# Technical Note
# Dracal Technologies Inc

## RTD300 Long-Term Stability

## Document Information

**Document type:** Technical note
**Product:** RTD300 high-precision USB adapter for 2/3-wire Pt100 RTD probes
**Manufacturer:** Dracal Technologies Inc.
**Test period:** 2022-09-07 to 2026-02-24 (approximately 3.5 years)
**Date of issue:** 2026-10-30
**Revision:** 1.0

## Summary

Six RTD300 adapters were monitored continuously for approximately 3.5 years, each connected to a fixed high-precision 100 Ω resistor in place of an RTD probe. For a Pt100 sensor, 100 Ω corresponds to 0 °C. Readings were logged every 5 minutes with a resolution of 0.01 °C.

Over the full test period, the net change in reading of every unit was **at most +0.01 °C**, which is one logging increment. The average net change across the six units was **+0.009 °C**. No individual reading departed from the 0 °C nominal value by more than −0.01 °C or +0.02 °C.

These results describe the **adapter alone**. When estimating the long-term stability of a complete measurement chain, the drift of the RTD probe itself must be added, and it is generally the larger contribution.

## 1. Purpose and Scope

### 1.1. Purpose

Laboratory, industrial and OEM users often need a value for long-term drift to build a measurement uncertainty budget or to justify a recalibration interval. This note presents the results of Dracal's long-term stability test on the RTD300 adapter so that users can make that assessment with real data rather than a specification alone.

### 1.2. Scope

The test covers the RTD300 adapter electronics: excitation, analog-to-digital conversion, internal references and firmware conversion to temperature. It does not cover the RTD probe, its cable, or the effect of the user's installation. Results apply to the measurement point tested (100 Ω, equivalent to 0 °C).

## 2. Test Method

### 2.1. Units Tested

Six RTD300 adapters taken from regular production were tested in parallel. They are identified as Units 1 to 6 in this note.

### 2.2. Setup and Conditions

- **Input:** each adapter was connected to a fixed high-precision 100 Ω resistor. Per IEC 60751, a Pt100 element has a nominal resistance of 100 Ω at 0 °C, so a stable adapter should read 0 °C.
- **Environment:** the units operated in ordinary indoor room conditions. Ambient temperature was not actively controlled.
- **Acquisition:** one reading every 5 minutes per unit, logged with a resolution of 0.01 °C. This corresponds to about 344,000 readings per unit.
- **Data coverage:** 94 % of the theoretical 5-minute readings were recorded. The remainder is due to a few interruptions of the logging system, the longest lasting 28 days. No data were removed from the analysis.

### 2.3. Data Analysis

Three indicators were calculated for each unit:

- **Net change:** mean reading over the last 30 days of the test minus mean reading over the first 30 days.
- **Linear trend:** slope of a straight line fitted to the daily mean readings over the full period, expressed in °C per year.
- **Extreme readings:** lowest and highest single 5-minute reading over the full period.

## 3. Results

### 3.1. Summary Table

| Unit | First 30 days mean (°C) | Last 30 days mean (°C) | Net change (°C) | Linear trend (°C/year) | Min / max reading (°C) |
|---|---|---|---|---|---|
| Unit 1 | 0.009 | 0.011 | +0.002 | +0.0001 | 0.00 / +0.02 |
| Unit 2 | 0.000 | 0.010 | +0.010 | +0.0034 | 0.00 / +0.01 |
| Unit 3 | 0.000 | 0.010 | +0.010 | +0.0014 | 0.00 / +0.01 |
| Unit 4 | 0.000 | 0.010 | +0.010 | +0.0034 | −0.01 / +0.01 |

| Unit | First 30 days mean (°C) | Last 30 days mean (°C) | Net change (°C) | Linear trend (°C/year) | Min / max reading (°C) |
|---|---|---|---|---|---|
| Unit 5 | 0.001 | 0.010 | +0.009 | +0.0011 | 0.00 / +0.01 |
| Unit 6 | 0.000 | 0.010 | +0.010 | +0.0034 | −0.01 / +0.01 |
| All units | 0.002 (avg.) | 0.010 (avg.) | +0.009 (avg.) | +0.0021 (avg.) | −0.01 / +0.02 (overall) |

*Table 1. Long-term stability indicators for six RTD300 adapters at 100 Ω (0 °C), September 2022 to February 2026.*

## 3.2. Behaviour over Time

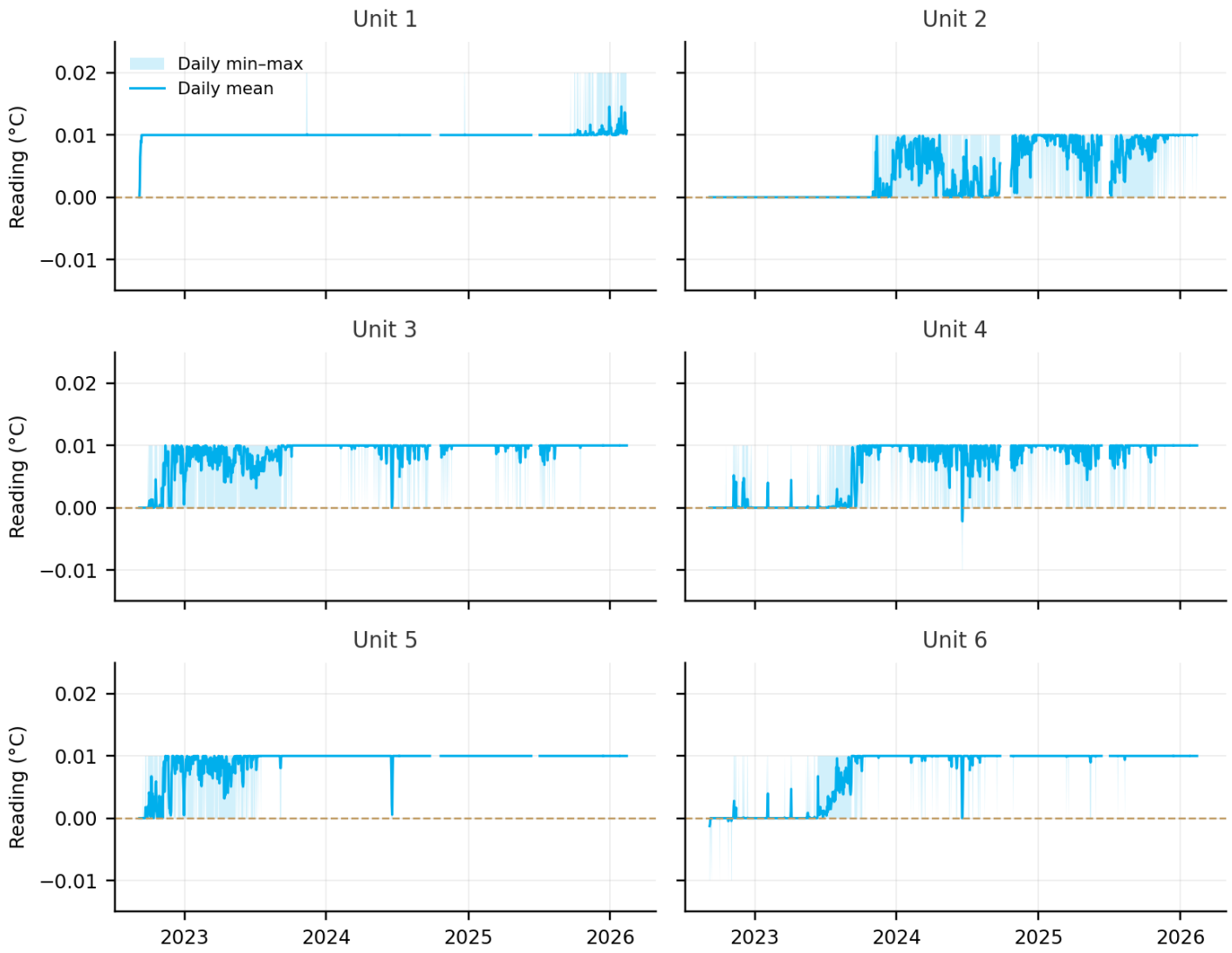



*Figure 1. Daily mean reading (line) and daily range of 5-minute readings (shaded) for each unit. The dashed line marks the 0 °C nominal value. Gaps correspond to logging interruptions.*

## 3.3. Observations

- **All six units ended the test within one logging increment of 0 °C.** Each unit shows a single step from 0.00 °C to +0.01 °C, occurring at a different time for each unit: within the first two weeks for Unit 1, within the first months for Units 3 and 5, around the end of the first year for Units 4 and 6, and

progressively during the second and third years for Unit 2.

- **The step appears gradually.** Before settling at +0.01 °C, each unit alternates between 0.00 °C and +0.01 °C for weeks or months. This is the expected signature of a very slow change crossing the 0.005 °C rounding threshold of the logged value, rather than a sudden shift.
- **Small seasonal variation.** Averaged across units, readings were slightly lower in late spring and summer than in winter. The pattern is consistent with a small influence of room temperature on the measurement, which was not controlled during the test. A short dip shared by several units in June 2024 points to the same kind of common environmental cause.
- **Unit 1 late readings.** Since October 2025, Unit 1 has occasionally read +0.02 °C, raising its last 30-day mean to 0.011 °C. Its net change from its very first reading is therefore about +0.011 °C, in line with the other units.

# 4. Interpretation and Limitations

The results show that the adapter's reading at 0 °C changed by about 0.01 °C or less over 3.5 years. Users should take the following limitations into account when applying these figures.

- **Logging resolution.** The RTD300 resolves 0.0001 °C, but this test logged values rounded to 0.01 °C. Changes smaller than about 0.005 °C therefore cannot be resolved for an individual unit, and the results are best read as an upper bound rather than an exact drift value.
- **Reference resistor included.** The result combines the drift of the adapter and of the 100 Ω reference resistor. It is therefore a conservative estimate for the adapter, unless the two drifts happened to offset each other.
- **Single measurement point.** Only 100 Ω (0 °C) was tested. Drift at other resistance values, in particular at high temperatures, may differ and is not covered by this note.
- **Sample size.** Six units describe the typical behaviour of the product and show good unit-to-unit consistency. They do not establish a statistical limit for the whole production population. These values are typical results, not a guaranteed specification; the RTD300 datasheet remains the reference for guaranteed performance.
- **Uncontrolled environment.** Room temperature variations contribute to the readings, as shown by the seasonal pattern. The drift attributable to ageing alone is therefore likely no larger than the values reported here.

# 5. Guidance for Users

## 5.1. Uncertainty Budgets

Where the drift of the adapter must be included in an uncertainty budget, one conservative approach consistent with the GUM (JCGM 100:2008) is to treat it as a rectangular distribution with a half-width of 0.01 °C over a 3.5-year period. This gives a standard uncertainty of 0.01 / √3 ≈ 0.006 °C for the

adapter. The final choice of model remains the responsibility of the user's quality system.

### 5.2. Include the Probe

The drift of the RTD probe must be evaluated separately and added to the adapter contribution. Probe drift depends on the probe construction and on its use: exposure to high temperatures, thermal cycling, mechanical shock and vibration are the main factors. In most applications it is larger than the adapter drift reported here.

### 5.3. Periodic Verification

A periodic check of the complete measurement chain (adapter and probe together) at a known reference point, such as an ice point prepared according to ASTM E563, is a simple way to confirm stability between calibrations and to support the chosen recalibration interval.

## 6. Manufacturing Practice

Before calibration and shipping, every Dracal instrument undergoes a 60-day burn-in period. This step allows early component settling to take place at the factory rather than in service, which maximizes long-term stability once the instrument reaches the customer.

## 7. Conclusion

Over approximately 3.5 years of continuous operation, six RTD300 adapters connected to a fixed 100 Ω resistor showed a net change of at most +0.01 °C at 0 °C, with an average of +0.009 °C and consistent behaviour from unit to unit. The adapter is therefore a minor contributor to the long-term drift of a typical RTD measurement chain; the probe should be the main focus of any long-term stability assessment.

Additional details on this test are available on request from Dracal technical support at support@dracal.com.

## References


- IEC 60751:2022, Industrial platinum resistance thermometers and platinum temperature sensors. International Electrotechnical Commission.
- JCGM 100:2008, Evaluation of measurement data – Guide to the expression of uncertainty in measurement (GUM). BIPM.
- ASTM E563, Standard Practice for Preparation and Use of an Ice-Point Bath as a Reference Temperature. ASTM International.