SH SCIENTIFIC Since 1982
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Since 1982, we've provided laboratory and production equipment to organizations spanning material science and engineering, mechanical and chemical engineering, extraction and processing, biotechnology, heavy industry, education, government, and healthcare.

FURNACE TEMPERATURE UNIFORMITY

RAW DATA FROM PTCR TESTS

Temperature uniformity is of the utmost importance as you're comparing furnace models. For some applications, it's arguably the single most critical factor.

It's also an area in which SH Scientific furnaces excel—a fact which we point out at every opportunity.

But why, exactly, are we so confident in that claim?

It comes down to rigorous and continual testing.

We want you to have the same confidence that we do, so we've decided to do something a bit unconventional in this industry, and share our raw internal PTCR test results.

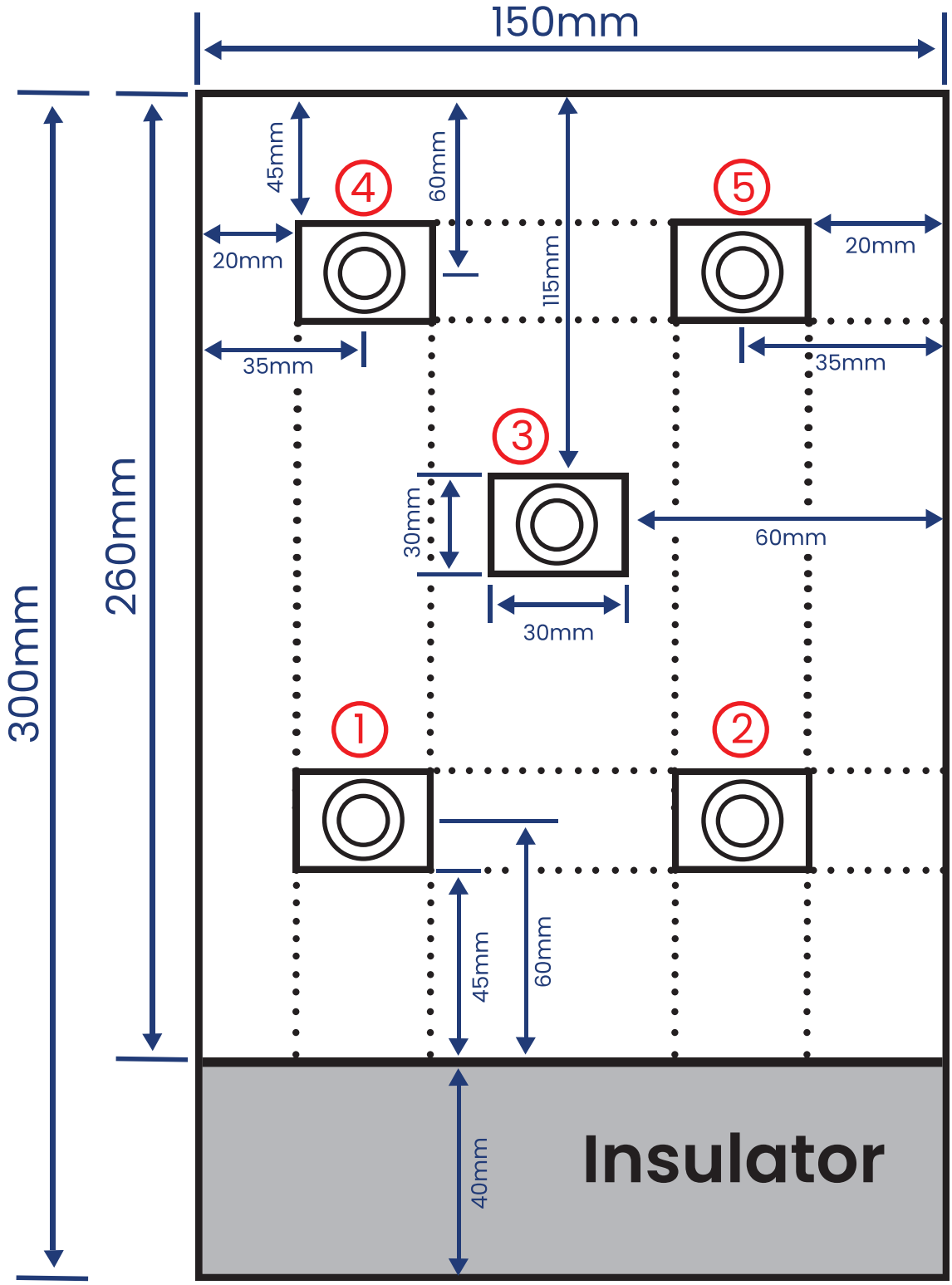
OUR PTCR TESTING METHODOLOGY

We use different uniformity testing techniques at various stages of R&D, production, and QC.

One of the most important is process temperature control ring (PTCR) testing. It's a simple and trustworthy method that's easily adapted to any chamber size and heating configuration.

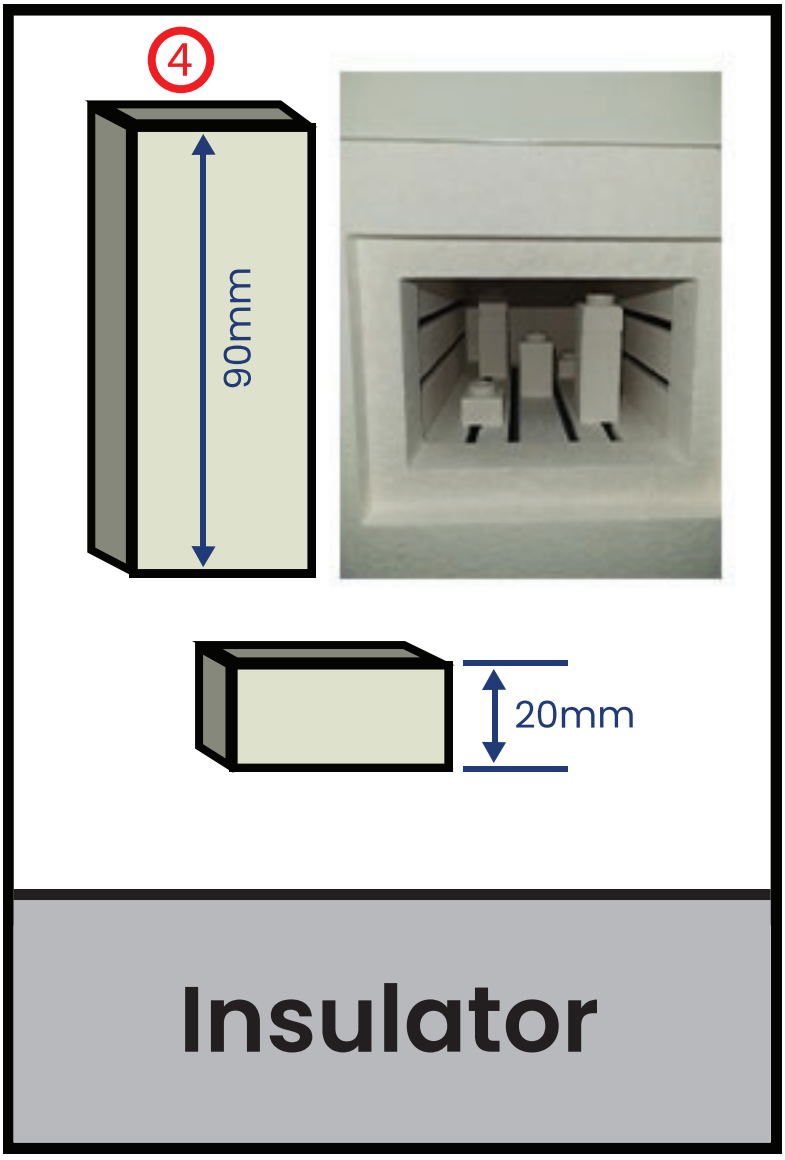
1. **Select appropriate PTCRs for the test temperature range.**
2. **Place them according to the chamber style:**
    A. In a muffle furnace, put one in the exact center, two in diagonal corners near the top, and two in the other diagonal corners near the bottom.
    B. In a tube furnace, arrange them consecutively along the full length of the heating zone(s). Use as many as needed, e.g., 15 x 20 mm rings to cover a 300 mm heating zone.
3. **Ramp at 5° C/min to the target temperature, then hold it for two hours.**
4. **Measure each ring with high-precision calipers (resolution ≤ 0.01 mm).**
5. **Use the PTCR vendor's chart to translate each caliper reading into a temperature.**

To keep results comparable, we have a specific positioning protocol for each chamber variation. **For instance, our 5-liter muffle furnace is set up as follows:**


150mm
300mm
260mm
45mm
60mm
115mm
20mm
35mm
4
5
20mm
35mm
3
30mm
60mm
30mm
1
2
45mm
60mm
40mm
Insulator

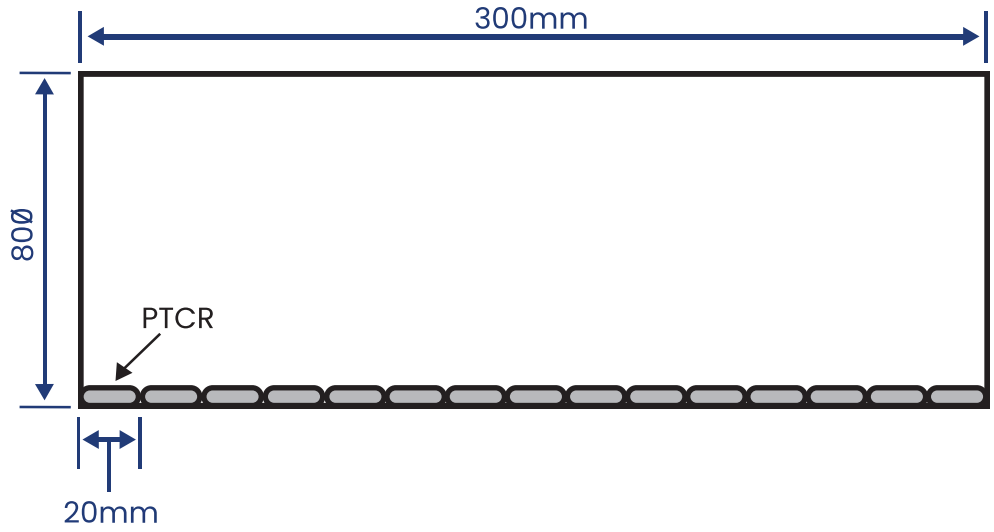
Door Side

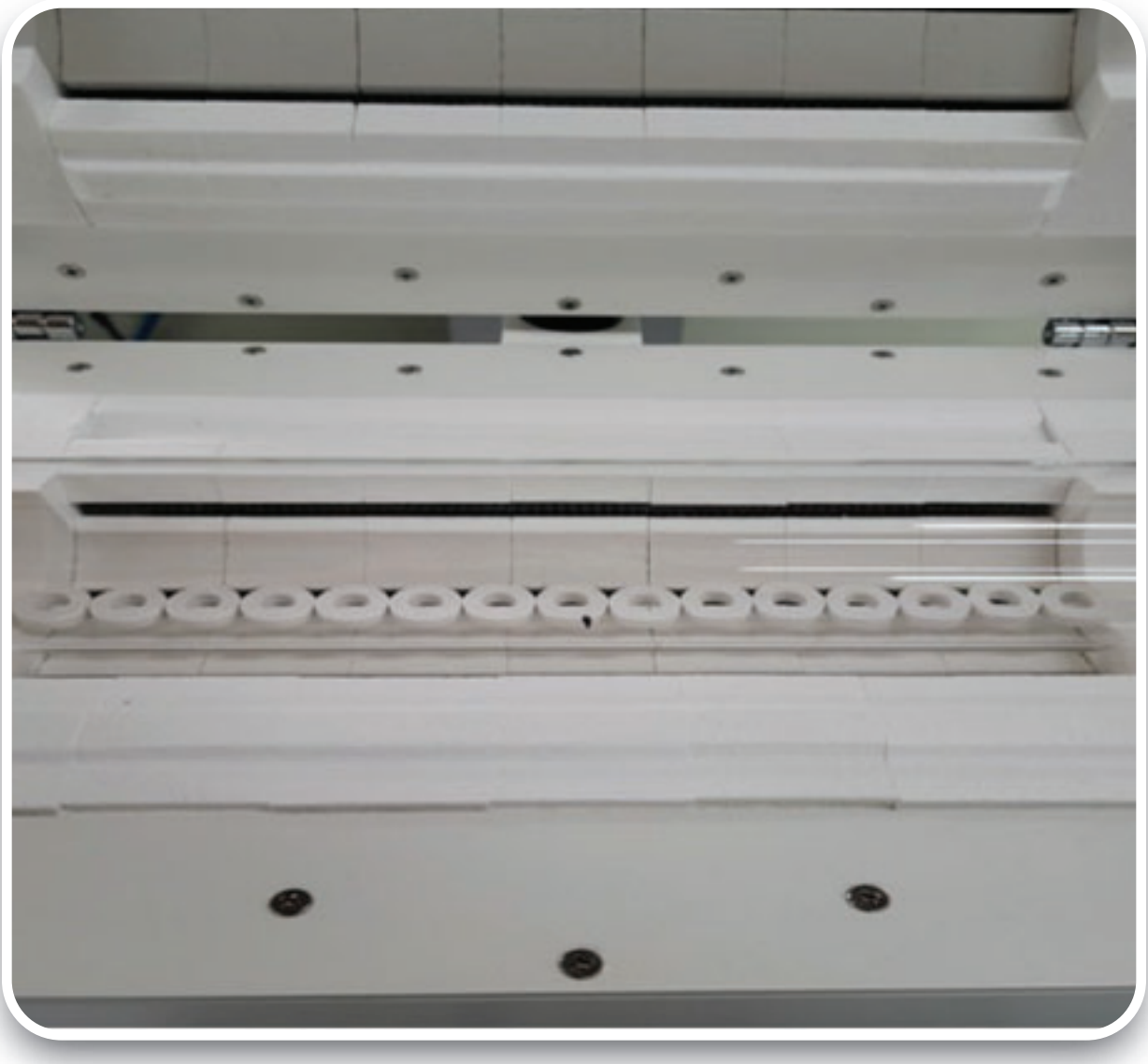
SH-FU-5MG



Door Side

...whereas our single-zone tube furnace calls for:





SAMPLE RESULTS BY MODEL

Now that we've walked through our methodology, here are some actual results obtained during recent in-house testing.

Muffle furnaces (uniformity: ± 0.2%–0.7%)

SH-FU-5MGE (max 1050° C)

NO.	Diameter (mm)	Converted Temperature (°C)	Average Temperature (°C)	Tolerance (°C)
1	18.09	823	827.8	+/-4.8 **(+/- 0.5%)**
2	18.08	824		
3	18.01	831		
4	18.02	830		
5	18.01	831		

SH-FU-11MGE (max 1050° C)

NO.	Diameter (mm)	Converted Temperature (°C)	Average Temperature (°C)	Tolerance (°C)
1	18.04	828	**826.6**	+/-6.4 **(+/- 0.7%)**
2	18.08	824		
3	17.99	833		
4	18.08	824		
5	18.08	824		

SH-FU-5MG (max 1200° C)

NO.	Diameter (mm)	Converted Temperature (°C)	Average Temperature (°C)	Tolerance (°C)
1	18.15	818	**823.4**	+/-5.4 **(+/- 0.6%)**
2	18.12	820		
3	18.05	827		
4	18.05	827		
5	18.07	825		

SH-FU-27MG (max 1200° C)

NO.	Diameter (mm)	Converted Temperature (°C)	Average Temperature (°C)	Tolerance (°C)
1	18.12	820	**823.0**	+/-3.0 **(+/- 0.3%)**
2	18.07	825		
3	18.10	822		
4	18.08	824		
5	18.08	824		

SH-FU-11MH (max 1500° C)

NO.	Diameter (mm)	Converted Temperature (°C)	Average Temperature (°C)	Tolerance (°C)
1	19.40	1185	**1184.6**	+/-3.6 **(+/- 0.3%)**
2	19.42	1181		
3	19.39	1187		
4	19.40	1185		
5	19.40	1185		

SH-FU-36MH (max 1500° C)

NO.	Diameter (mm)	Converted Temperature (°C)	Average Temperature (°C)	Tolerance (°C)
1	19.39	1187	**1187.0**	+/-2.0 **(+/- 0.2%)**
2	19.40	1185		
3	19.38	1189		
4	19.40	1185		
5	19.38	1189		

Tube furnaces (uniformity: ± 1.0%)

SH-FU-80STG (1 zone; max 1200° C)

NO.		Diameter (mm)	Converted Temperature (°C)	Average Temperature (°C)	Tolerance (°C)
1		20.07	635		
2		19.59	691		
3		19.14	731		
4		18.97	745		
5		18.82	758		
6	center area 100mm	18.67	771	779	+/-8 (+/-1%)
7		18.55	782		
8		18.51	785		
9		18.55	782		
10		18.63	775		
11		18.79	761		
12		18.94	748		
13		19.16	729		
14		19.51	698		
15		20.05	639		

Since 1982
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Serving North America Since 2013

In 2018, after particularly rapid growth in the American education and public sectors, we founded a US head office in Portland, Oregon. Whether you're visiting us on behalf of a major institution, a small lab, or anything in between, we're honored that you're considering SH Scientific as a potential partner. We look forward to a lasting relationship in support of your innovation and discovery.

A BRIEF HISTORY OF
SH SCIENTIFIC