AMS2750H Pyrometry Solutions

Eurotherm™ provides a range of products, engineered solutions, and services throughout the world. Our specialist heat treatment know-how and embedded expertise can help you to save energy, improve material properties and reduce regulatory costs.

We provide scalable solutions that enable smart operations and help to reduce downtime.

Safer world

We help our customers to meet material property specifications and reduce regulatory costs.

Sustainable world

We help our customers reduce energy and manufacturing costs by providing scalable, high-reliability, power, and control solutions.

We have application expertise in:

- Control algorithms for temperature, atmosphere, vacuum, and energy management
- Electrical power control
- Furnace/oven process control and sequencing
- Recipe and setpoint management
- Batch entry and management
- Data historian and reporting
- Alarm management
- Plant and machine SCADA with customized operator interfaces
- Open IoT platforms to support Industry 4.0/IoT digital transformation
  - Augmented reality
  - Predictive maintenance
  - Remote monitoring
- OEM support
- Compliance: AMS2750H, CQI9, calibration, TUS, SAT
- System lifecycle and cybersecurity support services

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Heat treatment is a Nadcap℠ 'special process'. Any process that can change or alter a part's material or physical integrity by introducing stresses via mechanical, thermal, or chemical operations may be considered a special process and must be given particular care to avoid potential defects. AMS2750 was created to provide standardized pyrometry requirements (temperature measurement) in the heat treatment of products for the aerospace industry. Organizations need qualified employees and a well-documented set of procedures and approved equipment to provide evidence that proves both the procedure and results of each batch processed.

Nadcap acts as the approval body for 'special processes' for the aerospace industry and is administered by the Performance Review Institute (PRI). Regular audits are undertaken to ensure facilities meet the requirements. AMS2750 is also referenced in other special process standards and has been adopted in different forms for the automotive (CQI9), oil & gas, and other industries.

AMS2750H overview

The AMS2750 specification covers pyrometry requirements for equipment used in the thermal processing of metallic materials. The following provides an overview of the main sections addressed by Eurotherm products. Please refer to the AMS2750H standards for the full detail (www.sae.org).

Temperature sensors (section 3.1)

This section in the standard outlines the sensor job, use, type, calibration and accuracy requirements. The fig. 1 gives an example of common thermocouple types and accuracy requirements.

Thermocouple construction includes both expendable (any portion of the thermal element exposed to the process environment) and non-expendable thermocouples (thermal element protected from the process environment e.g., metal sheath).

Base-metal non-expendable load thermocouple usage is dependent on temperature.

Control thermocouple replacement period should be based on data from SAT, TUS, re-calibration, trend analysis and results.

Instrumentation (section 3.2)

This section outlines the instrument job, type, calibration and accuracy requirements. The fig.(s) 3 and 4 outline the key instrument type requirements supplied by Eurotherm. Recording instruments should be checked annually to the accuracy of ±1 min/h by an external timing device (timing device calibrated every 2 years to ±1 s/min). A possible alternative is to document digital synchronization to NIST (or equivalent) via satellite, internet, or phone (at least monthly) to support these accuracy requirements.

Thermal processing equipment (section 3.3)

This section defines the furnace class (1-6) uniformity tolerance and the instrumentation type (A-E).

SAT (section 3.4) describes a probe check to assess the variation from the control systems with an independent master thermocouple and field instrument. TUS (section 3.5) is used to assess the temperature variation within a qualified work zone with respect to setpoint temperature.

Fig. 1	Thermocouple accuracies
Type R, S	±1.0°F or ±0.6°C or ±0.1%
Type J, K, N	±2.0°F or ±1.1°C or ±0.4%

Fig. 2	Set temperature	
Usage period	°F	°C
One use	>2300	>1260
Quarterly or 10 uses	>2200 to ≤2300	>1205 to ≤1260
Quarterly or 90 uses	>1800 to ≤2200	>980 to ≤1205
Quarterly or 180 uses	>1200 to ≤1800	>650 to ≤980
Quarterly or 270 uses	>500 to ≤1200	>260 to ≤650
Quarterly or unlimited uses	≤500	≤260

Fig. 3	Instrument accuracies
Field test	±1.0°F or ±0.6°C or ±0.1%. Shall be digital and have a readability of 0.1°F or 0.1°C.
Control, recording instruments	±2.0°F or ±1.1°C or ±0.2%. Recording instruments shall be digital and have a readability of 0.1°F or 0.1°C.

Fig. 4	Calibration intervals
Field test	Quarterly
Control, recording instruments	Class 1 monthly Class 2,3,4 quarterly Class 5,6 semiannually Refrigeration and quench equipment calibration semiannually.

Furnace Class		
	°F	°C
1	±5.0	±3.0
2	±10.0	±6.0
3	±15.0	±8.0
4	±20.0	±10.0
5	±25.0	±14.0
6	±50.0	±28.0

Sensors per control zone	Instrumentation type					
	A	B	C	D+	D	E
Control	x	x	x	x	x	x
Recording	x	x	x	x	x	
Hot & Cold	x		x			
Load	x	x				
Additional Record				x		
Over-Temp	x	x	x	x	x	

Instrumentation to Help Meet AMS2750H

When subject to the necessary field calibration, the following instruments manufactured by Eurotherm are suitable for use in aerospace (Nadcap/AMS2750H) and automotive (IATF16949/CQI9 version 4).

Control or recording (AMS2750H table 7)

Calibration to meet ±2.0°F or ±1.1°C or ±0.2% of temperature, whichever is greater.

Type	Eurotherm instrument	Model numbers
Control	EPC2000 programmable controller	All models
	2000 series controller	2704 and 2604
	EPC3000 programmable controller	EPC3016, EPC3008, and EPC3004
	3000 series controller	3200 series and 3500 series
	Mini8® loop controller	With enhanced thermocouple board (ET8)
Over-temperature	EPC3000 programmable controller	EPC3000 series FM option can meet the integrated control/over-temperature requirement
Control and recording	nanodac™ recorder/controller[1]	All models
	E+PLC range	E+PLC400[1]
	PAC system hardware	T2550[1] and T2750[1]
Recording	6180 AeroDAQ[1] and 6000 series graphical recorder	6100XIO[1], 6100[1], 6180XIO[1], and 6180A[1]
	versadac™ scalable data recorder[1]	All models
	Eycon™ 10/20 visual supervisors[1]	All models

Field test instruments

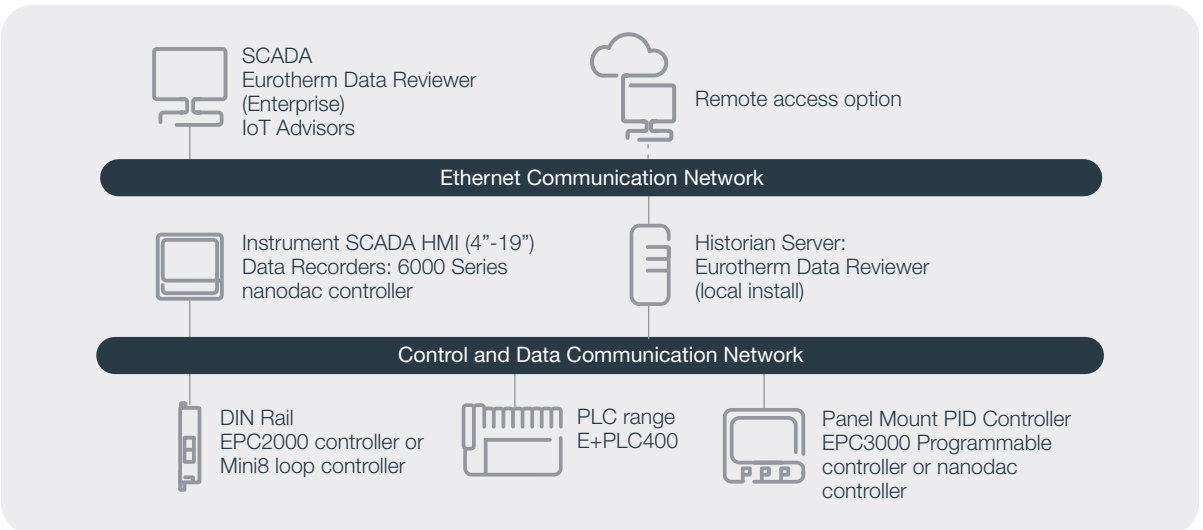
6000 series graphical recorder, model numbers: 6100A TUS and 6180A TUS with external CJC and fast-acting accuracy to meet ±1.0°F or ±0.6°C or ±0.1% of temperature, whichever is greater.

[1]Devices for use in data acquisition (AMS2750H 3.2.4). Please refer to table below for electronic record solutions. Simple Network Time Protocol (SNTP) is available in the 6000 series graphical recorder, nanodac recorder/controller, E+PLC range, PAC system hardware (model numbers T2550, T2750), and Eycon 10/20 visual supervisors to provide digital synchronization to help meet recording timing accuracy (to NIST or other international equivalent).

Electronic records	AMS2750G clause	CQI-9 4th Ed.	Eurotherm solutions
Tamper evident	3.2.4.2a	P3.2.6	Records unalterable without detection. Eurotherm 6000 series recorders, nanodac recorder/controller, versadac scalable recorder, E+PLC controller, and T2750 PAC controller create write-once, read-only data records in a tamper-evident binary file format with the file extension .UHH.
Record playback	3.2.4.2b	P3.2.6	Source data unalterable in reviewing tool. Eurotherm Data Reviewer software utility enables playback of the data in an easy to examine trend format. The source data is recorded in a tamper-evident file format.
Records in readable form	3.2.4.2c	Section 4 job audit	Accurate, complete records for inspection, review, and copying. Eurotherm Data Reviewer and AVEVA™ Reports for Operations software can generate accurate copies of records in human-readable and electronic form, suitable for inspection, review, and duplication.
Record review	3.2.4.2d	Section 4 job audit	Evidence of record reviews in electronic or printed format. Eurotherm Data Reviewer has an embedded annotation function to provide evidence that the record was reviewed - this review then becomes a part of the permanent record. The record can be printed as a PDF file (for electronic review) or a hard-copy for physical marking to verify review.
Protection of records	3.2.4.2e	IATF 16949:2016 defines retention periods	Retrieval of accurate records throughout the retention period. Eurotherm Data Reviewer is a 2nd generation software utility that also accepts Eurotherm .UHH file formats created 15+yrs ago. Redundant archiving of the source data provides additional retention assurance. 6000 series recorders support secure FTP when transferring files to Eurotherm Data Reviewer. Eurotherm 'store and forward' feature automatically backfills data to servers if communications are temporarily lost.
Hardware and software operation	3.2.4.2f		Operate throughout retention period (min. 5 years). The Eurotherm established obsolescence program ensures both hardware and software are supported throughout stated retention periods.
System access	3.2.4.2g		Authorization methods of record access. Data acquisition products have an optional user management feature that can be used to manage password access.
Software revisions	3.2.4.3		Eurotherm Data Reviewer software revisions do not impact process parameters. Setpoint cycle revisions in PLC's or programmers can be controlled by authorized access and quality procedures. Eurotherm control products have passcode protection on configuration. Eurotherm Data Reviewer operates independently to cycle setpoint programmers and will not impact process parameters on revision updates.

Industry 4.0 ready technology

Eurotherm provides open IoT platforms that support the digital transformation to Industry 4.0 technology. Eurotherm connected instruments and software fit into this cybersecurity-in-mind designed architecture.



44621 Guilford Drive, Suite 100
20147 Ashburn, VA
USA

Phone: +1-703-724-7300

www.eurotherm.com

Contact your local sales representative

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