

invenSYS  
Eurotherm

# nanodac<sup>TM</sup>

Recorder/Controller



imagine making the  
impossible possible

imagine bigger better smaller, we did. We combined our extensive expertise in absolute data security and world class control to bring you the best in recording and control in a space-saving, small box with a superb full colour display and it is called the nanodac™ recorder/controller. Add to this an absolute commitment to technological innovation, constant reinvestment in research and development, and a team of engineering oriented salesmen who understand your process requirements; we can and do imagine making the impossible possible for our customers.

## nanodac Recorder/Controller

The nanodac recorder/controller offers the ultimate in graphical recording combined with PID control and setpoint programs for a box of its size. The compact ¼ DIN panel mount unit offers four high accuracy universal inputs for data recording and PID control. This secure data recording device with accurate control is enhanced by a full colour, ¼ VGA, 320 x 240 pixel display to bring a crystal clear operator interface to even the smallest of machines.



### Bigger

- Bigger on the inside
- 50MB Flash memory
- More functionality in one box
- Toolkit blocks

### Better

- Eurotherm PID algorithm
- Recording methodology
- Dual programmer
- Crystal clear display
- Graphics
- User interface
- Webserver

### Smaller

- Recording and control in ¼ DIN box
- Engineering with better tools and combined functionality

imagine bigger  
better smaller

invenSense  
**Eurotherm**



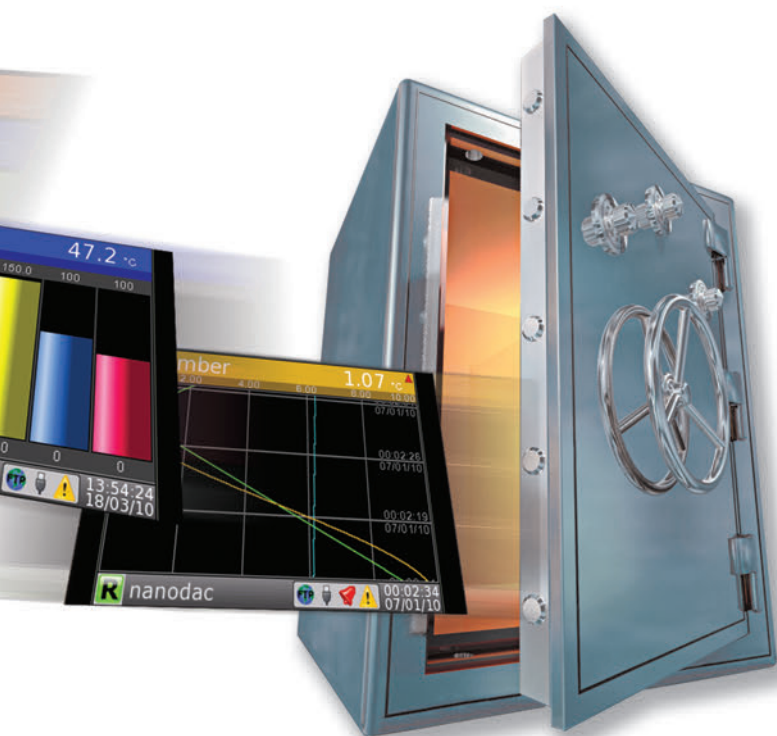
## Better Recording Strategy

The recording functionality within the nanodac instrument contains decades of knowledge and understanding of the requirements of capturing and storing electronic data. We understand that different applications have different needs and the nanodac recorder can store your information in either open CSV format or in a secure, check summed format to protect data integrity. Whichever format you choose for your process we have the tools to help you keep this data safe; get it to the place you need, and in the format you require.

- 50MB Flash memory for data storage
- 8Hz sample and recording rate
- Secure, binary data (UHH) or open (CSV) data files
- 4 universal input channels (8 optional)
- 30 additional channels for use as mathematical functions, Modbus inputs, totalisers or counters.

The nanodac recorder has a variety of ways in which you can view your data: bar graph, trend, numeric values. The clear, full colour display with your data in the format you need makes it easy for operators to see what is happening in a particular process. The push buttons below the display also enable simple scrolling between configured views.

Each nanodac instrument contains an impressive 50MB of non-volatile Flash memory for data storage. All process data is continually logged to this memory and the recorder offers multiple archive strategies to ensure that your data is never lost.





# A local historian that's small and powerful

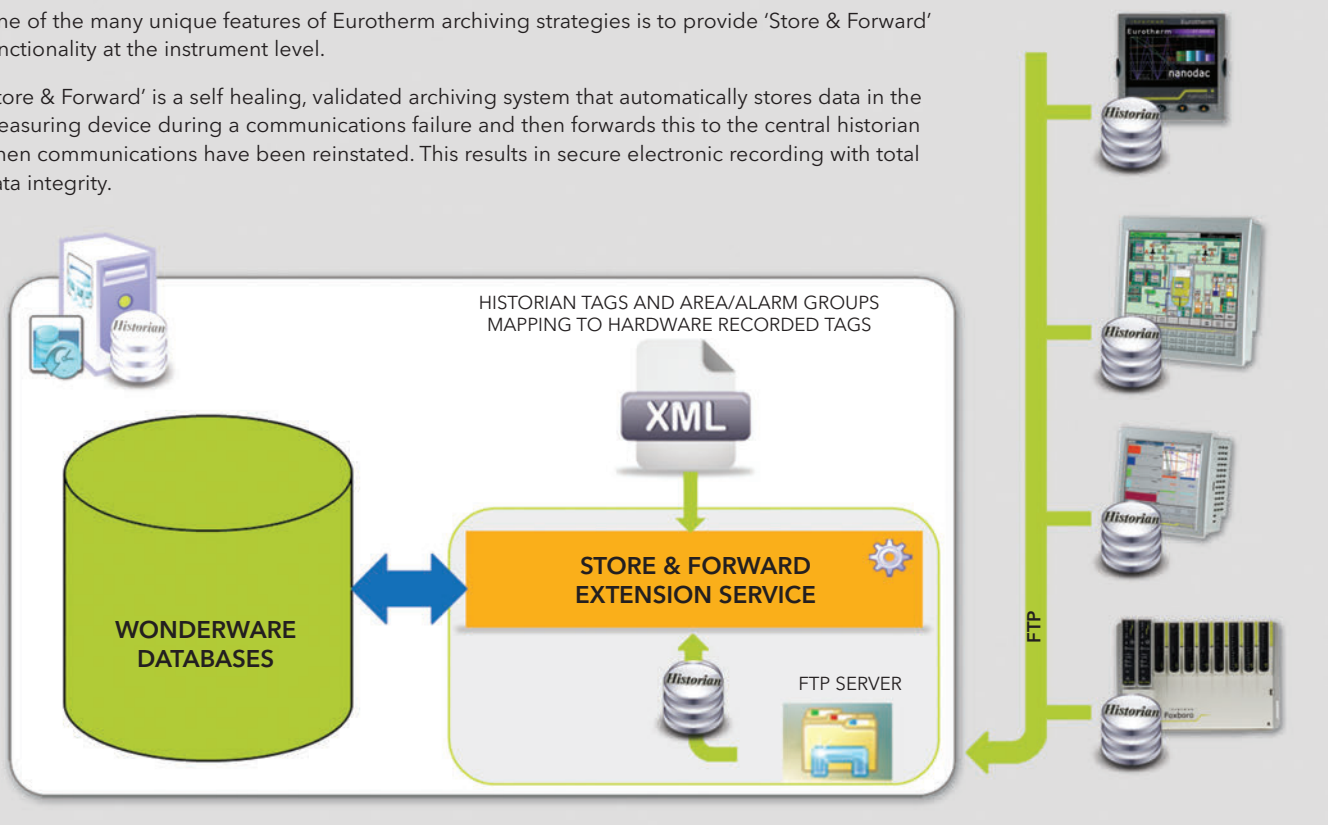
The unique archiving strategy of Eurotherm can be found in many of its products; both nanodac and the Foxboro PAC are the latest additions. These products share a common data acquisition filing system that is integrated into the Invensys Operations Management ArchestrA System Platform.

This filing system produces secure check summed archive files that are tamperproof. In regulated industries these so called UHH files are generally retained in a long term storage archive as the primary manufacturing record source for later recall.

There is a direct interface to the Invensys Operations Management System Platform and in the event of a communications failure data continues to be stored within the device itself. Should a communications failure occur, the Eurotherm Store & Forward extension service identifies both the time of the last good reading and, post communications repair, the time of the first good reading. The extension service then requests the missing data from the device and forwards this to the Wonderware Historian and any other filing system.

One of the many unique features of Eurotherm archiving strategies is to provide 'Store & Forward' functionality at the instrument level.

'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. This results in secure electronic recording with total data integrity.



# Control that's small and powerful

## Better Control Algorithm

The nanodac recorder/controller can also provide two independent control loops. This control functionality utilises the advanced Eurotherm PID algorithm providing high performance and reliability to your process. Functionality includes one of the best autotune facilities available along with overshoot inhibition (cutbacks); compensation for power fluctuations using power feedforward; linear, fan, oil and water cooling.

## Cascade

Cascade control makes use of multiple control loops to ultimately control one process variable. In its simplest form there are two control loops. The output of the primary (or master) control loop will be used to determine the setpoint of the secondary (or slave) control loop. The output from the secondary loop will be used to control the process. The nanodac supports the option for a single Cascade (Advanced Control) loop providing a Master/Slave pair. 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.

## Autotune

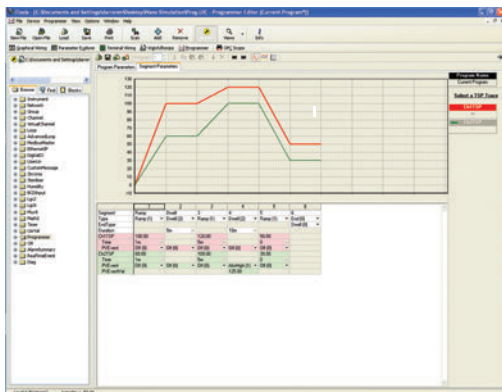
The balancing of the P, I and D terms varies from process to process. In a plastics extruder, for example, there are different responses to a die, casting roll, drive loop, thickness control loop or pressure loop. In order to achieve the best performance from an extrusion line all loop tuning parameters must be set to their optimum values. Tuning involves setting the following PID menu parameters: Proportional Band (PB), Integral Time (Ti), Derivative Time (Td), Cutback High (CBH), Cutback Low (CBL), and Relative Cool Gain (R2G - applicable to heat/cool systems only). Users have the choice of tuning the loop automatically or manually. Autotune can be performed at any time, but normally it is performed only once, during the initial commissioning of the process. The auto tune algorithm reacts in different ways depending on the initial conditions of the plant. Auto tune uses the 'one-shot' tuner which works by switching the output on and off to induce an oscillation in the process value. From the amplitude and period of the oscillation, it calculates the tuning parameter values.



# Easy to use setpoint profiler

## Programmer

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

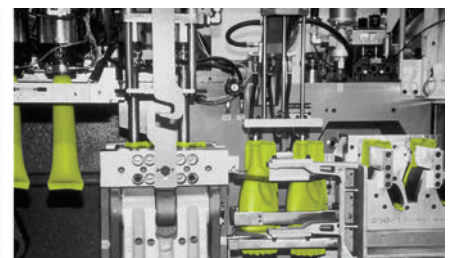


## Programme Editor

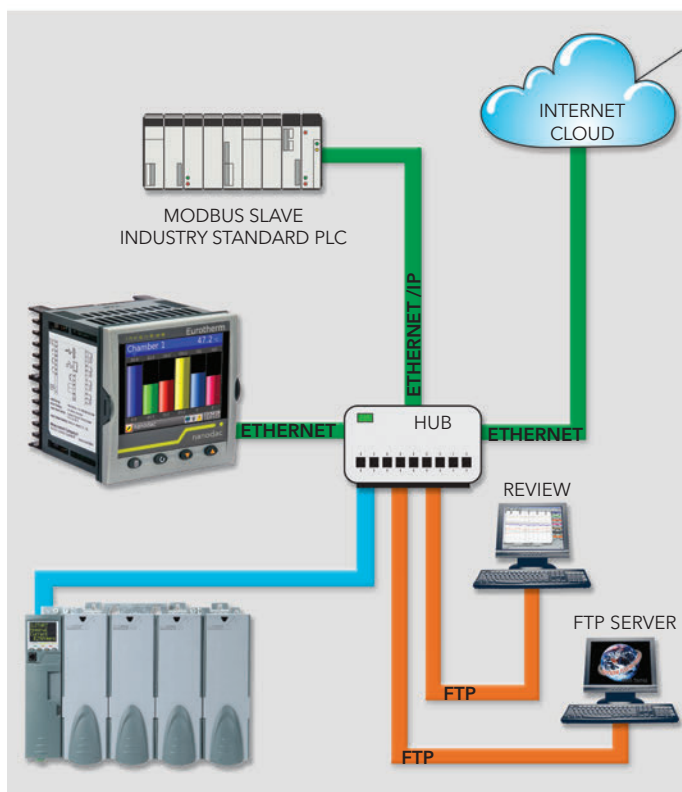
Simple setup of set-point profiles

- Store, retrieve and download program files
- Unlimited program storage
- Online and offline editing

The Set-point Program Editor within iTools provides a simple method of configuring set-point profiles and programmable event outputs. Programs can be edited live - online with the controller, or offline - for download after editing or storage of the profile. Storage of profiles is limited only by the amount of disk space available on the PC.



## Get your data in the way you need it



### PC tools to keep your data secure yet provide the flexibility you need

The nanodac recorder is supported by PC based tools to get your data in the way you need it. Review software acts as an efficient and secure library for data from which charts can be reviewed, printed and exported to other PC packages as required. Review maintains the integrity of secure, binary files (UHH format) created by the nanodac recorder and can be configured to pull data directly over the network and provide a third data back up route.

- Automatic, data archiving to removable USB memory stick (up to 8GB)
- Automatic, remote data archiving over Ethernet network using FTP
- Automatic, remote data archiving directly into Review database
- Remote visualisation via Webserver

### System Integration

The nanodac offers much more than secure data recording; by devolving loop control to a nanodac 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 can be easily integrated into an Ethernet instrumentation network, and integration with other Eurotherm devices is simplified further by the use of Product Profiles (Mini8, EPower, 3000 Series etc).

### EtherNet/IP Connectivity

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. When using EtherNet/IP the nanodac EDS file can be registered and the parameter input and output tables edited using Allen Bradley's PC configuration tools.



# Designed for ease of use

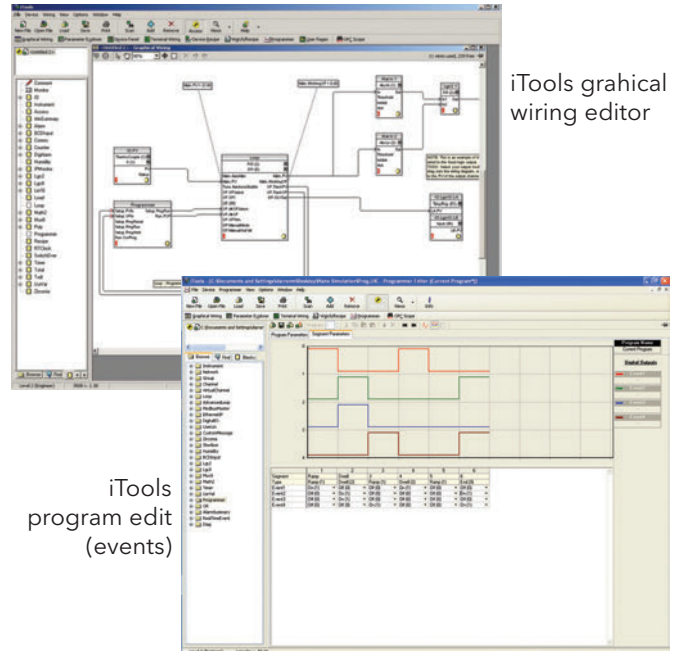
## Better performance, smaller box

The nanodac input circuitry provides high accuracy with high noise rejection. We believe that if you cannot measure accurately, you cannot control accurately. If you cannot measure without noise you cannot measure accurately. This instrument meets the exacting standards (including Nadcap) required for good control and recording.

## Designed for ease of use

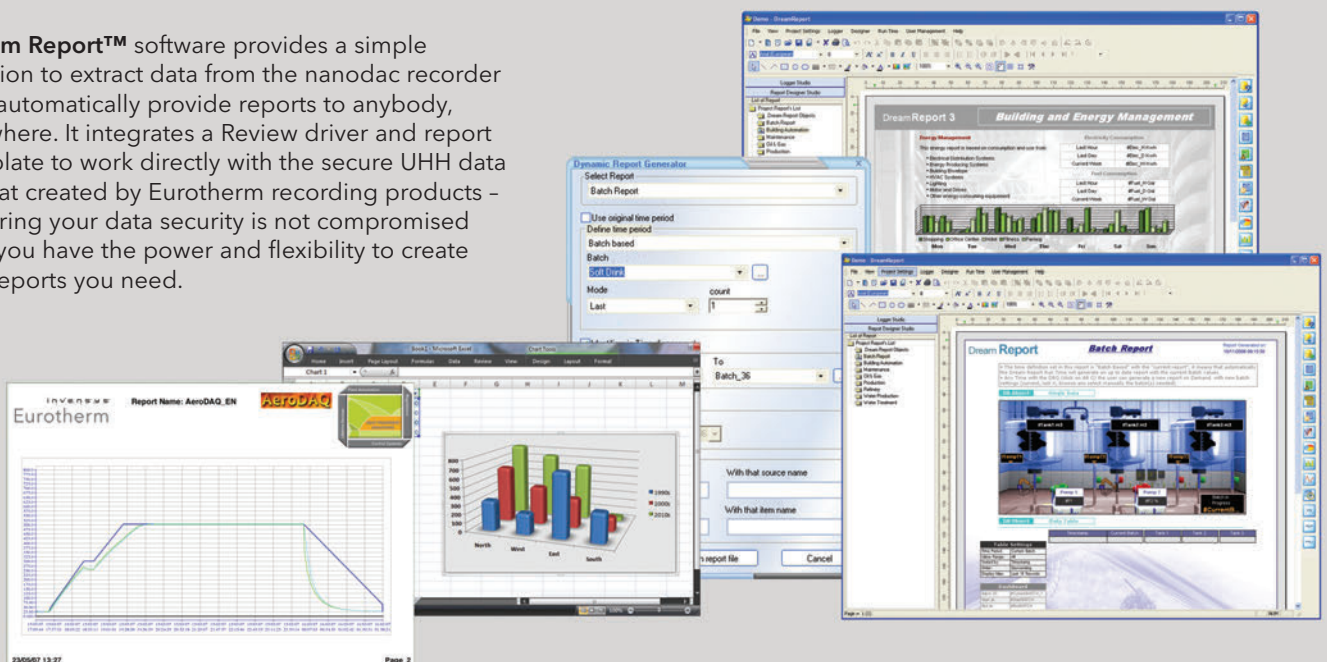
As well as precision PID control from the world's leading supplier and secure data recording, the nanodac instrument can be configured using iTools software. This software is used across the Eurotherm controller ranges and is proven to reduce engineering and save cost through its powerful cloning facility. Any configuration created for a nanodac recorder/controller can be stored, modified offline and/or cloned for use in other instruments. This makes the spares holding simple and flexible and vastly reduces engineering and any down time that may occur. iTools also provides a Graphical Wiring Editor reducing the engineering time for even the most sophisticated configurations.

- Clone and download complete configurations to an instrument quickly and easily
- Reduce engineering and downtime
- Reduce spares holding requirements



# Create the reports you need

**Dream Report™** software provides a simple solution to extract data from the nanodac recorder and automatically provide reports to anybody, anywhere. It integrates a Review driver and report template to work directly with the secure UHH data format created by Eurotherm recording products - ensuring your data security is not compromised and you have the power and flexibility to create the reports you need.





## Success stories commercial benefits

Case Study

### Unique benefits for vital healthcare instrument sterilisation



Our nanodac™ recorder/controller provides unique functionality as an independent monitoring system for sterilisers. The key benefits are a highly visible crystal clear display and large integral memory.

#### Customer Challenge

Our OEM customer is a leader in the manufacture and supply of sterilizers to the Healthcare and Life Science sector.

Their aim was to improve their independent monitoring capabilities for wrapped surgical instrument sterilisation and provide a clear indication of pass/failed cycles with a reliable history backup.

#### Solution

Our unique partnership, taking advantage of our combined industry expertise, enabled the development of a new steriliser application block.

nanodac recorder function with:

- Highly visible display with clear pass/fail message facility and indicator light
- Tamper resistant Data with 'Store & Forward' strategy over Ethernet
- 50MB Internal memory providing on board data storage for several months

#### Customer Benefits

- Unique solution for all industries where sterilisation is a vital part of the automation process
  - Healthcare industry including surgical equipment, fluids, containers
  - Pharmaceutical & laboratory equipment
  - Food & Beverage manufacture
- Live Data verification – independent from the Steriliser Controller
- Integral 'Store & Forward' function ensures absolute data integrity and archiving
- Inven'sys Eurotherm brand and Quality Systems such as ISO 9001 and Tick IT ensure we satisfy strict current and future drafted global regulations for monitoring, detailed traceability and validation
- Our global service capability gives added peace of mind

Case Study

### Greater accuracy and prolonged lifetime of Heat Treatment probes



The nanodac™ recorder/controller is the ideal solution for greater accuracy and repeatability when measuring carbon potential in the manufacture of carbon steel.

#### Customer Challenge

Our Heat Treatment customer needed to control the carbon potential levels and the temperature in his heat treatment furnace. He also had the need to record and retain this data in a secure manner. Limited panel space and limited budget meant he was looking for a small, economical solution.

#### Solution

The nanodac recorder/controller is the ideal solution. In one small box it contains two control loops which can be used for accurately measuring, recording and controlling temperature and carbon levels. It also provides support for data recording which is useful for charting the setpoints and furnace power demand.

#### Customer Benefits

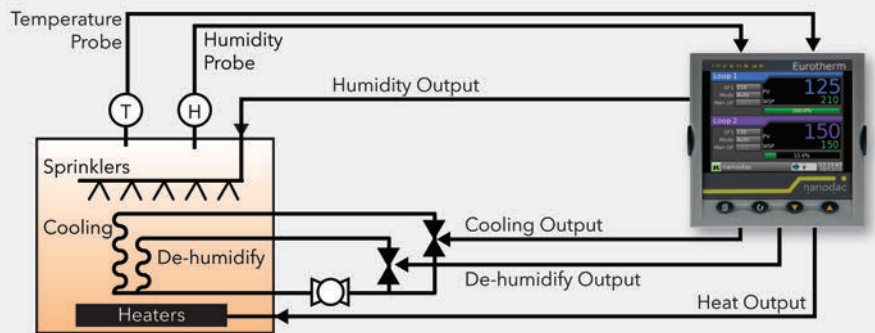
- Can easily be mounted in existing panel
- Provides secure archiving of data
- Integrated Probe Care routines for repeatability and probe life
- Provides a basis for calculating power demand



# Real-world applications

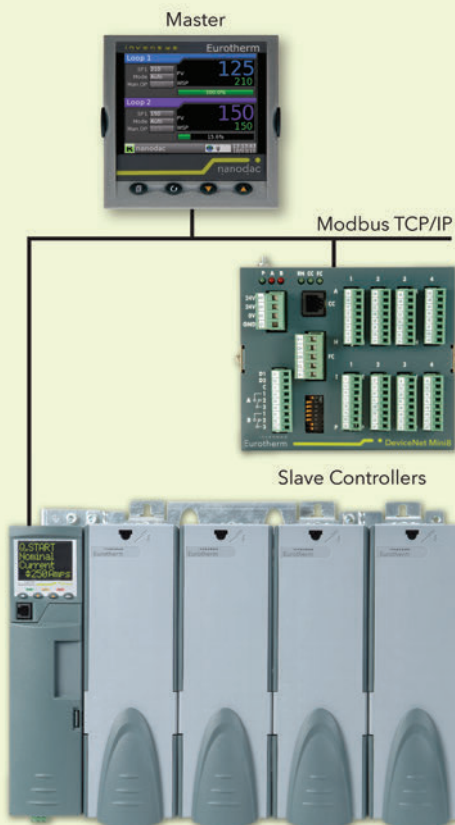
## Dual loop

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.



## Master comms

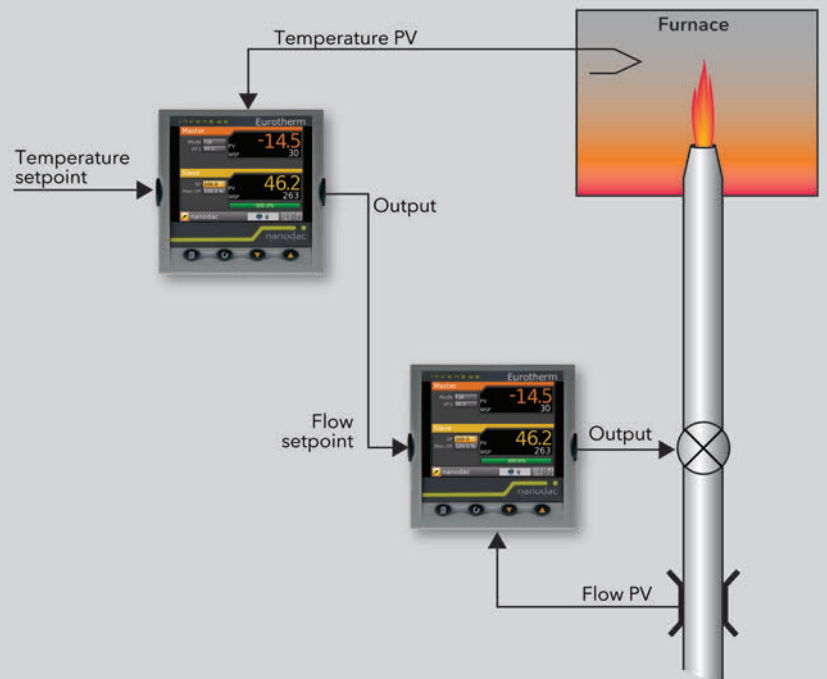
In all nanodac instruments it is possible to use the Modbus TCP/IP communication link to send a value (often setpoint) from one controller to up to two slave devices.



## Cascade control

Cascade control makes use of multiple control loops to ultimately control one process variable. In its simplest form there are two control loops.

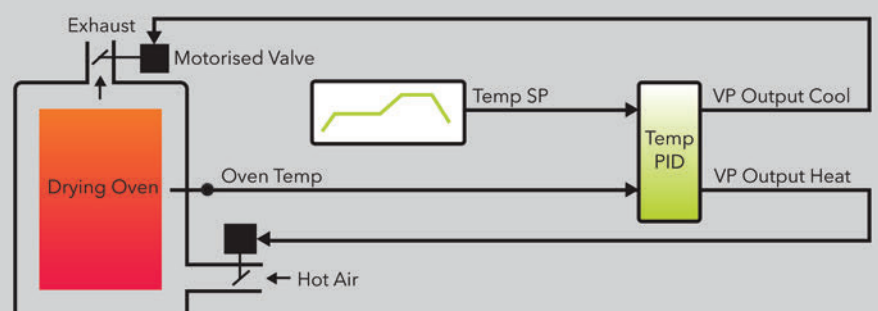
- Disturbances affecting the secondary controller can be corrected before significant influence on the primary variable.
- Closing the control loop around the secondary part of the process reduces the phase lag seen by the primary controller resulting in increased speed of response.



## Dual valve positioning

The Dual Valve Positioning (VP) feature on the nanodac allows two motorised valves to be modulated from one controller. Typically one valve would actuate a burner or hot air inlet and the other a cooling damper. This feature removes the need to interface the controller via external positioners.

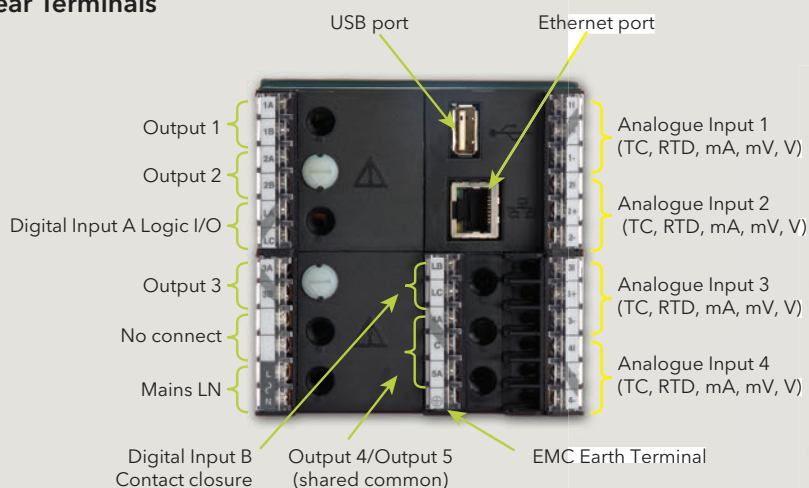
The VP feature can be used with or without a feedback potentiometer and can also be used with PID in either control channel to provide control strategies such as PID Heat/VP Cool.



# Specification

General	
Display	3.5" TFT colour (320 pixels wide x 240 pixels high)
User Interface	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	Multiplexor, Timers, 2 Input Logic blocks, User Values, BCD, 8 Input Logic blocks
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
Network Addressing	DHCP or Fixed (static) IP addressing
Additional Blocks	
Application	Zirconia, Relative Humidity and Steriliser

## Rear Terminals





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## International sales and service



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Egypt	Slovakia
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Ethiopia	Sri Lanka
Fiji	Sudan
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Greece	Tanzania
Greenland	The Gambia
Guinea	Tunisia
Hungary	Turkey
Iceland	Turkmenistan
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