Worry Less, Do More

Eurotherm nanodac™
Recorder / Controller

High integrity graphical data recording aids statutory compliance across regulated industries

World class PID control for greater performance and process reliability

eurotherm.com/nanodac

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by **Schneider** Electric

Do You Work in a Regulated Industry and Need to Keep Traceable Records?

Do You Suffer from Poor Quality in Your Finished Goods Leading to Excessive Waste?

The nanodac Recorder/Controller Combines Expertise in Recording and Control for Specialist Applications

▶ We combined our deep knowledge of the stringent data security requirements of regulated industries with our control expertise in specialist applications such as cascade control, sterilization and carbon control to bring you world class recording and control in a space-saving, small box with a superb full colour display.

▶ Add to this our commitment to technological innovation, constant reinvestment in research and development, and a team of engineers who understand your process requirements and you will find in Eurotherm a partner able to flex with the demands of your business as the regulatory and audit landscape changes.

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Maintaining Data Integrity and Traceable Records that are Easily Accessible

Recording and reporting of data is vital in order to meet critical process parameters across regulated industries and to provide additional benefits such as analysing data to enable process improvements in energy usage, efficiency or predictive maintenance.

The nanodac recorder saves time and simplifies reporting and the audit process with digital batch recording and electronic signatures.

This aids compliance with FDA 21 CFR part 11, GAMP5, GAMP, Nadcap and HACCP/HARPC requirements.

Recording details of a batch process is critical for understanding and reacting to deviations from defined limits. The data is then easily retrievable by operators or the quality engineer for assessment. Software for reviewing files can focus on where problems occurred and the historical data also shows all operator and alarm messages.

The reviewing software also allows digital signatures to be added to the record (batch) for sign off.

Do You Suffer from Poor Quality and Inconsistency in the Process?

Improve Product Quality and Lower Production Costs, with Precision Control.

Precision control begins with the measurement circuitry. The nanodac controller measurement system has the highest thermal stability and outstanding noise rejection for this class of controller. High sampling rate, automatically adapting to input type, delivers rapid, precise, repeatable control performance.

Proven over many years of use, the Eurotherm PID algorithm used in the nanodac device delivers industry-leading response time to setpoint change or process disturbance, including a cascade function. The speed of response means time and energy is not wasted waiting for operating temperature to

be reached, while minimizing overshoot and oscillations common in many PID implementations.

Repeatable control increases process yield and OEE while reducing scrap. High precision measurements allow tight process tolerances to be met easily. With a longer design life and three-year warranty as standard, the Eurotherm nanodac recorder/controller will deliver high quality production batch after batch, year after year.

Programmer

Heat Treatment is one of the many processes that often need to vary the setpoint of the control process over a set period of time; this is achieved by using a setpoint program. The nanodac offers an optional Dual Programmer supporting up to 100 programs locally with each program supporting 25 segments. Th nanodac also provides remote access to a further 100 programs that can eaisly be retrieved via FTP or USB memory stick.
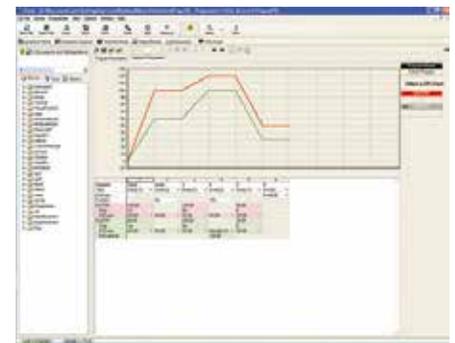
Eurotherm overshoot cut back capability

– – –	Setpoint (SP)
———	Overshoot
———	Overshoot inhibition

(Temperature vs Time)
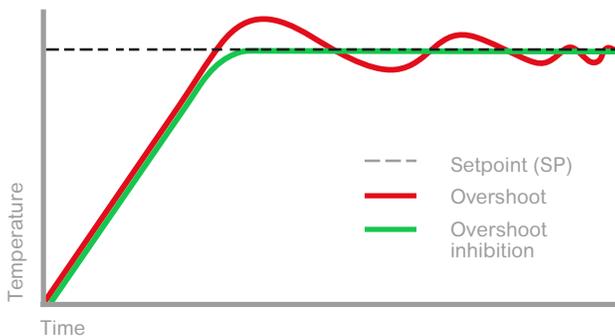
By automatically reducing power demand near the setpoint the Eurotherm cut back feature significantly minimizes overshoot which reduces waste and optimizes energy usage. This lowers the risk of parts not reaching operating temperature or overheating.

Eurotherm over ramp suppression achieves optimum ramp rate without affecting quality

– – –	Setpoint (SP)
———	Fast Ramp
———	Precision PID
———	Slow Ramp

(Temperature vs Time)
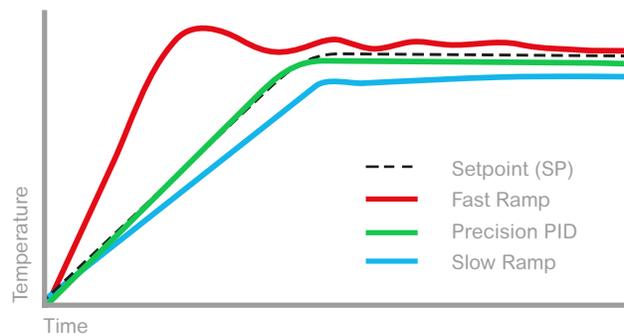
Ramp rate controls the rate of change to setpoint, keeping the material within specified temperature limits, minimizing damage and distortion in the final product. A holdback "Guaranteed Soak" function enables material to reach the required temperature before the process advances.

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The nanodac solution offered us the control we needed as well as recording data straight from our process in the way we needed for our Food Safety Management system.

Cheese Manufacturer Proprietor, France

Improve Quality, Reduce Waste

- Eurotherm PID algorithm aids precise repeatable control to help improve quality, increase yield and minimize waste
- Steam Flow calculations for energy usage modification
- Low total cost of ownership

Reduce Equipment Costs and Increase Equipment Efficiency

- Easy to install and commission
- Easy operator set up and simple cloning
- Intuitive, user friendly operation
- Robust design for reliability in demanding environments and highly regulated industrial processes
- Easy connection to networked devices, and *Industry 4.0 / IIoT technologies via native comms for all major protocols
- Free comprehensive PC configuration tool (iTools)

High Data Integrity and Recording Functionality Help Simplify the Audit Process

- Electronic signing and authorisation in accordance with 21CFR Part 11
  — Unique user accounts and passwords
  — GAMP5 CAT 3 templates available simplifying the validation process
- Proven tamper resistant recording methodology trusted by auditors
- Powerful batch functionality
- Multiple Archiving Strategies
- Binary data (UHH) or open (CSV) data files

Repeatable control and traceable batch records ideal for regulated industries.

Global Certification

- Certified to international standards including CE, cUL, CCC (exempt), EAC (CUTR)
- Panel sealing to NEMA4X IP66
- Complies with control requirements of AMS2750E and CQI-9
- Aids compliance with data recording requirements of FDA 21CFR 11 for life science and F&B including HARPC and HACCP
- See datasheet for full list of certifications

*Industrial Internet of Things (IIoT) and Industry 4.0 technologies can improve cost efficiencies, enable predictive maintenance and can result in competitive advantage – a natural fit to an existing process set up and this technology easily wraps around current installations.

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Get Your Data in the Way You Need it

Fast straightforward communications

EtherNet/IP™ Connectivity

In addition to native Modbus, the nanodac can also be supplied with EtherNet/IP*connectivity providing support for either Client or Server modes of operation. This simplifies integration with Allen Bradley Programmable Logic Controllers.

BACnet™ Connectivity

BACnet has been designed specifically to meet the communication needs of building automation and control systems for applications such as heating, ventilating, and air-conditioning control, lighting control and access control. The nanodac recorder/controller can be easily integrated into a Building Management System (BMS) using the BACnet protocol.

Straightforward System Integration

The nanodac instrument offers much more than tamper resistant data recording. By devolving loop control to a nanodac device, a PLC is able to concentrate on providing fast and effective logic control without the burden of running complex control algorithms.

Utilising the popular Modbus TCP/IP communications protocol the nanodac recorder/controller can be easily integrated into an Ethernet instrumentation network, and integration with other Eurotherm devices is simplified further by the use of product profiles (EPower, EPC3000 series etc.).
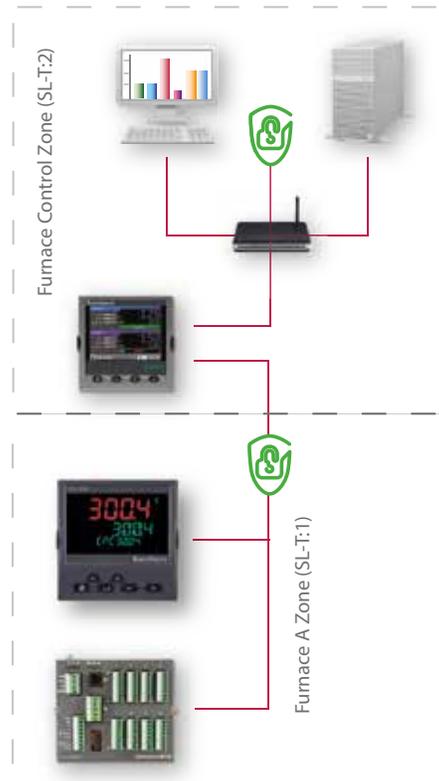
Furnace Control Zone (SL-T:2)

Furnace A Zone (SL-T:1)

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Case Studies

Unique Benefits for Vital Healthcare Instrument Sterilization

Customer Challenge

Our OEM customer is a leader in the manufacture and supply of sterilizers to the Healthcare and Life Science sector. They wanted to improve their independent monitoring capabilities for wrapped surgical instrument sterilization and provide a clear indication of pass/failed cycles with a reliable history backup.

Solution

Due to the strong partnership and our combined industry expertise, together with our customer we developed a sterilizer application block:

The nanodac™ recorder/controller provides unique functionality as an independent monitoring system for sterilizers.

- Highly visible display with clear pass/fail message facility and indicator light
- Tamper resistant data integrity with 'Store & Forward'* strategy over Ethernet
- Flexible recording, reporting formats, compact solution and minimizing size of machine

Customer Benefits

- For all industries where sterilization is a vital part of the process such as:
  — Healthcare – surgical equipment, and containers
  — Pharmaceutical & laboratory equipment
  — Food & Beverage manufacture
- Live Data verification – independent from the Sterilizer Controller
- Proven data integrity and archiving capability ('Store and Forward')
- Eurotherm Brand and Quality Systems such as ISO 9001 and Tick IT satisfy global regulations for monitoring,detailed traceability and validation
- Our global service capability gives added peace of mind

*Store & Forward' is a self healing, validated archiving system that automatically stores data in the measuring device during a communications failure and then forwards this to the central historian when communications have been reinstated.

Greater Accuracy and Prolonged Lifetime of Heat Treatment Probes

Customer Challenge

Our Heat Treatment customer needed to improve the control of carbon potential levels and the temperature in his heat treatment furnace to increase the quality and yield of the manufactured steel. He is also required to record and retain all the process data in a secure manner. Limited panel space and limited budget meant he was looking for a small, economical solution that provided the precision control and data integrity he needed.

Solution

The nanodac™ recorder/controller provides greater accuracy and repeatability when measuring carbon potential in the manufacture of carbon steel. With two control loops, the nanodac instrument offers precise measuring, recording and controlling of temperature and carbon levels. The recorder functionality offers proven tamper resistant data recording. For our Heat Treatment customer, this was excellent for charting the set points and furnace power demand.

Customer Benefits

- Compact and easily mounted in existing panel
- Proven data archiving and recording functionality which helps simplify the audit process
- Integrated Probe Care routines aids repeatability and probe life
- Precision control ability means greater accuracy and repeatability measuring carbon potential
- Provides a basis for calculating power demand

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We Understand that Different Applications have Different Needs

Dual Loop

The Dual Loop capability in the nanodac recorder/controller makes it ideal for controlling interactive processes such as those found in carburising furnaces, environmental chambers, autoclaves and fermenters. All of these applications require control and often setpoint programming of two variables. By using the advanced maths and logic functions within the nanodac recorder/controller, intelligent control strategies can be created to compensate for interactive effects between variables and maintain them at setpoint.

Temperature Probe

Humidity Probe

Humidity Output

Sprinklers

Cooling

De-humidify

Heaters

Cooling Output

De-humidify Output

Heat Output

Cascade Control

Temperature PV

Furnace

Temperature setpoint

Output

Flow setpoint

Output

Flow PV
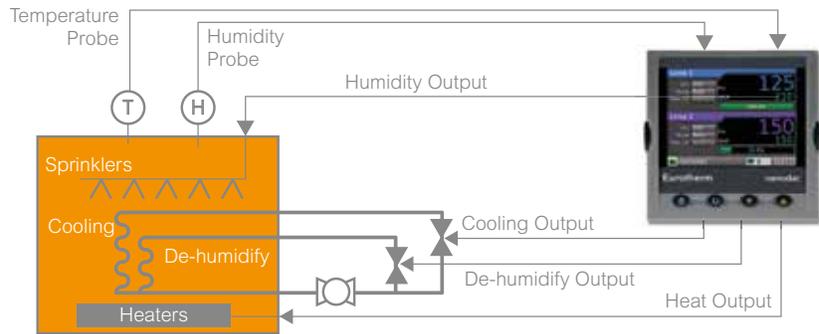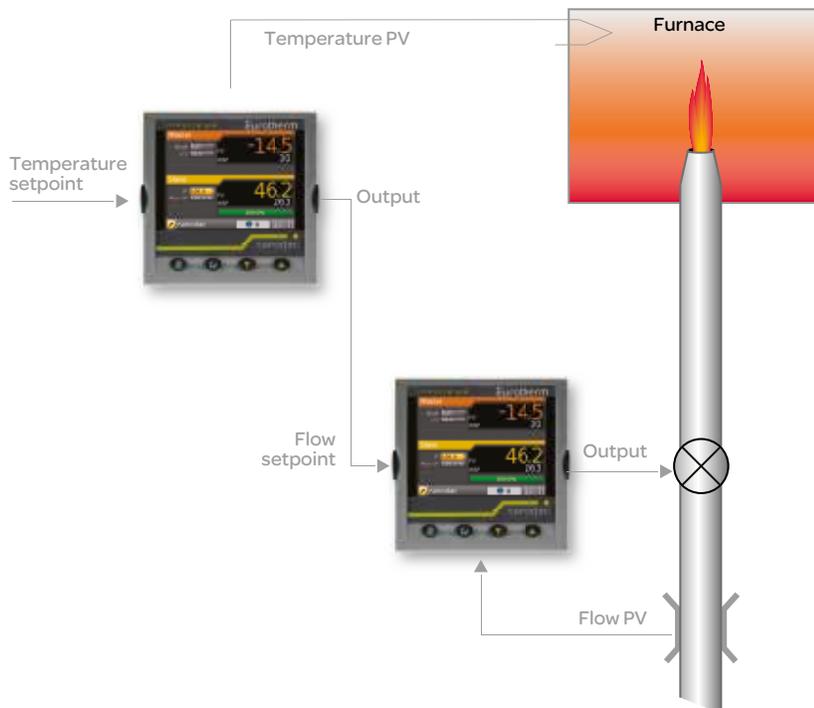
Cascade Control Offers Increased Speed of Response and More Accurate and Faster Commissioning

The main benefits of Cascade Control are:

- Disturbances affecting the secondary controller can be corrected before significant influence on the primary variable

- Closing the control loop around the secondary part of the process reduces the phase lag seen by the primary controller, resulting in increased speed of response

- Unique single step cascade auto-tuning for accurate quick commissioning

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Steam Flow Calculation

Steam Flow Calculation for Energy Management Information.

The nanodac recorder/controller has an option that allows the instrument to make steam flow calculations for energy usage modifications. It acts as a steam flow computer calculating the saturated steam mass flow. The nanodac device can be directly connected to the Automation Network (BACnet) to monitor energy performance and to identify problems as they occur as well as the data being used for energy cost allocation.

The option allows equations designed particularly for use with saturated steam. Mass Flow, Heat Flow and Heat Consumed can all be calculated and recorded.

All of these equations can be set to use either pressure or temperature as the measured input and use look ups from the 1999 ASME Steam Tables.

Level Controller

75.0
75.0

TDG Controller

2500
2500

Steam

Water

TDG

Feedwater

Bottom Blowdown
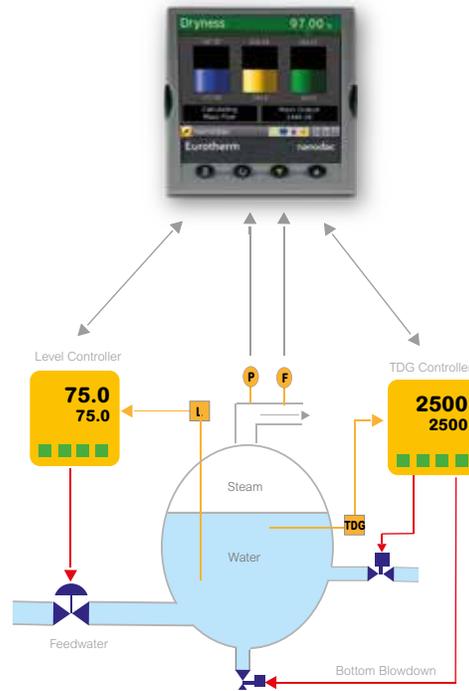
Real World Applications

Environmental and Stability Chamber Monitoring

Monitoring of storage and production environments has become an important issue within the Pharmaceutical Industry. The FDA and other regulatory bodies require not only accurate measurement and storage of room parameters but if the storage medium is electronic then the methods used must comply with 21 CFR Part 11.

The nanodac Recorder/Controller provides recording in accordance with 21 CFR Part 11 as well as remote viewing, standard maths equations and multiple alarm/event alert strategies ideal for this type of monitoring and storage requirements.

- Local logging capability
- Easy integration into multiple room system
- Sophisticated alarm functionality

http://www.eurotherm.com/chamber-monitoring

6000 Series Recorders

Router

Internet / LAN

nanodac™ Recorder Controller

Remove Viewing
Measurement monitoring and storage

nanodac webserver

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Key Features

General	
Display	3.5" TFT colour (320 pixels wide x 240 pixels high)
Userinterface	Four Push/Tactile (Washdown Front) buttons (Page, Scroll, Lower and Raise)
Panel Size	¼ DIN (96mm x 96mm)
IP Rating	IP65 (Standard), IP66 NEMA4X (Washdown Front)
PV Accuracy	Better than 0.1% of reading
Alarms	2 per channel
Alarm Types	Absolute High/Low, Deviation High/Low, Deviation Band, Rate of Change
USB port	1 USB 1.1 port at rear

Recording	
Memory for Data Storage	50MB
Recording Formats	UHH (Eurotherm proprietary secure, check summed file system) or CSV
Recording Destinations	Internal Flash, FTP Server, or USB memory stick (up to 8GB)
Recording Speed	8Hz
Trend Speed	8Hz
Removable Media	USB memory stick (up to 8GB)
Virtual Channels	15 Standard, plus 15 optional (Maths/Totalisers/Counters)
Maths Types	Add, Subtract, Multiply, Divide, Group Min/Max, Channel Min/Max, Channel average, Configuration revision, Modbus Input
Recording Groups	One
Toolkit Blocks	Multiplexer, Timers, 2 Input Logic blocks, User Values, BCD, 8 Input Logic blocks
Batch	Single batch, 8 batch fields
Auditor	Aids compliance to 21 CFR Part 11

Control	
Control Loops	Two plus Advanced Control loop
Control Types	On/Off, PID, VP, Cascade (Advanced Loop)
Power Feedforward	Yes

Communications	
Ethernet	10/100baseT autosensing/negotiating
Protocols	Modbus TCP/IP Master/Slave, EtherNet/IP Client/Server, FTP, BACnet™ Slave
Networking Addressing	DHCP or Fixed (static) IP addressing

Additonal Blocks	
Application	Zirconia, Relative Humidity, Sterilizer, Steam Flow and Mass Flow

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Greater Capability Across a Range of Highly Regulated Applications

— Engineering with better tools and combined functionality

— Auditor (aids 21 CFR 11 compliance)

— 4 universal input channels (8 optional)

— 50MB Flash memory for data storage 8Hz sample and recording rate

— 30 additional channels for use as mathematical functions, Modbus inputs, totalizers or counters

— Dual programmer

— Toolkit blocks

— Graphical wiring

— Webserver

— Batch

Industrial furnaces • Autoclaves • Crystal growing • Atmosphere control • Composite materials processing
Heat exchangers • Climatic chambers • Annealers Dryers • Ovens • Pasteurizers • Sterilizers • Incubators
Boilers • Extruders • Blow molders • Injection molders • Trace heating • Bushing control • Disinfection processes
Batch processing • Melt pressure control • Industrial distillation
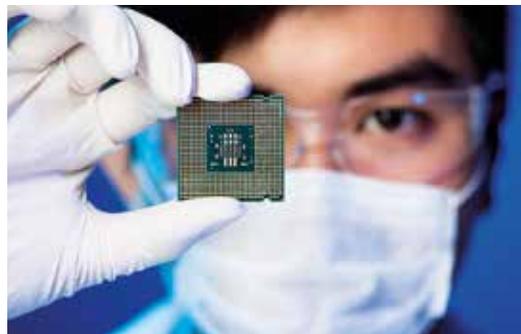
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Find your Local Sales Engineer to Request a Demonstration

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