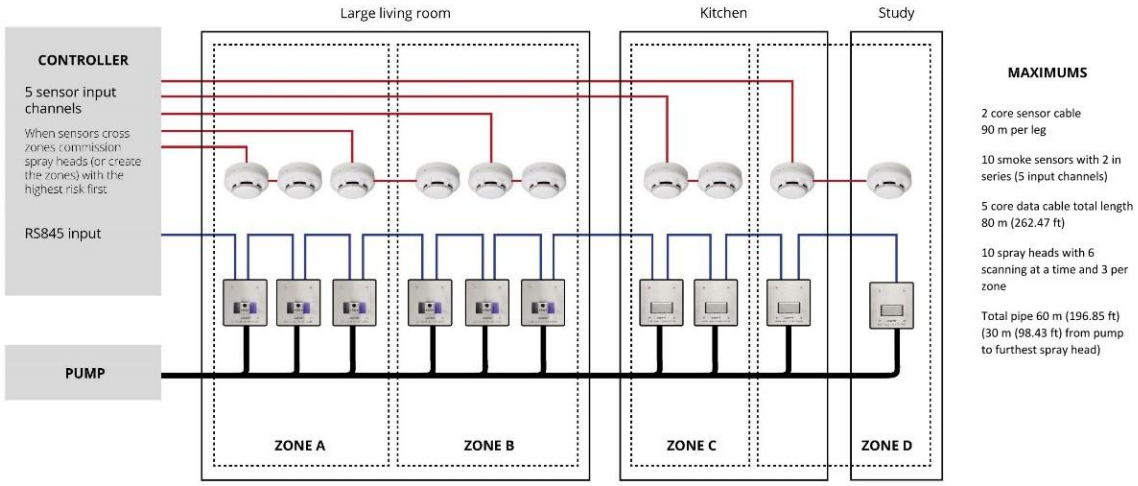


Figure 4: Technical Limitations Summary

Figure 2-2: Plumis Automist Operational Bounds [12]

3.0 Test Configurations

The results of fire test conducted by the Baltic Fire Laboratory are compared to the fire test conducted by Underwriters Laboratories (UL) Inc. The primary objective of the fire test conducted by UL was a preliminary investigation to determine the fire suppression performance of the Plumis Automist system in a test enclosure with an 8-foot-high (2.44-meter-high) ceiling. The primary objective of the fire test conducted by Baltic Fire Laboratory was to compare the fire suppression performance of the Plumis Automist system in a room with increased ceiling height to the same test with an 8-foot-high ceiling. Baltic Fire Laboratory was tasked by Plumis Ltd. to test the Plumis Automist system in conditions that were not tested during UL's preliminary investigation to determine the effectiveness when protecting a space with increased ceiling heights.

For the Plumis Automist system to be compliant with UL 2167A, temperatures in the test room are required to be below certain temperature thresholds. Seven thermocouples were used in the small room test enclosure scenarios to measure temperatures at the ceiling and at eye level during the test. The temperature acceptance criteria are shown Table 3-1.

Table 3-1: Residential Fire Testing Requirements

Temperature Requirement	*UL2167A [8] Test Criteria*
Temperature Requirement 1 (Flashover Prevention)	The maximum temperature 3 inches (76 mm) below the ceiling at the center of the room shall not exceed 600°F (316°C).
Temperature Requirement 2 (Life Safety)	The maximum temperature at the location 63 inches (5 feet 3 inches, 1.6 m) above the floor as illustrated in Figure below shall be permitted to exceed 200°F (93°C) at only one of the two locations;
Temperature Requirement 3 (Life Safety)	The temperature at the location described in (b) shall not exceed 130 °F (54 °C) for more than any continuous 2-minute period at only one of the two locations.
Temperature Requirement 4 (Flashover Prevention)	The maximum ceiling material temperature 0.25 inches (6 mm) behind the finished ceiling surface directly over ignition as illustrated in Figure 23.1 shall not exceed 500°F (260°C).

The test procedure begins with ignition of a tray filled with heptane and cotton wicks. The duration of the test is 30 minutes from when the first nozzle is activated. Note for the UL2167A testing, the test begins at time 0:00, when the fuel source is ignited, but the Baltic Fire Laboratory tests begin at time 0:00, but the fuel source is ignited at time 1:00.

3.1 UL 2167A

The UL standard for the Plumis Automist system [8] outlines 17 different fire testing scenarios. The unpublished working standard of this test is referred to as UL 2167B, and the published standard is UL 2167A. The independent variables of these 17 testing scenarios were the size of the test enclosures, Automist nozzle locations, fuel packages, obstruction of Automist nozzle, and smoke detector locations.

Two test enclosures with a ceiling height of 8 feet were used in the UL 2167A testing: a small room sized 14 feet 8 inches by 26 feet 3 inches (4.47 meters by 8 meters) and the large room sized 18 feet by 38 feet (5.49 meters by 11.58 meters). The small room size was driven by the listed spray distance of the nozzle and the large room size was driven by the intended spacing of the smoke detectors listed with the system. The small room used one smoke detector located on the ceiling at the center of the test enclosure while the large room used two smoke detectors spaced such that the edge of their detection range coincided with the corner of the room. For this report, only tests performed in the small room are considered, as they are more directly comparable to the Baltic Fire Laboratory test.

In the small room tests, two Automist nozzle locations were used: The near-wall adjacent to the fuel load and the far wall opposite the fuel load, with the nozzle located 3.94 feet (1.2 meters) AFF in both configurations. Figure 3-1 shows the two nozzle configurations, and Figure 3-2 shows the small room test enclosure configuration, including thermocouple locations.

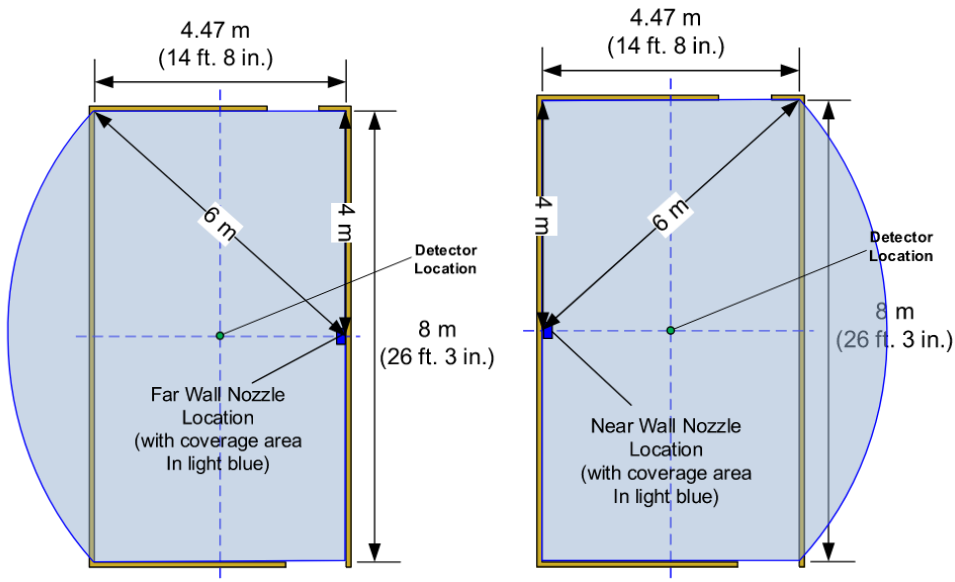


Figure 3-1: Small Room Nozzle Locations

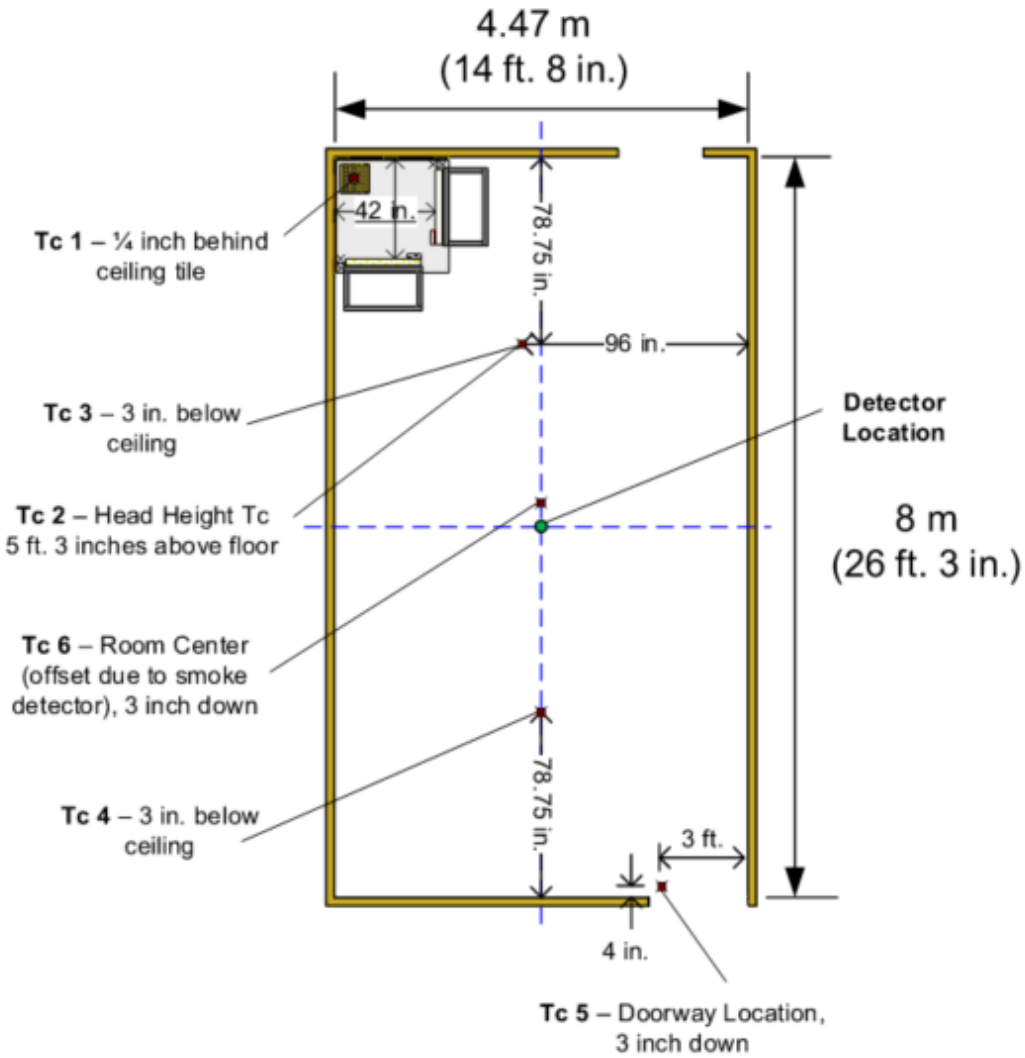


Figure 3-2: Small Room Test Enclosure Configuration

The following five different fuel packages were used in the UL 2167A testing:

1. Fabricated sofa with Plywood.
2. A UL 2167 simulated furniture and crib with plywood on the walls.
3. A UL 2167 simulated furniture and crib with drapes on the walls.
4. Cooking oil.
5. A fabricated sofa in the center of the room.

The cooking oil fire is not intended to judge the performance of water mist systems in a one- or two-family residence so a comparison of the results of this fire have not been included in this report. The fabricated sofa is specific to UL 2167A and is larger, burns slower, and produces more smoke than the UL 2167 simulated furniture. Only tests including the fabricated sofa with Plywood or UL 2167 simulated furniture and crib with plywood on the walls fuel packages occurring in the small room test enclosure are compared in this report. The sofa was considered for use in the Baltic testing, though was not used. Only the UL 2167 simulated furniture and crib was used as it produced less smoke and therefore is considered

the worst case in terms of smoke detection time (see Table 4-1). The UL 2167 simulated furniture and crib are shown in Figure 3-3 and the fabricated sofa is shown in Figure 3-4.

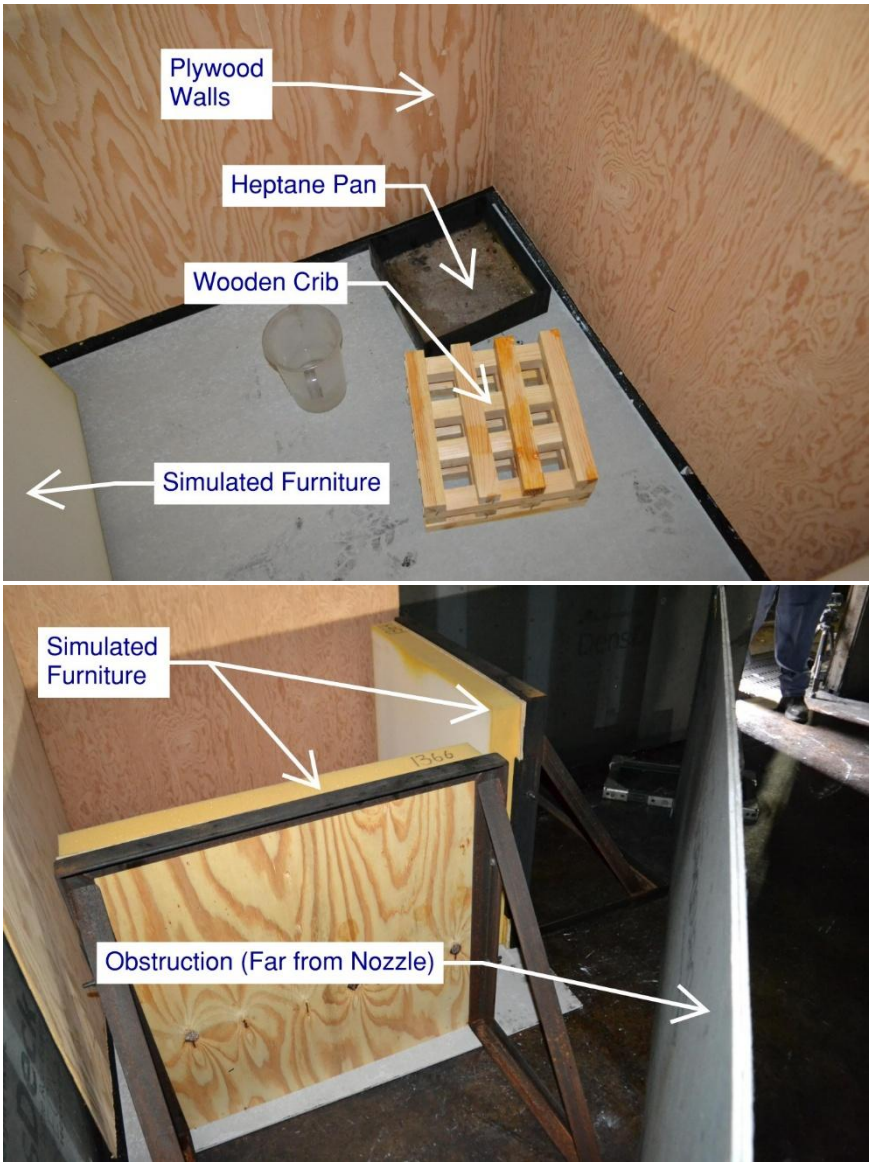


Figure 3-3: UL 2167 Simulated Furniture and Wooden Crib

Figure 3-4: UL 2167A Sofa

All UL 2167A fire test runs, including their fuel loads, nozzle location, obstruction location, and room size, are provided in Table 3-2.

Table 3-2: UL 2167A Fire Test Runs

Test #	Fuel Load	Nozzle Wall	Obstructions	Room Size
1	Fabricated sofa with Plywood	Far	None	Small (14'8" X 26'3")
2	Fabricated sofa with Plywood	Near	None	Small (14'8" X 26'3")
3	UL 2167 simulated furniture with plywood on the walls	Far	None	Small (14'8" X 26'3")
4	UL 2167 simulated furniture with plywood on the walls	Near	None	Small (14'8" X 26'3")
5	UL 2167 simulated furniture with drapes on the walls	Far	None	Small (14'8" X 26'3")
6	UL 2167 simulated furniture with drapes on the walls	Near	None	Small (14'8" X 26'3")
7	Cooking oil	Far	None	Small (14'8" X 26'3")
8	Fabricated sofa with Plywood	Far	Close to Nozzle	Small (14'8" X 26'3")
9	Fabricated sofa with Plywood	Near	Close to Nozzle	Small (14'8" X 26'3")
10	Fabricated sofa with Plywood	Far	Far from Nozzle	Small (14'8" X 26'3")
10A	UL 2167 simulated furniture with plywood on the walls	Far	Far from Nozzle	Small (14'8" X 26'3")
11	UL 2167 simulated furniture with plywood on the walls	Near	Far from Nozzle	Small (14'8" X 26'3")
12	Fabricated sofa with Plywood in Room Center	Far Short Wall	None	Small (14'8" X 26'3")
13	Fabricated sofa with Plywood	Far	None	Large (18' X 38')
14	UL 2167 simulated furniture with plywood on the walls	Far	None	Large (18' X 38')
15	Fabricated sofa with Plywood	Far	Far from Nozzle	Large (18' X 38')
16	UL 2167 simulated furniture with plywood on the walls	Far	Far from Nozzle	Large (18' X 38')

3.2 BALTIC FIRE LAB TEST

The Baltic Fire Laboratory replicated Test 3 from the UL 2167A fire tests because its fuel load produced little smoke, leading to a later detection time, and allowing the fire to develop further before nozzle activation. There were a few minor differences from the basic UL 1267A test configuration, including the room size and instrumentation locations.

The test enclosure was sized in accordance with BS EN 14972-17, meaning they were 26.25 feet by 13.1 feet (8.0 meters by 4.0 meters) instead of 26.25 feet by 14.67 feet (8.0 meters by 4.47 meters) used in the UL 2167A tests. Where the UL 2167A test enclosure was approximately 8 feet high, the Baltic Fire Laboratory test enclosure was 8.2 feet (2.5 meters) tall (test no. 251126-3), and the other test enclosure was 18 feet (5.5 meters) tall (test no. 251126-4). Based on these changes, the distance from the nozzle on the far wall to the corner of the room decreased by approximately 1 foot 1.5 inches, the floor area decreased by approximately 40.69 square feet, and the volume decreased by approximately 402.52 cubic feet.

In both test scenarios the Plumis Automist nozzles were installed at a wall height of 3.94 feet (1.2 meters) above the floor in accordance UL2167A, in the far wall location.

In both test scenarios, the fuel package used was the UL 2167 simulated furniture with plywood, referred to in this testing as the wood crib. In test no. 251126-3 one smoke detector is placed on the ceiling at the center of the test enclosure in accordance with UL 2167A. In the other test scenario, test no. 251126-4, two smoke detectors are placed on the ceiling in the center of the test enclosure, spaced 13.1 feet (4 meters) apart and 6.6 feet (2 meters) from the walls. Figure 3-5 shows the nozzle placement and smoke detector spacing for both test scenarios.

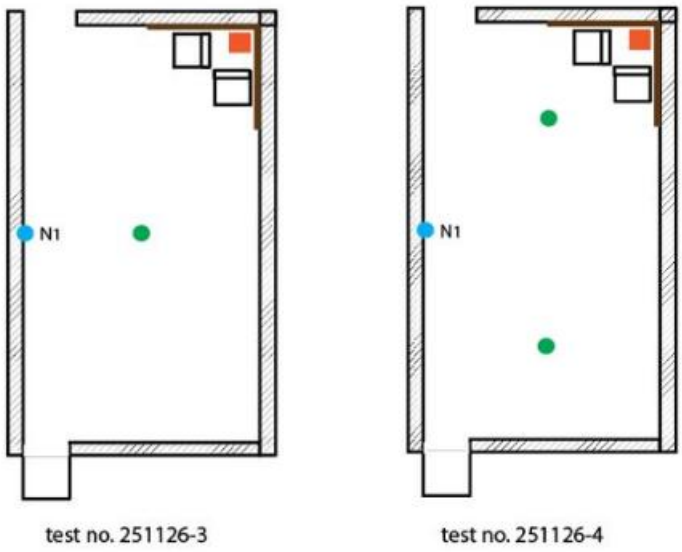
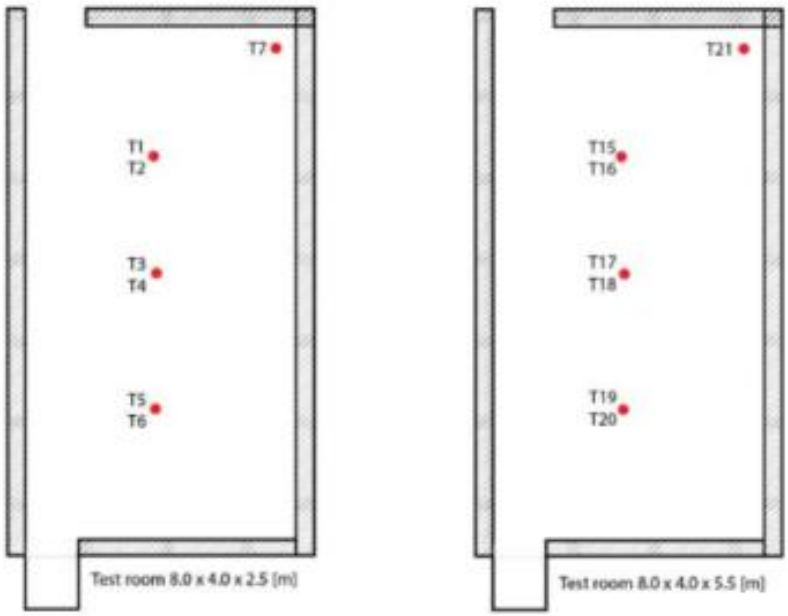


Figure 3-5: Tests 251126-3 & 251126-4 Smoke Detector Configuration

The configuration of the thermocouples for each test are shown in Figure 3-6.



Thermocouple no.	Localisation
T1	1.6 [m] above the floor
T2	75 [mm] below the ceiling
T3	1.6 [m] above the floor
T4	75 [mm] below the ceiling
T5	1.6 [m] above the floor
T6	75 [mm] below the ceiling
T7	75 [mm] below the ceiling
T15	1.6 [m] above the floor
T16	75 [mm] below the ceiling
T17	1.6 [m] above the floor
T18	75 [mm] below the ceiling
T19	1.6 [m] above the floor
T20	75 [mm] below the ceiling
T21	75 [mm] below the ceiling

Figure 3-6: Test 251126-3 & 251126-4 Thermocouple Configuration

The test setup for the Baltic Fire Lab testing is shown in Figure 3-7.

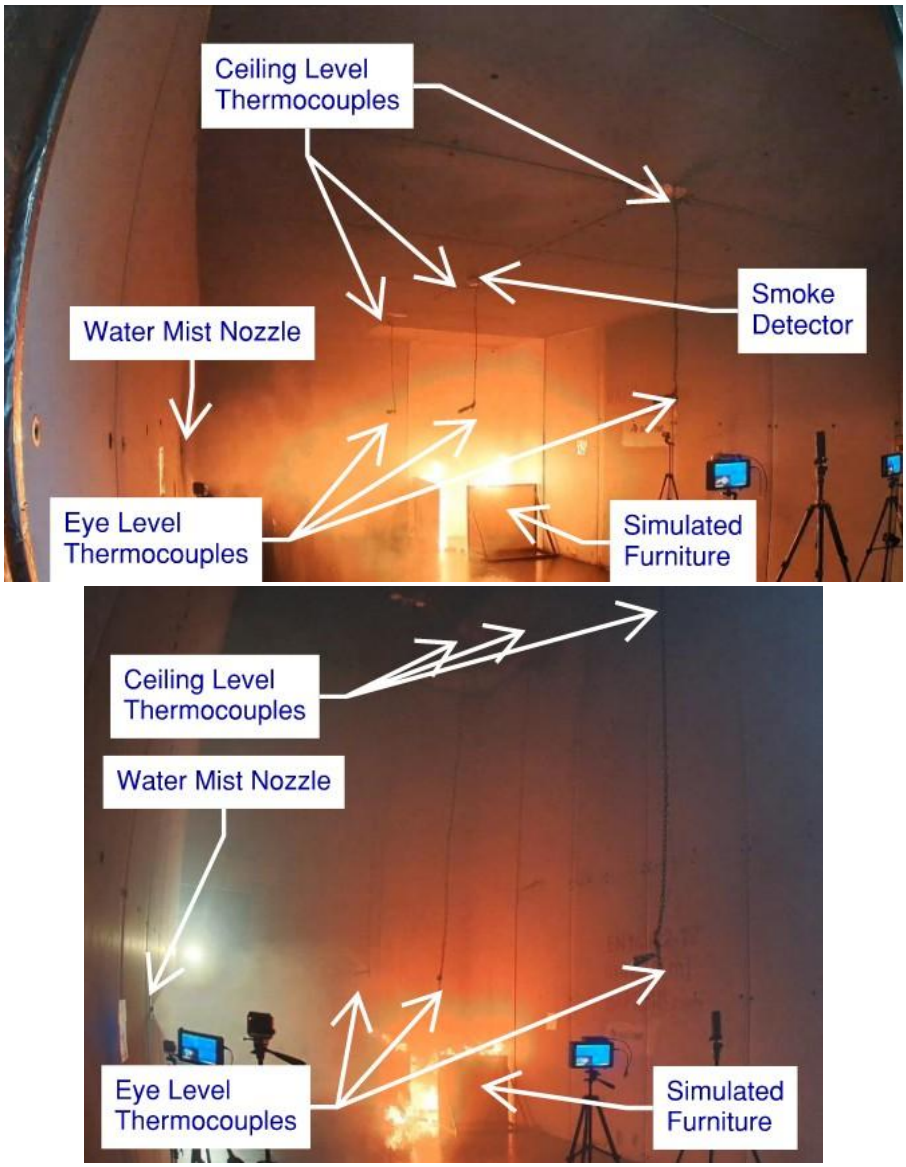


Figure 3-7: Test 251126-3 (Top) & 251126-4 (Bottom)

4.0 Test Results

The test results for UL 2167A tests 1, 2, 3, 4, 8,10, and 10A and the Baltic Fire Laboratory tests 251126-3 and 251126-4 are outlined in Table 4-1, Table 4-2, and Table 4-3. Table 4-1 lists the operational sequence times for each test, Table 4-2 lists the lengths of each operational phase, and Table 4-3 lists the maximum temperature seen at each thermocouple alongside their location and criteria.

Table 4-1: Operation Sequences Times for Tests

Event	*Operation Sequence Time (seconds)*								
	UL 2167A							*Baltic Fire Laboratory*	
	Test 1 [1,3]	*Test 2* [1,4]	*Test 3* [2,3]	*Test 4* [2,4]	*Test 8* [1,3]	*Test 10* [1,3]	*Test 10A* [2,3]	*Test 251126-3* [2,3]	*Test 251126-4* [2,3]
Smoke detector operation time (nozzle scanning start time)	0:28	0:30	1:29	1:37	0:27	0:32	1:30	0:50 (1:50)	1:16 (2:16)
Pump start	0:41	2:11	1:36	1:46	0:43	1:39	1:40	0:58 (1:58)	1:24 (2:24)
Nozzle discharge start	1:04	2:33	1:57	2:05	1:05	2:00	2:00	1:18 (2:18)	1:45 (2:45)
Test duration	30:41	32:11	31:37	31:47	30:44	31:39	31:40	30:58 (31:58)	32:24 (32:24)

1. Fuel Load: Fabricated sofa with plywood covering the wall
2. Fuel Load: UL 2167 simulated furniture with plywood
3. Nozzle Location: Far Wall
4. Nozzle Location: Near Wall

Table 4-2: Time Differences for Tests

Time Difference	*Operation Sequence Time (seconds)*								
	UL 2167A							*Baltic Fire Laboratory*	
	Test 1 [1,3]	*Test 2* [1,4]	*Test 3* [2,3]	*Test 4* [2,4]	*Test 8* [1,3]	*Test 10* [1,3]	*Test 10A* [2,3]	*Test 251126-3* [2,3]	*Test 251126-4* [2,3]
$\Delta t_{det-start}$	0:28	0:30	1:29	1:37	0:27	0:32	1:30	0:50	1:16
$\Delta t_{pump-det}$	0:13	1:41	0:07	0:09	0:16	1:07	0:10	0:08	0:08
$\Delta t_{nozzle-pump}$	0:23	0:22	0:21	0:19	0:22	0:21	0:20	0:20	0:21

1. Fuel Load: Fabricated sofa with plywood covering the wall
2. Fuel Load: UL 2167 simulated furniture with plywood
3. Nozzle Location: Far Wall
4. Nozzle Location: Near Wall

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Table 4-3: Maximum Temperatures Recorded for Tests

Thermocouple ID# (Baltic)	*Location (Baltic Test)*		*Temp. Criteria [°F] (Baltic)*	*Maximum Ceiling Temperature [°F] / (Seconds Above Temperature Criteria)*								
				UL 2167A Test #							*Baltic Fire Laboratory Test #*	
	Where	*Height*		*1* [1,3]	*2* [1,4]	*3* [2,3]	*4* [2,4]	*8* [1,3]	*10* [1,3]	*10A* [2,3]	*251126-3* [2,3]	*251126-4* [2,3]
Tc #1 (Tc #7/21)	Above fire	Imbedded above ceiling tile (3 inches below ceiling)	<500°F (<600°F)	126	105	117	111	100	94	138	251	199
Tc #2 (Tc #1/15)	"First Sprinkler"	5 feet 3 inches above test room floor	200°F >130°F <2 min.	166 (100 s)	136 (44 s)	128	144 (57 s)	103	109	136 (17 s)	93	93
Tc #3 (Tc #2/16)	"First Sprinkler"	3 inches below ceiling	<600°F	367	218	200	222	122	135	273	147	153
Tc #7 (Tc #3/17)	Centred on room	5 feet 3 inches above test room floor	<200°F >130°F <2 min	Not Taken	Not Taken	Not Taken	Not Taken	104	107	158 (67 s)	110	108
Tc #6 (Tc #4/18)	Centred on room	3 inches below ceiling	<600°F	310	178	180	193	138	131	205	156	153
(Tc #5/19)	"Second Sprinkler"	5 feet 3 inches above test room floor	<200°F >130°F <2 min	Not Taken	Not Taken	Not Taken	Not Taken	Not Taken	Not Taken	Not Taken	112	99
Tc #4 (Tc #6/20)	"Second Sprinkler"	3 inches below ceiling	<600°F	268	163	175	186	126	127	198	125	133
Tc #5	"Doorway location"	3 inches below ceiling	<600°F	265	167	180	191	136	138	212	Not Taken	Not Taken

1. Fuel Load: Fabricated sofa with plywood covering the wall
2. Fuel Load: UL 2167 simulated furniture with plywood
3. Nozzle Location: Far Wall
4. Nozzle Location: Near Wall

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4.1 UL 2167A

The transient temperature results for UL 2167A tests 1 (Figure 4-1), 2 (Figure 4-2), 3 (Figure 4-3), 4 (Figure 4-4), 8 (Figure 4-5), 10 (Figure 4-6), and 10A (Figure 4-7) are shown in below.

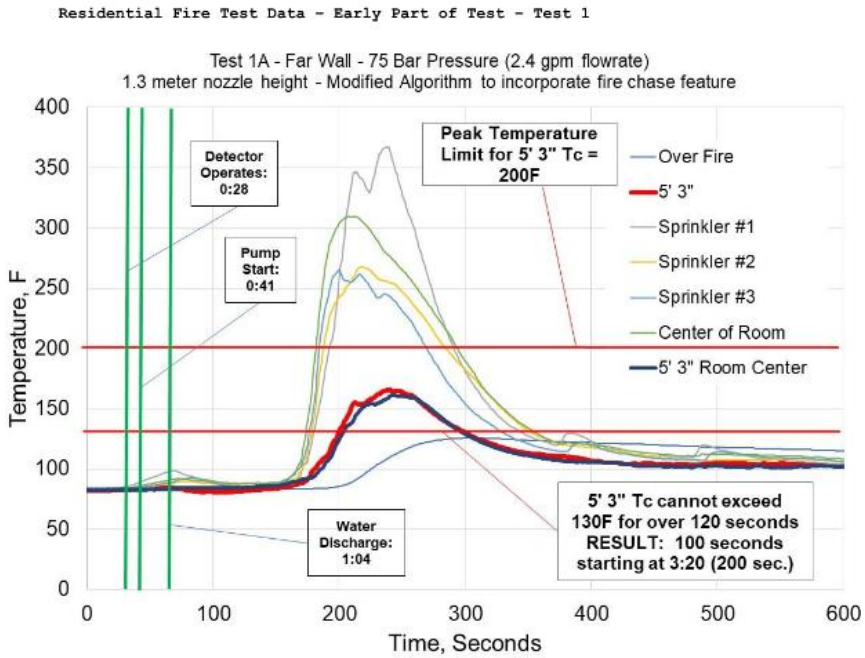

Figure 4-1: UL 2167A Test 1 Data

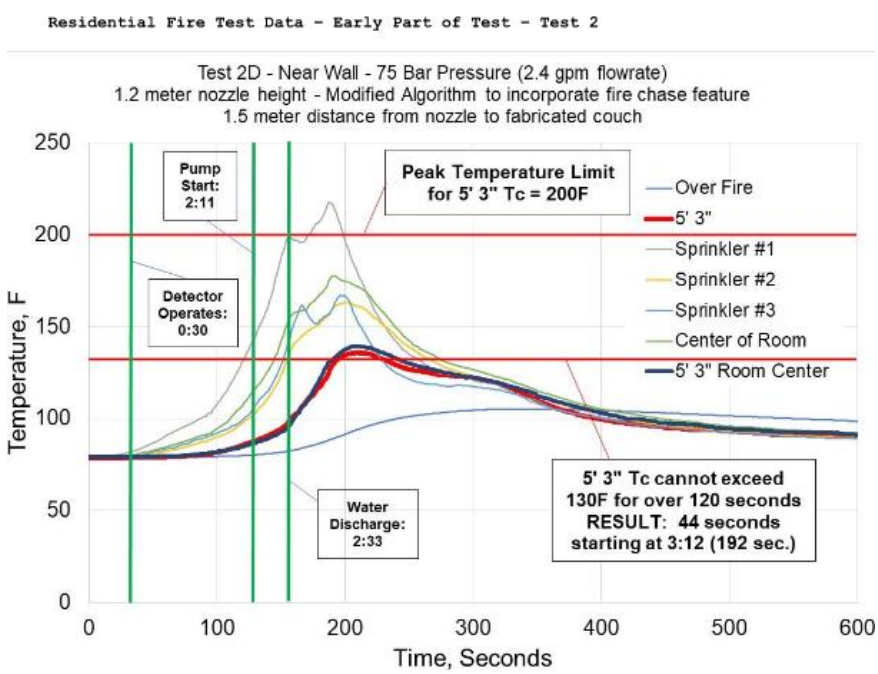

Figure 4-2: UL 2167A Test 2 Data

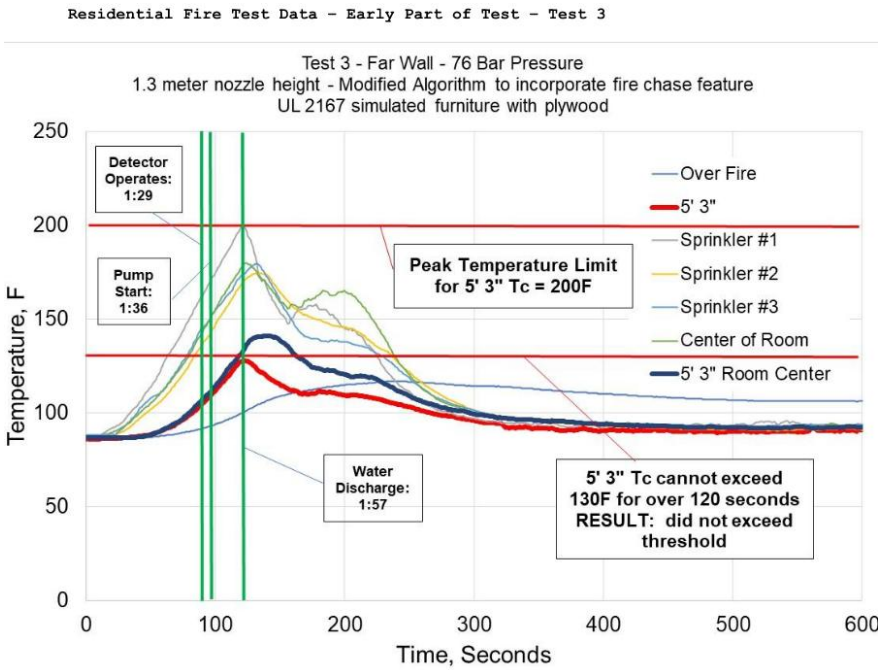

Figure 4-3: UL 2167A Test 3 Data

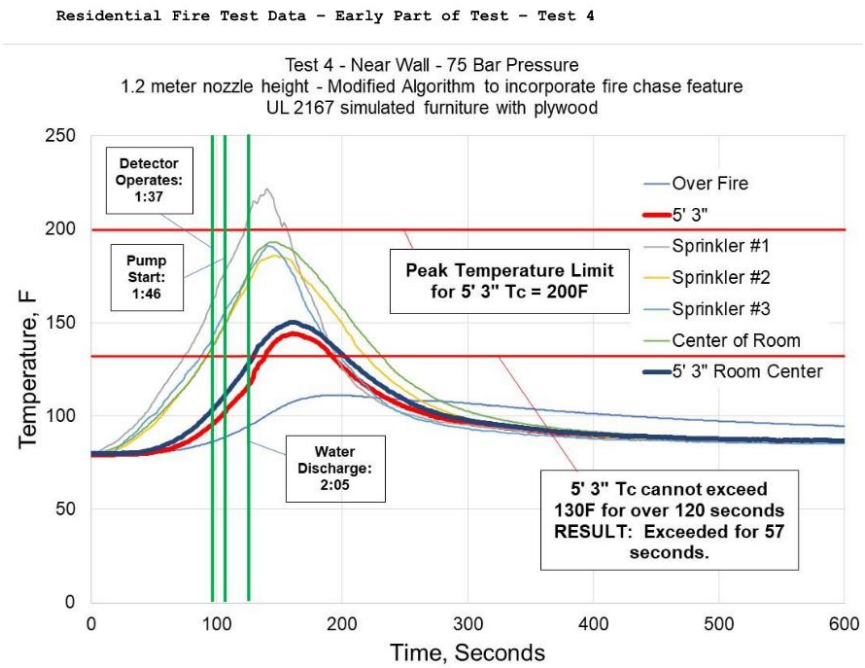

Figure 4-4: UL 2167A Test 4 Data

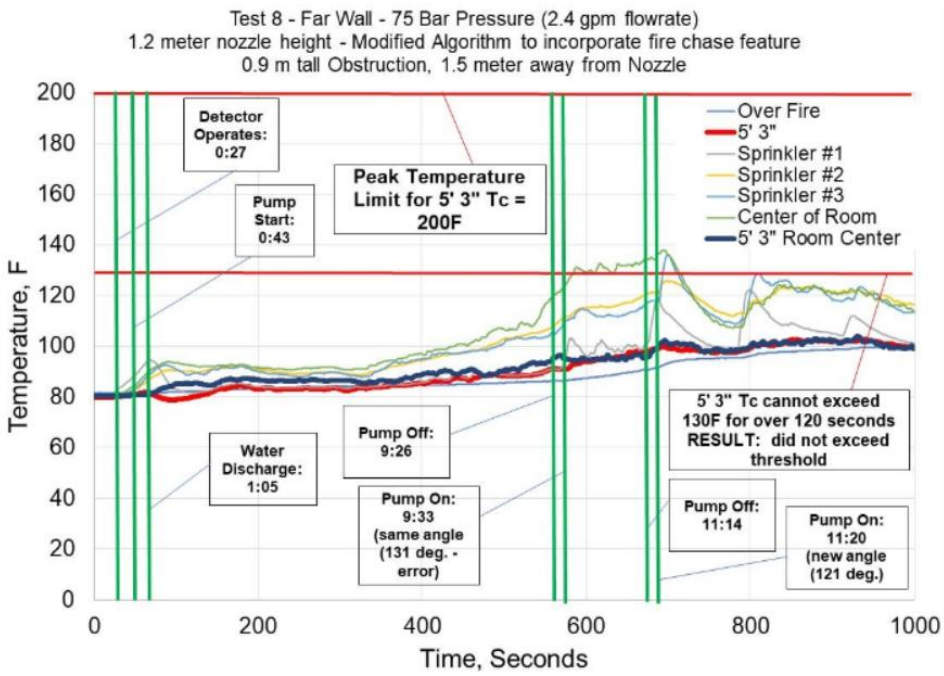

Figure 4-5: UL 2167A Test 8 Data

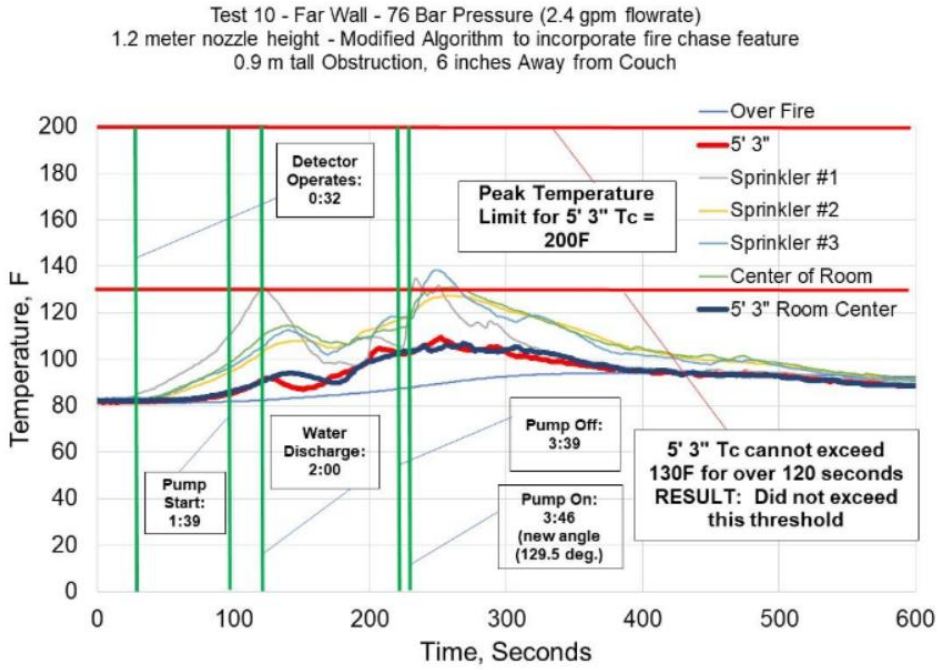

Figure 4-6: UL 2167A Test 10 Data

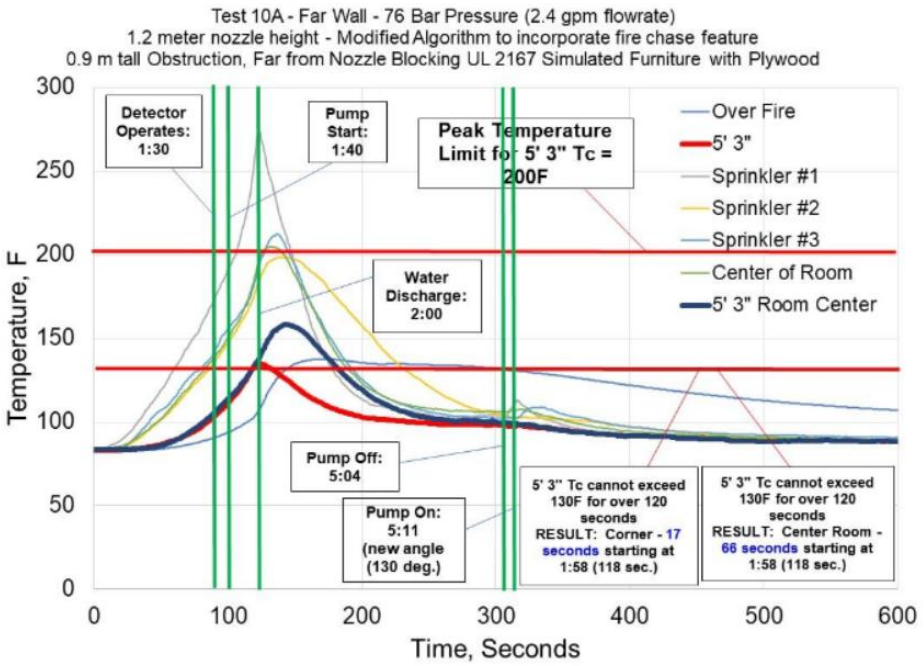

Figure 4-7: UL 2167A Test 10A Data

In the UL 2167A tests considered, the smoke detector consistently activates around 30 seconds from ignition for the fabricated sofa and around 1 minute 30 seconds for the UL 2167 simulated furniture with plywood.

For most tests, the time from when the smoke detector activated until the pump started (the time for the water mist nozzles to “discover” the location of the fire) was less than 20 seconds. However, the sofa fire with the nozzles on the near wall in test 2 and the sofa fire with the nozzles on the far wall but with an obstruction close to the sofa took between 1 and 2 minutes. All other sofa tests not depicted in Table 4-1, Table 4-2, and Table 4-3 also took between 1 and 2 minutes.

For all UL 2167A tests, the time from pump activation to nozzle discharge was approximately 20 seconds. These are tested with the maximum length of piping allowed for the Plumis Automist system, so for any compliant Plumis Automist installation, this process will take approximately 20 seconds or less.

The thermocouple above the ceiling above the fire did not exceed 140ºF (failure criterion is 500ºF) during any test, none of the thermocouples 3 inches below the ceiling exceeded 400ºF (failure criterion is 600ºF) in any of the tests, and none of the thermocouples at 5.25 feet AFF exceeded 200ºF (failure criterion is 200ºF) and none of the thermocouples exceeded 130ºF for greater than 2 minutes.

Most tests with obstructions had to readjust the water mist nozzle at least once to completely control the fire. Similarly, some tests, including Test 1, had a second peak temperature where the fire had spread to another location in the fuel load. The temperature criteria were still met in these cases.

The system was able to meet the performance requirements, prevent compartment flashover, and receive UL listing based on the results of these tests.

4.2 BALTIC FIRE LAB TEST

The transient temperature results for the Baltic Fire Laboratory tests 251126-3 (Figure 4-8) and 251126-4 (Figure 4-9) are shown in below.

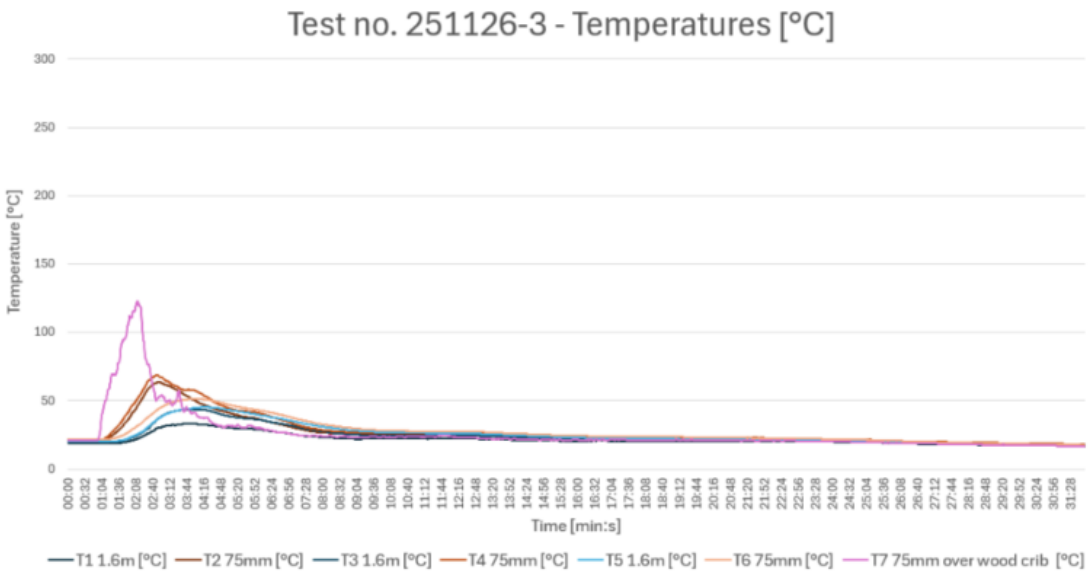

Figure 4-8: Test 251126-3 Recorded Temperature Results (Graph is in Celsius)

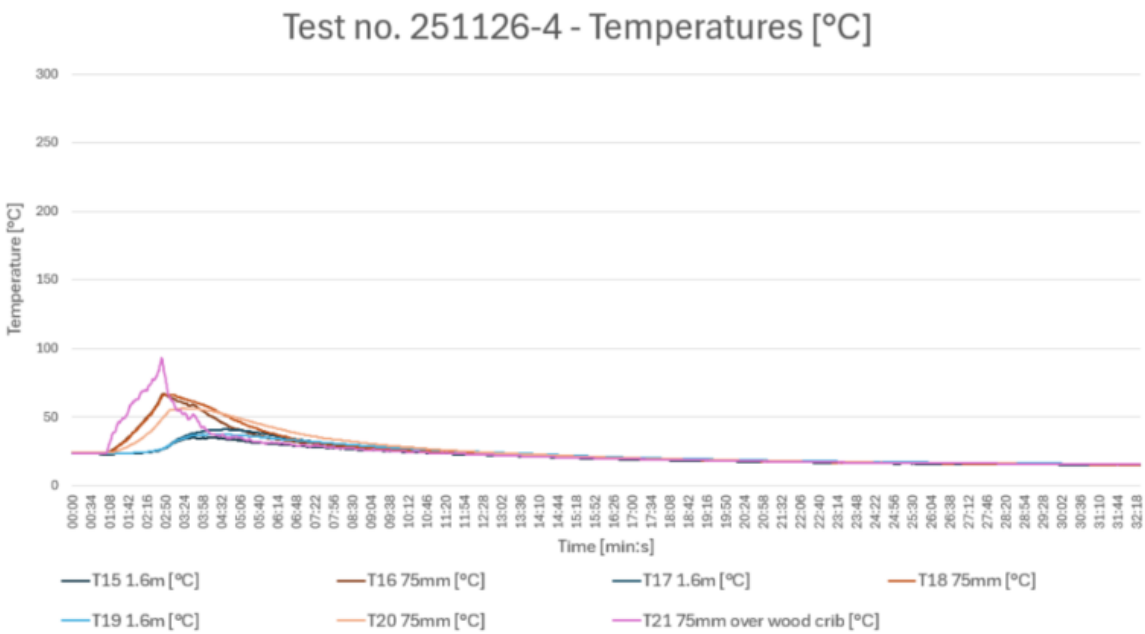

Figure 4-9: Test 251126-4 Recorded Temperature Results (Graph is in Celsius)

In the Baltic Fire Laboratory tests, the smoke detector activated at approximately 50 seconds from ignition for the first test with the lower ceilings and at approximately 1 minute 16 seconds for the test with the higher ceiling. (approximately 26 seconds later).

For both tests, the time from when the smoke detector was triggered until when the pump started (the time for the water mist nozzles to “discover” the location of the fire) was less than 10 seconds

For both tests, the time from pump activation to nozzle discharge was approximately 20 seconds. This was tested with the maximum length of piping allowed for the Plumis Automist system, similar to the UL 2167A testing.

None of the thermocouples 3 inches below the ceiling exceeded 300ºF (failure criterion is 600ºF) in either of the tests, and none of the thermocouples at 5.25 feet AFF exceeded 115ºF (failure criterion is 200ºF) and none of the thermocouples exceeded 130ºF for greater than 2 minutes.

The Baltic Fire Laboratory tests met the same criteria as those completed for the UL 2167A tests.

5.0 Analysis of Test Results

The test results vary in the fuel load, obstructions, and smoke detector spacing. Higher ceilings will primarily have an impact on the detection time. They will not affect the time from detection until the fire is targeted and the pump starts. As the time until detection is the primary limiting factor in controlling the UL 2167 simulated furniture and crib fires, this was the fire that was chosen for the Baltic Fire Laboratory high ceiling tests.

5.1 FUEL LOADS

UL 2167A has two general types of fuel loads for tests meant to judge performance in one- and two-family dwellings: the fabricated sofa (Figure 3-4) and the UL 2167 simulated furniture and crib (Figure 3-3). The fabricated sofa has more mass but burns slower and produces more smoke. By contrast, the UL 2167 simulated furniture and crib has less mass and burns faster and with less smoke.

The fabricated sofa produced more smoke and activated the smoke detector quicker, therefore the Plumis Automist system can begin targeting the fire sooner. These tests produced some of the highest temperatures seen in the UL 2167A testing, though they were still well within the temperature criteria. In a number of tests with the sofa, including Tests 2 (Figure 4-2) and 10 (Figure 4-6), the limiting timeframe is the time from smoke detection until the fire is targeted and the pump starts. This is due to the location of the nozzle in relation to the sofa in Test 2 and due to the obstruction in front of the sofa in Test 10. In these cases, the Plumis Automist system is shown to be effective even with a delay of 1.5 to 2 minutes from smoke detection to the pump start.

The UL 2167 simulated furniture and crib activated the smoke detector after approximately 1 minute 30 seconds in the UL 2167A testing, which was quicker than in the Baltic Fire Laboratory testing at approximately 2 minutes. It took approximately a minute longer for the smoke detectors to activate than for the fabricated sofa, but by the time the smoke was detected the fires had developed enough that the nozzles could more easily distinguish the fires, leading to similar times from detection until the pumps activated with a difference of only about 10 seconds for these tests (See Tests 3, 4, and 10A in Table 4-2). One of the worst-case fire tests aside from Test 1, which used the fabricated sofa, was Test 10A, which used the UL 2167 simulated furniture. The additional time from smoke detection to target acquisition and pump start due to the obstruction in the test, coupled with the delayed detection time allowed the fire to develop further than most other tests before it was eventually controlled. (See Table 4-2 and Table 4-3)

5.2 OBSTRUCTIONS

UL 2167A fire tests 8, 9,10, and 11 show that obstructions between the Plumis Automist nozzle and the fire can affect the time it takes for the nozzles to target a fire, delaying nozzle activation and potentially leading to more severe fires. Obstructions were not considered in the Baltic Fire Laboratory tests, as the concern was the ceiling height, but Plumis suggests using two overlapping Automist systems in the same space if time to smoke detection is a concern. This overlapping system offers the following benefits:

- If both nozzles see the fire and trigger at a similar time, a higher water mist density will help control the fire easier.
- If one nozzle is partially obstructed, there will be a redundant water mist nozzle which may have a faster response time.
- If there is a reignition event or if the fire moves within the room, the redundant nozzle could potentially see the fire's new location before the first nozzle.

5.3 SMOKE DETECTOR SPACING

The time from ignition until detection may be further segregated into two parts: the time for the smoke to reach the ceiling and the time for the smoke impinging on the ceiling to travel horizontally to the smoke detectors. The first segment of time is what is affected by higher ceilings, but the second may be decreased by reducing the spacing between smoke detectors, which decreases the required lateral movement of the smoke once it reaches the ceiling.

In the first fire test at the Baltic Fire Laboratory, the single detector was centered on the room, 14.67 feet (4.47 meters) from the corner with the fire. In the second test the detectors were spaced 13.12 feet (4 meters) apart, or 9.28 feet (2.83 meters) from the corner. While Plumis calls for a typical spacing of 17.38 feet (5.3 meters) for its smoke sensors in its DIOM [12], which was tested in the UL 2167A large room tests, it is recommended using the spacing tested by the Baltic Fire Laboratory with high ceilings where the system is installed in spaces with ceilings less greater than the UL tested 8-foot ceiling height until further testing can be done with the large room and high ceilings.

6.0 Conclusion

Jensen Hughes believes testing conducted by the Baltic Fire Laboratory for the Plumis Automist water mist system with ceiling heights up to 18 feet is comparable to the fire testing done by UL with a wooden crib and shows that the system is capable of meeting the intent of NFPA 750 to prevent flashover in the room of fire origin and to improve the capability for occupants to escape or be evacuated in spaces greater than 8 feet high. This is because the configuration of the testing completed by Baltic Fire Laboratory was comparable to the approved UL 2167A, and yielded results that met the acceptance criteria.

Reviews of the UL and Baltic Fire Laboratory testing done found that there are multiple components to the time from ignition to the time of nozzle discharge. Ceiling height affects the time smoke takes to reach the ceiling, but other solutions may be implemented to reduce detection time, such as the following:

+ Detector spacing may be reduced to reduce the time smoke takes to travel laterally across the ceiling.
  - 9.28-foot (2.83-meter) spacing is recommended based on the dimension of the Baltic Fire Laboratory test enclosure and the spacing of the smoke detectors.
+ A redundant Plumis Automist system should be installed to reduce the probability of an obstruction affecting the time from smoke detection to nozzle targeting and pump starting. While the testing shows favorable results with high ceilings, there are enough unknowns to warrant additional precautions.
  - The redundant nozzle would help capture any resurgence of heat if the fire travels from its point of ignition.
  - When assessing the water supply for the site, concurrent flow from both nozzles would need to be taken into account.

While the results of the Baltic Fire Laboratory testing were positive, it is recommended to implement one or both of the above strategies at sites with higher ceilings to provide better overall protection.

Submitted by Jensen Hughes,

Jarred Druzynski, MS
Associate
jarred.druzynski@jensenhughes.com

Digitally signed by Kelly Opert
DN: C=US, E=kelly.opert@jensenhughes.com, O=Jensen Hughes, OU=RDT&E, CN=Kelly Opert
Date: 2026.07.31 14:16:14-04'00'

Kelly Opert, PE
Engineering Manager
kelly.opert@jensenhughes.com

7.0 References

The following references were used in the development of this report:

1. CBC, 2025 California Building Code, IBC.
2. CBC, 2025 California Fire Code, IFC.
3. CCR, 2025 California Code of Regulations, Title 19, Division 1, CCR
4. NFPA 13D, 2025 Edition: Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes.
5. NFPA 750, 2027 Edition: Standard on Water Mist Fire Protection Systems.
6. Underwriters Laboratories (UL), 2025, UL 199: Automatic Sprinklers for Fire-Protection Service
7. UL, 2021, UL 2167: Water Mist Nozzles for Fire Protection Service
8. UL, 2025, UL 2167A: UL LLC Outline of Investigation for Targeting Water Mist System Units for One- and Two-Family Dwellings for Fire Protection Service
9. Klote, Milke, Turnbull, Kashef, Phillips, Evans, Webb, and Roth ; Handbook of Smoke Control Engineering 2nd Edition; ASHRAE; 2024
10. The SFPE Handbook of Fire Protection Engineering ,5th Edition, edited by Morgan J. Hurley, P.E.; et al., Society of Fire Protection Engineers, Quincy, MA (2016)
11. Plumis Automist UL 2167A Fire Testing Report “Letter Report – PI Fire Testing Project 4790418313 – Final”
12. Plumis Automist DIOM “Automist Design Installation & Operation Manual US Version v1.1”
13. Plumis Automist UL 2167A “Certificate of Compliance” Certificate # UL-US-2440774-0
14. Jensen Hughes “1KOM08U001 Plumis Equivalency Report Rev. 0 - 06.22.2026 - Signed”
15. Baltic Fire Laboratory 2025 “TRBFL2525-2 -FINAL SIGNED (1): TEST REPORT No. TRBFL2525-2”

Appendix A. Baltic Fire Laboratory Accreditation

PCA

Zakres akredytacji Nr AB 1792
Scope of accreditation No AB 1792

ZAKRES AKREDYTACJI LABORATORIUM BADAWCZEGO
SCOPE OF ACCREDITATION FOR TESTING LABORATORY
Nr/No AB 1792

wydany przez / issued by
POLSKIE CENTRUM AKREDYTACJI
01-382 Warszawa, ul. Szczotkarska 42

Wydanie/Issue 7 z/of 05.09.2025

	Nazwa i adres / Name and address
AB 1792	**BALTIC FIRE LABORATORY Sp. z o.o.** **BFL FIRE TESTING LABORATORY** **ul. Banińska 8** **80-209 Tuchom**
Kod identyfikacyjny / Identification code [1]	**Dziedzina i przedmiot badań / Field of testing and item:**
- H/17	- Badania ogniowe wyrobów innych / Fire tests of other products

Wersja strony/Page version: A

[1] Kod identyfikacyjny zgodnie z załącznikiem do dokumentu DAB-07 dostępnym na stronie internetowej www.pca.gov.pl / The identification code according to the Annex to document DAB-07, available at PCA website www.pca.gov.pl

POLSKIE CENTRUM AKREDYTACJI * 1 *

KIEROWNIK DZIAŁU AKREDYTACJI
BADAŃ MECHANICZNYCH I FIZYCZNYCH

MARIA SZAFRAN

Niniejszy dokument jest załącznikiem do Certyfikatu Akredytacji Nr AB 1792 z dnia 09.02.2022 r.
Cykl akredytacji od 11.07.2025 r. do 18.07.2029 r.
Status akredytacji oraz aktualność zakresu akredytacji można potwierdzić na stronie internetowej PCA *www.pca.gov.pl*

This document is an annex to accreditation certificate No AB 1792 of 09.02.2022
Accreditation cycle from 11.07.2025 to 18.07.2029
The status of accreditation and validity of the scope of accreditation can be confirmed at PCA website *www.pca.gov.pl*

Wydanie nr / Issue No 7, 05.09.2025 1/7

THE REPRODUCING OF THE REPORT IS PERMITTED ONLY IN FULL.
IN OTHER CASE, WRITTEN APPROVAL OF THE CONTRACTOR SHALL BE GIVEN.

BFL Fire Testing Laboratory ul. Banińska 8, 80-209 Tuchom		
Przedmiot badań/wyrób	**Rodzaj działalności/badane cechy/metoda**	**Dokumenty odniesienia**
Wodne systemy przeciwpożarowe Dysze tryskaczowe	Skuteczność gaszenia i tłumienia ognia Temperatura Stężenie (O_2) Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas Obszar uszkodzenia, %	IMO Res. A.800(19) ze zmianami w IMO MSC.265(84) Appendix 2 PN-EN 14972-1:2021, Annex A PN-EN 14972-3:2022-01 PN EN 14972-4:2024 PN-EN 14972-10:2022-09 UL 2167 (2021) pkt 44, 45, 46, 48, 49, 50 VdS 3883-1:2020-06 VdS 3883-2:2020-06 VdS 3883-5:2020-06 FM Approval Standard Class 5560:2021 Appendix P
Wodne systemy przeciwpożarowe Dysze tryskaczowe	Skuteczność gaszenia ognia Temperatura Stężenie (O_2) Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas	IMO MSC/Circ.1165 Appendix B ze zmianami w IMO MSC.1/Circ.1269 oraz IMO MSC.1/Circ.1386 UL 2167 (2021) pkt 43 FM Approval Standard Class 5560:2021 Appendix E FM Approval Standard Class 5560:2021 Appendix F PN-EN 14972-8:2020-06 PN-EN 14972-14:2022-02 PN-EN 14972-15:2022-02 PN-EN 14972-9:2020-06
Wodne systemy przeciwpożarowe Dysze tryskaczowe	Skuteczność gaszenia i tłumienia ognia Temperatura Stężenie (O_2) Stężenie (CO) Stężenie (CO_2) Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas Obszar uszkodzenia, %	PN EN 14972-7:2024

Wersja strony: A

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Przedmiot badań/wyrób	Rodzaj działalności/badane cechy/metoda	Dokumenty odniesienia
Wodne systemy przeciwpożarowe Dysze tryskaczowe	Skuteczność gaszenia i tłumienia ognia Rozprzestrzeniane się płomienia Temperatura Stężenie (O_2) Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas	IMO MSC.1/Circ.1268
Wodne systemy przeciwpożarowe Dysze tryskaczowe	Skuteczność gaszenia ognia Rozprzestrzeniane się płomienia Temperatura Stężenie (O_2) Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas Zakres: t > 1 s	IMO MSC.1/Circ.1387 Appendix
Wodne systemy przeciwpożarowe Dysze tryskaczowe	Skuteczność tłumienia ognia Rozprzestrzeniane się płomienia Temperatura Stężenie tlenu Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas Obszar uszkodzenia, %	IMO MSC.1/Circ.1430/Rev.03 Appendix VdS 3883-4:2020-06 PN-EN 14972-5:2024
Wodne systemy przeciwpożarowe Materiały instalacyjne	Rozprzestrzeniane się płomienia Temperatura Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas	A.753(18) GUIDELINES FOR THE APPLICATION OF PLASTIC PIPES ON SHIPS
Wodne systemy przeciwpożarowe Dysze tryskaczowe	Skuteczność gaszenia ognia Rozprzestrzeniane się płomienia Temperatura Stężenie tlenu Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas	FM Approval Standard Class 5560:2021 Appendix M FM Approval Standard Class 5560:2021 Appendix N
Wodne systemy przeciwpożarowe Dysze tryskaczowe	Skuteczność gaszenia i tłumienia ognia Temperatura Stężenie tlenu Objętościowe natężenie przepływu (metoda wagowa, metoda bezpośrednia) Ciśnienie Czas Obszar uszkodzenia, %	VdS 3883-3:2020-06 PN-EN 14972-6:2023-10

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PCA Zakres akredytacji Nr AB 1792

Przedmiot badań/wyrób	Rodzaj działalności/badane cechy/metoda	Dokumenty odniesienia
Wodne systemy przeciwpożarowe **Dysze tryskaczowe**	Skuteczność gaszenia i tłumienia ognia Temperatura Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas	VdS 3883-6:2020-06 BS EN 14972-17:2025 UL 2167 (2021) pkt 47 UL 2167A (2024) pkt 23
Wodne systemy przeciwpożarowe **Dysze tryskaczowe**	Skuteczność gaszenia i tłumienia ognia Temperatura Stężenie (O_2) Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas Obszar uszkodzenia, %	VdS 3883-7:2020-06
Wodne systemy przeciwpożarowe **Dysze tryskaczowe**	Skuteczność gaszenia i tłumienia ognia Temperatura Stężenie (O_2) Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas Obszar uszkodzenia, %	VdS 3883-8:2020-06 PN EN 14972-11:2023-10
Aerosolowe systemy przeciwpożarowe **Generatory aerosolu**	Skuteczność gaszenia ognia Temperatura Stężenie (O_2) Stężenie (CO) Stężenie (CO_2) Ciśnienie (Pa) Pomiar masy Czas	IMO MSC.1/Circ.1270 ISO 15779 Annex D
Wodne systemy przeciwpożarowe **Dysze tryskaczowe**	Skuteczność gaszenia i tłumienia ognia Temperatura Stężenie (O_2) Stężenie (CO) Stężenie (CO_2) Stężenie (HCN) Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas	ARGE Guideline - Part 2:2018 Rev. 4.1 pkt. 3.2, 3.3 UNI 11565:2021 Appendix B
Wodne systemy przeciwpożarowe **Dysze tryskaczowe**	Skuteczność tłumienia ognia Temperatura Stężenie tlenu Stężenie (O_2) Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas Stopień uszkodzenia, %	Procedura badawcza BFL TP-02 ver. 4 z 13.08.2021 PN-EN 14972-1:2021, Annex A

Wersja strony: A

Wydanie nr 7, 05.09.2025 r. 4/7

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Przedmiot badań/wyrób	Rodzaj działalności/badane cechy/metoda	Dokumenty odniesienia
Gazowe systemy przeciwpożarowe	Skuteczność gaszenia ognia Temperatura Stężenie (O_2) Stężenie (CO) Stężenie (CO_2) Ciśnienie (Pa) Pomiar masy Czas	NCC71 - 1.1.2021 Chapter 2
Gazowe systemy przeciwpożarowe	Skuteczność gaszenia ognia Temperatura Stężenie (O_2) Ciśnienie (Pa) Pomiar masy Czas	ISO 14520-1:2023 Annex C UL2166 (2021) pkt 35, 36 ,37 FM Approval Standard Class 5600:2023 Chapter 4.1
Pianowe systemy przeciwpożarowe **Koncentraty pianowe**	Skuteczność gaszenia ognia Temperatura Czas	MSC.1/Circ.1312 pkt 3.9 UL 162 (2021) pkt 11, 12 FM Approval Standard Class 5130:2021 chapter 4.2, 4.3, 4.7
Wodne systemy przeciwpożarowe **Dysze tryskaczowe**	Skuteczność gaszenia ognia Temperatura Stężenie (O_2) Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas	EN 14972-12:2023
Wodne systemy przeciwpożarowe **Dysze tryskaczowe**	Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Temperatura Ciśnienie	IMO MSC/Circ.1165 pkt 4.10
Wodne systemy przeciwpożarowe **Dysze tryskaczowe**	Skuteczność gaszenia ognia Temperatura Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas	ISO 15371:2015 PN-EN 17446:2021
Wodne systemy przeciwpożarowe **Dysze tryskaczowe**	Skuteczność gaszenia ognia Temperatura Stężenie (O_2) Stężenie (CO) Stężenie (CO_2) Objętościowe natężenie przepływu (metoda bezpośrednia, metoda wagowa) Ciśnienie Czas	FM Approval Standard Class 5560:2021 Appendix A FM Approval Standard Class 5560:2021 Appendix B FM Approval Standard Class 5560:2021 Appendix C FM Approval Standard Class 5560:2021 Appendix D FM Approval Standard Class 5560:2021 Appendix I JH-C077-E-RP-001
Gaśnice przenośne	Minimalna skuteczność gaśnicza – ocena pożaru testowego grupy A, Minimalna skuteczność gaśnicza – ocena pożaru testowego grupy B	PN-EN 3-7:2008 (Appendix I)

Wersja strony: A

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Przedmiot badań/wyrób	Rodzaj działalności/badane cechy/metoda	Dokumenty odniesienia
Gaśnice przewoźne	Minimalna skuteczność gaśnicza – ocena pożaru testowego grupy A Minimalna skuteczność gaśnicza – ocena pożaru testowego grupy B	PN-EN 1866-1:2010 (chapter 8)

Wersja strony: A

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Wykaz zmian
Zakresu Akredytacji Nr AB 1792

Status zmian: wersja pierwotna - A

POLSKIE CENTRUM AKREDYTACJI * 1 *

Zatwierdzam status zmian

KIEROWNIK DZIAŁU AKREDYTACJI BADAŃ MECHANICZNYCH I FIZYCZNYCH

MARIA SZAFRAN
dnia: 05.09.2025 r.

TEST REPORT END

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Appendix B. Baltic Fire Laboratory Certificates

Appendix F – laboratory certificates

POLSKIE CENTRUM AKREDYTACJI
POLISH CENTRE FOR ACCREDITATION

Sygnatariusz EA MLA
EA MLA Signatory

CERTYFIKAT AKREDYTACJI
LABORATORIUM BADAWCZEGO
ACCREDITATION CERTIFICATE OF TESTING LABORATORY

Nr AB 1792

Potwierdza się, że: / This is to confirm that:

BALTIC FIRE LABORATORY Sp. z o.o.
BFL FIRE TESTING LABORATORY
ul. Banińska 8
80-209 Tuchom

spełnia wymagania normy PN-EN ISO/IEC 17025:2018-02
meets requirements of the PN-EN ISO/IEC 17025:2018-02 standard

Akredytowana działalność jest określona w Zakresie Akredytacji Nr AB 1792
Accredited activity is defined in the Scope of Accreditation No AB 1792

Akredytacja pozostaje w mocy pod warunkiem przestrzegania wymagań jednostki akredytującej określonych w kontrakcie Nr AB 1792
This accreditation remains in force provided the Laboratory observes the requirements of Accreditation Body defined in the Contract No AB 1792

POLSKIE CENTRUM AKREDYTACJI 1

DYREKTOR
POLSKIEGO CENTRUM AKREDYTACJI
LUCYNA OLBORSKA

Warszawa, 9 lutego 2022 roku

THE REPRODUCING OF THE REPORT IS PERMITTED ONLY IN FULL.
IN OTHER CASE, WRITTEN APPROVAL OF THE CONTRACTOR SHALL BE GIVEN.

Appendix C. Baltic Fire Laboratory Testing – Calibration

Appendix D – cone calorimeter test certificate for foam

SYCHTA LABORATORIUM Sp. J.
Laboratorium Badań Palności Materiałów
ul. Ofiar Stutthofu 90
72-010 Police

AB 1501

TEST REPORT

Order no: 01.12.2025 Signature: SL/Z-1316/ISO 5660-1/1549a/2025 Police, 15.12.2025

Test methods:

1. ISO 5660-1:2015/Amd.1:2019. Reaction to fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method)

Content of request: Reaction to fire test according to ISO 5660-1. Requirements:

Density (kg/m^3):	27,2<…<30,4
HRR Peak (kW/m^2):	345 +/- 85
Heat of combustion (MJ/kg):	22 +/- 3

Sponsor: Baltic Fire Laboratory Sp. z o.o.
St. Banińska 8
80-209 Tuchom
Poland

Material: Polyurethane foam - BFL6F30

Composition: Polyurethane foam with a density of 27,2-30,4 kg/m^3
Thickness: 25 mm

Manufacturer/supplier: Baltic Fire Laboratory Sp. z o.o.
St. Banińska 8
80-209 Tuchom
Poland

Assessment:

Density (kg/m^3):	30,0	27,2<…<30,4
HRR Peak (kW/m^2):	349	345 +/- 85
Heat of combustion (MJ/kg):	23,2	22 +/- 3

The reprint and the copying: only with the agreement of Baltic Fire Laboratory Sp. z o.o.

Without the written consent of the Sychta Laboratory the report can be copied only in one piece.

Report applies only to the sample tested and is not necessarily indicative of the qualities of apparently identical or similar products.

Content of test report: five pages with signature and numbers.

VAT PL8513152392 phone +48 914210214 biuro@sychta.eu
KRS 0000387681 mobile +48 502078855 www.sychta.eu

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SYCHTA LABORATORIUM

TEST RESULTS

SL/Z-1316/ISO 5660-1/1549a/2025

1. Heat release rate of specimen according to ISO 5660-1

Test conditions:
- irradiance: 30 kW·m^{-2}
- horizontal position,
- sample thickness: 25,5±2 mm,
- no frame retainer shall be used.

Table 4. Heat release rate

Name of measured quantity	Unit	Specimen					Average	Standard deviation
		1	2	3	4	5		
Mass of the specimen	g	7,7	7,8	7,7	7,6	7,6	7,7	0,1
Specimen thickness	mm	25,4	25,6	25,6	25,6	25,6	25,6	0,1
Density	kg·m^{-3}	30,5	30,3	29,9	29,8	29,7	30,0	0,3
Ignition time	s	2	4	2	2	2	2	1
Extinction time	s	48	58	62	74	54	59	10
Duration of the test	s	620	634	626	632	654	633	13
Maximum heat release rate	kW·m^{-2}	342	370	340	360	332	349	16
Total heat release	MJ·kg^{-1}	23,1	22,7	23,2	23,3	23,5	23,2	0,3
Maximum average rate of heat emission MARHE	kW·m^{-2}	211,3	217,1	217,6	234,2	219,7	220,0	8,5

Remarks: none.

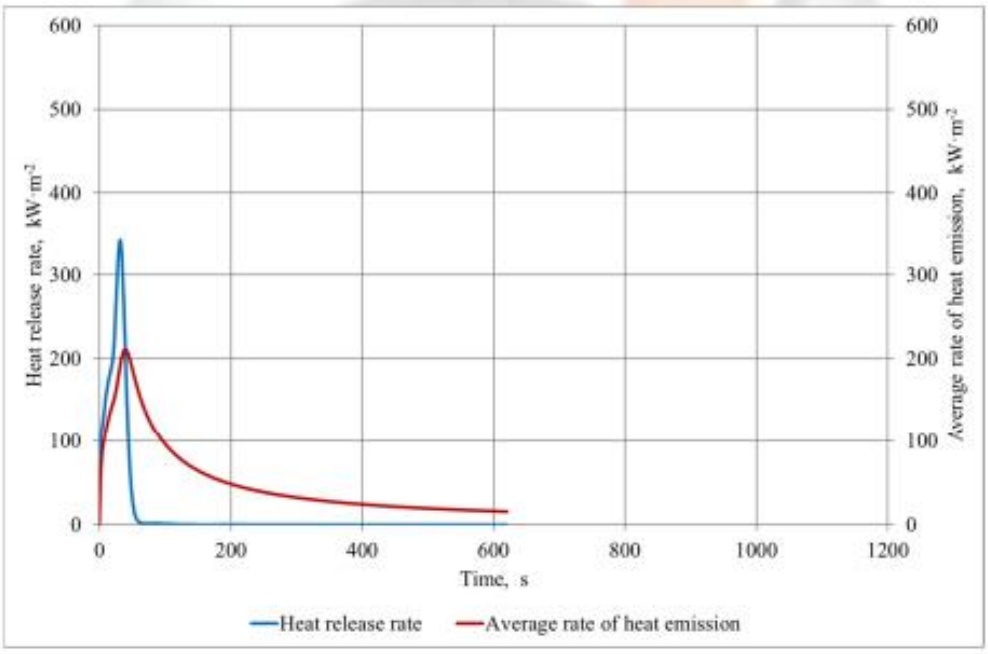

Figure 4.1. The relation of heat release rate and the time – specimen 1

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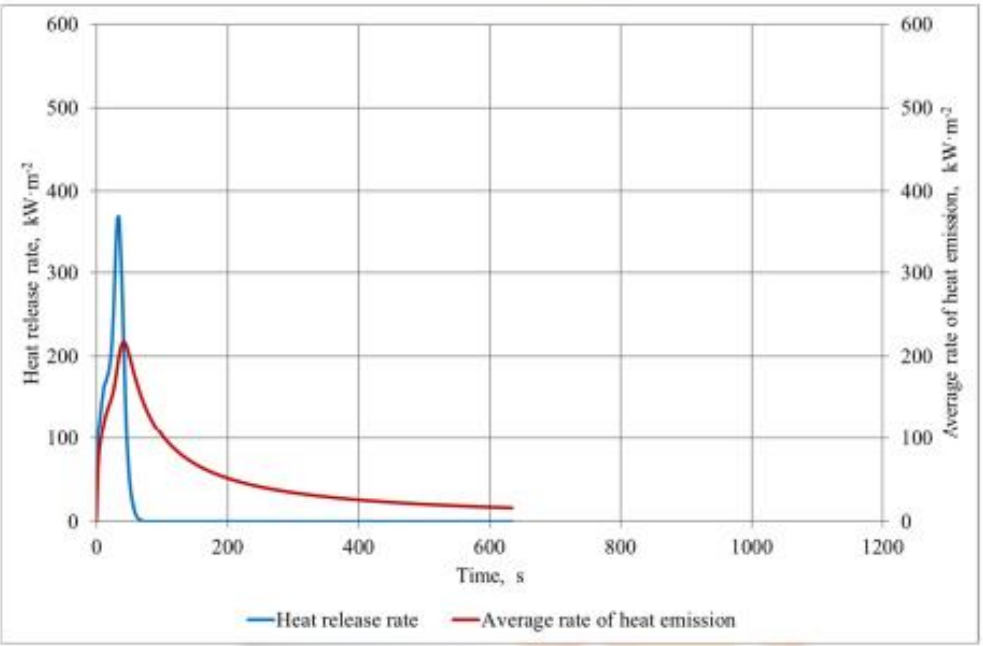

Figure 4.2. The relation of heat release rate and the time – specimen 2

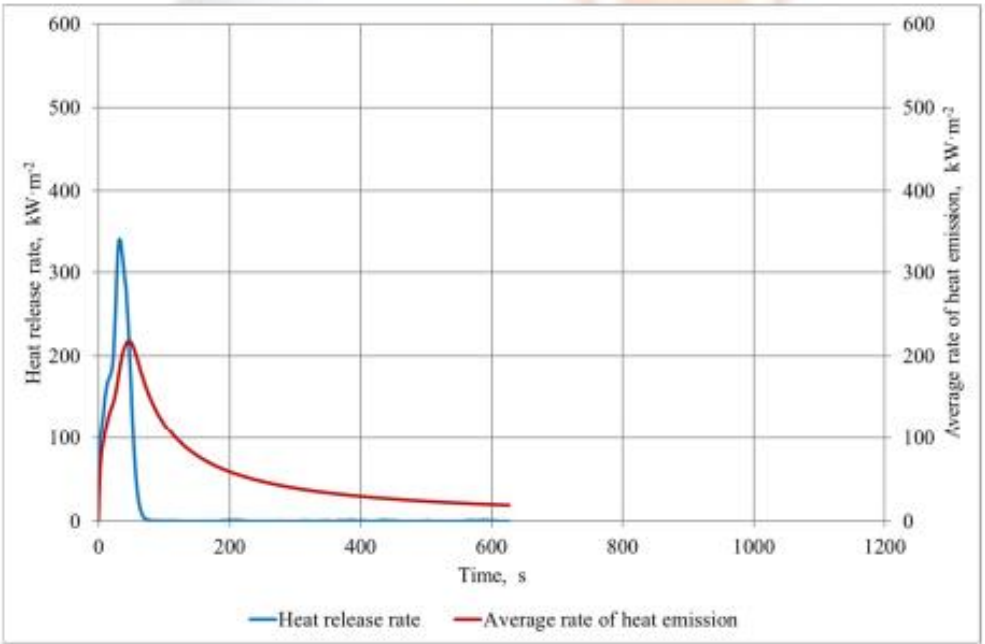

Figure 4.3. The relation of heat release rate and the time – specimen 3

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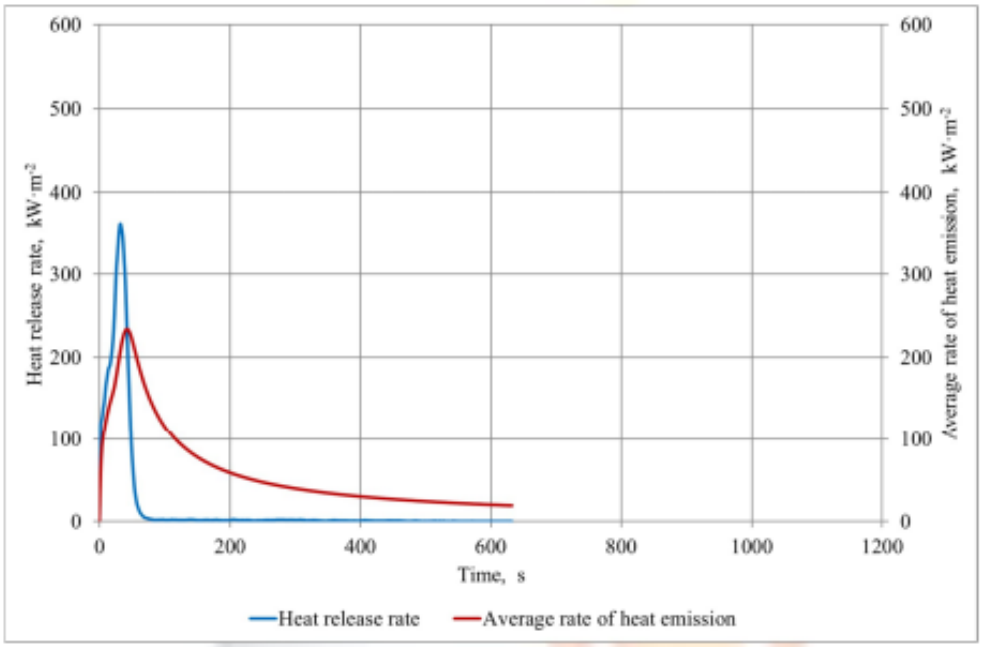

Figure 4.4. The relation of heat release rate and the time – specimen 4

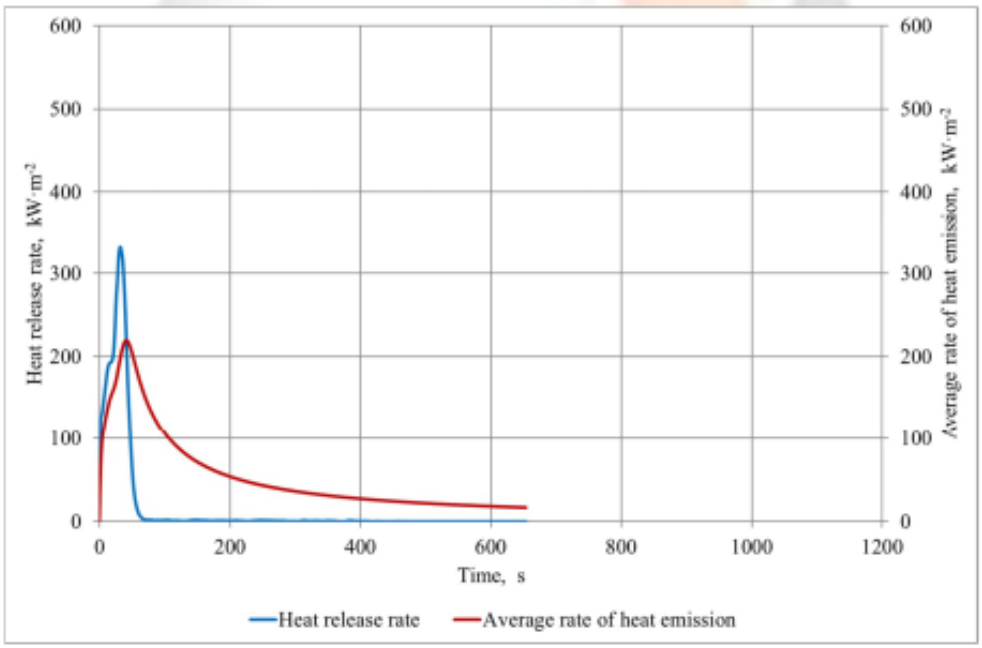

Figure 4.5. The relation of heat release rate and the time – specimen 5

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SYCHTA LABORATORIUM

TEST RESULTS

SL/Z-1316/ISO 5660-1/1549a/2025

2. Final findings

Density 27,2<…<30,4 (kg/m³)	HRR Peak 345 +/- 85 (kW/m²)	Heat of combustion 22 +/- 3 (MJ/kg)	Fulfilling the requirements
30,0	349	23,2	YES/~~NO~~

3. Remaining required information

Date of receipt of samples: 03.12.2025

Sampling: Sponsor took and delivered samples.

Description of the test material: Sponsor delivered 15 samples of white foam with description BFL6F30 with dimension of 100x100x25,3-25,7 mm and density of 29,7-30,5 kg/m².

Conditioning of specimens: constant mass at a temperature of 23±2°C, and relative humidity of 50±5 %.

Declarations:

1. The test results relate to the behaviour of the test specimens under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the products in use.
2. The information provided on the first page of the report concerning the scope of research and identification of the tested object/objects were provided by the Sponsor.

Operators:

mgr inż. Andrzej Sychta

SYCHTA LABORATORIUM Sp. J.
72-010 Police, ul. Ofiar Stutthofu 90
tel./fax +48 91 4210 214, tel. 502078855
e-mail: biuro@sychta.eu www.sychta.eu
KRS 0000387681 REGON 321023120
NIP 8513152392

Authorised by:

KIEROWNIK TECHNICZNY
dr inż. Krzysztof Sychta

Date and place of test - 10-11.12.2025, Police

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Appendix E – instrumentation list

POS.	Description	Manufacturer	Model	Serial no.	Calibrated date	Cert no.
BFL13	Current meter	National Instruments	NI 9203	1CA668F	11.07.2024	2604/2024/E
BFL24	Anemometer	Testo	Testo 440	83508081	03.02.2025	42/A/25
BFL28	Moisture meter / Hygrometer / Thermometer (wood)	Testo	Testo 606-2	38782986/1021	23.08.2024	5011-KL-V0042-24
BFL45	Thermohigrometer	Meraserw	CEM DT-321S	210602678	07-11.03.2025	714/E/2025
BFL71	Pressure transmitter	Aplisens	PC-28	02245384	07.03.2024	0100/PCL/2024
BFL77	Manometer	Gesa	MD0906	2305252019852	10.05.2024	0637/2024/3
BFL83	Stopwatch	Casio	HS-80TW	K051188	12.06.2024	OUM6.6W2.473.14 35.2024.2
BFL85	Meter 5m	Stanley	-	1029/2024/1	12.08.2024	SW/1029/2024/1
BFL115	Flow meter	Endress Hauser	Promass F300	RA074602000	11.06.2025	20250611_F1_01
BFL117	Climatic chamber	-	-	-	05-06.06.2025	182/6/25
BFL120	Manometer	Gesa	MD0906	2206201176750	13.06.2025	1061/2025/3
BFL140	Thermostatic chamber	WAMED	SUP-200G	-	17.11.2025	848/11/25
BFL141	Balance	Radwag	WLC 30/F1/R	856846	11.10.2025	13817/4771/25/E
BFL1002	Thermocouple module	National Instruments	NI 9213	187F11C	31.10.2024	4100/2024/E
T1	PA2506021/10	Guenther	TYP K	1851220/46	20-23.06.2025	PA2506021
T2	PA2507022/4	Guenther	TYP K	1851220/24	11-14.07.2025	PA2507022
T3	PA2507023/1	Guenther	TYP K	1821220/17	14.07.2025	PA2507023
T4	PA2506021/6	Guenther	TYP K	1851220/31	20-23.06.2025	PA2506021
T5	PA2507023/3	Guenther	TYP K	1821220/37	14.07.2025	PA2507023
T6	PA2506021/9	Guenther	TYP K	1851220/39	20-23.06.2025	PA2506021
T7	PA2507022/1	Guenther	TYP K	1851220/13	11-14.07.2025	PA2507022
T15	PA2505037/2	Guenther	TYP K	1831220/5	22.05.2025	PA2505037
T16	PA2507022/3	Guenther	TYP K	1851220/21	11-14.07.2025	PA2507022
T17	PA2506021/8	Guenther	TYP K	1851220/38	20-23.06.2025	PA2506021
T18	PA2505038/1	Guenther	TYP K	1821220/8	22.05.2025	PA2505038
T19	PA2505037/4	Guenther	TYP K	1831220/4	22.05.2025	PA2505037
T20	PA2507022/2	Guenther	TYP K	1851220/17	11-14.07.2025	PA2507022
T21	PA2507022/7	Guenther	TYP K	1851220/42	11-14.07.2025	PA2507022

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Baltic Fire Laboratory
BFL S/N: BFL13
Calib.Date: 11.07.2024
Next Calib.: 10.07.2026

Institute of Power Engineering

Institute of Power Engineering – National Research Institute
MEASURING APPARATUS LABORATORY
02-981 Warszawa, ul. Augustówka 36
tel. (22) 34 51 438
lap@ien.com.pl www.ien.com.pl

PCA Polskie Centrum Akredytacji
AP 013

Calibration laboratory accredited by
Polish Centre for Accreditation, a signatory to EA MLA and ILAC MRA
that include recognition of calibration certificates.
Accreditation No AP 013

CALIBRATION CERTIFICATE

Date of issue: 12 July 2024 Certificate No: 2604/2024/E Page 1/2

OBJECT OF CALIBRATION	Current meter model NI 9203, manufacturer NATIONAL INSTRUMENTS, serial number 1CA668F, 8-channel with a current measuring chain.
APPLICANT	Baltic Fire Laboratory Sp. z o.o. 80 – 209 Tuchom, ul. Banińska 8 Order No: MAP.4032.864.2024
PLACE OF CALIBRATION	Baltic Fire Laboratory Sp. z o.o. 80 – 209 Tuchom, ul. Banińska 8
CALIBRATION METHOD	Calibration was performed according to the Measurement Procedure P4/MAP „Calibration apparatus for measuring temperature, pressure, electrical quantities and humidity on objects", edition XII released on 30 May 2023.
ENVIRONMENTAL CONDITIONS	Ambient temperature (25,8 ÷ 26,4) °C Relative humidity (66,2 ÷ 73,6) %
DATE OF CALIBRATION	11 July 2024
TRACEABILITY	This certificate is issued under the agreement EA MLA in the field of calibration and provides traceability of measurement results to the International System of Units (SI).
CALIBRATION RESULTS	The results have been presented on page 2/2 of this certificate including uncertainty of measurement. The result apply to the object of calibration only.
UNCERTAINTY OF MEASUREMENT	Uncertainty of measurement has been evaluated in compliance with EA-4/02 M:2022. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor $k = 2$.

Akredytowane Laboratorium AP 013 Wzorcujące

Z-ca KIEROWNIKA
Laboratorium Aparatury Pomiarowej
Inż. Rafał Malinowski

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CALIBRATION CERTIFICATE issued by ACCREDITED LABORATORY No AP 013.

Date of issue: 12 July 2024 | Certificate No: 2604/2024/E | Page 2/2

CALIBRATION RESULTS

The results of the calibration are as follows:

REFERENCE VALUE *Wp*	AVERAGE MEASURED VALUE *Ww*								MEASUREMENT ERROR *Ww-Wp*								MEASUREMENT UNCERTAINTY *U*
mA	mA								mA								mA
Measuring chain →	**1A**	**2A**	**3A**	**4A**	**5A**	**6A**	**7A**	**8A**	**1A**	**2A**	**3A**	**4A**	**5A**	**6A**	**7A**	**8A**	
Mark on the card →	**CH0**	**CH 1**	**CH 2**	**CH 3**	**CH 4**	**CH 5**	**CH 6**	**CH 7**	**CH0**	**CH 1**	**CH 2**	**CH 3**	**CH 4**	**CH 5**	**CH 6**	**CH 7**	
Reading in the program → DAQ Express 4.1.0 Nr 7.1.0.50148	CDAQ1Mod2/ai0	CDAQ1Mod2/ai1	CDAQ1Mod2/ai2	CDAQ1Mod2/ai3	CDAQ1Mod2/ai4	CDAQ1Mod2/ai5	CDAQ1Mod2/ai6	CDAQ1Mod2/ai7	CDAQ1Mod2/ai0	CDAQ1Mod2/ai1	CDAQ1Mod2/ai2	CDAQ1Mod2/ai3	CDAQ1Mod2/ai4	CDAQ1Mod2/ai5	CDAQ1Mod2/ai6	CDAQ1Mod2/ai7	
4,000	3,993	3,992	3,990	4,006	4,000	3,994	3,998	4,002	-0,007	-0,008	-0,010	0,006	0,000	-0,006	-0,002	0,002	0,030
8,000	8,020	8,015	7,992	7,988	8,291	8,006	8,004	7,996	0,020	0,015	-0,008	-0,012	0,291	0,006	0,004	-0,004	0,030
12,000	11,990	12,005	11,998	12,012	11,995	12,012	11,995	12,000	-0,010	0,005	-0,002	0,012	-0,005	0,012	-0,005	0,000	0,030
16,000	16,012	16,000	15,985	16,004	16,004	15,980	15,997	15,979	0,012	0,000	-0,015	0,004	0,004	-0,020	-0,003	-0,021	0,030
20,000	19,998	19,993	19,985	19,986	20,003	19,984	19,992	19,992	-0,002	-0,007	-0,015	-0,014	0,003	-0,016	-0,008	-0,008	0,030

Authorized by: KIEROWNIK TECHNICZNY Laboratorium Pomiarowej

inż. Rafał Malinowski

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LABORATORY FOR CALIBRATION
OF THE VENTILATION MEASURING DEVICES
STRATA MECHANICS RESEARCH INSTITUTE of POLISH ACADEMY OF SCI.
30-059 CRACOW, POLAND Reymonta 27 Str. phone.: +48 12 6376200; fax: +48 12 6372884
www.lwwpp.imgpan.pl; lwwpp@imgpan.pl

Laboratory accredited by
Polish Centre for Accreditation, a signatory to EA MLA and ILAC MRA
that include recognition of calibration certificates.
Accreditation No AP 118.

AP 118

CALIBRATION CERTIFICATE

Date of issue: February 3 2025 **Certificate No: 42/A/25** **Page 1/2**

OBJECT OF CALIBRATION	Name: Vane anemometer Type: Testo 440, probe 0635 9370 Factory No: 83508081, probe no. 20980936 Range: (0,1 ÷ 15,0) m/s Reading accuracy: 0,01 m/s Manufacturer: Testo
APPLICANT	Baltic Fire Laboratory Sp. z o.o. 80-209 Tuchom, ul. Banińska 8
CALIBRATION SITE	Laboratory for Calibration of the Ventilation Measuring Devices 30-059 Cracow, Poland, Reymonta 27 Str.
CALIBRATION METHOD	Anemometers calibration instruction no P/01 of 15.07.2022 r.
ENVIRONMENTAL CONDITIONS	Temperature: (19,90 ÷ 20,14) deg C Barometric pressure: (1003,47 ÷ 1003,69) hPa Air density: (1,18 ÷ 1,18) kg/m3
DATE OF CALIBRATION	February 3 2025
TRACEABILITY	This certificate is issued under the agreement EA MLA in the field of calibration and provides traceability of measurement results to the International System of Units (SI).
CALIBRATION RESULTS	Printed on the second page and they concern only the calibration object.
UNCERTAINTY OF MEASUREMENT	Measurement uncertainty has been evaluated in compliance with the EA-4/02 M:2022. The expanded uncertainty assigned corresponds to a coverage probability of 95% and the coverage factor k = 2.

Baltic Fire Laboratory
BFL S/N: BFL24
Calib.Date: 03.02.2025
Next Calib.: 03.02.2027

Baltic Fire Laboratory
BFL S/N: BFL42
Calib.Date: 03.02.2025
Next Calib.: 03.02.2027

Acting Head of the Calibration Laboratory

Dr Eng. Jakub Janus

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CALIBRATION CERTIFICATE issued by ACCREDITED LABORATORY No AP 118

Date of issue: February 3 2025 **Certificate No: 42/A/25** **Page 2/2**

CALIBRATION RESULTS Calibration results are the following:

Lp.	Reference Velocity		Velocity indicated by anemometer		Correction	Measurement uncertainity
	V		Va		DV=V-Va	U(Dv)
	m/s	m/min	m/s	m/min	m/s	m/s
1	0,15	9	0,12	7	0,03	0,05
2	1,00	60	1,04	62	-0,04	0,05
3	3,00	180	3,06	184	-0,06	0,14
4	5,00	300	5,15	309	-0,15	0,11
5	10,00	600	10,30	618	-0,30	0,11
6	15,00	900	15,27	916	-0,27	0,16

Checked by

Dr Eng. Paweł Jamróz

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Český metrologický institut
Okružní 31, 638 00 Brno
tel. +420 545 555 111
www.cmi.cz

K 2202

Calibration laboratory No. 2202 accredited by the Czech Accreditation Institute according to ISO/IEC 17025:2017

Laboratory: Regional Inspectorate Pardubice, Průmyslová 455, 530 03 Pardubice
Department of moisture of solids, tel.: 466 670 696; e-mail : lpitrovanetolicka@cmi.cz

CERTIFICATE OF CALIBRATION

5011-KL-V0042-24

Date of issue: August 23th, 2024

Customer: Baltic Fire Laboratory
ul. Banińska 8
80-209 Tuchom

Baltic Fire Laboratory
BFL S/N: BFL28
Calib.Date: 23.08.2024
Next Calib.: 22.08.2026

User*: Baltic Fire Laboratory
ul. Banińska 8
80-209 Tuchom

Measuring instrument: Moisture meter of wood

Manufacturer: TESTO

Type: Testo 606-2

Serial number: 38782986/1021

Identific. number: BFL 28

Measuring range: (7 – 78) % - for material curve 2

Number of calibration scales: 1 - pine

The results of the calibration have been obtained following the procedures reported in this Certificate and are related only to the calibrated measuring instrument, the date, place and conditions of the calibration.

Date of calibration: August 22-23th, 2024

Calibrated by:

Ing. Lucie Pitrová Netolická

Český metrologický institut -50/2-

Director of the regional inspectorate:

Ing. Zuzana Pálková, Ph.D.

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CERTIFICATE OF CALIBRATION **5011-KL-V0042-24** Page 2 of 2

Metrological traceability: During the calibration of the moisture meter was used secondary moisture standard of solid substances – wood, SEVPL-D, serial number: 001/92, range (4 ÷ 110) % [m/m] and digital thermometer - hygrometer, reference number: 970053.

The measurements are metrologically traceable to national/international standards.

Calibration procedure: Tests of the meter were performed according to calibration procedure No. 511-MP-C003 Calibration of moisture meters for wood. The moisture content of the wood samples used for calibration was adjusted by conditioning.
The measurement was carried out according to the working manual for the tested hygrometer.
Type of material used for calibration: wood - pine
Calibration curve set on a calibrated gauge: 2 (pine)

Place of calibration: (complete address) ČMI OI Pardubice - laboratoř VPL, Průmyslová 455, 530 03 Pardubice

Ambient conditions: (nominal values) 1) temperature: (23 ± 5)°C
2) relative humidity: max. 70 %

Results of calibration:

No. sample	BO11	BO12	BO13	BO21	BO22	BO23	BO31	BO32	BO33
w_h	7.30	7.65	7.65	10.80	10.93	10.55	17.73	18.05	18.48
w_r	8.81	8.60	8.65	11.82	12.34	12.40	18.76	19.48	19.07
s_r	**-1.51**	**-0.95**	**-1.00**	**-1.02**	**-1.42**	**-1.85**	**-1.04**	**-1.43**	**-0.59**
U_c	**0.42**	**0.54**	**0.87**	**0.89**	**0.53**	**0.95**	**0.95**	**0.91**	**0.91**

Explanations:
line 2: w_h: mean of 4 moisture measurements of the sample with the tested moisture meter in % moisture
line 3: w_r: reference gravimetric moisture determination of the sample in % moisture
line 4: error of moisture meter $s_r = w_h - w_r$ in % humidity
line 5: uncertainty U_c in % moisture for individual samples

The standard uncertainty of measurement has been determined in accordance with EA-4/02 M:2022 document. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k corresponding to a coverage probability of approximately 95 %, which for normal distribution corresponds to a coverage factor $k = 2$.

* … data from customer

End of calibration certificate.

Český metrologický institut
Oblastní inspektorát Pardubice
Průmyslová 455
530 03 Pardubice
-e-

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Institute of Power Engineering

Institute of Power Engineering – National Research Institute
MEASURING APPARATUS LABORATORY
02-981 Warszawa, ul. Augustówka 36
tel. (22) 34 51 438
lap@ien.com.pl www.ien.com.pl

PCA Polskie Centrum Akredytacji WZORCOWANIE
AP 013

Baltic Fire Laboratory
BFL S/N: BFL45
Calib.Date: 07–11.03.2025
Next Calib.: 11.03.2027

Calibration laboratory accredited by
Polish Centre for Accreditation, a signatory to EA MLA and ILAC MRA
that include recognition of calibration certificates.
Accreditation No AP 013

ilac-MRA

CALIBRATION CERTIFICATE

Date of issue: 11 March, 2025 Certificate No: 714/E/2025 Page 1/2

OBJECT OF CALIBRATION	Termohygrometer model DT-321S, manufacturer CEM, serial number 210602678, inventory number BFL45 with integrated external sensor.
APPLICANT	Baltic Fire Laboratory Sp. z o.o. 80 - 209 Tuchom, ul. Banińska 8 Order No: MAP.4032.245.2025
CALIBRATION METHOD	Calibration was performed at the premises of the LAP IEN-PIB according to the Measurement Procedure W1/MAP "Calibration of Humidity Measuring Instruments", XII edition released on 18 September 2020.
ENVIRONMENTAL CONDITIONS	Ambient temperature (22,6 ÷ 26,8) °C Relative humidity (25,6 ÷ 37,9) %
DATE OF CALIBRATION	7 March ÷ 11 March 2025
TRACEABILITY	This certificate is issued under the agreement EA MLA in the field of calibration and provides traceability of measurement results to the International System of Units (SI).
CALIBRATION RESULTS	The results have been presented on page 2/2 of this certificate including uncertainty of measurement. The results apply to the object of calibration only.
UNCERTAINTY OF MEASUREMENT	Uncertainty of measurement has been evaluated in compliance with EA-4/02 M:2022. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor $k = 2$.

Akredytowane Laboratorium Wzorcujące AP 013

Z-ca KIEROWNIKA
Laboratorium Aparatury Pomiarowej
inż. Rafał Malinowski

This certificate may be presented or copied as a whole document only.

THE REPRODUCING OF THE REPORT IS PERMITTED ONLY IN FULL.
IN OTHER CASE, WRITTEN APPROVAL OF THE CONTRACTOR SHALL BE GIVEN.

CALIBRATION CERTIFICATE issued by ACCREDITED LABORATORY No AP 013.

Date of issue: 11 March, 2025 Certificate No: 714/E/2025 Page 2/2

CALIBRATION RESULTS

Calibration results are the following:

AVERAGE REFERENCE VALUE *Wp*		AVERAGE MEASURED VALUE *Ww*		MEASUREMENT ERROR *Ww-Wp*		MEASUREMENT UNCERTAINTY *U*	
t	*RH*	*t*	*RH*	*t*	*RH*	*t*	*RH*
°C	%	°C	%	°C	%	°C	%
10,08	49,5	10,09	49,3	0,01	-0,2	0,15	0,7
19,98	29,6	19,99	27,3	0,01	-2,3	0,15	0,6
19,95	49,5	19,96	44,6	0,01	-4,9	0,15	0,7
19,99	69,5	20,02	64,0	0,03	-5,5	0,15	1,0
29,92	50,2	29,91	46,6	-0,01	-3,6	0,15	0,7
49,94	50,3	49,91	47,1	-0,03	-3,2	0,15	0,8

Temperatures given are referred to the International Temperature Scale of 1990 (ITS-90).

Authorized by:

KIEROWNIK TECHNICZNY
Laboratorium Aparatury Pomiarowej

inż. Rafał Malinowski

THE REPRODUCING OF THE REPORT IS PERMITTED ONLY IN FULL.
IN OTHER CASE, WRITTEN APPROVAL OF THE CONTRACTOR SHALL BE GIVEN.

APLISENS S.A.
LABORATORIUM WZORCUJĄCE APLISENS
03-192 Warszawa, ul. Morelowa 7
tel.: 22 814 07 77 w. 162, faks: 22 814 07 78
e-mail: laboratorium@aplisens.pl http://www.aplisens.pl
PRACOWNIA CIŚNIEŃ
03-192 Warszawa, ul. Morelowa 7
e-mail: laboratorium@aplisens.pl

Baltic Fire Laboratory
BFL S/N: BFL71
Calib.Date: 07.03.2024
Next Calib.: 06.03.2026

PCA Polskie Centrum Akredytacji WZORCOWANIE
AP 122

Laboratorium wzorcujące akredytowane przez Polskie Centrum Akredytacji, sygnatariusza porozumień EA MLA i ILAC MRA dotyczących wzajemnego uznawania świadectw wzorcowania. Nr akredytacji AP 122.
Calibration laboratory accredited by Polish Centre for Accreditation, a signatory to EA MLA and ILAC MRA that include recognition of calibration certificates. Accreditation No. AP 122.

ilac-MRA

ŚWIADECTWO WZORCOWANIA

CALIBRATION CERTIFICATE

Data wydania: *Date of issue* 07.03.2024 | Numer świadectwa: *Certificate No.* 0100/PCL/2024 | Strona nr: 1/2 *Page*

OBIEKT WZORCOWANIA *OBJECT OF CALIBRATION*

Nazwa: *Name*	Przetwornik ciśnienia *Pressure transmitter*	Nr fabryczny: *Serial Number*	02245384
		Producent: *Producer*	APLISENS
Typ: *Type*	PC-28		
Zakres wskazań: *Indication range*	(0÷25) MPa		
Sygnał wyjściowy: *Output signal*	(4÷20) mA, charakterystyka liniowa *(4÷20) mA, with linear characteristic*		

ZGŁASZAJĄCY *APPLICANT*
Baltic Fire Laboratory Sp. z o.o.
ul. Baniński 8
80-209 Tuchom

MIEJSCE WZORCOWANIA *PLACE OF CALIBRATION*
APLISENS S.A., Laboratorium Wzorcujące Aplisens - Pracownia Ciśnień
ul. Morelowa 7, 03-192 Warszawa

METODA WZORCOWANIA *CALIBRATION METHOD*
Zgodnie z Procedurą PR-01 "Wzorcowanie przetworników ciśnienia" wydanie B z dnia 14.11.2023 r
According to PR-01 Procedure: Calibration of pressure transmitters, edition B from 14.11.2023

WARUNKI ŚRODOWISKOWE *ENVIRONMENTAL CONDITIONS*

Temperatura otoczenia *Environment temperature*	Wilgotność względna *Relative humidity*	Ciśnienie atmosferyczne *Atmospheric pressure*
(19,7÷20,4) °C	(27,9÷31,9) %	(1000,0÷1016,6) hPa

DATA WZORCOWANIA *DATE OF CALIBRATION*
07.03.2024

SPÓJNOŚĆ POMIAROWA *TRACEBILITY*
Świadectwo jest wydane w ramach porozumienia EA MLA w zakresie wzorcowania i potwierdza spójność wyników pomiarów z jednostkami miar Międzynarodowego Układu Jednostek Miar (SI).
This certificate is issued under the agreement EA MLA in the calibration field and provides traceability of measurement results to the International System of Units (SI).

WYNIKI WZORCOWANIA *CALIBRATION RESULTS*
Podano na stronie 2 niniejszego świadectwa wraz z wartościami niepewności pomiaru i dotyczą wyłącznie obiektu wzorcowanego.
The results have been presented on 2 page of this certificate, including the measurement uncertainty, and they apply to the calibrated object only.

NIEPEWNOŚC POMIARU *UNCERTAINTY OF MEASUREMENT*
Niepewność pomiaru została określona zgodnie z dokumentem EA-4/02 M:2022. Podane wartości niepewności stanowią niepewności rozszerzone przy prawdopodobieństwie rozszerzenia ok. 95% i współczynniku rozszerzenia k=2.
Uncertainty of measurement has been evaluated in compliance with EA-4/02 M:2022. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor k=2.

LABORATORIUM WZORCUJĄCE APLISENS / PRACOWNIA CIŚNIEŃ
ZSW259986/80 | KCL000123 | PC24000093

Niniejsze świadectwo może być okazywane lub kopiowane tylko w całości.
This certificate may be presented or copied as a whole document only.

THE REPRODUCING OF THE REPORT IS PERMITTED ONLY IN FULL.
IN OTHER CASE, WRITTEN APPROVAL OF THE CONTRACTOR SHALL BE GIVEN.

ŚWIADECTWO WZORCOWANIA wydane przez Laboratorium Wzorcujące Aplisens Nr AP 122
CALIBRATION CERTIFICATE issued by Laboratorium Wzorcujące Aplisens No. AP 122

Data wydania: *Date of issue* 07.03.2024 Numer świadectwa: *Certificate No.* 0100/PCL/2024 Strona nr: 2/2 *Page*

WYNIKI WZORCOWANIA
CALIBRATON RESULTS

Wyniki wzorcowania obiektu przedstawiono poniżej:
Calibration results are the following:

Wartość ciśnienia odniesienia *Reference pressure value*	Wartość natężenia prądu odpowiadająca wartości ciśnienia odniesienia *Current strenght value related to reference pressure value*	Zmierzona wartość natężenia prądu *Measured current strenght value*	Wartość ciśnienia odpowiadająca zmierzonej wartości natężenia prądu *Pressure value related to measured current strenght value*	Błąd pomiaru *Measurement error*		Niepewność pomiaru *Measurement uncertainty*	
MPa	mA	mA	MPa	mA	MPa	mA	MPa
0,0000	4,000	4,000	0,0000	0,000	0,0000	0,001	0,0016
6,2500	8,000	7,997	6,2453	-0,003	-0,0047	0,001	0,0016
12,5001	12,000	11,995	12,4922	-0,005	-0,0079	0,002	0,0031
18,7503	16,000	15,995	18,7422	-0,005	-0,0081	0,003	0,0047
25,0005	20,000	19,998	24,9969	-0,002	-0,0036	0,004	0,0062

KOMENTARZ
COMMENT

Podczas wzorcowania przetwornik umieszczono w pozycji pionowej czujnikiem w dół.
The transmitter was placed in vertical position with the sensor down during the calibration.

mgr inż. Barbara Buczek
Buczek
Kierownik Laboratorium Wzorcującego Aplisens
2024-03-07
Autoryzował(a):
Authorized by:

Niniejsze świadectwo może być okazywane lub kopiowane tylko w całości.
This certificate may be presented or copied as a whole document only.

THE REPRODUCING OF THE REPORT IS PERMITTED ONLY IN FULL.
IN OTHER CASE, WRITTEN APPROVAL OF THE CONTRACTOR SHALL BE GIVEN.

Baltic Fire Laboratory
BFL S/N: BFL77
Calib.Date: 10.05.2024
Next Calib.: 09.05.2026

TENSLAB Laboratorium Wzorcujące

TENSLAB Spółka z ograniczoną odpowiedzialnością
LABORATORIUM WZORCUJĄCE

Siedziba:	Laboratorium:	Kontakt:
80-554 GDAŃSK	81-336 GDYNIA	www.tenslab.pl
ul. Śnieżna 5	ul. Kadłubowców 4	tel: +48 58 380 06 44

PCA Polskie Centrum Akredytacji WZORCOWANIE
AP 180

Calibration laboratory accredited by Polish Centre for Accreditation, a signatory to EA MLA and ILAC MRA that include recognition of calibration certificates. Accreditation No AP 180.

ilac-MRA

CALIBRATION CERTIFICATE

Date of issue: 10 May 2024 Certificate No: 0637/2024/3 Page 1/ 2

OBJECT OF CALIBRATION	Digital pressure gauge, Type: MD0906, Serial number: 2305252019852, Producer: Gesa, Resolution: 0,01 bar, Measuring range: 0,0÷250,0 bar, Class: 0,2, Identification number: no data.
CUSTOMER	BALTIC FIRE LABORATORY SPÓŁKA Z O. O. ul. Banińska 8 80-209 Tuchom
PLACE OF CALIBRATION	TENSLAB Sp. z o.o. Laboratorium Wzorcujące ul. Kadłubowców 4 81-336 Gdynia
CALIBRATION METHOD	Procedura pomiarowa - Ciśnieniomierze elektroniczne - PP TENSLAB/CE/1/18 date of issue 20.07.2018
ENVIRONMENTAL CONDITIONS	Ambient temperature: (21,7 ÷ 22,3) °C
DATE OF CALIBRATION	10 May 2024
TRACEABILITY	This certificate is issued under the agreement EA MLA in the field of calibration and provides traceability of measurement results to the International System of Units (SI).
CALIBRATION RESULTS	The results have been presented on page(s) 2 of this certificate including uncertainty of measurement. The results relate only to the object of calibration.
UNCERTAINTY OF MEASUREMENT	Uncertainty of measurement has been evaluated in compliance with EA-4/02 M:2022. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor k = 2.

Laboratorium Wzorcujące AP 180

This Calibration Certificate can be shown or copy only as a whole.

THE REPRODUCING OF THE REPORT IS PERMITTED ONLY IN FULL.
IN OTHER CASE, WRITTEN APPROVAL OF THE CONTRACTOR SHALL BE GIVEN.

CALIBRATION CERTIFICATE issued by ACCREDITED LABORATORY No AP 180

Date of issue: 10 May 2024 Certificate No: 0637/2024/3 Page 2/ 2

CALIBRATION RESULTS

Calibration results are the following:

Determination of measurement error:

No	Measured pressure value	Reference pressure value	Measurement error	Hysteresis	Measurement uncertainty
	bar				
1.	0,00	0,00	0,00	0,00	0,10
2.	5,00	5,01	-0,01	0,04	0,10
3.	16,00	15,97	0,03	0,07	0,10
4.	25,00	24,90	0,10	0,14	0,12
5.	50,00	49,79	0,21	0,16	0,13
6.	75,00	74,76	0,24	0,16	0,13
7.	100,00	99,75	0,25	0,15	0,12
8.	150,00	149,75	0,25	0,19	0,14
9.	200,00	199,70	0,30	0,15	0,13
10.	225,00	224,72	0,28	0,10	0,12
11.	250,00	249,76	0,24	0,10	0,11
12.	-	-	-	-	-
13.	-	-	-	-	-
14.	-	-	-	-	-
15.	-	-	-	-	-

Authorized by:

KIEROWNIK TECHNICZNY

Paula Keister-Łyko

END OF CALIBRATION CERTIFICATE

THE REPRODUCING OF THE REPORT IS PERMITTED ONLY IN FULL.
IN OTHER CASE, WRITTEN APPROVAL OF THE CONTRACTOR SHALL BE GIVEN.

Baltic Fire Laboratory
BFL S/N: BFL83
Calib.Date: 12.06.2024
Next Calib.: 11.06.2026

DIRECTOR
OF THE REGIONAL OFFICE OF MEASURES IN GDAŃSK

Calibration Laboratories Group
Laboratory of Electricity and Physicochemistry
Polanki 124c Str., 80-308 Gdańsk
tel.: 58-5245-200 fax: 58-5245-229 e-mail: w2@oum.gda.pl www.oum.gda.pl

CALIBRATION CERTIFICATE

Date of issue: 12 June 2024 | Certificate No: OUM6.6W2.473.1435.2024.2.EN | Page 1/2

OBJECT OF CALIBRATION	Electronic stopwatch		Type:	HS-80TW
	Manufacturer:	Casio	No:	K051188
	Indicate range:	9 h 59 min 59,999 s	Resolution:	0,001 s
APPLICANT	Gdańskie Usługi Metrologiczne Sp. z o.o. ul. Kręta 18 80-217 Gdańsk			
USER	Baltic Fire Laboratory Sp. z o.o. ul. Banińska 8 80-209 Tuchom			
PLACE OF CALIBRATION	At the Laboratory of Electricity and Physicochemistry facility			
CALIBRATION METHOD	"Wzorcowanie stoperów elektronicznych wyzwalanych ręcznie" PP/6W2/S24/02 wydanie 6 z dnia 16 września 2020 r.			
ENVIRONMENTAL CONDITIONS	Temperature:	(23,8 ÷ 24,4) °C		
DATE OF CALIBRATION	12 June 2024			
TRACEABILITY	This certificate is issued under the agreement EA MLA in the field of calibration and provides traceability of measurement results to the International System of Units (SI).			
CALIBRATION RESULTS	The results apply to the calibrated object only and have been presented on page 2/2 of this certificate including uncertainty of measurement. niepewności pomiaru.			
UNCERTAINTY OF MEASUREMENT	Uncertainty of measurement has been evaluated in compliance with EA-4/02 M:2022. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor k= 2.			

z up. Dyrektora
Okręgowego Urzędu Miar w Gdańsku
Małgorzata Śledziowska
Główny Specjalista
Laboratorium Elektryczności i Fizykochemii

AP 086

F2/P-11/10.02.2023

Regional Office of Measures in Gdańsk

This certificate may be presented or copied only in its entirety.

THE REPRODUCING OF THE REPORT IS PERMITTED ONLY IN FULL.
IN OTHER CASE, WRITTEN APPROVAL OF THE CONTRACTOR SHALL BE GIVEN.

CALIBRATION CERTIFICATE issued by ACCREDITED LABORATORY No AP 086

Date of issue: 12 June 2024 Certificate No: OUM6.6W2.473.1435.2024.2.EN Page 2/2

CALIBRATION RESULTS Calibration results are the following:

1) form time interval τ = 1h

error for 1h time interval	uncertainty
s	s
0,011	0,010

2) of any time interval τ :

$\Delta\tau = y\tau +/-$ 0,010 s

y - relative stopwatch error
Δ τ - measurement error

y in time calibration:

y	uncertainty
$x10^{-6}$	$x10^{-6}$
3,01	0,30

Notice
The stated measurement error does not take into account the subjective error associated with the reaction time of the person taking the measurements.

Authorized by:

STARSZY INSPEKTOR
mgr Ewa Korzeniowska

THE END OF THE CALIBRATION CERTIFICATE

THE REPRODUCING OF THE REPORT IS PERMITTED ONLY IN FULL.
IN OTHER CASE, WRITTEN APPROVAL OF THE CONTRACTOR SHALL BE GIVEN.

Baltic Fire Laboratory
BFL S/N: BFL85
Calib.Date: 12.08.2024
Next Calib.: 12.08.2028

LAB MESK

"LAB MESK" EUGENIUSZ STEPNOWSKI
01-441 Warsaw, Deotymy Street 43a apt.6

Calibration Laboratory Lab Mesk
Wólczyńska Street 133, building no. 5, apt no. 541, 01-919 Warsaw
tel.: 505-414-661, 500-002-611 | labmesk.pl | e-mail: laboratorium@labmesk.pl
Provided address is permament place of laboratory activities
Calibration laboratory accredited by
Polish Centre for Accreditation, a signatory to EA MLA and ILAC MRA
that include recognition of calibration certificates.
Accreditation No AP 171.

PCA
AP 171

CALIBRATION CERTIFICATE

Date of issue: 12th August 2024 Certificate No: SW/1029/2024/1 Page: 1/2

OBJECT OF CALIBRATION	Measuring tape	
	Manufacturer:	Stanley
	Manufacturing number:	-
	Identification number:	1029/2024/1
	Range:	5,0 m
	Graduation:	1 mm
APPLICANT	Baltic Fire Laboratory Sp. z o.o. Banińska 8, 80-209 Tuchom	
CALIBRATION METHOD	Calibration procedure "IW5.8.21 Przymiary" version 2 of 20th September 2022	
ENVIRONMENTAL CONDITIONS	Temperature:	(19,3 ÷ 19,7)°C
DATE OF CALIBRATION	12th August 2024	
TRACEABILITY	This certificate is issued under the agreement EA MLA in the field of calibration and provides traceability of measurement results to the International System of Units (SI).	
CALIBRATION RESULTS	The results have been presented on page 2 of this certificate including uncertainty of measurement The results refer only to the instrument mentioned in the field "object of calibration".	
UNCERTAINTY OF MEASUREMENT	Uncertainty of measurement has been evaluated in compliance with EA-4/02 M:2022. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor $k = 2$.	

Laboratorium Wzorcujące AP 171

KIEROWNIK LABORATORIUM
Marcin Yokaj

This certificate may be presented or copied as a whole document only.

THE REPRODUCING OF THE REPORT IS PERMITTED ONLY IN FULL.
IN OTHER CASE, WRITTEN APPROVAL OF THE CONTRACTOR SHALL BE GIVEN.

CALIBRATION CERTIFICATE issued by ACCREDITED LABORATORY No. AP 171

Date of issue: 12th August 2024 Certificate No: SW/1029/2024/1 Page: 2/2

CALIBRATION RESULTS

Calibration results are the following:

Nominal length of the calibrated section	Permissible length of the calibrated section	Measurement uncertainty
mm	mm	mm
Upper scale		
0÷100 docisk	100,13	0,14
0÷100 zaczep	100,08	
0÷1000 zaczep	1000,02	
0÷2000 zaczep	2000,30	
0÷3000 zaczep	3000,36	0,25
0÷4000 zaczep	4000,44	
0÷5000 zaczep	5000,78	
Lower scale		
0÷100 docisk	100,13	0,14
0÷100 zaczep	100,08	
0÷1000 zaczep	1000,02	
0÷2000 zaczep	2000,30	
0÷3000 zaczep	3000,36	0,25
0÷4000 zaczep	4000,44	
0÷5000 zaczep	5000,78	

Authorized by:

KIEROWNIK LABORATORIUM
Marcin [illegible]

End of calibration certificate.

THE REPRODUCING OF THE REPORT IS PERMITTED ONLY IN FULL.
IN OTHER CASE, WRITTEN APPROVAL OF THE CONTRACTOR SHALL BE GIVEN.

N.o.: 20250611_F1_01

Endress+Hauser
People for Process Automation

Accredited Calibration Laboratory according to: NAH 2-0327/2021

Baltic Fire Laboratory
BFL S/N: BFL115
Calib.Date: 11.06.2025
Next Calib.: 11.06.2027

Calibration certificate

Subject:	Promass F 300 Calibration
Manufacturer:	Endress+Hauser
Type / Order code:	Promass 8F3B15-D7C4/0
Serial number: / Tag number:	no. RA074602000 - BFL 115
Measuring range / calibrated range	0-108,3 kg/min / 1,66-108,3 kg/min
Output signal:	4-20 mA
Calibration factor:	1.9828
Ordered by:	Baltic Fire Laboratory
Place and date of calibration:	E+H Cal. Lab. 11.06.2025
Calibrated by:	Lukács László
Status:	OK for calibration

References	Order code	Serial n.:	Certificate
Promass 83F	83F08-AD2SAMABAAAJ	9B098002000	N11203636
Promass 83F	83F25-AD2SAMABAAAJ	9B097F02000	N11203740
Promass 83F	83F50-AD2SAMABAAAJ	CB0A2C02000	N11203392
TR11-ARACARY17000		9C005E142FD	WT1804393
TTR31-A1A111YY2CAB		F2004C0426E	WT1504267

The measurement results were traced to the national standard.

The calibration certificate contains data specific to the time and circumstances of the calibration of the instrument.

Calibration method:

The calibration was performed according to KE-01/2019.01.10 ver.:1

Conditions of calibration:

Water temperature:	21,3 °C
Ambient temperature:	21,9 °C
Measuring fluid:	tapwater

Stamps:

The calibration is certified by the 20250611_F1_01 stamp on the device.

This certificate can only be copied in its full form and scope

Endress+Hauser Magyarország
Folyamatműszerezési Kft.
1139 Budapest
Forgách u. 9/b.

Telefon +36 1 412 0421
Telefax +36 1 412 0424
hungary@hu.endress.com
www.hu.endress.com

1/2

THE REPRODUCING OF THE REPORT IS PERMITTED ONLY IN FULL.
IN OTHER CASE, WRITTEN APPROVAL OF THE CONTRACTOR SHALL BE GIVEN.

N.o.: 20250611_F1_01

Endress+Hauser
People for Process Automation

Accredited Calibration Laboratory according to: NAH 2-0327/2021

Results:

Set points	Set points	Reference value	Measured value	Measuring error	Measurement Uncertainty
%	kg/min	kg	kg	%	%
1,55%	1,676	1,677	1,680	0,18%	0,15
23,08%	25,003	25,003	25,011	0,03%	0,15
46,19%	50,040	50,041	50,030	-0,02%	0,15
70,30%	76,152	75,518	75,496	-0,03%	0,15
99,21%	107,473	108,371	108,357	-0,01%	0,15

Measurement uncertainty:
The uncertainty values given in the tabloids are extended ones which include uncertainties coming from the etalons, from the method of calibration and from enviromental conditions. In case of a normal (Gauss) distribution, the value multiplied by k=2 fits a 95% cover probability. The standard uncertainty was determined by the publication no. EA 4/02M of the European Accrediting Organization.

Validity of the certificate:
The date of a repeated inspection is to be determined by the user with regard to the operation circumstances of the measurement device

ENDRESS+HAUSER MAGYARORSZÁG KFT.
1139 Budapest, Forgách u. 9./b
Tel.: 412-0421 • Fax: 412-0424

Calibrated by
Laszlo Lukacs

Checked by
Laszlo Nemes

This certificate can only be copied in its full form and scope

Endress+Hauser Magyarország
Folyamatműszerezési Kft.
1139 Budapest
Forgách u. 9/b.

Telefon +36 1 412 0421
Telefax +36 1 412 0424
hungary@hu.endress.com
www.hu.endress.com

THE REPRODUCING OF THE REPORT IS PERMITTED ONLY IN FULL.
IN OTHER CASE, WRITTEN APPROVAL OF THE CONTRACTOR SHALL BE GIVEN.

LABORATORIUM USŁUGOWO-BADAWCZE
„BIOCHEMIK" Sp. z o.o.

Pracownia Wzorcowania

ul. Strefowa 15, 64 – 920 Piła
Mob. +48 727 630 955, e-mail: wzorcowanie@biochemik.pl, www.wzorcowanie.biochemik.pl

Calibration laboratory accredited by
Polish Centre of Accreditation, a signatory to EA MLA and ILAC MRA
that include recognition of calibration certificates.
Accreditation No AP 158

AP 158

CALIBRATION CERTIFICATE

Date of issue: 12th June 2025 **Certificate No: 182/6/25** **Page 1/4**

OBJECT OF CALIBRATION	Climatic chamber Manufacturer: - Type: - Serial number: - User marking: BFL 117 Resolution: 0,1 °C, 0,1 % Workspace dimensions: (width x depth x height): (2280 x 5400 x 2280) mm
APPLICANT	Baltic Fire Laboratory Sp. z o.o. ul. Banińska 8 80-209 Tuchom, Poland
PLACE OF CALIBRATION	Baltic Fire Laboratory Sp. z o.o. ul. Banińska 8 80-209 Tuchom, Poland
CALIBRATION METHOD	Calibration has been carried out according to the calibration procedure „Climatic and thermostatic chambers", PW-06, 7th edition of 02 January 2022.
ENVIRONMENTAL CONDITIONS	Temperature: (16,8 ÷ 19,8) °C Relative humidity: (65,4 ÷ 74,6) %
DATE OF CALIBRATION	5th June ÷ 6th June 2025
TRACEABILITY	This certificate is issued under the agreement EA MLA in the field of calibration and provides traceability of measurement results to the International System of Units (SI).
CALIBRATION RESULTS	The results have been presented on page 2/4 of this certificate including uncertainty of measurement. The results apply only to the calibration object.
UNCERTAINTY OF MEASUREMENT	Uncertainty of measurement has been evaluated in compliance EA-4/02 M:2022. The expanded uncertainty assigned corresponds to a coverage probability of 95% and the coverage factor k=2.

Baltic Fire Laboratory
BFL S/N: BFL117
Calib.Date: 05–06.06.2025
Next Calib.: 05.06.2027

Laboratorium Wzorcujące • Akredytowane AP 158

Head of the Calibration Laboratory

M.Sc.Eng. Paweł Janik

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CALIBRATION CERTIFICATE issued by ACCREDITED LABORATORY No AP 158

Date of issue: 12th June 2025 **Certificate No: 182/6/25** **Page 2/4**

CALIBRATION RESULTS Calibration results are the following:

Set value of the test object		Average measured reference value		Average temperature indication of the test object		Measurment error		Measurement uncertainty [1]	
t	RH	t_W	RH_W	t_X	RH_X	Δt	ΔRH	U	
°C	%	°C	%	°C	%	°C	%	°C	%
Measuring location L1, Point P2									
-18,0	-	-18,6	-	-18,6	-	0,0	-	2,2	-
19,0	90,0	19,2	92,5	19,0	92,6	-0,2	0,1	0,2	3,5
21,0	90,0	21,2	90,5	21,0	91,6	-0,2	1,1	0,3	6,4
25,0	80,0	25,1	81,3	25,0	82,0	-0,1	0,7	0,6	3,5
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)									

[1]The measurement uncertainty include into account the spatial inhomogeneity of the chamber.

TEMPERATURE DISTRIBUTION IN THE CHAMBER (at temperature setting: -18,0 °C)

Measuring point	Average value reference temperature at the measuring point	Minimum value of the reference temperature at the measuring point	Maximum value of the reference temperature at the measuring point	Measurement uncertainty[3]
	°C	°C	°C	°C
L1P1	-18,83	-20,11	-17,75	2,19
L1P2	-18,55	-19,65	-17,62	2,06
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)				

[3]The measurement uncertainty does not include into account the spatial inhomogeneity of the chamber.

TEMPERATURE AND RELATIVE HUMIDITY DISTRIBUTION IN THE CHAMBER (at humidity setting: 90,0 % at 19,0 °C)

Measuring point	Average value of reference humidity and temperature at the measuring point		Minimum value of reference humidity and temperature at the measuring point		Maximum value of reference humidity and temperature at the measuring point		Measurement uncertainty[2]	
	°C	% RH	°C	% RH	°C	% RH	°C	% RH
L1P1	19,21	93,85	19,12	93,20	19,28	94,70	0,20	2,36
L1P2	19,20	92,51	19,12	91,76	19,28	93,36	0,20	3,11
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)								

[2]The measurement uncertainty does not include into account the spatial inhomogeneity of the chamber.

Authorized by:
M.Sc.Eng. Marta Piotrowska

Additional information:
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Date of issue: 12th June 2025 **Certificate No: 182/6/25** **Page 3/4**

TEMPERATURE AND RELATIVE HUMIDITY DISTRIBUTION IN THE CHAMBER (at humidity setting: 90,0 % at 21,0 °C)

Measuring point	Average value of reference humidity and temperature at the measuring point		Minimum value of reference humidity and temperature at the measuring point		Maximum value of reference humidity and temperature at the measuring point		Measurement uncertainty[2)]	
	°C	% RH	°C	% RH	°C	% RH	°C	% RH
L1P1	21,24	91,90	21,16	87,87	21,42	93,27	0,25	5,94
L1P2	21,23	90,52	21,15	86,54	21,39	91,94	0,23	6,23
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)								

[2)]The measurement uncertainty does not include into account the spatial inhomogeneity of the chamber.

TEMPERATURE AND RELATIVE HUMIDITY DISTRIBUTION IN THE CHAMBER (at humidity setting: 80,0 % at 25,0 °C)

Measuring point	Average value of reference humidity and temperature at the measuring point		Minimum value of reference humidity and temperature at the measuring point		Maximum value of reference humidity and temperature at the measuring point		Measurement uncertainty[2)]	
	°C	% RH	°C	% RH	°C	% RH	°C	% RH
L1P1	25,06	82,76	24,94	82,32	25,50	83,72	0,60	2,31
L1P2	25,06	81,31	24,93	80,80	25,50	82,20	0,60	3,05
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)								

[2)]The measurement uncertainty does not include into account the spatial inhomogeneity of the chamber.

PARAMETERS CHARACTERIZING THE CHAMBER (at temperature setting : -18,0 °C)

Reference value	Inhomogenity	Time stability[3)]	Radiation effect
°C	°C	°C	°C
Measuring location L2, Point P1			
-18,55	0,28	1,10	-
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)			

[3)]Determined within 60 minutes

PARAMETERS CHARACTERIZING THE CHAMBER (at humidity setting: 90,0 % at 19,0 °C)

Reference value		Inhomogenity		Time stability[3)]		Radiation effect
°C	% RH	°C	% RH	°C	% RH	°C
Measuring location L2, Point P1						
19,20	92,51	0,01	1,34	0,08	0,85	0,02
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)						

[3)]Determined within 60 minutes

PARAMETERS CHARACTERIZING THE CHAMBER (at humidity setting: 90,0 % at 21,0 °C)

Reference value		Inhomogenity		Time stability[3)]		Radiation effect
°C	% RH	°C	% RH	°C	% RH	°C
Measuring location L2, Point P1						
21,23	90,52	0,01	1,38	0,16	3,98	0,02
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)						

[3)]Determined within 60 minutes

Authorized by:
M.Sc.Eng. Marta Piotrowska

Additional information:
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CALIBRATION CERTIFICATE issued by ACCREDITED LABORATORY No AP 158

Date of issue: 12th June 2025 **Certificate No: 182/6/25** **Page 4/4**

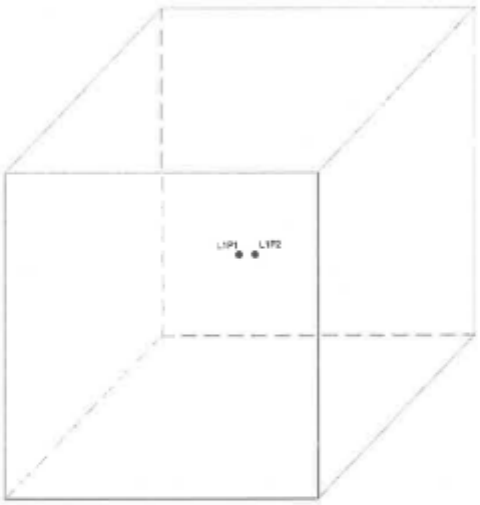
PARAMETERS CHARACTERIZING THE CHAMBER (at humidity setting: 80,0 % at 25,0 °C)

Reference value		Inhomogenity		Time stability[3)]		Radiation effect
°C	% RH	°C	% RH	°C	% RH	°C
Measuring location L2, Point P1						
25,06	81,31	0,00	1,45	0,44	0,89	0,02
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)						

[3)]Determined within 60 minutes

REVIEW DRAWING

Distribution of measurement points during calibration in the temperature setting: -18,0 °C and in the relative humidity setting: 90,0 %, at temperature 19,0 °C; 90,0 % at temperature 21,0 °C; 80,0 % at 25,0 °C; The drawing does not reflect the actual proportions.



Measuring point	Description of measurement points	Sensor No.
L1P1	The sensor is placed 1100 mm from the left and 2700 mm from the back wall, at a height of 1140 mm.	B/252/W/S/PW/P B/21/W/S/PW/P
L1P2	**The sensor is placed 1140 mm from the left and 2700 mm from the back wall, at a height of 1140 mm - the reference sensor.**	B/253/W/S/PW/P B/16/W/S/PW/P

Authorized by:
M.Sc.Eng. Marta Piotrowska

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TENSLAB
Laboratorium Wzorcujące

TENSLAB Spółka z ograniczoną odpowiedzialnością
LABORATORIUM WZORCUJĄCE

Siedziba:	Laboratorium:	Kontakt:
80-554 GDAŃSK	81-336 GDYNIA	www.tenslab.pl
ul. Śnieżna 5	ul. Kadłubowców 4	tel: +48 58 380 06 44

PCA
Polskie Centrum Akredytacji
>O<
WZORCOWANIE
AP 180

Calibration laboratory accredited by Polish Centre for Accreditation, a signatory to EA MLA and ILAC MRA that include recognition of calibration certificates. Accreditation No AP 180.

ilac-MRA

Baltic Fire Laboratory
BFL S/N: BFL120
Calib.Date: 13.06.2025
Next Calib.: 13.06.2027

CALIBRATION CERTIFICATE

Date of issue: 13 June 2025 Certificate No: 1061/2025/3 Page 1/ 2

OBJECT OF CALIBRATION	Digital pressure gauge, Type: MD0906, Serial number: 2206201176750, Producer: Gesa, Resolution: 0,01 bar, Measuring range: 0,0÷100,0 bar, Class: 0,1, Identification number: no data.
CUSTOMER	BALTIC FIRE LABORATORY SPÓŁKA Z O. O. ul. Banińska 8 80-209 Tuchom
PLACE OF CALIBRATION	TENSLAB Sp. z o.o. Laboratorium Wzorcujące ul. Kadłubowców 4 81-336 Gdynia
CALIBRATION METHOD	Procedura pomiarowa - Ciśnieniomierze elektroniczne - PP TENSLAB/CE/1/18 date of issue 20.07.2018
ENVIRONMENTAL CONDITIONS	Ambient temperature: (21,8 ÷ 22,4) °C
DATE OF CALIBRATION	13 June 2025
TRACEABILITY	This certificate is issued under the agreement EA MLA in the field of calibration and provides traceability of measurement results to the International System of Units (SI).
CALIBRATION RESULTS	The results have been presented on page(s) 2 of this certificate including uncertainty of measurement. The results relate only to the object of calibration.
UNCERTAINTY OF MEASUREMENT	Uncertainty of measurement has been evaluated in compliance with EA-4/02 M:2022. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor k = 2.

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CALIBRATION CERTIFICATE issued by ACCREDITED LABORATORY No AP 180

Date of issue: 13 June 2025 Certificate No: 1061/2025/3 Page 2/ 2

CALIBRATION RESULTS

Calibration results are the following:

Determination of measurement error:

No	Measured pressure value	Reference pressure value	Measurement error	Hysteresis	Measurement uncertainty
	bar				
1.	0,00	0,00	0,00	0,00	0,04
2.	5,00	5,03	-0,03	0,01	0,04
3.	8,00	8,03	-0,03	0,01	0,04
4.	16,00	16,03	-0,03	0,01	0,04
5.	30,00	30,02	-0,02	0,02	0,04
6.	40,00	40,02	-0,02	0,02	0,04
7.	50,00	50,02	-0,02	0,02	0,04
8.	60,00	60,02	-0,02	0,02	0,04
9.	75,00	75,01	-0,01	0,02	0,04
10.	90,00	90,01	-0,01	0,02	0,04
11.	100,00	100,02	-0,02	0,01	0,04
12.	-	-	-	-	-
13.	-	-	-	-	-
14.	-	-	-	-	-
15.	-	-	-	-	-

Medium: oil

Authorized by:

Technical Manager
Paula Keister-Łyko

END OF CALIBRATION CERTIFICATE

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LABORATORIUM USŁUGOWO-BADAWCZE
„BIOCHEMIK" Sp. z o.o.

Pracownia Wzorcowania
ul. Strefowa 15, 64 – 920 Piła
Mob. +48 727 630 955, e-mail: wzorcowanie@biochemik.pl, www.wzorcowanie.biochemik.pl

Calibration laboratory accredited by
Polish Centre of Accreditation, a signatory to EA MLA and ILAC MRA
that include recognition of calibration certificates.
Accreditation No AP 158

AP 158

CALIBRATION CERTIFICATE

Date of issue: 28th November 2025 **Certificate No: 848/11/25** **Page 1/4**

OBJECT OF CALIBRATION	Thermostatic chamber Manufacturer: WAMED Type: SUP-200G Serial number: - User marking: BFL 140 Resolution: 0,1 °C Workspace dimensions: (width x depth x height): (550 x 400 x 1030) mm
APPLICANT	Baltic Fire Laboratory Sp. z o.o. ul. Banińska 8 80-209 Tuchom, Poland
PLACE OF CALIBRATION	Baltic Fire Laboratory Sp. z o.o. ul. Banińska 8 80-209 Tuchom, Poland
CALIBRATION METHOD	Calibration has been carried out according to the calibration procedure „Climatic and thermostatic chambers", PW-06, 7th edition of 02 January 2022.
ENVIRONMENTAL CONDITIONS	Temperature: (16,8 ÷ 18,3) °C Relative humidity: (41,9 ÷ 44,7) %
DATE OF CALIBRATION	17th November 2025
TRACEABILITY	This certificate is issued under the agreement EA MLA in the field of calibration and provides traceability of measurement results to the International System of Units (SI).
CALIBRATION RESULTS	The results have been presented on page 2/4 of this certificate including uncertainty of measurement. The results apply only to the calibration object.
UNCERTAINTY OF MEASUREMENT	Uncertainty of measurement has been evaluated in compliance EA-4/02 M:2022. The expanded uncertainty assigned corresponds to a coverage probability of 95% and the coverage factor k=2.

Baltic Fire Laboratory
BFL S/N: BFL140
Calib.Date: 17.11.2025
Next Calib.: 17.11.2027

Laboratorium Wzorcujące Akredytowane AP 158

Head of the Calibration Laboratory

M.Sc.Eng. Paweł Janik

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CALIBRATION CERTIFICATE issued by ACCREDITED LABORATORY No AP 158

Date of issue: 28th November 2025 **Certificate No: 848/11/25** **Page 2/4**

CALIBRATION RESULTS Calibration results are the following:

Set value of the test object	Average measured reference value	Average temperature indication of the test object	Measurment error	Measurement uncertainty [1)]
t	t_W	t_X	Δt	U
°C	°C	°C	°C	°C
Measuring location L1, Point P2				
23,0	22,4	23,0	0,6	1,1
49,0	50,7	49,1	-1,6	0,9
104,0	105,6	104,0	-1,6	2,1
150,0	146,6	150,1	3,5	3,2
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)				

[1)]The measurement uncertainty include into account the spatial inhomogeneity of the chamber.

TEMPERATURE DISTRIBUTION IN THE CHAMBER (at temperature setting: 23,0 °C)

Measuring point	Average value reference temperature at the measuring point	Minimum value of the reference temperature at the measuring point	Maximum value of the reference temperature at the measuring point	Measurement uncertainty[3)]
	°C	°C	°C	°C
L1P1	22,35	21,85	22,98	1,01
L1P2	22,39	21,88	23,02	1,01
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)				

[2)]The measurement uncertainty does not include into account the spatial inhomogeneity of the chamber.

TEMPERATURE DISTRIBUTION IN THE CHAMBER (at temperature setting: 49,0 °C)

Measuring point	Average value reference temperature at the measuring point	Minimum value of the reference temperature at the measuring point	Maximum value of the reference temperature at the measuring point	Measurement uncertainty[3)]
	°C	°C	°C	°C
L1P1	50,66	50,20	50,93	0,80
L1P2	50,73	50,20	51,02	0,86
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)				

[2)]The measurement uncertainty does not include into account the spatial inhomogeneity of the chamber.

TEMPERATURE DISTRIBUTION IN THE CHAMBER (at temperature setting: 104,0 °C)

Measuring point	Average value reference temperature at the measuring point	Minimum value of the reference temperature at the measuring point	Maximum value of the reference temperature at the measuring point	Measurement uncertainty[3)]
	°C	°C	°C	°C
L1P1	105,23	104,44	106,42	2,01
L1P2	105,64	104,82	106,87	2,04
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)				

[2)]The measurement uncertainty does not include into account the spatial inhomogeneity of the chamber.

Authorized by:
M.Sc.Eng. Marta Piotrowska

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Date of issue: 28th November 2025 **Certificate No: 848/11/25** **Page 3/4**

TEMPERATURE DISTRIBUTION IN THE CHAMBER (at temperature setting: 150,0 °C)

Measuring point	Average value reference temperature at the measuring point	Minimum value of the reference temperature at the measuring point	Maximum value of the reference temperature at the measuring point	Measurement uncertainty[3)]
	°C	°C	°C	°C
L1P1	146,49	145,34	148,75	3,19
L1P2	146,58	145,52	148,82	3,17
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)				

[2)]The measurement uncertainty does not include into account the spatial inhomogeneity of the chamber.

PARAMETERS CHARACTERIZING THE CHAMBER (at temperature setting: 23,0 °C)

Reference value	Inhomogenity	Time stability[3)]	Radiation effect
°C	°C	°C	°C
Measuring location L1, Point P2			
22,39	0,04	0,63	0,00
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)			

[3)]Determined within 60 minutes

PARAMETERS CHARACTERIZING THE CHAMBER (at temperature setting: 49,0 °C)

Reference value	Inhomogenity	Time stability[3)]	Radiation effect
°C	°C	°C	°C
Measuring location L1, Point P2			
50,73	0,07	0,53	0,00
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)			

[3)]Determined within 60 minutes

PARAMETERS CHARACTERIZING THE CHAMBER (at temperature setting: 104,0 °C)

Reference value	Inhomogenity	Time stability[3)]	Radiation effect
°C	°C	°C	°C
Measuring location L1, Point P2			
105,64	0,41	1,23	0,00
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)			

[3)]Determined within 60 minutes

PARAMETERS CHARACTERIZING THE CHAMBER (at temperature setting: 150,0 °C)

Reference value	Inhomogenity	Time stability[3)]	Radiation effect
°C	°C	°C	°C
Measuring location L1, Point P2			
146,58	0,09	2,24	0,00
Calibration results refer to the International Temperature Scale of 1990 (ITS – 90)			

[3)]Determined within 60 minutes

Authorized by:
M.Sc.Eng. Marta Piotrowska

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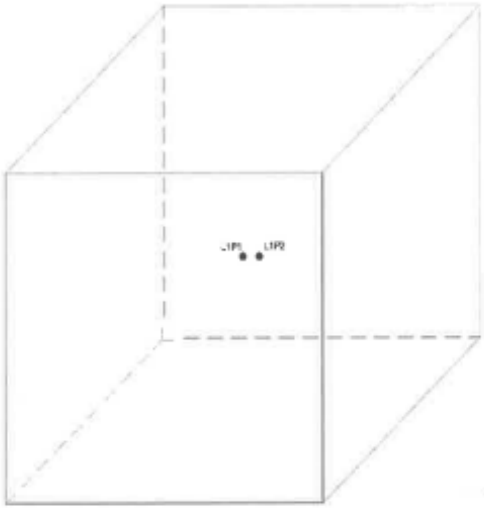
Date of issue: 28th November 2025 **Certificate No: 848/11/25** **Page 4/4**

REVIEW DRAWING

Distribution of measurement points during calibration in the temperature setting: 23,0 °C, 49,0 °C, 104,0 °C, 150,0 °C. The drawing does not reflect the actual proportions.



Measuring point	Description of measurement points	Sensor No.
L1P1	The sensor is placed 225 mm from the left and 200 mm from the back wall, at a height of 530 mm.	B/137/W/S/PW/P
L1P2	**The sensor is placed 275 mm from the right and 200 mm from the back wall, at a height of 530 mm - the reference sensor.**	B/139/W/S/PW/P

Authorized by:
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RADWAG Wagi Elektroniczne Witold Lewandowski
26-600 Radom, Toruńska 5
METROLOGY, RESEARCH AND CERTIFICATION CENTRE - MEASURING LABORATORY
26-600 Radom, Starowiejska 17A
tel. /48/ 386 64 70; fax.: /48/ 385 00 11

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Accreditation No AP 069.

CALIBRATION CERTIFICATE

Dispatch date: 11 October 2025 | Certificate No: 13817/4771/25/E | Page: 1 / 2

OBJECT OF CALIBRATION	Non-automatic electronic weighing instrument - single range Manufacturer: RADWAG Wagi Elektroniczne Type / symbol: WLC 30/F1/R Serial No: 856846 Capacity *Max*: 30 kg Scale interval *d*: 0,5 g
	Baltic Fire Laboratory BFL S/N: BFL141 Calib.Date: 11.10.2025 Next Calib.: 11.10.2027
APPLICANT	RADWAG Wagi Elektroniczne ul. Toruńska 5, 26-600 Radom
USER	Baltic Fire Laboratory Sp. z o.o. ul. Banińska 8, 80-209 Tuchom
PLACE OF CALIBRATION	RADWAG Wagi Elektroniczne Centrum Metrologii, Badań i Certyfikacji - Laboratorium Pomiarowe ul. Starowiejska 17 A, 26-600 Radom
CALIBRATION METHOD	Calibration Procedure PW 01 rev. XV of 2 January 2025 based on EURAMET cg-18 v. 4.0 (11/2015).
ENVIRONMENTAL CONDITIONS	Air temperature: (23,58 ÷ 23,62) ± 0,20 °C Relative air humidity: (49,0 ÷ 49,3) ± 1,1 %
DATE OF CALIBRATION	11 October 2025
TRACEABILITY	This certificate is issued under the agreement EA MLA in the field of calibration and provides treaceability of measurement results to the International System of Units (SI).
CALIBRATION RESULTS	The results have been presented on page 2 of this certificate including uncertainty of measurement.
UNCERTAINTY OF MEASUREMENT	Uncertainty of measurement has been evaluated in compliance with EA-4/02 M:2022. The expanded uncertainty assigned corresponds to a coverage probability of 95% and the coverage factor $k = 2$.

Akredytowane Laboratorium Wzorcujące AP 069

KIEROWNIK
Laboratorium Pomiarowego
Tomasz Jędrzejewski

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CALIBRATION CERTIFICATE issued by ACCREDITED LABORATORY No AP 069

Dispatch date: 11 October 2025 | Certificate No: 13817/4771/25/E | Page: 2 / 2

CALIBRATION RESULTS Calibration results presented below refer only to the calibration object described on the first page of the certificate.

Adjustment device: external
Adjustment weight: external

MEASUREMENT ERROR

Load L g	Load TARE L_T g	Mass reference m_{ref} g	Indication of instrument I g	Measurement error $E(I)$ g	Uncertainty of measurement $U(E)$ g
50		50,00007	50,0	0,0	0,7
7000		7000,00463	7000,5	0,5	0,9
15000		15000,0042	15000,5	0,5	1,5
22000		22000,00823	22000,0	0,0	2,0
30000		30000,0078	30000,0	0,0	2,7

REPEATABILITY

Load L g	Standard deviation s g
30000	0,27
Standard deviation calculated for 5 series of measurement.	

ECCENTRICITY

Position of load	Load L_{ecc} g	Area no	Indication of instrument I_{ecc} g	Indication difference ΔI_{ecc} g
	10000	1	10000,5	$\lvert\Delta I_{ecc}\rvert_{max}$ 1,5
		2	10001,0	0,5
		3	9999,5	-1,0
		4	9999,0	-1,5
		5	10001,0	0,5

Authorized by: Tomasz Jędrzejewski

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Baltic Fire Laboratory
BFL S/N: BFL1002
Calib.Date: 31.10.2024
Next Calib.: 31.10.2026

Institute of Power Engineering

Institute of Power Engineering – National Research Institute
MEASURING APPARATUS LABORATORY
02-981 Warszawa, ul. Augustówka 36
tel. (22) 34 51 438
lap@ien.com.pl www.ien.com.pl

PCA Polskie Centrum Akredytacji
AP 013

Calibration laboratory accredited by
Polish Centre for Accreditation, a signatory to EA MLA and ILAC MRA
that include recognition of calibration certificates.
Accreditation No AP 013

CALIBRATION CERTIFICATE

Date of issue: 31 October 2024 Certificate No: 4100/2024/E Page 1/3

OBJECT OF CALIBRATION	Temperature indicator model NI 9213, manufacturer NATIONAL INSTRUMENTS, serial number 187F11C, 16-channel with a temperature measuring chain cooperating with K-type thermocouples.
APPLICANT	Baltic Fire Laboratory Sp. z o.o. 80 – 209 Tuchom, ul. Banińska 8 Order No: MAP.4032.1332.2024
PLACE OF CALIBRATION	Baltic Fire Laboratory Sp. z o.o. 80 – 209 Tuchom, ul. Banińska 8
CALIBRATION METHOD	Calibration was performed according to the Measurement Procedure P4/MAP „Calibration apparatus for measuring temperature, pressure, electrical quantities and humidity on objects", edition XII released on 30 May 2023.
ENVIRONMENTAL CONDITIONS	Ambient temperature (19,6 ÷ 20,2) °C Relative humidity (65,3 ÷ 72,2) %
DATE OF CALIBRATION	22 October 2024
TRACEABILITY	This certificate is issued under the agreement EA MLA in the field of calibration and provides traceability of measurement results to the International System of Units (SI).
CALIBRATION RESULTS	The results have been presented on page 2/3 ÷ 3/3 of this certificate including uncertainty of measurement. The result apply to the object of calibration only.
UNCERTAINTY OF MEASUREMENT	Uncertainty of measurement has been evaluated in compliance with EA-4/02 M:2022. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor $k = 2$.

Laboratorium Wzorcujące Akredytowane AP 013

KIEROWNIK
Laboratorium Aparatury Pomiarowej
mgr inż. Roman Witkowski

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CALIBRATION CERTIFICATE issued by ACCREDITED LABORATORY No AP 013.

Date of issue: 31 October 2024 | Certificate No: 4100/2024/E | Page 2/3

CALIBRATION RESULTS

The results of the calibration for compliance with the thermometric characteristics according to PN – EN 60584 – 1:2014 – 04 are as follows:

REFERENCE TEMPERATURE *Wp*	MEASURED TEMPERATURE *Ww*										MEASUREMENT ERROR *Ww-Wp*										MEASUREMENT UNCERTAINTY *U*
°C	°C										°C										°C
Mark on the card →	**TC0**	**TC1**	**TC2**	**TC3**	**TC4**	**TC5**	**TC6**	**TC7**	**TC8**	**TC9**	**TC0**	**TC1**	**TC2**	**TC3**	**TC4**	**TC5**	**TC6**	**TC7**	**TC8**	**TC9**	
Reading in the program → DAQ Express 4.1.0 Nr 7.1.0.50148	CDAQ1Mod8/ai0	CDAQ1Mod8/ai1	CDAQ1Mod8/ai2	CDAQ1Mod8/ai3	CDAQ1Mod8/ai4	CDAQ1Mod8/ai5	CDAQ1Mod8/ai6	CDAQ1Mod8/ai7	CDAQ1Mod8/ai8	CDAQ1Mod8/ai9	CDAQ1Mod8/ai0	CDAQ1Mod8/ai1	CDAQ1Mod8/ai2	CDAQ1Mod8/ai3	CDAQ1Mod8/ai4	CDAQ1Mod8/ai5	CDAQ1Mod8/ai6	CDAQ1Mod8/ai7	CDAQ1Mod8/ai8	CDAQ1Mod8/ai9	
10,0	10,1	10,1	9,9	9,9	9,9	9,9	9,8	9,8	9,8	9,8	0,1	0,1	-0,1	-0,1	-0,1	-0,1	-0,2	-0,2	-0,2	-0,2	0,2
58,0	58,2	58,2	58,0	58,1	58,0	58,0	57,9	57,9	57,9	57,9	0,2	0,2	0,0	0,1	0,0	0,0	-0,1	-0,1	-0,1	-0,1	0,2
250,0	250,2	250,1	250,0	250,0	249,9	250,0	249,9	249,9	249,9	249,9	0,2	0,1	0,0	0,0	-0,1	0,0	-0,1	-0,1	-0,1	-0,1	0,2
500,0	500,1	500,1	500,0	500,0	499,9	500,0	499,9	499,9	499,9	499,8	0,1	0,1	0,0	0,0	-0,1	0,0	-0,1	-0,1	-0,1	-0,2	0,2
950,0	950,1	950,1	950,0	950,0	949,9	950,0	949,8	949,8	949,8	949,8	0,1	0,1	0,0	0,0	-0,1	0,0	-0,2	-0,2	-0,2	-0,2	0,2
1200,0	1200,2	1200,1	1200,0	1200,0	1199,9	1200,0	1199,8	1199,9	1199,8	1199,8	0,2	0,1	0,0	0,0	-0,1	0,0	-0,2	-0,1	-0,2	-0,2	0,2

Temperatures given are referred to the International Temperature Scale of 1990 (ITS-90).

Authorized by: KIEROWNIK Laboratorium Aparatury Pomiarowej mgr inż. Roman Witkowski

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CALIBRATION CERTIFICATE issued by ACCREDITED LABORATORY No AP 013.

Date of issue: 31 October 2024 | Certificate No: 4100/2024/E | Page 3/3

CALIBRATION RESULTS

The results of the calibration for compliance with the thermometric characteristics according to PN – EN 60584 – 1:2014 – 04 are as follows:

REFERENCE TEMPERATURE *Wp*	MEASURED TEMPERATURE *Ww*						MEASUREMENT ERROR *Ww-Wp*						MEASUREMENT UNCERTAINTY *U*
°C	°C						°C						°C
Mark on the card →	**TC10**	**TC11**	**TC12**	**TC13**	**TC14**	**TC15**	**TC10**	**TC11**	**TC12**	**TC13**	**TC14**	**TC15**	
Reading in the program → DAQ Express 4.1.0 Nr 7.1.0.50148	CDAQ1Mod8/ai10	CDAQ1Mod8/ai11	CDAQ1Mod8/ai12	CDAQ1Mod8/ai13	CDAQ1Mod8/ai14	CDAQ1Mod8/ai15	CDAQ1Mod8/ai10	CDAQ1Mod8/ai11	CDAQ1Mod8/ai12	CDAQ1Mod8/ai13	CDAQ1Mod8/ai14	CDAQ1Mod8/ai15	
10,0	9,8	9,7	9,7	9,7	9,7	9,8	-0,2	-0,3	-0,3	-0,3	-0,3	-0,2	0,2
58,0	57,8	57,8	57,8	57,8	57,8	57,9	-0,2	-0,2	-0,2	-0,2	-0,2	-0,1	0,2
250,0	249,8	249,8	249,8	249,8	249,8	249,9	-0,2	-0,2	-0,2	-0,2	-0,2	-0,1	0,2
500,0	499,8	499,8	499,8	499,8	499,8	499,9	-0,2	-0,2	-0,2	-0,2	-0,2	-0,1	0,2
950,0	949,8	949,7	949,7	949,7	949,7	949,8	-0,2	-0,3	-0,3	-0,3	-0,3	-0,2	0,2
1200,0	1199,7	1199,7	1199,7	1199,7	1199,7	1199,9	-0,3	-0,3	-0,3	-0,3	-0,3	-0,1	0,2

Temperatures given are referred to the International Temperature Scale of 1990 (ITS-90).

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mgr inż. Roman Wilkowski

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AP 201

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ul. Wrocławska 27C 55-095 Długołęka
Laboratorium wzorcujące akredytowane
przez Polskie Centrum Akredytacji,
sygnatariusza porozumień EA MLA i ILAC MRA
dotyczących wzajemnego uznawania świadectw
Nr akredytacji AP 201
Calibration laboratory accredited by Polish Centre for Accreditation, a signatory to EA MLA and ILAC MRA that include recognition of calibration certificates. Accreditation No. AP 201

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Technologie pomiaru temperatury
Niezawodne · Dokładne · Certyfikowane

ŚWIADECTWO WZORCOWANIA NR: PA2506021

CALIBRATION CERTIFICATE NO.

Data wydania: 24.06.2025
Release date

ZGŁASZAJĄCY *Applicant*	**BALTIC FIRE LABORATORY Sp. z o. o.** **ul. Banińska 8** **80-209 Tuchom**
MIEJSCE WZORCOWANIA *Place of calibration*	**Guenther Polska Sp. z o.o.** **ul. Wrocławska 27c** **55-095 Długołęka**
NR ZAMÓWIENIA ZEW. *External order No.*	**zam. z dnia 04.06.2025**
NR ZAMÓWIENIA WEW. *Internal order No.*	**ZS 053/06/2025**

OBIEKT WZORCOWANIA *Calibration object*

Nazwa: *Name*	**Czujnik termoelektryczny** *Thermocouple* **Non-expendable** **Ø : 1,5 mm**	Typ: *Type*	**1x NiCr-NiAl/K**
Kod artykułu: *Article code*	**20053110**	Producent/Model: *Manufacture/Model*	**Guenther**

DATA WZORCOWANIA *Calibration date*	20-23.06.2025
RODZAJ WZORCOWANIA *Calibration type*	Rekalibracja / Recalibration

METODA WZORCOWANIA *Calibration method*

Wzorcowanie zostało przeprowadzone zgodnie z procedurą QMV9.01.01 Wzorcowanie termoelementu metodą porównawczą wer. 3.0 z dnia 12.10.2021 (opracowanej na podstawie ASTM E220-19).
The calibration has been performed in accordance with procedure QMV9.01.01 Calibration of the thermocouple by the comparison method ver.3.0 of 12.10.2021 (based on the ASTM E220-19).

SPÓJNOŚĆ POMIAROWA *Measurement traceability*

Świadectwo potwierdza spójność wyników pomiarów z jednostkami miar Międzynarodowego Układu Jednostek Miar (SI).
The certificate provides traceability of measurement results to the International System of Units (SI).

NIEPEWNOŚĆ POMIARU *Measurement uncertainty*

Niepewność pomiaru została określona zgodnie z dokumentem EA-4/02 M:2022.
Podane wartości niepewności stanowią niepewności rozszerzone przy prawdopodobieństwie rozszerzenia ok. 95% i współczynniku rozszerzenia $k = 2$.
The measurement uncertainty has been determined in accordance with EA-4/02 M: 2022.
The reported uncertainties of measurement are stated as the expanded uncertainties corresponded to a coverage probability of approximately 95% and a coverage factor $k = 2$.

UWAGI *Comments*

Podane wyniki wzorcowania dotyczą wyłącznie wzorcowanego obiektu.
Calibration results apply only calibrated object.
W razie wątpliwości ważny jest oryginalny polski tekst.
If there are any doubts, the Polish version shall prevail.
Niniejsze świadectwo może być okazywane lub kopiowane tylko w całości.
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GUENTHER Polska Sp. z o.o.
ul. Wrocławska 27 C, 55-095 Długołęka, Polska
Tel. +48 (0) 71 / 352 70 70
Faks +48 (0) 71 / 352 70 71
biuro@guenther.com.pl · www.guenther.com.pl
NIP 895-19-06-389
REGON 020702531
KRS 0000300821
BNP PARIBAS BANK POLSKA S.A.
PLN 95 1750 1064 0000 0000 2055 6722
EUR 61 1750 1064 0000 0000 2055 6757 Kod SWIFT/BIC: PPABPLPKXXX

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ŚWIADECTWO WZORCOWANIA NR: PA2506021
CALIBRATION CERTIFICATE NO.
Wydane przez LABORATORIUM AKREDYTOWANE Nr AP 201
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UŻYTE WZORCE I URZĄDZENIA POMIAROWE
Reference probes and measuring devices

WZORZEC
Reference probes

T≤ 250 °C	Pt100 / 4	SW 44/35/INTiBS-LWT/2025	L-R-0025	07-04-2026
T> 250 °C	Pt100 / 4	4166/2024	L-R-0021	28-10-2025
T> 500 °C	PtRh10-Pt/S	PA2411069/1	L-T-0040	19-11-2025

URZĄDZENIE POMIAROWE
Measuring instrument

T≤ 58 °C	Keysight	2672/2024	L-M-0007	14-07-2025
T> 58 °C	Keysight	76/2025	L-M-0008	16-01-2026
T> 250 °C	Keysight	2672/2024	L-M-0007	14-07-2025
T> 500 °C	Keysight	4990/2024	L-M-0009	22-12-2025

ELEMENT GRZEJNY
Temperature source

T≤ 58 °C	Fluke	głębokość zanurzenia = 150 mm	L-H-0002
T> 58 °C	Fluke	głębokość zanurzenia = 150 mm	L-H-0003
T> 500 °C	Additel	głębokość zanurzenia = 150 mm	L-H-0011

Immersion depth

SPOINA ODNIESIENIA 0 °C
Cold junction

T≤ 58 °C	WIKA	głębokość zanurzenia = 150 mm	L-Z-0002
T> 58 °C	WIKA	głębokość zanurzenia = 150 mm	L-Z-0004
T> 250 °C	WIKA	głębokość zanurzenia = 150 mm	L-Z-0002

Immersion depth

WARUNKI ŚRODOWISKOWE
Environmental conditions

Temperatura otoczenia (21,9 ÷ 24,7) °C
Ambient temperature
Wilgotność względna (29,9 ÷ 44,3) %
Humidity

Data wzorcowania: 20-23.06.2025
Calibration date

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Page

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ŚWIADECTWO WZORCOWANIA NR: PA2506021
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WYNIKI WZORCOWANIA
Results of calibration

CZUJNIK TYPU *Sensor type*	TEMPERATURA *Temperature* NOMINALNA *Nominal* [°C]	TEMPERATURA *Temperature* ODNIESIENIA *Reference* [°C]	TEMPERATURA *Temperature* OBLICZONA *Calculated* [°C]	ZMIERZONE NAPIĘCIE TERMOELEKTRYCZNE *Thermovoltage* [mV]	BŁĄD POMIARU *Measurement error* [°C]	NAJWIĘKSZY BŁĄD DOPUSZCZALNY *Maximum permissible error* +/- [°C]	NIEPEWNOŚĆ POMIARU *Measurement uncertainty* +/- [°C]	UWAGI *Comments*
K	10,0	10,0	9,9	0,394	-0,1	1,5	0,7	1851220/1 PA2506021/1
	58,0	57,9	57,5	2,333	-0,4	1,5	0,7	
	250,0	250,1	249,1	10,118	-1,0	1,5	0,7	
	500,0	498,2	497,2	20,524	-1,0	2,0	0,7	
	950,0	950,5	948,3	39,247	-2,2	3,8	1,8	
K	10,0	10,0	9,8	0,391	-0,2	1,5	0,7	1851220/5 PA2506021/2
	58,0	57,9	57,6	2,338	-0,3	1,5	0,7	
	250,0	250,0	250,0	10,153	0,0	1,5	0,7	
	500,0	498,2	497,8	20,551	-0,4	2,0	0,7	
	950,0	950,0	949,5	39,295	-0,5	3,8	1,8	
K	10,0	10,0	9,8	0,391	-0,2	1,5	0,7	1851220/10 PA2506021/3
	58,0	57,9	57,6	2,337	-0,3	1,5	0,7	
	250,0	250,0	249,7	10,140	-0,3	1,5	0,7	
	500,0	498,2	497,4	20,532	-0,8	2,0	0,7	
	950,0	950,0	947,5	39,214	-2,5	3,8	1,8	
K	10,0	10,0	9,8	0,393	-0,2	1,5	0,7	1851220/15 PA2506021/4
	58,0	57,9	57,6	2,337	-0,3	1,5	0,7	
	250,0	250,0	250,4	10,171	0,4	1,5	0,7	
	500,0	499,5	499,7	20,632	0,2	2,0	0,7	
	950,0	950,0	950,3	39,325	0,3	3,8	1,8	
K	10,0	10,0	9,9	0,394	-0,1	1,5	0,7	1851220/22 PA2506021/5
	58,0	57,9	57,4	2,330	-0,5	1,5	0,7	
	250,0	250,0	249,2	10,121	-0,8	1,5	0,7	
	500,0	498,2	497,0	20,515	-1,2	2,0	0,7	
	950,0	950,7	949,4	39,291	-1,3	3,8	1,8	
K	10,0	10,0	9,9	0,393	-0,1	1,5	0,7	1851220/31 PA2506021/6
	58,0	57,9	57,5	2,333	-0,4	1,5	0,7	
	250,0	250,0	249,6	10,138	-0,4	1,5	0,7	
	500,0	498,2	497,5	20,536	-0,7	2,0	0,7	
	950,0	950,0	949,4	39,289	-0,6	3,8	1,8	
K	10,0	10,0	9,9	0,395	-0,1	1,5	0,7	1851220/33 PA2506021/7
	58,0	57,9	57,6	2,337	-0,3	1,5	0,7	
	250,0	250,0	249,2	10,123	-0,8	1,5	0,7	
	500,0	499,5	499,1	20,605	-0,4	2,0	0,7	
	950,0	950,0	950,1	39,317	0,1	3,8	1,8	

Data wzorcowania: 20-23.06.2025
Calibration date

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ul. Wrocławska 27 C
55-095 Długołęka
Polska
Tel. +48 (0)71 / 352 70 70
Faks +48 (0)71 / 352 70 71
biuro@guenther.com.pl · www.guenther.com.pl
NIP 895-19-06-589
REGON 020702531
KRS 0000300621
BNP PARIBAS BANK POLSKA S.A.
PLN 36 1750 1064 0000 0000 2055 6722
EUR 61 1750 1064 0000 0000 2065 6757 Kod SWIFT/BIC: PPABPLPKXXX

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CALIBRATION CERTIFICATE NO.
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CZUJNIK TYPU *Sensor type*	NOMINALNA *Nominal*	TEMPERATURA *Temperature* ODNIESIENIA *Reference*	OBLICZONA *Calculated*	ZMIERZONE NAPIĘCIE TERMOELEKTRYCZNE *Thermovoltage*	BŁĄD POMIARU *Measurement error*	NAJWIĘKSZY BŁĄD DOPUSZCZALNY *Maximum permissible error*	NIEPEWNOŚĆ POMIARU *Measurement uncertainty*	UWAGI *Comments*
	[°C]			[mV]	[°C]	+/- [°C]	+/- [°C]	
K	10,0	10,0	9,9	0,394	-0,1	1,5	0,7	185122/38 PA2506021/8
	58,0	57,9	57,4	2,329	-0,5	1,5	0,7	
	250,0	250,1	248,8	10,106	-1,3	1,5	0,7	
	500,0	498,2	496,8	20,507	-1,4	2,0	0,7	
	950,0	950,5	948,3	39,245	-2,2	3,8	1,8	
K	10,0	10,0	9,8	0,391	-0,2	1,5	0,7	185122/39 PA2506021/9
	58,0	57,9	57,6	2,338	-0,3	1,5	0,7	
	250,0	250,0	250,2	10,162	0,2	1,5	0,7	
	500,0	499,5	499,6	20,626	0,1	2,0	0,7	
	950,0	950,0	949,9	39,309	-0,1	3,8	1,8	
K	10,0	10,0	9,9	0,395	-0,1	1,5	0,7	185122/46 PA2506021/10
	58,0	57,9	57,6	2,334	-0,3	1,5	0,7	
	250,0	250,1	249,2	10,121	-0,9	1,5	0,7	
	500,0	498,2	496,8	20,507	-1,4	2,0	0,7	
	950,0	950,5	948,7	39,264	-1,8	3,8	1,8	

UWAGI
Comments

- Temperatura nominalna: punkt nastawy wynikający z zamówienia.
  Nominal temperature: set point specified in the order.
- Temperatura odniesienia: średnia wartość z pomiarów odczytanych z wzorca.
  Reference temperature: average value of the measurement results read from the reference standard.
- Temperatura obliczona: wartość temperatury obliczona na podstawie normy ASTM E230M-23a z wartości zmierzonej napięcia termoelektrycznego obiektu.
  Calculated temperature: temperature value calculated from the measured thermovoltage of the calibrated object on the basis of the ASTM E230M-23a.
- Błąd pomiaru = Temperatura obliczona - Temperatura odniesienia
  Measurement error = Calculated temperature - Reference temperature
- Największy błąd dopuszczalny: dopuszczalny błąd pomiaru temperatury według klasy 1 wg PN EN 60584-1:2014 pkt 5.1.
  Maximum permissible error: according to the Class 1 acc. to PN EN 60584-1: 2014 point 5.1.
- Stwierdzenie zgodności z daną specyfikacją podjęto na podstawie zasady prostej akceptacji ILAC G8:09/2019 w=0 TUR>3:1.
  Ryzyko specyficzne błędnej akceptacji/ błędnego odrzucenia wynosi 50%.
- *Compliance with the principles of the simple acceptance according to the ILAC G8:09/2019 w=0 TUR >3:1. The specific risk of a false acceptance/false rejection can be up to 50%.*

ZGODNOŚĆ Z WYMAGANIAMI
Conformity with requirements

Na podstawie wszystkich wyników wzorcowania stwierdzono zgodność z wymaganiami PN-EN 60584-1:2014-04 pkt 5.1 dla klasy 1. Conformance with PN-EN 60584-1:2014-04 pt 5.1 class 1 was found on the basis of all calibration results.

Wykonał: A.Grykałowska
Made by
Inżynier Laboratorium
Laboratory Engineer
dr inż. Agnieszka Grykałowska

Autoryzował:
Approved
Kierownik Laboratorium
Head of Laboratory
mgr inż. Elwira Słocka

Podpis:
Signature

KONIEC/ *End*

Data wzorcowania: 20-23.06.2025
Calibration date

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ul. Wrocławska 27C 55-095 Długołęka
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Niezawodne . Dokładne . Certyfikowane

ŚWIADECTWO WZORCOWANIA NR: PA2507022

CALIBRATION CERTIFICATE NO.

Data wydania: 14.07.2025
Release date

ZGŁASZAJĄCY *Applicant*	**BALTIC FIRE LABORATORY Sp. z o. o.** **ul. Banińska 8** **80-209 Tuchom**
MIEJSCE WZORCOWANIA *Place of calibration*	**Guenther Polska Sp. z o.o.** **ul. Wrocławska 27c** **55-095 Długołęka**
NR ZAMÓWIENIA ZEW. *External order No.*	**zam. z dnia 02.07.25**
NR ZAMÓWIENIA WEW. *Internal order No.*	**ZS 023/07/2025**
OBIEKT WZORCOWANIA *Calibration object*	**Nazwa:** *Name* **Czujnik termoelektryczny** *Thermocouple* **Non-expendable** **Ø : 1,5 mm** **Typ:** *Type* **1x NiCr-NiAl/K** **Kod artykułu:** *Article code* **20053110** **Nr fabryczny:** *Serial No* **1851220/13** **1851220/17** **1851220/21** **1851220/24** **1851220/36** **1851220/37** **1851220/42** **Producent/Model:** *Manufacturer/Model* **Guenther**
DATA WZORCOWANIA *Calibration date*	11-14.07.2025
RODZAJ WZORCOWANIA *Calibration type*	Rekalibracja / Recalibration

METODA WZORCOWANIA *Calibration method*	Wzorcowanie zostało przeprowadzone zgodnie z procedurą QMV9.01.01 Wzorcowanie termoelementu metodą porównawczą wer. 3.0 z dnia 12.10.2021 (opracowanej na podstawie ASTM E220-19). *The calibration has been performed in accordance with procedure QMV9.01.01 Calibration of the thermocouple by the comparison method ver.3.0 of 12.10.2021 (based on the ASTM E220-19).*
SPÓJNOŚĆ POMIAROWA *Measurement traceability*	Świadectwo potwierdza spójność wyników pomiarów z jednostkami miar Międzynarodowego Układu Jednostek Miar (SI). *The certificate provides traceability of measurement results to the International System of Units (SI).*
NIEPEWNOŚĆ POMIARU *Measurement uncertainty*	Niepewność pomiaru została określona zgodnie z dokumentem EA-4/02 M:2022. Podane wartości niepewności stanowią niepewności rozszerzone przy prawdopodobieństwie rozszerzenia ok. 95% i współczynniku rozszerzenia $k = 2$. *The measurement uncertainty has been determined in accordance with EA-4/02 M: 2022.* *The reported uncertainties of measurement are stated as the expanded uncertainties corresponded to a coverage probability of approximately 95% and a coverage factor k = 2.*
UWAGI *Comments*	Podane wyniki wzorcowania dotyczą wyłącznie wzorcowanego obiektu. *Calibration results apply only calibrated object.* W razie wątpliwości ważny jest oryginalny polski tekst. *If there are any doubts, the Polish version shall prevail.* Niniejsze świadectwo może być okazywane lub kopiowane tylko w całości. *This certificate may be presented or copied as a whole document only.*

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ŚWIADECTWO WZORCOWANIA NR: PA2507022
CALIBRATION CERTIFICATE NO.
Wydane przez LABORATORIUM AKREDYTOWANE Nr AP 201
Released by Accredited Laboratory No. AP 201

UŻYTE WZORCE I URZĄDZENIA POMIAROWE
Reference probes and measuring devices

WZORZEC
Reference probes

T≤ 58 °C	Pt100 / 4	SW 43/35/INTiBS-LWT/2025	L-R-0024	07-04-2026
T> 58 °C	Pt100 / 4	SW 44/35/INTiBS-LWT/2025	L-R-0025	07-04-2026
T> 250 °C	Pt100 / 4	4166/2024	L-R-0021	28-10-2025
T> 500 °C	PtRh10-Pt/S	1012-KL-35028-24	L-T-0039	30-10-2025

URZĄDZENIE POMIAROWE
Measuring instrument

T≤ 58 °C	Keysight	Z4.Z42.4180.124.2024.3381.1	L-M-0013	20-10-2025
T> 58 °C	Keysight	Z4-Z42.4180.49.2025.1433.1	L-M-0011	27-04-2026
T> 250 °C	Keysight	Z4.Z42.4180.124.2024.3381.1	L-M-0013	20-10-2025
T> 500 °C	Keysight	76/2025	L-M-0008	16-01-2026

ELEMENT GRZEJNY
Temperature source

T≤ 58 °C	Fluke	głębokość zanurzenia = 150 mm	L-H-0002
T> 58 °C	Fluke	głębokość zanurzenia = 200 mm	L-H-0006
T> 500 °C	Additel	głębokość zanurzenia = 150 mm *Immersion depth*	L-H-0011

SPOINA ODNIESIENIA 0 °C
Cold junction

T≤ 500 °C	WIKA	głębokość zanurzenia = 150 mm	L-Z-0003
T> 500 °C	WIKA	głębokość zanurzenia = 150 mm *Immersion depth*	L-Z-0004

WARUNKI ŚRODOWISKOWE
Environmental conditions

Temperatura otoczenia *Ambient temperature*	(21,9 ÷ 25,3) °C
Wilgotność względna *Humidity*	(35,6 ÷ 53,5) %

Data wzorcowania: 11-14.07.2025
Calibration date

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GUENTHER Polska
member of the GÜNTHER Group
Technologie pomiaru temperatury
Niezawodne . Dokładne . Certyfikowane

ŚWIADECTWO WZORCOWANIA NR: PA2507022
CALIBRATION CERTIFICATE NO.
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Released by Accredited Laboratory No. AP 201

WYNIKI WZORCOWANIA
Calibration results

CZUJNIK TYPU *Sensor type*	TEMPERATURA *Temperature* NOMINALNA *Nominal*	ODNIESIENIA *Reference*	OBLICZONA *Calculated*	ZMIERZONE NAPIĘCIE TERMOELEKTRYCZNE *Thermovoltage*	BŁĄD POMIARU *Measurement error*	NAJWIĘKSZY BŁĄD DOPUSZCZALNY *Maximum permissible error*	NIEPEWNOŚĆ POMIARU *Measurement uncertainty*	UWAGI *Comments*
	[°C]			[mV]	[°C]	+/- [°C]	+/- [°C]	
K	10,0	10,1	10,1	0,403	0,0	1,5	0,7	PA2507022/1 **1851220/13**
	58,0	57,3	57,0	2,309	-0,3	1,5	0,7	
	250,0	249,5	249,5	10,132	0,0	1,5	0,7	
	500,0	499,6	499,9	20,642	0,3	2,0	0,7	
	950,0	950,4	947,8	39,228	-2,6	3,8	1,8	
K	10,0	10,0	9,9	0,396	-0,1	1,5	0,7	PA2507022/2 **1851220/17**
	58,0	57,7	57,2	2,320	-0,5	1,5	0,7	
	250,0	249,5	249,5	10,134	0,0	1,5	0,7	
	500,0	499,6	498,1	20,562	-1,5	2,0	0,7	
	950,0	950,7	949,6	39,297	-1,1	3,8	1,8	
K	10,0	10,0	9,9	0,395	-0,1	1,5	0,7	PA2507022/3 **1851220/21**
	58,0	57,7	57,2	2,317	-0,5	1,5	0,7	
	250,0	249,5	249,5	10,135	0,0	1,5	0,7	
	500,0	499,6	498,5	20,580	-1,1	2,0	0,7	
	950,0	950,8	949,8	39,305	-1,0	3,8	1,8	
K	10,0	10,0	9,9	0,394	-0,1	1,5	0,7	PA2507022/4 **1851220/24**
	58,0	57,7	57,4	2,329	-0,3	1,5	0,7	
	250,0	249,5	248,6	10,096	-0,9	1,5	0,7	
	500,0	499,6	500,2	20,655	0,6	2,0	0,7	
	950,0	950,7	950,2	39,322	-0,5	3,8	1,8	
K	10,0	10,0	10,0	0,397	0,0	1,5	0,7	PA2507022/5 **1851220/36**
	58,0	57,7	57,2	2,319	-0,5	1,5	0,7	
	250,0	249,5	248,6	10,099	-0,9	1,5	0,7	
	500,0	499,6	500,0	20,643	0,4	2,0	0,7	
	950,0	950,7	949,9	39,309	-0,8	3,8	1,8	
K	10,0	10,0	9,9	0,395	-0,1	1,5	0,7	PA2507022/6 **1851220/37**
	58,0	57,7	57,1	2,317	-0,6	1,5	0,7	
	250,0	249,5	249,3	10,125	-0,2	1,5	0,7	
	500,0	499,6	499,9	20,639	0,3	2,0	0,7	
	950,0	950,4	949,1	39,278	-1,3	3,8	1,8	
K	10,0	10,0	10,0	0,398	0,0	1,5	0,7	PA2507022/7 **1851220/42**
	58,0	57,7	57,1	2,316	-0,6	1,5	0,7	
	250,0	249,5	249,3	10,125	-0,2	1,5	0,7	
	500,0	499,6	499,5	20,623	-0,1	2,0	0,7	
	950,0	950,7	947,7	39,224	-3,0	3,8	1,8	

Data wzorcowania: 11-14.07.2025
Calibration date

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GUENTHER Polska Sp. z o.o.
ul. Wrocławska 27 C
55-095 Długołęka
Polska
Tel. +48 (0) 71 / 352 70 70
Faks +48 (0) 71 / 352 70 71
biuro@guenther.com.pl · www.guenther.com.pl
NIP 895-19-06-589
REGON 020702631
KRS 0200305821
BNP PARIBAS BANK POLSKA S.A.
PLN 36 1750 1064 0000 0000 2055 6722
EUR 51 1750 1064 0000 0000 2055 6757 Kod SWIFT/BIC: PPABPLPKXXX

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ŚWIADECTWO WZORCOWANIA NR: PA2507022
CALIBRATION CERTIFICATE NO.
Wydane przez LABORATORIUM AKREDYTOWANE Nr AP 201
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UWAGI
Comments

- Temperatura nominalna: punkt nastawy wynikający z zamówienia.
  Nominal temperature: set point specified in the order.
- Temperatura odniesienia: średnia wartość z pomiarów odczytanych z wzorca.
  Reference temperature: average value of the measurement results read from the reference standard.
- Temperatura obliczona: wartość temperatury obliczona na podstawie normy ASTM E230M-23a z wartości zmierzonej napięcia termoelektrycznego obiektu.
  Calculated temperature: temperature value calculated from the measured thermovoltage of the calibrated object on the basis of the ASTM E230M-23a.
- Błąd pomiaru = Temperatura obliczona - Temperatura odniesienia
  Measurement error = Calculated temperature - Reference temperature
- Największy błąd dopuszczalny: dopuszczalny błąd pomiaru temperatury według klasy 1 wg PN EN 60584-1:2014 pkt 5.1.
  Maximum permissible error: according to the Class 1 acc. to PN EN 60584-1: 2014 point 5.1.
- Stwierdzenie zgodności z daną specyfikacją podjęto na podstawie zasady prostej akceptacji ILAC G8:09/2019 w=0 TUR>3:1.
  Ryzyko specyficzne błędnej akceptacji/ błędnego odrzucenia wynosi 50%.
- *Compliance with the principles of the simple acceptance according to the ILAC G8:09/2019 w=0 TUR >3:1. The specific risk of a false acceptance/false rejection can be up to 50%.*

ZGODNOŚĆ Z WYMAGANIAMI
Conformity with requirements

Na podstawie wszystkich wyników wzorcowania stwierdzono zgodność z wymaganiami PN-EN 60584-1:2014-04 pkt 5.1 dla klasy 1. Conformance with PN-EN 60584-1:2014-04 pt 5.1 class 1 was found on the basis of all calibration results.

Wykonał: *Made by*	Inżynier Laboratorium *Laboratory Engineer*	Autoryzował: *Approved*	Z-ca Kierownika Laboratorium *Deputy Head of Laboratory*
Podpis: *Signature*	dr inż. Agnieszka Grykałowska	Podpis: *Signature*	mgr Joanna Zając

KONIEC/ *End*

Data wzorcowania: 11-14.07.2025
Calibration date

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PCA Polskie Centrum Akredytacji WZORCOWANIE
AP 201

ilac-MRA

Guenther Polska Sp. z o.o.
ul. Wrocławska 27C 55-095 Długołęka
Laboratorium wzorcujące akredytowane
przez Polskie Centrum Akredytacji,
sygnatariusza porozumień EA MLA i ILAC MRA
dotyczących wzajemnego uznawania świadectw
Nr akredytacji AP 201
Calibration laboratory accredited by Polish Centre for Accreditation, a signatory to EA MLA and ILAC MRA that include recognition of calibration certificates. Accreditation No. AP 201

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Niezawodne . Dokładne . Certyfikowane

ŚWIADECTWO WZORCOWANIA NR: PA2507023

CALIBRATION CERTIFICATE NO.

Data wydania: 14.07.2025
Release date

ZGŁASZAJĄCY *Applicant*	**BALTIC FIRE LABORATORY Sp. z o. o.** **ul. Banińska 8** **80-209 Tuchom**
MIEJSCE WZORCOWANIA *Place of calibration*	**Guenther Polska Sp. z o.o.** **ul. Wrocławska 27c** **55-095 Długołęka**
NR ZAMÓWIENIA ZEW. *External order No.*	**zam. z dnia 02.07.25**
NR ZAMÓWIENIA WEW. *Internal order No.*	**ZS 023/07/2025**
OBIEKT WZORCOWANIA *Calibration object*	**Nazwa:** *Name* **Czujnik termoelektryczny** *Thermocouple* **Non-expendable** **Ø : 1,5 mm** **Typ:** *Type* **1x NiCr-NiAl/K** **Kod artykułu:** *Article code* **20053099** **Nr fabryczny:** *Serial No.* **1821220/17** **1821220/20** **1821220/37** **Producent/Model:** *Manufacturer/Model* **Guenther**
DATA WZORCOWANIA *Calibration date*	11-14.07.2025
RODZAJ WZORCOWANIA *Calibration type*	Rekalibracja / Recalibration

METODA WZORCOWANIA *Calibration method*	Wzorcowanie zostało przeprowadzone zgodnie z procedurą QMV9.01.01 Wzorcowanie termoelementu metodą porównawczą wer. 3.0 z dnia 12.10.2021 (opracowanej na podstawie ASTM E220-19). *The calibration has been performed in accordance with procedure QMV9.01.01 Calibration of the thermocouple by the comparison method ver.3.0 of 12.10.2021 (based on the ASTM E220-19).*
SPÓJNOŚĆ POMIAROWA *Measurement traceability*	Świadectwo potwierdza spójność wyników pomiarów z jednostkami miar Międzynarodowego Układu Jednostek Miar (SI). *The certificate provides traceability of measurement results to the International System of Units (SI).*
NIEPEWNOŚĆ POMIARU *Measurement uncertainty*	Niepewność pomiaru została określona zgodnie z dokumentem EA-4/02 M:2022. Podane wartości niepewności stanowią niepewności rozszerzone przy prawdopodobieństwie rozszerzenia ok. 95% i współczynniku rozszerzenia $k = 2$. *The measurement uncertainty has been determined in accordance with EA-4/02 M: 2022.* *The reported uncertainties of measurement are stated as the expanded uncertainties corresponded to a coverage probability of approximately 95% and a coverage factor $k = 2$.*
UWAGI *Comments*	Podane wyniki wzorcowania dotyczą wyłącznie wzorcowanego obiektu. *Calibration results apply only calibrated object.* W razie wątpliwości ważny jest oryginalny polski tekst. *If there are any doubts, the Polish version shall prevail.* Niniejsze świadectwo może być okazywane lub kopiowane tylko w całości. *This certificate may be presented or copied as a whole document only.*

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UŻYTE WZORCE I URZĄDZENIA POMIAROWE
Reference probes and measuring devices

WZORZEC
Reference probes

T≤ 58 °C	Pt100 / 4	SW 43/35/INTiBS-LWT/2025	L-R-0024	07-04-2026
T> 58 °C	Pt100 / 4	SW 44/35/INTiBS-LWT/2025	L-R-0025	07-04-2026
T> 250 °C	Pt100 / 4	4166/2024	L-R-0021	28-10-2025
T> 500 °C	PtRh10-Pt/S	1012-KL-35028-24	L-T-0039	30-10-2025

URZĄDZENIE POMIAROWE
Measuring instrument

T≤ 58 °C	Keysight	Z4.Z42.4180.124.2024.3381.1	L-M-0013	20-10-2025
T> 58 °C	Keysight	4990/2024	L-M-0009	22-12-2025
T> 250 °C	Keysight	76/2025	L-M-0008	16-01-2026
T> 500 °C	Keysight	76/2025	L-M-0008	16-01-2026

ELEMENT GRZEJNY
Temperature source

T≤ 58 °C	Fluke	głębokość zanurzenia = 150 mm	L-H-0002
T> 58 °C	Fluke	głębokość zanurzenia = 150 mm	L-H-0003
T> 250 °C	Fluke	głębokość zanurzenia = 200 mm	L-H-0006
T> 500 °C	Additel	głębokość zanurzenia = 150 mm	L-H-0011

Immersion depth

SPOINA ODNIESIENIA 0 °C
Cold junction

T≤ 58 °C	WIKA	głębokość zanurzenia = 150 mm	L-Z-0003
T> 58 °C	WIKA	głębokość zanurzenia = 150 mm	L-Z-0002
T> 250 °C	WIKA	głębokość zanurzenia = 150 mm	L-Z-0003
T> 500 °C	WIKA	głębokość zanurzenia = 150 mm	L-Z-0002

Immersion depth

WARUNKI ŚRODOWISKOWE
Environmental conditions

Temperatura otoczenia *Ambient temperature*	(21,9 ÷ 25,3) °C
Wilgotność względna *Humidity*	(35,6 ÷ 53,5) %

Data wzorcowania: 11-14.07.2025
Calibration date

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ŚWIADECTWO WZORCOWANIA NR: PA2507023
CALIBRATION CERTIFICATE NO.
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Released by Accredited Laboratory No. AP 201

WYNIKI WZORCOWANIA
Calibration results

CZUJNIK TYPU Sensor type	TEMPERATURA Temperature NOMINALNA Nominal	TEMPERATURA Temperature ODNIESIENIA Reference	TEMPERATURA Temperature OBLICZONA Calculated	ZMIERZONE NAPIĘCIE TERMOELEKTRYCZNE Thermovoltage	BŁĄD POMIARU Measurement error	NAJWIĘKSZY BŁĄD DOPUSZCZALNY Maximum permissible error	NIEPEWNOŚĆ POMIARU Measurement uncertainty	UWAGI Comments
	[°C]	[°C]	[°C]	[mV]	[°C]	+/- [°C]	+/- [°C]	
K	10,0	10,0	10,0	0,398	0,0	1,5	0,7	PA2507023/1 **1821220/17**
	58,0	57,7	57,4	2,329	-0,3	1,5	0,7	
	250,0	250,7	250,1	10,157	-0,6	1,5	0,7	
	500,0	499,6	499,6	20,627	0,0	2,0	0,7	
	950,0	950,8	949,9	39,312	-0,9	3,8	1,8	
K	10,0	10,0	10,0	0,397	0,0	1,5	0,7	PA2507023/2 **1821220/20**
	58,0	57,7	57,4	2,330	-0,3	1,5	0,7	
	250,0	250,7	250,3	10,166	-0,4	1,5	0,7	
	500,0	499,6	499,2	20,612	-0,4	2,0	0,7	
	950,0	950,8	949,0	39,276	-1,8	3,8	1,8	
K	10,0	10,0	10,1	0,402	0,1	1,5	0,7	PA2507023/3 **1821220/37**
	58,0	57,7	57,3	2,322	-0,4	1,5	0,7	
	250,0	249,5	248,4	10,088	-1,1	1,5	0,7	
	500,0	499,6	497,6	20,541	-2,0	2,0	0,7	
	950,0	950,8	947,7	39,224	-3,1	3,8	1,8	

UWAGI
Comments

- Temperatura nominalna: punkt nastawy wynikający z zamówienia.
  Nominal temperature: set point specified in the order.
- Temperatura odniesienia: średnia wartość z pomiarów odczytanych z wzorca.
  Reference temperature: average value of the measurement results read from the reference standard.
- Temperatura obliczona: wartość temperatury obliczona na podstawie normy ASTM E230M-23a z wartości zmierzonej napięcia termoelektrycznego obiektu.
  Calculated temperature: temperature value calculated from the measured thermovoltage of the calibrated object on the basis of the ASTM E230M-23a.
- Błąd pomiaru = Temperatura obliczona - Temperatura odniesienia
  Measurement error = Calculated temperature - Reference temperature
- Największy błąd dopuszczalny: dopuszczalny błąd pomiaru temperatury według klasy 1 wg PN EN 60584-1:2014 pkt 5.1.
  Maximum permissible error: according to the Class 1 acc. to PN EN 60584-1: 2014 point 5.1.
- Stwierdzenie zgodności z daną specyfikacją podjęto na podstawie zasady prostej akceptacji ILAC G8:09/2019 w=0 TUR>3:1.
  Ryzyko specyficzne błędnej akceptacji/ błędnego odrzucenia wynosi 50%.
- *Compliance with the principles of the simple acceptance according to the ILAC G8:09/2019 w=0 TUR >3:1. The specific risk of a false acceptance/false rejection can be up to 50%.*

ZGODNOŚĆ Z WYMAGANIAMI
Conformity with requirements

Na podstawie wszystkich wyników wzorcowania stwierdzono zgodność z wymaganiami PN-EN 60584-1:2014-04 pkt 5.1 dla klasy 1. Conformance with PN-EN 60584-1:2014-04 pt 5.1 class 1 was found on the basis of all calibration results.

Wykonał: *Made by*	Inżynier Laboratorium *Laboratory Engineer*	Autoryzował: *Approved*	Z-ca Kierownika Laboratorium *Deputy Head of Laboratory*
Podpis: *Signature*	dr inż. Agnieszka Grykałowska	Podpis: *Signature*	mgr Joanna Zając

KONIEC/ *End*

Data wzorcowania: 11-14.07.2025
Calibration date

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GUENTHER Polska Sp. z o.o.
ul. Wrocławska 27 C, 55-095 Długołęka, Polska
Tel. +48 (0)71 / 352 70 70
Faks +48 (0)71 / 352 70 71
biuro@guenther.com.pl · www.guenther.com.pl
NIP 895-19-06-589
REGON 020702531
KRS 0000300821
BNP PARIBAS BANK POLSKA S.A.
PLN 36 1750 1064 0000 0000 2055 6722
EUR 61 1750 1064 0000 0000 2055 6757 Kod SWIFT/BIC: PPABPLPKXXX

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Guenther Polska Sp. z o.o.
ul. Wrocławska 27C 55-095 Długołęka
Laboratorium wzorcujące akredytowane
przez Polskie Centrum Akredytacji,
sygnatariusza porozumień EA MLA i ILAC MRA
dotyczących wzajemnego uznawania świadectw
Nr akredytacji AP 201
Calibration laboratory accredited by Polish Centre for Accreditation, a signatory to EA MLA and ILAC MRA that include recognition of calibration certificates. Accreditation No. AP 201

GUENTHER Polska
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Technologie pomiaru temperatury
Niezawodnie . Dokładnie . Certyfikowanie

ŚWIADECTWO WZORCOWANIA NR: PA2505037

CALIBRATION CERTIFICATE NO.

Data wydania: 26.05.2025
Release date

ZGŁASZAJĄCY *Applicant*	**BALTIC FIRE LABORATORY Sp. z o. o.** **ul. Banińska 8** **80-209 Tuchom**
MIEJSCE WZORCOWANIA *Place of calibration*	**Guenther Polska Sp. z o.o.** **ul. Wrocławska 27c** **55-095 Długołęka**
NR ZAMÓWIENIA ZEW. *External order No.*	**Zam. z dnia 09.05.2025**
NR ZAMÓWIENIA WEW. *Internal order No.*	**ZS/105/05/2025**
OBIEKT WZORCOWANIA *Calibration object*	**Nazwa:** *Name* **Czujnik termoelektryczny** *Thermocouple* **Non-expendable** **Ø : 1,5 mm** **Typ:** *Type* **1xNiCr-NiAl/K** **Kod artykułu:** *Article code* **20053105** **Producent/Model:** *Manufacturer/Model* **Guenther**
DATA WZORCOWANIA *Calibration date*	22.05.2025
RODZAJ WZORCOWANIA *Calibration type*	Pierwotne / Initial

METODA WZORCOWANIA *Calibration method*	Wzorcowanie zostało przeprowadzone zgodnie z procedurą QMV9.01.01 Wzorcowanie termoelementu metodą porównawczą wer. 3.0 z dnia 12.10.2021 (opracowanej na podstawie ASTM E220-19). *The calibration has been performed in accordance with procedure QMV9.01.01 Calibration of the thermocouple by the comparison method ver.3.0 of 12.10.2021 (based on the ASTM E220-19).*
SPÓJNOŚĆ POMIAROWA *Measurement traceability*	Swiadectwo potwierdza spójność wyników pomiarów z jednostkami miar Międzynarodowego Układu Jednostek Miar (SI). *The certificate provides traceability of measurement results to the International System of Units (SI).*
NIEPEWNOŚĆ POMIARU *Measurement uncertainty*	Niepewność pomiaru została określona zgodnie z dokumentem EA-4/02 M:2022. Podane wartości niepewności stanowią niepewności rozszerzone przy prawdopodobieństwie rozszerzenia ok. 95% i współczynniku rozszerzenia $k = 2$. *The measurement uncertainty has been determined in accordance with EA-4/02 M: 2022.* *The reported uncertainties of measurement are stated as the expanded uncertainties corresponded to a coverage probability of approximately 95% and a coverage factor $k = 2$.*
UWAGI *Comments*	Podane wyniki wzorcowania dotyczą wyłącznie wzorcowanego obiektu. *Calibration results apply only calibrated object.* W razie wątpliwości ważny jest oryginalny polski tekst. *If there are any doubts, the Polish version shall prevail.* Niniejsze świadectwo może być okazywane lub kopiowane tylko w całości. *This certificate may be presented or copied as a whole document only.*

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ŚWIADECTWO WZORCOWANIA NR: PA2505037
CALIBRATION CERTIFICATE NO.
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UŻYTE WZORCE I URZĄDZENIA POMIAROWE
Reference probes and measuring devices

WZORZEC
Reference probes

T≤ 58 °C	Pt100 / 4	SW 44/35/INTIBS-LWT/2025	L-R-0025	07-04-2026
T> 58 °C	PtRh10-Pt/S	PA2411069/1	L-T-0040	19-11-2025

URZĄDZENIE POMIAROWE
Measuring instrument

Keysight	Z4-Z42.4180.49.2025.1433.1	L-M-0011	27-04-2026

ELEMENT GRZEJNY
Temperature source

T≤ 58°C	Fluke	głębokość zanurzenia = 160 mm	L-H-0009
T> 58°C	Fluke	głębokość zanurzenia = 200 mm	L-H-0006
T> 500°C	Additel	głębokość zanurzenia = 150 mm *Immersion depth*	L-H-0011

SPOINA ODNIESIENIA 0 °C
Cold junction

WIKA	głębokość zanurzenia = 150 mm *Immersion depth*	L-Z-0004

WARUNKI ŚRODOWISKOWE
Environmental conditions

Temperatura otoczenia *Ambient temperature*	(23,5 ÷ 24,5) °C
Wilgotność względna *Humidity*	(29,1 ÷ 34,7) %

Data wzorcowania: 22.05.2025
Calibration date

Strona **2 / 4**
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THE REPRODUCING OF THE REPORT IS PERMITTED ONLY IN FULL.
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Technologie pomiaru temperatury
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ŚWIADECTWO WZORCOWANIA NR: PA2505037
CALIBRATION CERTIFICATE NO.
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WYNIKI WZORCOWANIA
Calibration results

CZUJNIK TYPU *Sensor type*	NOMINALNA *Nominal*	TEMPERATURA *Temperature* ODNIESIENIA *Reference*	OBLICZONA *Calculated*	ZMIERZONE NAPIĘCIE TERMOELEKTRYCZNE *Thermovoltage*	BŁĄD POMIARU *Measurement error*	NAJWIĘKSZY BŁĄD DOPUSZCZALNY *Maximum permissible error*	NIEPEWNOŚĆ POMIARU *Measurement uncertainty*	UWAGI *Comments*
	[°C]			[mV]	[°C]	+/- [°C]	+/- [°C]	
K	10,0	10,0	9,7	0,387	-0,3	1,5	0,7	1831220/20 PA2505037/1
	58,0	57,4	57,2	2,318	-0,2	1,5	0,7	
	250,0	249,4	249,0	10,111	-0,4	1,5	0,9	
	500,0	499,3	499,4	20,618	0,1	2,0	0,9	
	950,0	950,8	949,5	39,292	-1,3	3,8	1,6	
K	10,0	10,0	9,7	0,387	-0,3	1,5	0,7	1831220/5 PA2505037/2
	58,0	57,4	57,2	2,319	-0,2	1,5	0,7	
	250,0	249,4	248,7	10,099	-0,7	1,5	0,9	
	500,0	499,3	498,8	20,595	-0,5	2,0	0,9	
	950,0	950,8	949,4	39,289	-1,4	3,8	1,6	
K	10,0	10,0	9,8	0,390	-0,2	1,5	0,7	1831220/15 PA2505037/3
	58,0	57,4	57,2	2,319	-0,2	1,5	0,7	
	250,0	249,4	249,2	10,121	-0,2	1,5	0,9	
	500,0	499,3	500,0	20,647	0,7	2,0	0,9	
	950,0	950,8	949,3	39,285	-1,5	3,8	1,6	
K	10,0	10,0	9,8	0,389	-0,2	1,5	0,7	1831220/4 PA2505037/4
	58,0	57,4	57,3	2,322	-0,1	1,5	0,7	
	250,0	249,4	248,6	10,098	-0,8	1,5	0,9	
	500,0	499,3	498,7	20,589	-0,6	2,0	0,9	
	950,0	950,8	949,3	39,285	-1,5	3,8	1,6	
K	10,0	10,0	9,8	0,389	-0,2	1,5	0,7	1831220/31 PA2505037/5
	58,0	57,4	57,2	2,321	-0,2	1,5	0,7	
	250,0	249,4	249,3	10,123	-0,1	1,5	0,9	
	500,0	499,3	500,1	20,652	0,8	2,0	0,9	
	950,0	950,8	949,7	39,301	-1,1	3,8	1,6	

UWAGI
Comments

- Temperatura nominalna: punkt nastawy wynikający z zamówienia.
  Nominal temperature: set point specified in the order.
- Temperatura odniesienia: średnia wartość z pomiarów odczytanych z wzorca.
  Reference temperature: average value of the measurement results read from the reference standard.
- Temperatura obliczona: wartość temperatury obliczona na podstawie normy ASTM E230M-23a z wartości zmierzonej napięcia termoelektrycznego obiektu.
  Calculated temperature: temperature value calculated from the measured thermovoltage of the calibrated object on the basis of the ASTM E230M-23a;
- Błąd pomiaru = Temperatura obliczona - Temperatura odniesienia
  Measurement error = Calculated temperature - Reference temperature
- Największy błąd dopuszczalny: dopuszczalny błąd pomiaru temperatury według normy klasy 1 wg PN EN 60584-1:2014 pkt 5.1.
  Maximum permissible error: according to the Class 1 acc. to PN EN 60584-1: 2014 point 5.1.
- Stwierdzenie zgodności z daną specyfikacją podjęto na podstawie zasady prostej akceptacji ILAC G8:09/2019 w=0 TUR>3:1,
  Ryzyko specyficzne błędnej akceptacji/ błędnego odrzucenia wynosi 50%.
- *Compliance with the principles of the simple acceptance according to the ILAC G8:09/2019 w=0 TUR >3:1. The specific risk of a false acceptance/false rejection can be up to 50%.*

Data wzorcowania: 22.05.2025
Calibration date

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GUENTHER Polska Sp. z o.o.
ul. Wrocławska 27 C
55-095 Długołęka
Polska
Tel. +48 (0)71 / 352 70 70
Faks +48 (0)71 / 352 70 71
biuro@guenther.com.pl - www.guenther.com.pl
NIP 895-19-06-589
REGON 020702531
KRS 0000360821
BNP PARIBAS BANK POLSKA S.A.
PLN 36 1750 1064 0000 0000 2055 6722
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ŚWIADECTWO WZORCOWANIA NR: PA2505037
CALIBRATION CERTIFICATE NO.
Wydane przez LABORATORIUM AKREDYTOWANE Nr AP 201
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ZGODNOŚĆ Z WYMAGANIAMI
Conformity with requirements

Na podstawie wszystkich wyników wzorcowania stwierdzono zgodność z wymaganiami PN-EN 60584-1:2014-04 pkt 5.1 dla klasy 1. Conformance with PN-EN 60584-1:2014-04 pt 5.1 class 1 was found on the basis of all calibration results.

Wykonał: *Made by*	Inżynier Laboratorium *Laboratory Engineer*	Autoryzował: *Approved*	Kierownik Laboratorium *Head of Laboratory*
Podpis: *Signature*	mgr inż. Tomasz Słocki	Podpis: *Signature*	mgr inż. Elwira Słocka

KONIEC/ *End*

Data wzorcowania: 22.05.2025
Calibration date

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ŚWIADECTWO WZORCOWANIA NR: PA2505038

CALIBRATION CERTIFICATE NO.

Data wydania: 26.05.2025
Release date

ZGŁASZAJĄCY *Applicant*	**BALTIC FIRE LABORATORY Sp. z o. o.** **ul. Banińska 8** **80-209 Tuchom**
MIEJSCE WZORCOWANIA *Place of calibration*	**Guenther Polska Sp. z o.o.** **ul. Wrocławska 27c** **55-095 Długołęka**
NR ZAMÓWIENIA ZEW. *External order No.*	**Zam. z dnia 09.05.2025**
NR ZAMÓWIENIA WEW. *Internal order No.*	**ZS/105/05/2025**
OBIEKT WZORCOWANIA *Calibration object*	**Nazwa:** *Name* **Czujnik termoelektryczny** *Thermocouple* **Non-expendable** **Ø : 1,5 mm** **Typ:** *Type* **1xNiCr-NiAl/K** **Kod artykułu:** *Article code* **20053099** **Producent/Model:** *Manufacturer/Model* **Guenther**
DATA WZORCOWANIA *Calibration date*	22.05.2025
RODZAJ WZORCOWANIA *Calibration type*	Pierwotne / Initial

METODA WZORCOWANIA *Calibration method*	Wzorcowanie zostało przeprowadzone zgodnie z procedurą QMV9.01.01 Wzorcowanie termoelementu metodą porównawczą wer. 3.0 z dnia 12.10.2021 (opracowanej na podstawie ASTM E220-19). *The calibration has been performed in accordance with procedure QMV9.01.01 Calibration of the thermocouple by the comparison method ver.3.0 of 12.10.2021 (based on the ASTM E220-19).*
SPÓJNOŚĆ POMIAROWA *Measurement traceability*	Swiadectwo potwierdza spójność wyników pomiarów z jednostkami miar Międzynarodowego Układu Jednostek Miar (SI). *The certificate provides traceability of measurement results to the International System of Units (SI).*
NIEPEWNOŚĆ POMIARU *Measurement uncertainty*	Niepewność pomiaru została określona zgodnie z dokumentem EA-4/02 M:2022. Podane wartości niepewności stanowią niepewności rozszerzone przy prawdopodobieństwie rozszerzenia ok. 95% i współczynniku rozszerzenia $k = 2$. *The measurement uncertainty has been determined in accordance with EA-4/02 M: 2022.* *The reported uncertainties of measurement are stated as the expanded uncertainties corresponded to a coverage probability of approximately 95% and a coverage factor $k = 2$.*
UWAGI *Comments*	Podane wyniki wzorcowania dotyczą wyłącznie wzorcowanego obiektu. *Calibration results apply only calibrated object.* W razie wątpliwości ważny jest oryginalny polski tekst. *If there are any doubts, the Polish version shall prevail.* Niniejsze świadectwo może być okazywane lub kopiowane tylko w całości. *This certificate may be presented or copied as a whole document only.*

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ul. Wrocławska 27 C
55-095 Długołęka
Polska
Tel. +48 (0)71 / 352 70 70
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biuro@guenther.com.pl , www.guenther.com.pl
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UŻYTE WZORCE I URZĄDZENIA POMIAROWE
Reference probes and measuring devices

WZORZEC
Reference probes

T≤ 58 °C	Pt100 / 4	SW 44/35/INTiBS-LWT/2025	L-R-0025	07-04-2026
T> 58 °C	PtRh10-Pt/S	PA2411069/1	L-T-0040	19-11-2025

URZĄDZENIE POMIAROWE
Measuring instrument

Keysight	Z4-Z42.4180.49.2025.1433.1	L-M-0011	27-04-2026

ELEMENT GRZEJNY
Temperature source

T≤ 58°C	Fluke	głębokość zanurzenia = 160 mm	L-H-0009
T> 58°C	Fluke	głębokość zanurzenia = 200 mm	L-H-0006
T> 500°C	Additel	głębokość zanurzenia = 150 mm	L-H-0011

Immersion depth

SPOINA ODNIESIENIA 0 °C
Cold junction

WIKA	głębokość zanurzenia = 150 mm	L-Z-0004

Immersion depth

WARUNKI ŚRODOWISKOWE
Environmental conditions

Temperatura otoczenia *Ambient temperature*	(23,5 ÷ 24,5) °C
Wilgotność względna *Humidity*	(29,1 ÷ 34,7) %

Data wzorcowania: 22.05.2025
Calibration date

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WYNIKI WZORCOWANIA
Calibration results

CZUJNIK TYPU Sensor type	TEMPERATURA Temperature NOMINALNA Nominal	TEMPERATURA Temperature ODNIESIENIA Reference	TEMPERATURA Temperature OBLICZONA Calculated	ZMIERZONE NAPIĘCIE TERMOELEKTRYCZNE Thermovoltage	BŁĄD POMIARU Measurement error	NAJWIĘKSZY BŁĄD DOPUSZCZALNY Maximum permissible error	NIEPEWNOŚĆ POMIARU Measurement uncertainty	UWAGI Comments
	[°C]	[°C]	[°C]	[mV]	[°C]	+/- [°C]	+/- [°C]	
K	10,0	10,1	9,8	0,389	-0,3	1,5	0,7	1821220/18 PA2505038/1
	58,0	57,4	57,1	2,314	-0,3	1,5	0,7	
	250,0	249,4	248,9	10,108	-0,5	1,5	0,9	
	500,0	499,3	499,5	20,624	0,2	2,0	0,9	
	950,0	951,1	950,1	39,319	-1,0	3,8	1,6	
K	10,0	10,1	9,8	0,389	-0,3	1,5	0,7	1821220/40 PA2505038/2
	58,0	57,4	57,1	2,317	-0,3	1,5	0,7	
	250,0	249,4	248,9	10,110	-0,5	1,5	0,9	
	500,0	499,3	498,4	20,58	-0,9	2,0	0,9	
	950,0	951,1	949,9	39,310	-1,2	3,8	1,6	
K	10,0	10,1	9,8	0,392	-0,3	1,5	0,7	1821220/26 PA2505038/3
	58,0	57,4	57,1	2,316	-0,3	1,5	0,7	
	250,0	249,4	248,5	10,092	-0,9	1,5	0,9	
	500,0	499,3	498,0	20,561	-1,3	2,0	0,9	
	950,0	951,1	949,6	39,297	-1,5	3,8	1,6	
K	10,0	10,1	9,8	0,392	-0,3	1,5	0,7	1821220/4 PA2505038/4
	58,0	57,4	57,2	2,319	-0,2	1,5	0,7	
	250,0	249,4	249,1	10,119	-0,3	1,5	0,9	
	500,0	499,3	499,8	20,634	0,5	2,0	0,9	
	950,0	951,1	950,1	39,318	-1,0	3,8	1,6	
K	10,0	10,1	9,8	0,391	-0,3	1,5	0,7	1821220/35 PA2505038/5
	58,0	57,4	57,2	2,318	-0,2	1,5	0,7	
	250,0	249,4	249,1	10,118	-0,3	1,5	0,9	
	500,0	499,3	499,5	20,625	0,2	2,0	0,9	
	950,0	951,1	950,0	39,312	-1,1	3,8	1,6	

UWAGI
Comments

- Temperatura nominalna: punkt nastawy wynikający z zamówienia.
  Nominal temperature: set point specified in the order.
- Temperatura odniesienia: średnia wartość z pomiarów odczytanych z wzorca.
  Reference temperature: average value of the measurement results read from the reference standard.
- Temperatura obliczona: wartość temperatury obliczona na podstawie normy ASTM E230M-23a z wartości zmierzonej napięcia termoelektrycznego obiektu.
  Calculated temperature: temperature value calculated from the measured thermovoltage of the calibrated object on the basis of the ASTM E230M-23a.
- Błąd pomiaru = Temperatura obliczona - Temperatura odniesienia
  Measurement error = Calculated temperature - Reference temperature
- Największy błąd dopuszczalny: dopuszczalny błąd pomiaru temperatury według normy klasy 1 wg PN EN 60584-1:2014 pkt 5.1.
  Maximum permissible error: according to the Class 1 acc. to PN EN 60584-1: 2014 point 5.1.
- Stwierdzenie zgodności z daną specyfikacją podjęto na podstawie zasady prostej akceptacji ILAC G8:09/2019 w=0 TUR>3:1.
  Ryzyko specyficzne błędnej akceptacji/ błędnego odrzucenia wynosi 50%.
- *Compliance with the principles of the simple acceptance according to the ILAC G8:09/2019 w=0 TUR >3:1. The specific risk of a false acceptance/false rejection can be up to 50%.*

Data wzorcowania: 22.05.2025
Calibration date

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Page

GUENTHER Polska Sp. z o.o.
ul. Wrocławska 27 C
55-095 Długołęka
Polska
Tel. +48 (0)71 / 352 70 70
Faks +48 (0)71 / 352 70 71
biuro@guenther.com.pl · www.guenther.com.pl
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ZGODNOŚĆ Z WYMAGANIAMI
Conformity with requirements

Na podstawie wszystkich wyników wzorcowania stwierdzono zgodność z wymaganiami PN-EN 60584-1:2014-04 pkt 5.1 dla klasy 1. Conformance with PN-EN 60584-1:2014-04 pt 5.1 class 1 was found on the basis of all calibration results.

Wykonał: *Made by*	Inżynier Laboratorium *Laboratory Engineer*	Autoryzował: *Approved*	Kierownik Laboratorium *Head of Laboratory*
Podpis: *Signature*	mgr inż. Tomasz Słocki	Podpis: *Signature*	mgr inż. Elwira Słocka

KONIEC/ *End*

Data wzorcowania: 22.05.2025
Calibration date

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IN OTHER CASE, WRITTEN APPROVAL OF THE CONTRACTOR SHALL BE GIVEN.