OBSERVATOR
instruments

Application note

Temperature calibration

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Document history

The Observator range is in continuous development and so specifications may be subject to change without prior notice. When in doubt about the accuracy of this document, contact the Observator Group.

Reference documents

Type of document / tool	Product type and name (incl. url)
Application note	Pressure calibration
	Shroud installation
	Temperature calibration
	Wiper replacement

Revision history

Date	Amendments	Company, position
2018-03-11	Initial document creation	Observator Australia, Document Controller
2018-04-09	Introduced document control	Observator Australia, Document Controller
2019-04-12	Added missing caption	Observator Australia, Document Controller
2019-07-01	Quality review	Observator Australia, Operation Manager
2020-01-30	Updated document format	Observator Australia, Document Controller
2020-03-08	Updated feature section	Observator Australia, Document Controller

Procedure sign-off:

Date	Company, position	Status
2018-04-09	Observator Australia, Document Controller	Finished
2019-12-06	Observator Australia, Managing Director	Approved
2020-03-03	Observator Group, Communication Officer	Approved

Distribution list

Date	Company, position

Table of contents

1 Features in secondary sense options

The NEP-5000 can offer temperature and liquid pressure measurements as secondary options. This document is an application note for NEP-5000 sensors external temperature option calibration (when selected by the customer). This application note explains how to calibrate the temperature sensor on NEP-5000 Analite series turbidity probes.

The built-in temperature option can offer temperature measurement range from -5˚C to +45˚C and can provide accuracy of ±0.5˚C.

When ordered with the temperature option, the sensor will be built into the optical face. Temperature measurement can only be read from Serial Digital Interface (SDI-12), free-flow and polled-mode output options.

- In SDI-12 mode, the temperature measurements will be updated when invoked by (aM6!) command.
- In Free-flow mode, the temperature measurement will be automatically measured every 1 second and applied to the output sentence.
- In Polled-mode, the temperature measurement will be updated when invoked by “Read” command or “Measure” command.

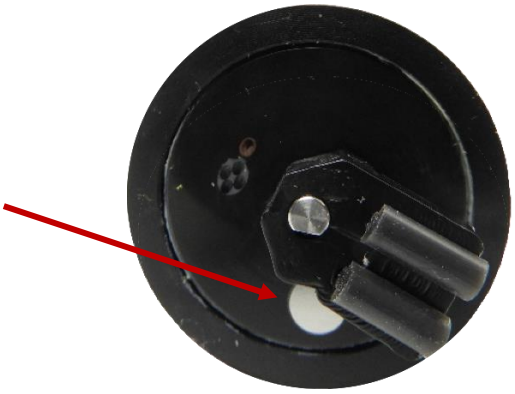

Figure 1.A: Temperature sensor

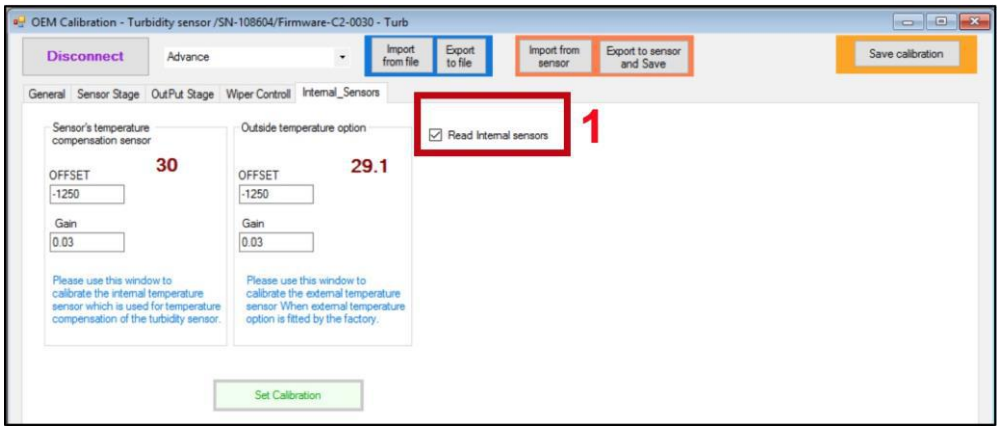

Figure 1.B: Test and calibration window for the internal and external temperature sensor

2 Temperature calibration

Due to the time and resources demand required by this procedure, it is recommended to calibrate 4 or more sensors at each cycle.

2.1 Pre-requests (instruments and items)

1. A temperature bath that has the following specification.
   - Liquid that stays liquid in -80C minimum.
   - The temperature bath must be able to maintain temperature stability of +0.10C or better.

2. A temperature reference that has a total calibrated accuracy of +0.20C.
   - Recommended Resistance Temperature Detector (RTD) sensor that meets above ie. a fluke 5627A.
   - To read a fluke 5627A, use any meter that follows PT100 385 RTD curve.

2.2 NEP-5000 calibration procedure

1. Place the sensor in to the temperature bath (without touching the side walls of the bath) and mount the 5627A temperature reference near the sensors in calibration.

2. Set the temperature bath to 0°C and wait until the bath reaches to 0°C. Verify using the reference temperature sensor.
3. Allow 10 to 15 minutes for the sensor to fully reach the bath temperature.

4. Connect the NEP-5000 sensor that is under calibration, to its calibration software. Click “Internal Sensors”. Under the heading “Outside temperature option”, set the “OFFSET” value to 0 and the “Gain” to 1. Then click “Set Calibration” and click “Save Calibration”.

Note: This action will displays temperature raw value in temperature display box.

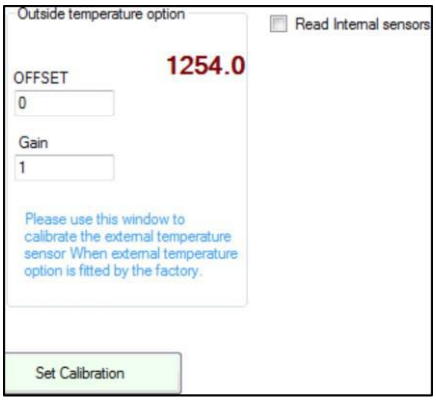

Figure 2.A: Set calibration

5. Read the temperature raw value by ticking the “read internal sensors” tick box.

Type this raw value in to the “offset” box as a negative value (if read value is 1,025, then type in to the box as -1,025). The new raw value must red as 0 +10.
Note that if the new raw value is not within 0 +10 or noise level is higher than +3, please reject the sensor or retry step 4. This is the 0°C offset value of the calibration.

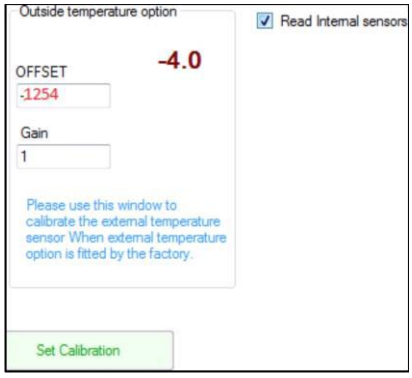

Figure 2.B: Type raw value in offset box

6. Click “Set Calibration” and click “Save Calibration”.

7. Set the temperature bath to 220C and wait until the bath reaches 220C. Verify using the reference temperature sensor.

8. Allow 10 to 15 minutes for the sensor to fully reach the bath temperature.

9. Read the temperature raw value by ticking the read sensor tick box. Use this new raw value in this equation and calculate the gain value.

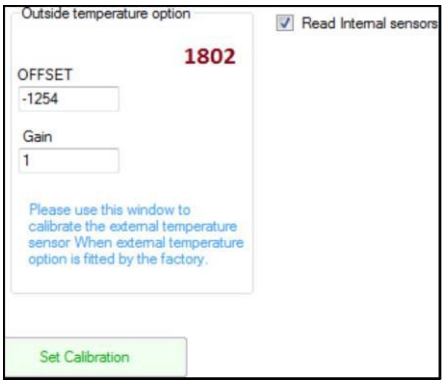

Figure 2.C: Read temperature raw value

$$Gain = \frac{22(Current\ Ref\ temperature)}{1802}$$

$$Gain = 0.0122$$

10. Enter the newly calculated gain value to the “Gain” box and click “Set Calibration” and click “Save Calibration”. Type up to four factional values (x.xxxx).

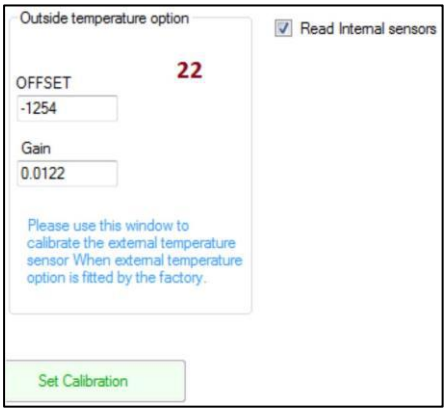

Figure 2.D: Enter gain value

Note: After entering the newly calculated gain value, the temperature now reads the same as the bath temperature or reference temperature.

Populate calibration verification table.

The following table must be included in the final turbidity calibration sheet.

Test temperature	1°C	11°C	22°C	32°C	42°C
NEP-5000 temperature readout value	1.1°C	10.8°C	22.1°C	32.5°C	42.4°C

Test temperature	1°C	11°C	22°C	32°C	42°C
NEP-5000 temperature readout value	1.1°C	10.8°C	22.1°C	32.5°C	42.4°C

All the recoded values must be matched with the fluke 5627A and readings must be within the NEP-5000 temperature option specification.

$$\text{Total error must be within } = \pm 0.5^{0}C$$

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