MIJ-NLTP
IC Temperature Probe
Nonlinear Version
High precision thermometer MIJ-NLTP

Feature

- Accuracy ±0.05℃ that exceeds Pt100 Class AA standard
- High sensitivity -0.1939℃/mV
- Fast response t63.2=2.6 seconds at Static Water
- Low power consumption 27.6μW(Overall, Max)

Applications

- Weather
- Soil
- Soil physics
- Outdoor and indoor environment measurement

Overview

The high-precision thermometer MIJ-NLTP by simply applying a power supply voltage and outputting a voltage and MIJ-NLTP realizes high-precision temperature measurements. It can be used at temperatures other than atmospheric temperature, soil temperature, and high temperatures that do not exceed 120 ° C.Generally, it is a standard practice to use a resistance temperature detector (platinum thermometer) to measure temperature with high accuracy, but since it is a principle to use the temperature characteristics of the resistance value of Pt as it is as a thermometer, it is actually used.In atmospheric measurements, with a Pt100 probe with a wind speed of 0 m / s and an outer diameter of 3 mm, the error due to self-heating when a current of 1 mA is passed is often +0.1 degrees (De Podesta et al. [1]). This issue is historically ignored and still ignored now on. Since the mid point of the calibration of Pt100 is performed in water, the above error exists in the atmosphere even if it is Pt100 after calibrationdue to the difference in heat capacity between air and water. With Pt1000, the current consumption is equivalent to 10 times that of Pt100, so it cannot be ignored. This issue can only be reduced by reducing power consumption and cannot be improved with a resistance type thermometer.MIJ-NLTP reduced power consumption to 12μA (temperature sensitive part.). It means self-heating be +0.0012 degrees.
+0.1(degree) * {12*10^6(A) / 1*10^3(A) = 0.0012(degrees)
In addition, it requires the incorporation of external wiring such as full or half bridges and shunt resistors, making the connection to the data logger a complex task. Or use a dedicated data logger compatible with Pt100, which is generally expensive and not versatile. MIJ-NLTP is a next-generation IC thermometer capable of high-precision temperature measurement, and can be easily connected to a general-purpose data logger without the need for such complicated work.

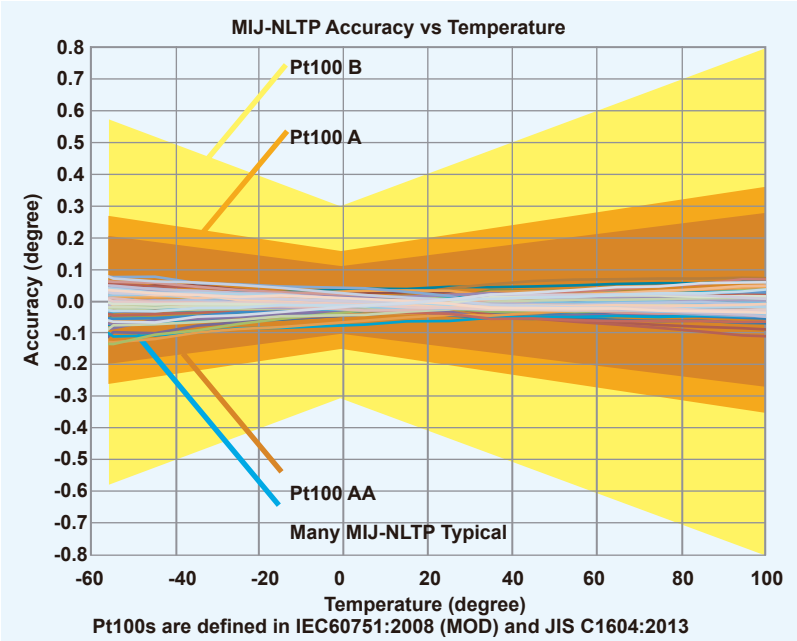
Reference:

M. de Podesta, S. Bell, R. Underwood, Air temperature sensors: dependence of radiative errors on sensor diameter in precision metrology and meteorology,Metrologia 55 (2018) 229–244. [1]

Strong Points

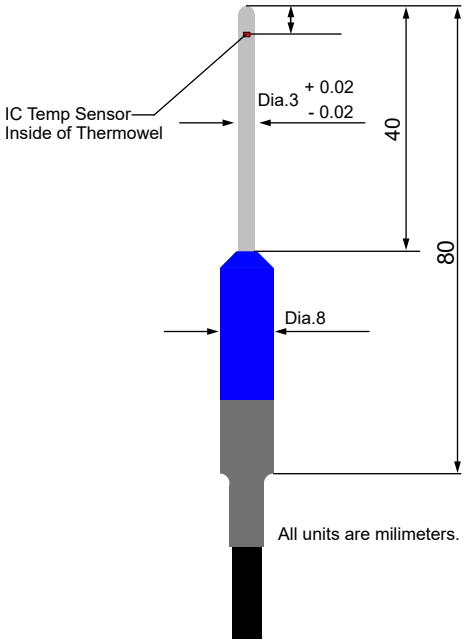
- Measurement accuracy ±0.05℃ (typical at 20～40℃), ±0.12℃ (-60～100℃)
- The temperature measuring part is φ3 x 40 mm SUS Thermowell, which realizes low heat capacity by making it thin and short.
- The IC built into the tip is 12 μA x 2 V = 24 μW (Max). Low self-heating of temperature measuring part.
- Output range from 520 to 1375 mV. Ideal for the measurement range of many general purpose data loggers.
- Resin is used for materials other than thermowell. Reduces the effects of radiant heat from the outside.
- Measurement accuracy over the measurement range of -55 to 110 ° C also exceeds the Pt100 Class AA standard (JIS C 1604: 2013).

NLTP Accuracy vs Temperature



Pt100s are defined in IEC60751:2008 (MOD) and JIS C1604:2013

Size



EMJ collaborated with CSE

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Temperature Calculation

The voltage output for NLTP temperature is given in True Temp (deg.) This temperature characteristic is not a linear relationship, but is expressed as a cubic expression as a result of calculation by the least squares method.

・Optimal cubic equation at -20 to 110 ° C(Eq.A)
Temp (℃) = -0.000000001809628*(mV)^3-0.000003325395*(mV)^2-0.1814103*(mV)+205.5894
・A linear formula that can be easily used at -20 to 110 ° C(Eq.B)
Temp (℃) = -0.1939*(mV)+212.81

We have prepared an **NLTP Calculation Sheet** that allows you to easily perform calculations simply by inputting the voltage output. It can be downloaded from our website.
Since the calculation error is the smallest, especially between -20 and 110 ° C, the calculation error is 0, so Eq.A is recommended when measuring the temperature in the natural environment. If you want to perform simpler operations, please use Eq.B.
You can check the details of this product error on our website.

Specification

Measurement principle	CMOS-Integrated Circuit
Measurement accuracy	±0.05℃ (typical at 20～40℃) ±0.12℃ (-60～100℃)
Self-heating error at static air	+0.0012 degrees
Measurement range	-55 to 110℃
Response speed	τ(63.2% at static water) = 2.6 seconds τ(63.2% at static sir) = 85.1 seconds
Raise speed	600μ seconds(0.0006 seconds, time from power-on to stable output)
Shap	Overall length 80mm (including temperature sensitive part 40mm, not including cable) Body diameter φ8 mm, temperature sensitive part diameter φ3 mm
Materials	Body: POM, Temperature sensitive part: SUS304
Cable length	Standard 5meter (Extension can be specified as an option)
Cable diameter	Outer diameter φ4.6mm, conductor AWG22(0.64mm, 0.32mm2)
Output voltage range	1375.219mV at -55 ℃, 520.551mV at 110 ℃
Power supply voltage range	Can be used with 2.5 to 30VDC and continuous voltage application
Power supply current	13.8μA max (Power supply circuit 1.8μA + temperature sensitive part 12μA)
Weight	approx.166g（Including 5m cable）
Pin wiring	Red/Preheat(Power), White/signal, Black/GND(COM)
Preheat time	≧600μ seconds (0.0006 seconds)
Optional	NLTP-BTTKIT（External power supply） (Power box with switch+ CR2032battery + 2 & 3 pole one-touch connector Battery Life：1.8 year (when supplying continuous power）

NLTP-BTTKIT(Option)

Equipped with ON / OFF switch

Data Logger

MIJ-12 waterproof (1ch)

MIJ-01 Multichannel (DIFF 8ch SE 16ch)

Compatible with third-party loggers (Logger must have functiion of Input F.S.0~5V)

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