

## AMS 2750 D, NADCAP, FDA, RPS

The AMS 2750 D (Aerospace Material Specifications) is a standard for the processing of materials in aviation and aerospace industry which has been increasingly applied in the automotive industry as well. The standard describes in detail the requirements for thermal processing systems:

- Temperature uniformity in the useful space
- Instrumentation (specification of the measurement and control instruments)
- Inspection cycles of temperature sensors including documentation of the inspection cycles
- Inspections of system precision

Adherence to the standard's rules is necessary to ensure that the required quality standard of the components to be manufactured can be reproduced in serial production. For this reason, extensive and repeated inspections as well instrument testing, including the relevant documentation, are required.

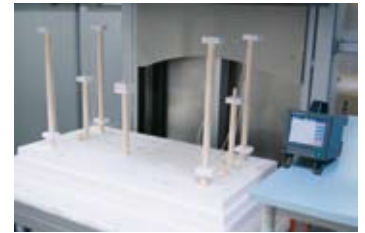
In principle, all the furnaces in Nabertherm's product range can be designed to comply with the AMS 2750 D specifications. They can even be designed on the basis of related standards, such as the RPS standard or FDA requirements. When information about the process, the charge, the necessary furnace class (1-6), and the type of instrumentation (A-E) is available, the respective furnace model can be designed for the individual heat treatment. This applies, for example, both for heat treatment of metal as well as for fiber composite materials which may also be covered by other standards. AMS 2750 D packages can also be offered as an upgrade for existing furnace systems – including furnace systems from other manufacturers.

The specifications contained in AMS 2750 D regarding instrumentation and furnace class can be summarized as follows:

Instrumentation	Type					Furnace class	Temperature uniformity	
	A	B	C	D	E		°C	°F
One thermocouple connected to the controller for each control zone	x	x	x	x	x	1	± 3	± 5
Record of the temperature measured by the control thermocouple	x	x	x	x		2	± 6	± 10
Sensors for recording the coldest and hottest positions	x		x			3	± 8	± 15
One charge thermocouple with record for each control zone	x	x				4	± 10	± 20
One over-temperature protection device for each control zone	x	x	x	x		5	± 14	± 25
						6	± 24	± 50

Depending on the quality requirements for the component to be heat-treated, the customer determines the type of instrumentation and the temperature uniformity class. The type of instrumentation describes the necessary combination of the control system used, the recording media and the thermocouples. The quality of the instrumentation used is determined by the required furnace class. The higher the furnace requirements are set, the more precise the instrumentation must be designed.

The furnace or the heat treatment system must be designed in a way that the requirements contained in AMS 2750 D can be met in a reproducible manner. The standard also mandates the testing intervals for the instrumentation (SAT = System Accuracy Test) and the temperature uniformity of the furnace (TUS = Temperature Uniformity Survey). The SAT/TUS tests must be carried out with measurement devices and sensors which work independently of the furnace's own instrumentation.



Measurement setup in a high-temperature furnace



Measurement setup in an annealing furnace

**Nabertherm Thermal Survey Report**

Survey report number: 001  
 Customer Address: [Redacted]

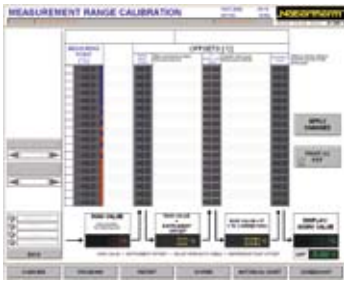
Nabertherm Identifier or Tag: 200811  
 Nabertherm Manufacturer: Nabertherm GmbH  
 Model No.: NUS 1643  
 Serial No.: 200811  
 Class Type: 20

Customer Test Procedure: AMS 2750D  
 Survey Date/Time start: 28 Jul 2008 @ 14:38:35  
 Survey Date/Time end: 29 Jul 2008 @ 17:18:52  
 Gate Source: Nabertherm-Neuburgstr. 12 D-91234  
 N. 250 Würzburg

Heat Survey Date: After installation  
 Survey Engineer: Roman Strohle  
 User: [Redacted]  
 Survey Result:

Signature: [Redacted]  
 Date: [Redacted]

# AMS 2750 D, NADCAP, FDA



## Implementation of AMS 2750 D

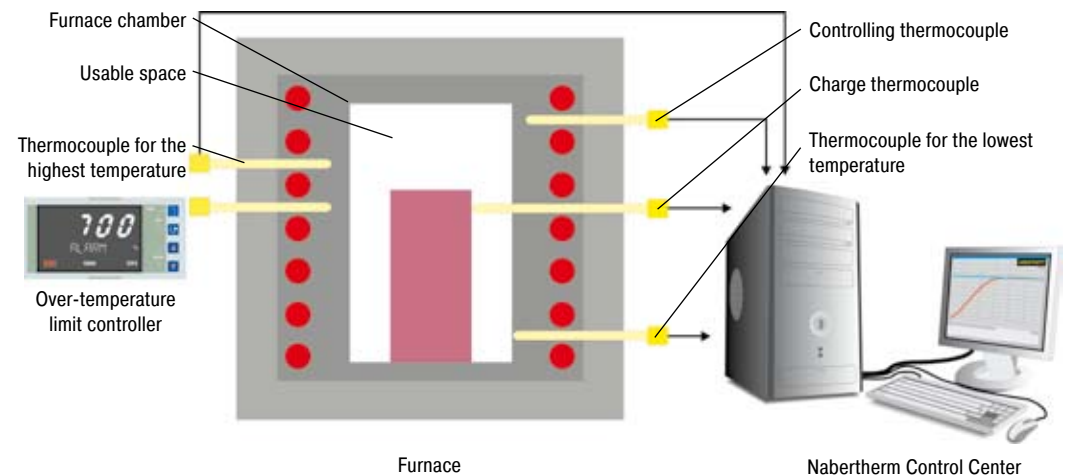
Basically, two different systems are available for control and documentation, a proven Nabertherm system solution or instrumentation using Eurotherm controllers/temperature recorders. The Nabertherm AMS package is a convenient solution that includes the Nabertherm Control Center for control, visualization, and documentation of the processes and test requirements based on PLC control.

## Instrumentation with Nabertherm Control Center (NCC) for Control, Visualization, and Documentation based on a Siemens PLC Controls

The attractive feature of the instrumentation with Nabertherm Control Center in combination with PLC controls of the furnace is the convenient data input and visualization. The software programming is structured in a way that both the user and the auditor can navigate it without difficulty.

In daily use, the following product characteristics stand out:

- Very easy to navigate and straight-forward presentation of all the data in plain text on the PC
- Automatic saving of the charge documentation at the end of the program
- Administration of the calibration cycles in the NCC
- Results of the measurement distance calibration are entered in the NCC
- Schedule management of the required testing cycles including a reminder function. The testing cycles for TUS (Temperature Uniformity Survey) and SAT (System Accuracy Test) are entered in days and monitored by the system and the operator or tester is informed in time about up-coming tests. The values of the tests are entered directly into NCC and saved as PDF files on the PC. There are no additional tasks involved in documenting the tests.
- Option of transferring the measurement data to a customer's server



Example of a design with Type A Nabertherm Control Center



The Nabertherm Control Center can be extended to enable a complete documentation of the heat treatment process apart from just the furnace data. For example, when heat-treating aluminum, in addition to the furnace, the temperatures in the quenching basin or a separate cooling medium can also be documented.

**Instrumentation for TUS Measurements as a Separate Model**

The TUS standard requires that the temperature uniformity of the furnace be tested with a TUS measurement at regular intervals. This measurement must be performed by an independent measurement system and not by the instrumentation used for process control. The testing intervals are filed in the NCC in days. The system reminds in time that a test must be performed.

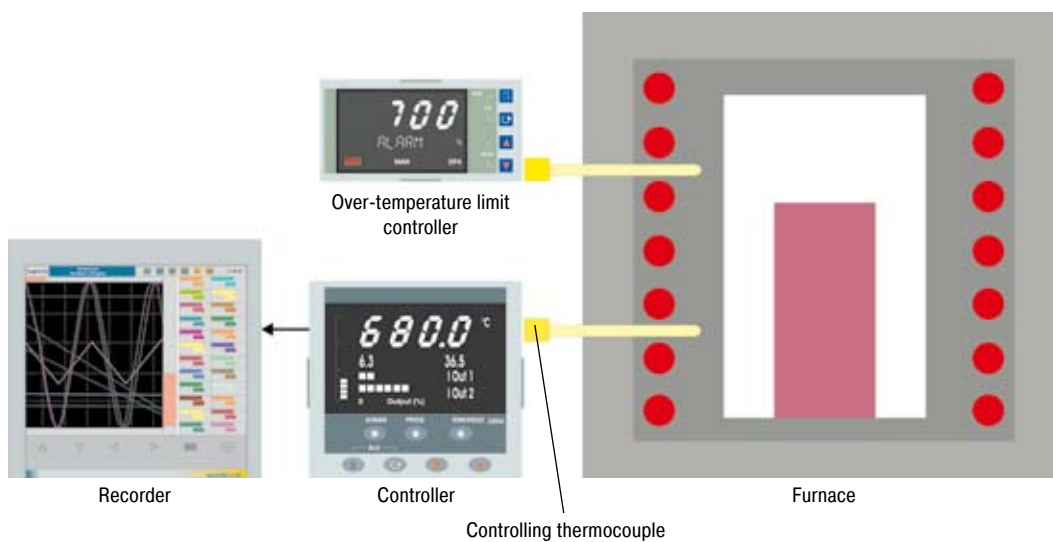
This test can be performed either using an independent temperature recorder (see page 64) with the customer's calibrated testing thermocouples or using the Nabertherm TUS module that is connected to the Nabertherm Control Center as a separate module.

The TUS module has its own PLC which converts the measurement results of the testing thermocouples. The evaluation, including an easy-to-navigate and simply log function, is then performed via the furnace's Nabertherm Control Center.



TUS module with ports for 16 thermocouples and PROFIBUS connection to the Nabertherm Control Center

**Alternative Instrumentation with Temperature Controllers and Recorders from Eurotherm**



Example of a design containing Type D Eurotherm instrumentation

As an alternative to instrumentation with the Nabertherm Control Center (NCC) and PLC controls, instrumentation with controllers and temperature recorders is also available. The temperature recorder has a log function that must be configured manually. The data can be saved to a USB stick and be evaluated, formatted, and printed on a separate PC. Besides the temperature recorder, which is integrated into the standard instrumentation, a separate recorder for the TUS measurements is needed (see also page 64).



N 12012/26 HAS1 according to AMS 2750 D