

# AMS 2750 G SUMMARY

By: Illiana Instrumentation

Revised 10/11/23

We have created this summary sheet as a quick reference to the requirements of AMS 2750 G encountered in most commercial heat treat facilities. We highly recommend that you refer to the full copy of the specification for complete details.

1 SCOPE defines the scope of the document. It describes what it covers.

2 REFERENCES list a bunch of related documents.

2.2 DEFINITIONS Is a very useful list of definitions. If you do not know the difference between a Modification offset and a Correction offset this is your place to learn about them. I highly recommend that you read all the definitions. There is a wealth of information in this section.

3 TECHNICAL REQUIREMENTS Starts to move into the heart of the specification. There are literally about 8 pages that define all the requirements for temperature sensors. These are primarily thermocouples in the heat treat industry.

3.1 TEMPERATURE SENSORS must be calibrated per table 1. This includes the thermocouples permanently installed in your furnace.

Sensor	Use	Sensor Type		Calibration/period	Calibrate Against	Max permitted error
TUS	TUS	Base or B,R,S		Before first use	Primary or secondary std	Type R,S +/- 1 deg F or 0.1%
SAT	SAT	Base or B,R,S		Before first use	Primary or secondary std	Base metal +/- 2 deg F or 0.4%
Control, Recording, Monitoring	Installation in equipment	Base or B,R,S		Before first use	Primary or secondary std	

Table 1 (Partial data only)

The following is a summary of temperature sensors requirements.

Temperature sensors must be calibrated before use. Calibration certificates must include an extensive amount of data as listed in paragraph 3.1.11.1 It is suggested that you purchase thermocouples from a reputable supplier familiar with AMS 2750 and specify that their certificate shall meet the requirements. You will need to provide the supplier with your intended use range.

*FURTHER INFORMATION: You will need to keep records documenting that all thermocouples were properly calibrated when purchased and where they were installed. We also highly recommend a*

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*documented calibration replacement program be implemented to thermocouples are replaced on a regular basis on operational temperature and usage.*

## 3.2 INSTRUMENTATION

There have been extensive changes to the accuracy requirements and recorder resolution requirements in revision F and G. These are summarized in table 7.

Instrumentation shall be calibrated, and measurements shall be traceable to NIST or other national standards.

A few of the huge changes are:

- Paper recorders are no longer allowed! (3.2.3.1)
- Digital recording instruments shall have a 0.1 degree F or C resolution (3.2.3.2)
- High limits need to be calibrated annually.

Table 7 is a great summary of calibration requirement and is highlighted in summary here.

Instrument	Inst. Type	Max calibration period	Standard	Calibration accuracy	Use
Field test inst.	SAT/TUS portable digital inst. Or data recorder.	Quarterly	Primary or secondary standard	+/- 1 Deg F or 0.1% or reading	Limited to inst. Calibration, SAT, TUS.
Controlling, overtemperature, recording, data acquisition instrumentation	Digital instrument	See note	Field Test	+/- 2 degrees F or 0.2% reading	Limited to control and recording, controlling temp. of thermal processing equip.

TABLE 7 SUMMARY Instruments and Instrument Calibration

Calibration frequency shall be (per table 7 footnotes)

Furnace Class	Calibration Interval
Class 1	Monthly
Class 2	Quarterly
Class 3	Quarterly
Class 4	Quarterly
Class 5	Semi-annually

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Class 6	Semi-annually
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Paragraph 3.2.3.4 indicates that calibration shall be performed at a minimum of 3 simulated sensor inputs shall be used at minimum, midpoint and maximum of the furnace qualified operating temperature range. Both as found and as left readings shall be documented.

Paragraph 3.2.3.9 indicates that each channel of a multichannel shall be calibrated if they can be altered. Basically, because the new modern recorders and data acquisition equipment can be biased on a point-by-point basis, the only way to know if every channel is correct is to check them all.

## 3.2.5 Instrumentation Calibration Results and Records

### **A calibration sticker shall include:**

- Instrument number or furnace number
- Date of calibration
- Due date of next calibration
- Technician
- Any limitations or restrictions

### **Calibration report shall include:**

This is an extensive list running from letter A to Q. A few key items are:

- Instrument number or furnace number.
- Make and model of instrument.
- Unique ID of test instrument used.
- Method of calibration.
- Statement of required accuracy.
- As found (initial) and as left (final) data for each calibration point.
- Correction and modification offsets as found and as left.
- Instrument calibration pass or fail Statement .
- Any limitation or restrictions.
- Calibration data and calibration due date.
- Traceability statement.
- Identification of technician and Calibration company (if not performed in house).
- Approval of an authorized agent for the calibration company (if not performed in house).
- User Quality organization approval.

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Paragraph 3.3 begins to address thermal processing equipment.

You need to decide what class your furnace will be qualified to as many of the specifications change based on furnace class. Choose carefully as better classes carry much stricter requirements.

Furnace class \_\_\_\_\_

Furnace Class	Temp. Uniformity Range Deg F	Temp. Uniformity Range Deg C
1	+/- 5	+/ 3
2	+/ 10	+/ 6
3	+/ 15	+/ 8
4	+/ 20	+/ 10
5	+/ 25	+/ 14
6	+/ 50	+/ 28

Table 8 Furnace Classes

Instrumentation is broken down into types as well in table 9.

The type of instruments you have together with the Class of furnace and type of work you are performing will dictate many things. These include:

How often you need to perform SAT's and what their requirements will be. Tables 11 and 12.

How often you need to perform TUS's and what their requirements will be. Tables 15 and 16.

The Tables are simply too big and too complex to include here. They are contained in the full version of AMS 2750 which you will need to obtain. SAE.com to order.

3.4 begins to address System Accuracy Test requirements. They are extensive. To summarize you need to put a calibrated test thermocouple in close proximity with your control thermocouple, read the test thermocouple on a test instrument, and compare it's reading to that of your temperature controller. This is basically checking to make sure your sensor and instrument reading agree with the reading on the test sensor and test instrument.

That is an oversimplification but is the general procedure. A few new changes to revision F and G require that your test instrument have a resolution of 0.1 degree. Many of the older instruments used will not meet this requirement.

Many of our customers have begun to use type N thermocouples for SAT testing as type K thermocouples have some restrictions about insertion depth that type N thermocouples do not. See

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paragraph 3.1.7.1 which says basically if you stick a type K thermocouple in your furnace to a depth of 30 inches once, you can no longer use it at a depth of less than 30 inches. So, if your control thermocouples are different lengths, a type N SAT thermocouple is the way to go.

Paragraph 3.5 begins to describe the process of performing a Temperature uniformity survey or TUS. There are about 10 pages dedicated to the details of performing a TUS. Basically, it involves inserting temperature sensors throughout your furnace. The furnace is then run at various temperatures that you would be using in typical production and data is gathered. This data is reviewed to make sure all locations within your furnace where you put production parts are within the desired temperature.

There are extensive requirements about the test instrument calibration and accuracy which were discussed earlier. Similarly, there are extensive requirements about the calibration of the thermocouple wire use and how and when it can be reused. As of the latest revision of AMS 2750 any use of expendable TUS wire over 1200 degrees results in the need to scrap the wire.

3.5.16 TUS results and records describe the requirements for the TUS report. Letters A to Z outline the items that need to be in the report. It is an extensive report with very specific requirements.

After you determine the Calibration, TUS, and SAT frequency you need to perform them on a regular basis and keep detailed records.

4 outlines Quality Assurance Provisions. The big change in the latest revisions is that paragraph 4.2 requires Third party pyrometry service providers to be accredited to ISO 17025 from and ILAC recognized cooperation body. This means if you are using an outside pyrometry company need must be accredited to ISO 17025.

## About Illiana Instrumentation Service LLC

We have a great deal of expertise with this specification, and we can provide a wide variety of services to help you comply with this specification in part or in whole. We are accredited to ISO 17025 by A2LA.

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