GOM-7804/7805 –
DC Milli-Ohm Meter

Temp function (TEMP/TC/TCONV) with/without PT-100

Simply Reliable

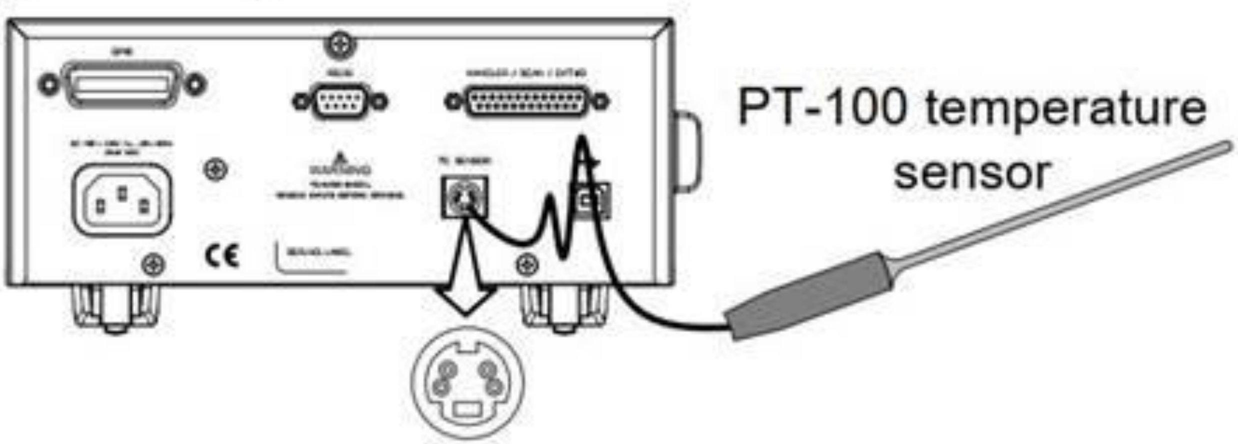
PT-100

PT-100 is temperature senser to detect ambient temperature.

It is mainly used on **Temperature Measurement/Temperature compensation/Temperature conversion function** of GOM-7804/7805.

Below is photo about how it connect with GOM.

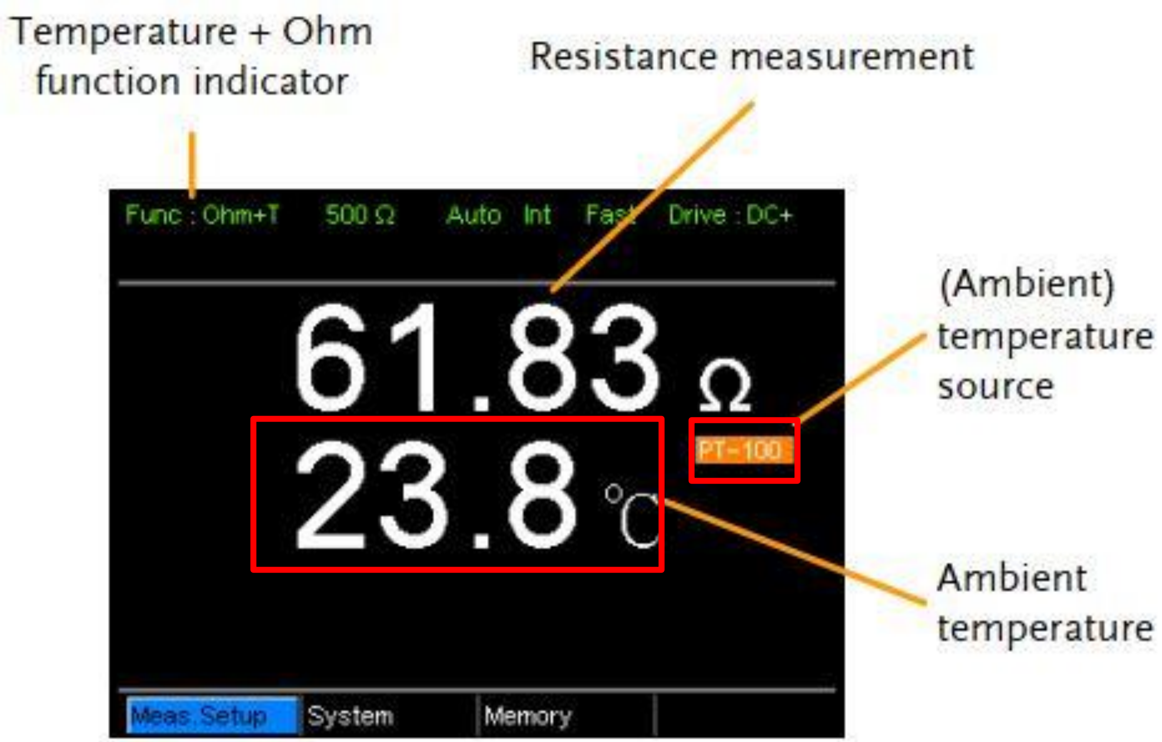
The temperature sensor uses the rear panel TC Sensor port for input.



Temperature Measurement (Ohm+T)

It must use PT-100 to measure the temperature.

But it would not affect any result of resistance measurement.



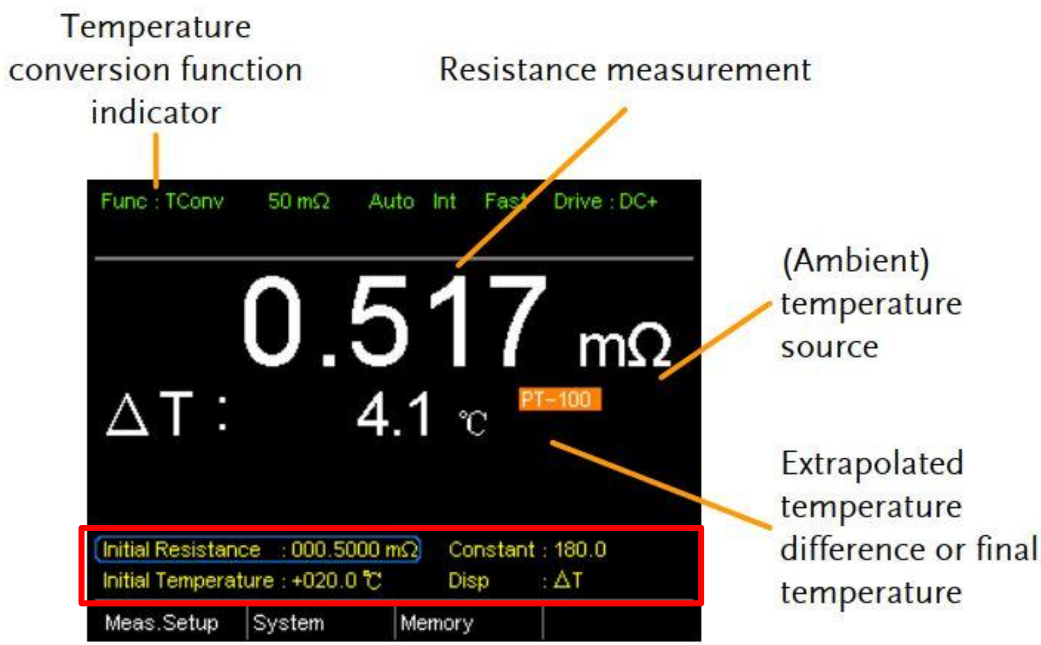
The temperature is displayed on the Ohm display.

Temperature conversion(TConv)

Use to determine the temperature change(△T) or final temperature (T) of a DUT at any given resistance.

(T) Final temperature = $t_2 = \Delta T + T_A$

To use this function, you need to set the **initial resistance/initial temperature of the DUT and the inferred zero resistance temperature of the DUT.**



Temperature conversion(TConv)

This function use to determine the temperature change(△T) or final temperature (T) of a DUT at any given resistance which works on the following formula:

$$\frac{R_2}{R_1} = \frac{t_0 + t_2}{t_0 + t_1}$$

Where:

R_2 = resistance @ temperature t_2

R_1 = resistance @ temperature t_1

t_0 = inferred zero resistance temperature in °C**

t_1 = temperature at R_1

t_2 =temperature at R_2

*(T) Final temperature = t2 = ΔT +TA

(TA) Ambient temperature = Ambient temperature when R2 is measured.

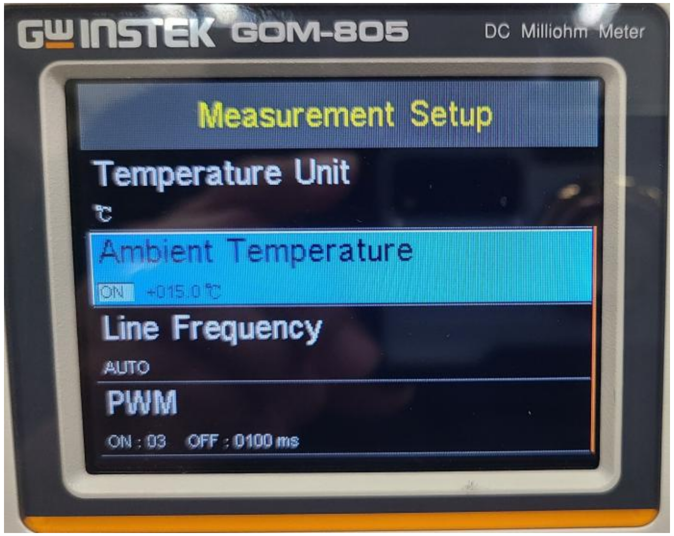
TA can either by **manually measured with the PT-100 sensor** or **it can be manually set.**

(ΔT) Extrapolated temperature difference = T – TA

Temperature conversion(TConv)

For example, the initial resistance of DUT is **5mΩ(R_1) at 10℃(t_1**, initial temp.) and constant **235** (**t_0**, inferred zero resistance temperature of copper)

Ambient temp can be set by manual or real read by PT-100(when ambient temp setting OFF). Here, we the **measured ambient temp by PT-100 is 21.6℃(temp function)** or **set Ambient temp at 15℃**



Temperature conversion(TConv)

We got reading **around 4.228 mΩ(R_2)** from DUT now and this function would auto display the calculated temperature change**(△T= calculated DUT temp according to above setting- Ambient temp)**

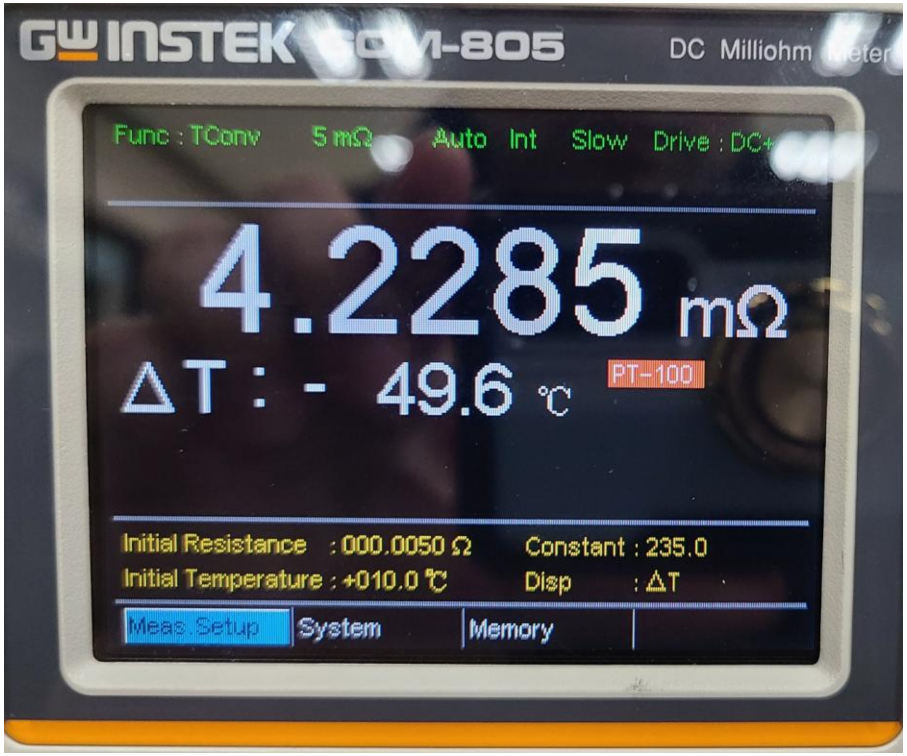
The calculated △T is -49.6℃ **when use PT-100.(** ambient temp TA is around 21.7℃)

4.228/5 = (235+(△T+TA))/(235+10)

1035.86 = 1283.5+ 5x △T

△T ≈ -49.4 ℃ ~ -49.6 ℃

(resistance/temp reading is varying)



Temperature conversion(TConv)

We got reading **around 4.228 mΩ(R_2)** from DUT now and this function would auto display the calculated temperature change**(△T= calculated DUT temp according to above setting- Ambient temp)**

The calculated △T is -42.8℃ **when set ambient temp at 15℃**

4.228/5 = (235+(△T+TA))/(235+10)

1035.86 = 1250+ 5x △T

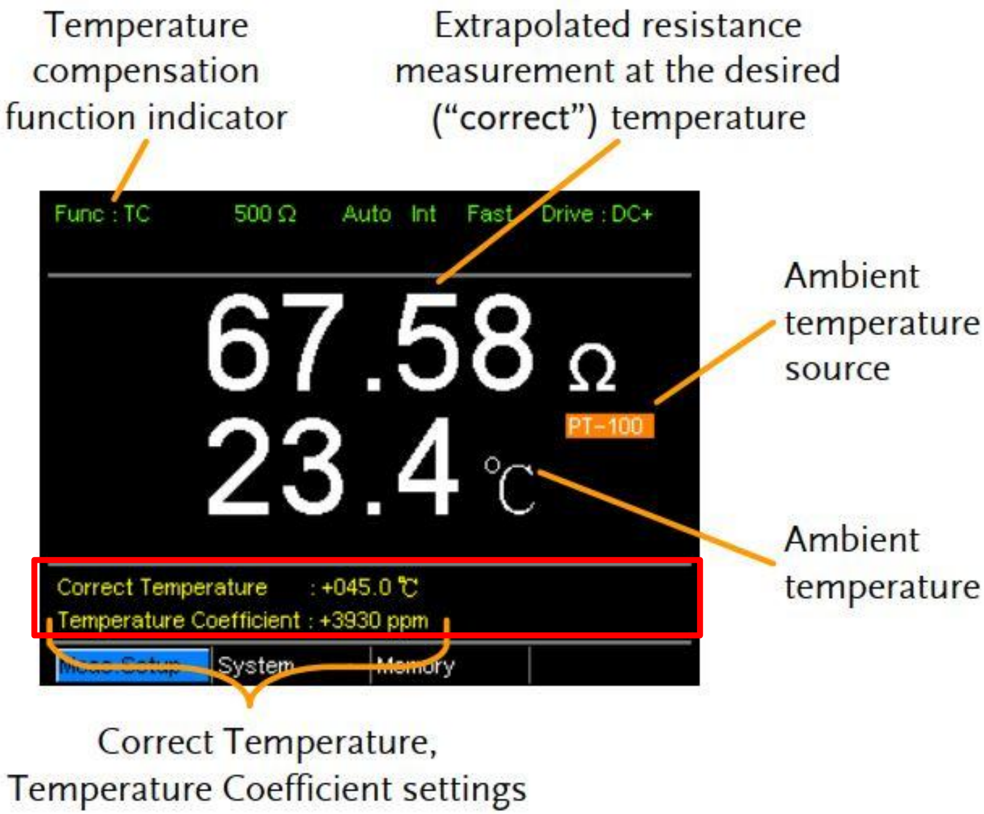
△T ≈ -42.8 ℃

(resistance reading is varying)

Temperature compensation(TC)

This function can **simulate the resistance of a DUT at a desired temperature**.

If the ambient temperature and the temperature coefficient of the DUT are known, it is possible to determine the resistance of a DUT at any temperature with this function.



Temperature compensation(TC)

This function works on the following formula:

$$R_{t0} = \frac{R_t}{1 + \alpha_{t0}(t - t_0)}$$

Where:

R_t = Measured resistance value (Ω)

R_{t0} = Corrected resistance value (Ω)

T_0 = Inferred absolute temperature

t_0 = Corrected temperature (°C)

t = Current ambient temperature (°C)

a_{t0} = Temperature coefficient of resistance at the correct temperature. $a_{t0} = \frac{1}{|T_0| + t_0}$.

To use this function, you need to set the temperature coefficient(a_{to}) of the DUT, ambient temp(t, if set by manual) and desired temperature(t_0 , correction temperature setting)

Temperature compensation(TC)

To use this function, you need to set the temperature coefficient(a_{to}) of the DUT, ambient temp(t, if set by manual) and desired temperature(t_0, correction temperature setting)

For example,

I want GOM to simulate the resistance of DUT(copper in here) at 40℃ (t_0).

The temperature coefficient of copper is +3930ppm (a_{to}). The setting as below.

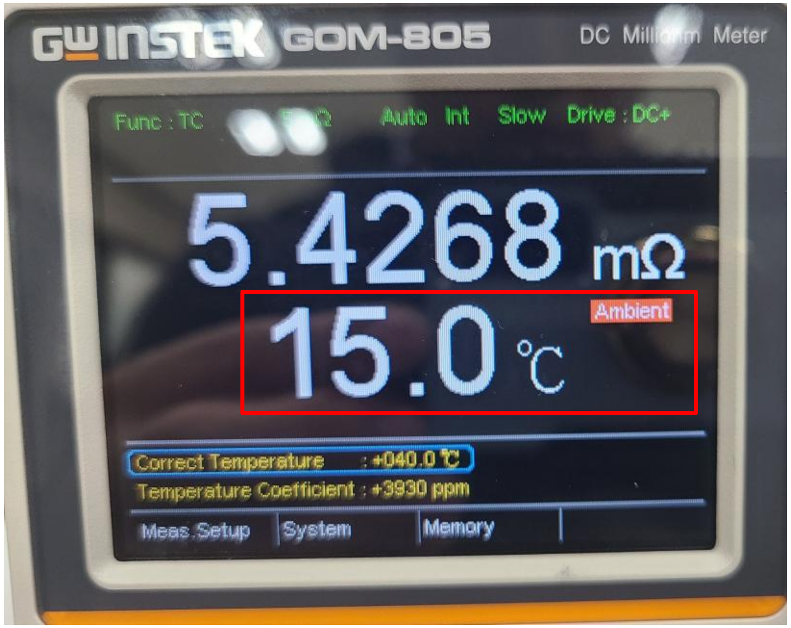
Temperature compensation(TC)

Now, I measure the resistance of DUT. It is actually is around 4.89 mΩ.(R_t)

If we set ambient temp at 15℃, we got 5.4268 mΩ reading.

It means the resistance of DUT would be **5.4268 mΩ at 40℃**.

R_{t0} = 4.89/(1+ 3930ppm * (15-40)) = 5.4268 mΩ



Temperature compensation(TC)

Now, I measure the resistance of DUT. It is actually is around 4.899 mΩ.(R_t)

If we got ambient temp via PT-100 which is 21.5℃, we got 5.2841 mΩ.

It means the resistance of DUT would be **5.2841 mΩ at 40℃.**

R_{t0} = 4.899/(1+ 3930ppm * (21.5-40)) ≈ 5.2841 mΩ