



## 1000-Series Thermal Cyclers

# Thermal Performance and Qualification Report

Software Version 2.0.42.0

**Institute/Client****SSI - Århus**

Department .

Address .

City, State Zip Århus

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**Instrument****Bio-Rad Laboratories C1000 Touch**

Alpha Block Type 96 Well

Alpha Block Serial Number RN102163

Base Serial number CT048911

Engineer Hamid Mostaghimi

Test Date 23 Feb 2022

Start Time 8:42 AM

End Time 8:50 AM

Thermal Qualification Hardware Bio-Rad Spread Station

Serial Number BR000268

Sensor Type Bio-Rad 96 well 15 probe

**Probe Calibration is valid for one year after the indicated calibration date:**

Position	Serial Number	Calibration Date
1	2201171589130599	17 Jan 2022
2	2201171543759473	17 Jan 2022
3	2201171703250642	17 Jan 2022
4	2201171712432234	17 Jan 2022
5	2201171551436610	17 Jan 2022
6	2201171596865089	17 Jan 2022
7	2201171506015576	17 Jan 2022
8	2201171534501536	17 Jan 2022
9	2201171748618044	17 Jan 2022
10	2201171767046896	17 Jan 2022
11	2201171730800175	17 Jan 2022
12	2201171721659759	17 Jan 2022
13	2201171817424447	17 Jan 2022
14	2201171776207620	17 Jan 2022
15	2201171757865011	17 Jan 2022

**Thermal Qualification Test Result****Pass**

Thermal Qualification performed by: \_\_\_\_\_

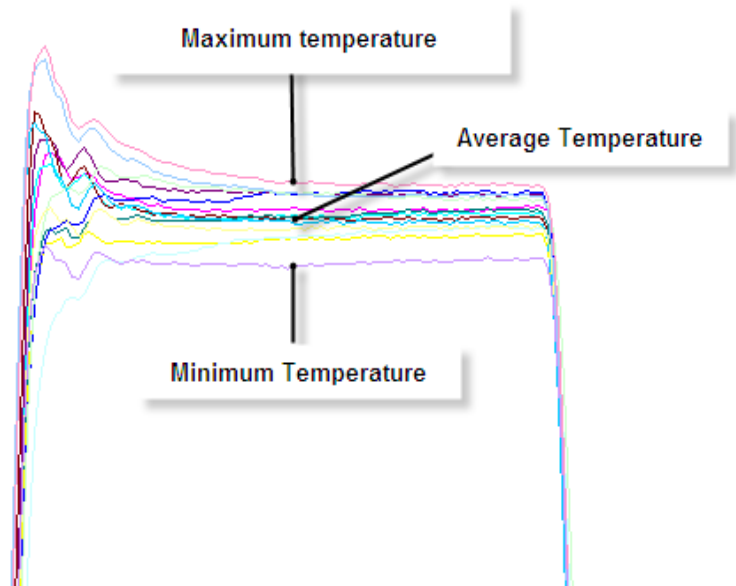
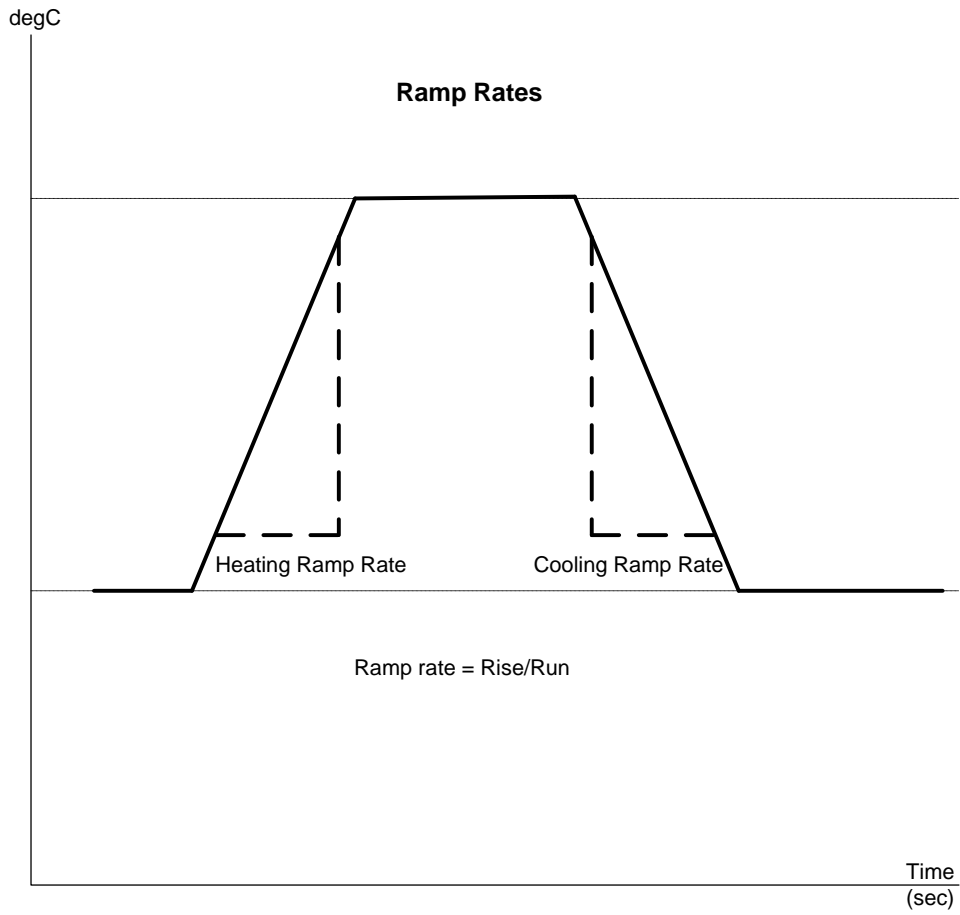


**Introduction:**

The purpose of this report is to present data generated by the thermal performance testing of the specified Bio-Rad thermal cycler. Conclusions of pass/fail are determined by comparing the test data against listed Bio-Rad instrument specifications. The testing equipment is NIST traceable.

**Definitions:**

- Measurement time: All temperature measurements are made 10 seconds after the block first reaches the target holding temperature.
- Minimum temperature: Lowest temperature reading at the given time point while holding at target temperature.
- Maximum temperature: Highest temperature reading at the given time point while holding at target temperature.
- Average temperature: Average of all temperature readings at the given time point while holding at target temperature.
- Thermal uniformity: Maximum temperature – minimum temperature
- Thermal accuracy: The difference between the average temperature and the target temperature.
- Ramp rate: Slope of graph (rise/run) during heating or cooling step.
- Settling time: The time it takes for the block to reach specified thermal uniformity after first reaching the target temperature.
- Overshoot: Single probe reading that is past target (higher when heating / lower when cooling)
- Target temperature: The temperature that the block is programmed to reach.



**Thermal Probe Test Positions**

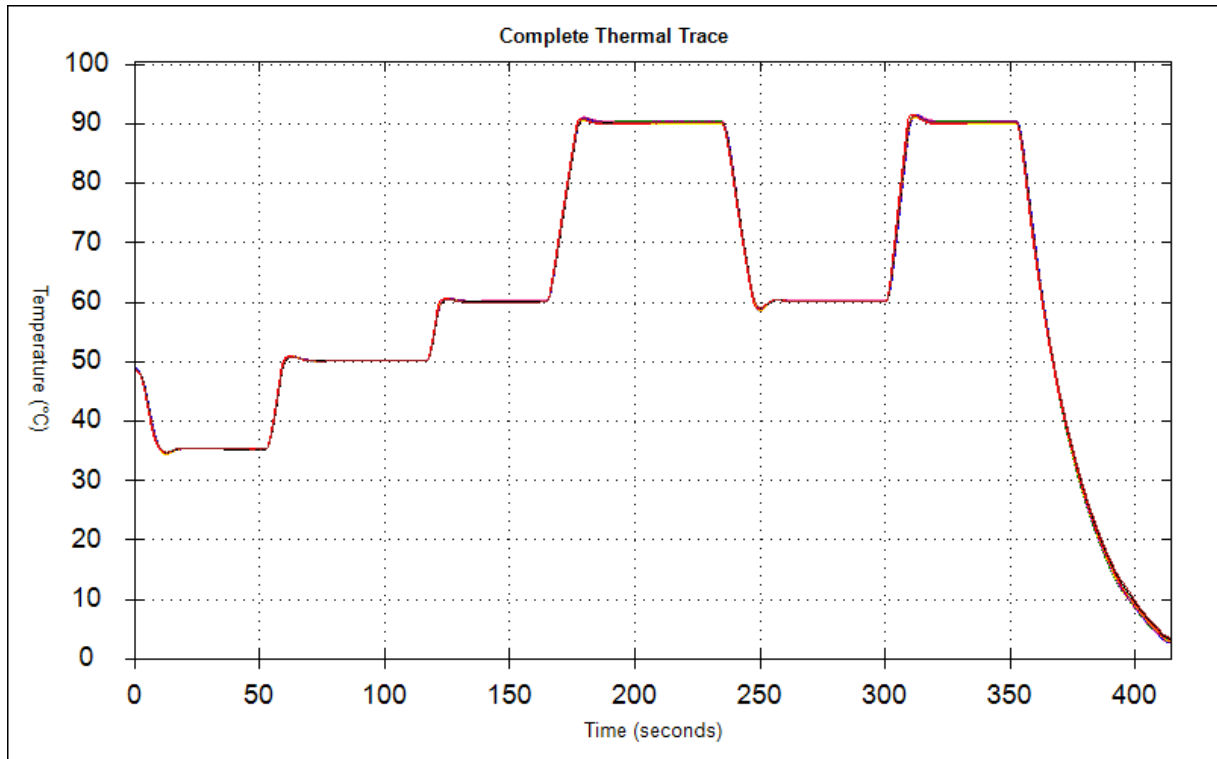
	1	2	3	4	5	6	7	8	9	10	11	12
A	<b>1</b>			<b>4</b>			<b>7</b>			<b>10</b>		<b>13</b>
B												
C												
D	<b>2</b>						<b>8</b>					<b>14</b>
E				<b>5</b>						<b>11</b>		
F												
G												
H	<b>3</b>			<b>6</b>			<b>9</b>			<b>12</b>		<b>15</b>

**Bio-Rad Specification**

Requirement	Bio-Rad Specification
Thermal Accuracy	$\pm 0.2^{\circ}\text{C}$ of programmed target at $90^{\circ}\text{C}$
Thermal Block Uniformity	$\pm 0.4^{\circ}\text{C}$ well-to-well within 10 sec of arrival at $90^{\circ}\text{C}$ ( $0.8^{\circ}\text{C}$ total spread)

**Thermal Qualification Test Results  
(10 seconds after arrival at target temperature)**

Target Temperature	Minimum Temperature	Maximum Temperature	Mean Temperature	Uniformity (Pass $\leq 0.8$ )	Accuracy (Pass $\pm 0.2$ )
$90^{\circ}\text{C}$	89.99	90.50	90.2	0.5	0.2
$60^{\circ}\text{C}$	60.18	60.31	60.2	0.1	0.2
$50^{\circ}\text{C}$	50.02	50.23	50.1	0.2	0.1



### Thermal Qualification Temperature Protocol

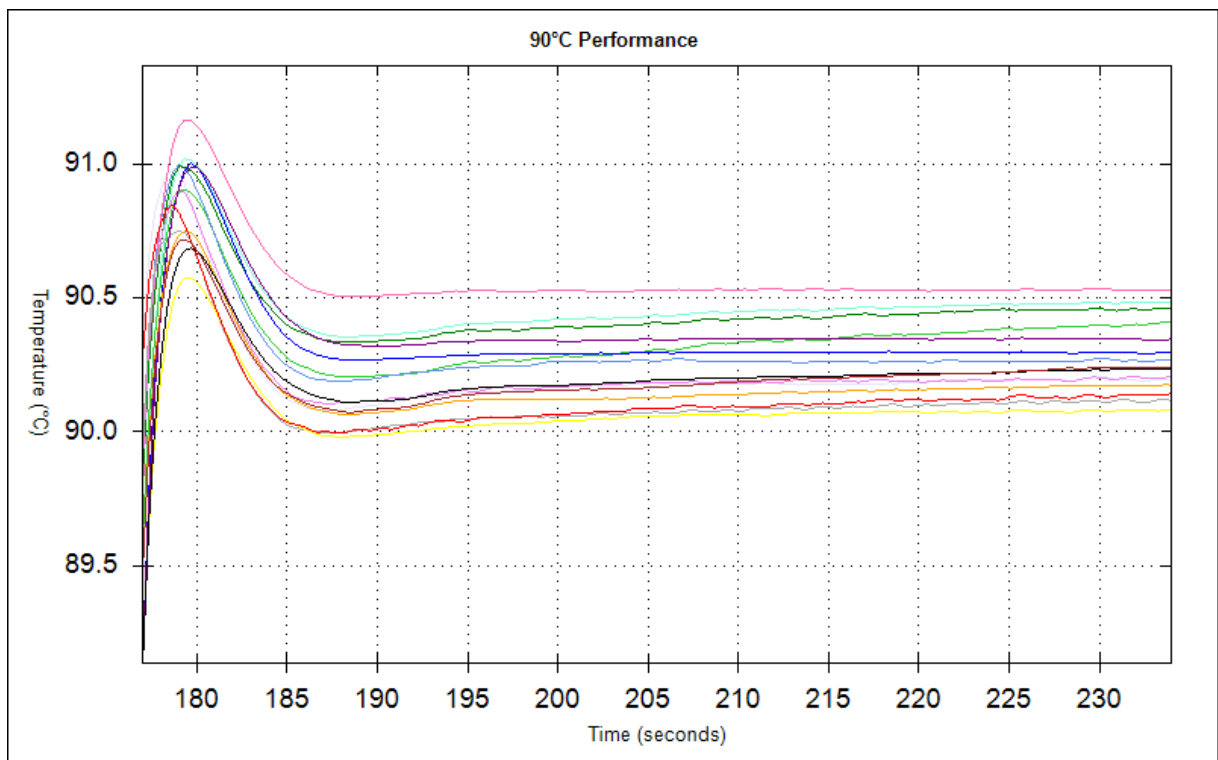
#### Block mode

- Step 1: 35C, 45 sec
- Step 2: 50°C, 60 sec
- Step 3: 60°C, 45 sec
- Step 4: 90°C, 60 sec
- Step 5: 60°C, 60 sec
- Step 6: 90°C, 45 sec
- Step 7: 4°C, 5 sec

Results @ 90°C

	10 seconds	30 seconds
Mean	90.2	90.3
Min	89.99	90.06
Max	90.50	90.52
Uniformity	0.5	0.5
Chan 1	90.08	90.18
Chan 2	90.11	90.20
Chan 3	90.01	90.09
Chan 4	90.07	90.13
Chan 5	90.32	90.34
Chan 6	89.99	90.06
Chan 7	90.01	90.07
Chan 8	90.27	90.29
Chan 9	90.11	90.18
Chan 10	90.33	90.41
Chan 11	90.50	90.52
Chan 12	90.20	90.26
Chan 13	90.21	90.33
Chan 14	90.35	90.44
Chan 15	90.10	90.17

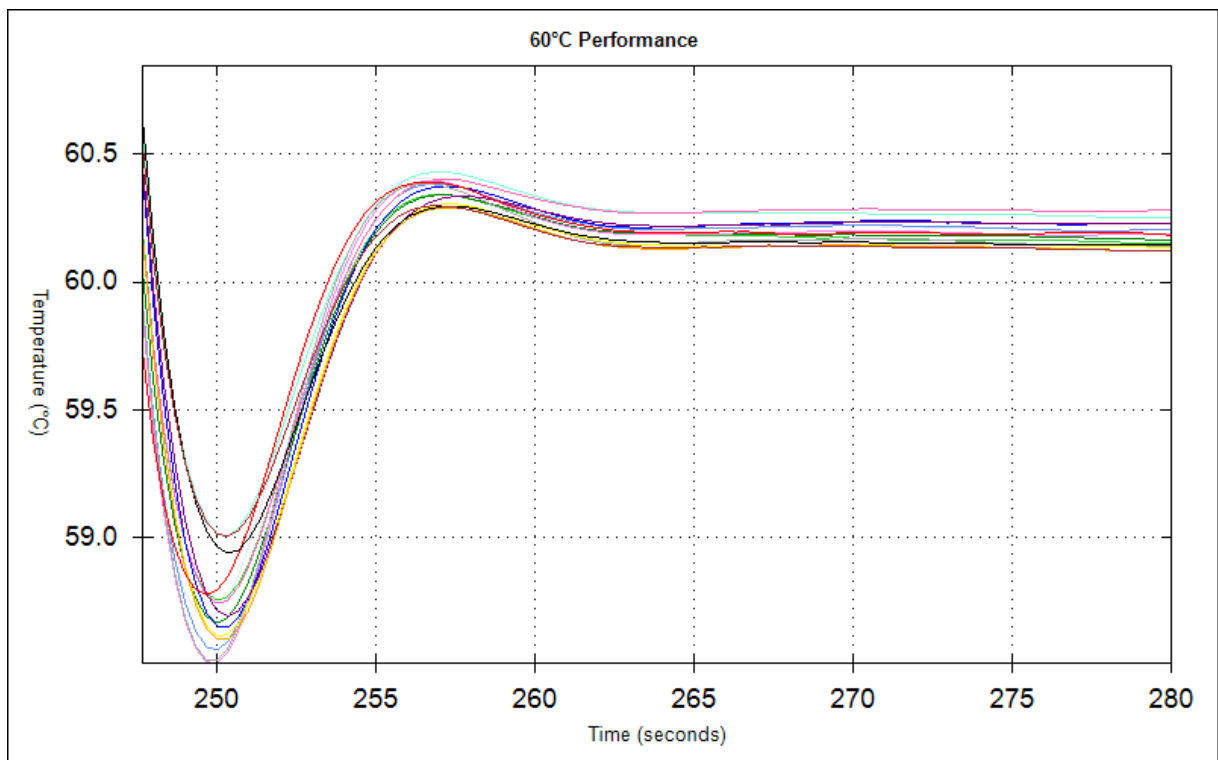
ALL VALUES IN °C



Results @ 60°C

	10 seconds	30 seconds
Mean	60.2	60.2
Min	60.18	60.12
Max	60.31	60.28
Uniformity	0.1	0.2
Chan 1	60.18	60.12
Chan 2	60.20	60.14
Chan 3	60.24	60.18
Chan 4	60.18	60.12
Chan 5	60.26	60.23
Chan 6	60.19	60.13
Chan 7	60.20	60.14
Chan 8	60.26	60.23
Chan 9	60.22	60.19
Chan 10	60.23	60.16
Chan 11	60.30	60.28
Chan 12	60.25	60.21
Chan 13	60.22	60.15
Chan 14	60.31	60.25
Chan 15	60.24	60.20

ALL VALUES IN °C



Results @ 50°C

	10 seconds	30 seconds
Mean	50.1	50.2
Min	50.02	50.10
Max	50.23	50.30
Uniformity	0.2	0.2
Chan 1	50.05	50.11
Chan 2	50.07	50.13
Chan 3	50.05	50.12
Chan 4	50.05	50.12
Chan 5	50.19	50.25
Chan 6	50.07	50.14
Chan 7	50.02	50.10
Chan 8	50.16	50.23
Chan 9	50.11	50.20
Chan 10	50.10	50.17
Chan 11	50.23	50.30
Chan 12	50.14	50.23
Chan 13	50.08	50.15
Chan 14	50.18	50.25
Chan 15	50.11	50.19

ALL VALUES IN °C

