Eurotherm®

# nanodac

## Recorder/Controller

### The ultimate in graphical recording combined with PID control

The nanodac™ recorder/controller offers the ultimate in graphical recording combined with PID control for a box of its size. The compact 1/4 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 color, 1/4 VGA display to bring a crystal clear operator interface to even the smallest of process control needs.

### Crystal clear, color display

The 3.5” TFT display offers incredibly clear visualization of process parameters with a wide selection of configurable views to best suit the application.

Views include: Horizontal and vertical trends, Horizontal and vertical bar graphs, Numeric, Alarm panel, Alarm status, and control loops. The unit also provides user wiring from the front of the product for detailed configuration without the need to connect to a PC.

### Data Acquisition and Recording

The nanodac recording functionality utilizes the secure strategies and UHH format developed by Eurotherm through years of recording expertise. As well as multiple real-time views and historical review on the product, multiple data archiving strategies are provided utilizing the 50MB onboard Flash memory, removable USB and data transfer via FTP to a specified server.

The four standard universal input channels provide high accuracy and 125ms parallel sampling. An additional 30 virtual channels can be utilized to provide math, counter, slave communications and totalizer functionality all within the nanodac™ recorder/controller.

- One, Two or Three Element Control
- Onboard Secure Data Recording
- High Accuracy Analog Inputs (4 standard – max of 8)
- Multi-use USB Port
- Compact Design with UL Approval
- Built-in Web Server for Remote Connection
- Ethernet Communications
- Up to 30 Virtual Channels
- Multiple I/O Options
- Multi-language Support
- Free Programming Software
- 1/4 VGA Crystal Clear Display
- Simple 4 Button Operation
- Multiple Security Levels for Complete Ease of Use


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## PID Control Loops

The nanodac instrument can also provide up to three independent control loops (optional). This control functionality utilizes 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.

Often times processes need to vary the setpoint 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, each program supporting 25 segments. The nanodac also provides remote access to a further 100 programs that can be easily retrieved via FTP or USB memory stick.

# Technical Specification

## General

### General

| | |
|---|---|
| I/O types Analog i/p: | Four/eight |
| Digital i/p: | Two |
| Digital (logic) o/p: | Two max (see order code) |
| Relay o/p: | Four max (see order code) |
| DC output: | Three max (see order code) |
| Features: | Modbus TCP master/slave (optional)<br>USB configuration save/restore Programmer (optional)<br>Two control loops (optional) Zirconia probe support (optional)<br>30 Virtual channels (each configurable as counter, maths, totalizer or comms input) Sterilizer (optional)<br>Relative humidity (optional)<br>Customized start up screen<br>EtherNet/IP* |

### Environmental performance

| | | |
|---|---|---|
| Ambient temperature range: | | |
| | Operating: | 0 to 55°C |
| | Storage: | –20 to +70°C |
| Humidity | Operating: | 5% to 85% RH non condensing |
| | Storage: | 5% to 85% RH non condensing |
| Protection | Front panel: | IP65 |
| Front panel washdown: | | IP66, NEMA 12 (International) |
| Behind panel: | | IP10 (International) |
| Shock/Vibration: | | T o BS EN61131-2 (5 to 150 Hz. at 1g; 1 octave per min.) |
| Altitude: | | <2000 metres |
| Atmosphere: | | Not suitable for use in explosive or corrosive atmospheres |
| Electrical safety: | | BS EN61010-1 (Installation category II; Pollution degree 2) |
| Electromagnetic compatibility | | |
| Emissions | (Standard units): | BS EN61326 Class B – Light industrial |
| | (Low voltage option): | BS EN61326 Class A – Heavy industrial |
| Immunity: | | BS EN61326 Industrial |

### Other approvals and compliance details

| | |
|---|---|
| General: | CE and cUL, EN61010 |
| PV input: | AMS2750D compliant |
| RoHS EU: | China |
| Packaging: | BS61131-2 section 2.1.3.3. |

### Physical

| | | |
|---|---|---|
| Panel mounting: | | 1/4 DIN |
| Weight: | Instrument only: | 0.44kg (15.52ozs) |
| Panel cutout dimension: | | 92 mm x 92 mm (both -0.0 +0.8)<br>or 3.62 in x 3.62 in (both -0.00 +0.03 in) |
| Depth behind panel: | | 90 mm (3.54 in) excluding wiring |

### Operator interface

| | |
|---|---|
| Display: | 3.5" TFT color display<br>(320 pixels wide x 240 pixels high) |
| Controls: | Four navigation pushbuttons below the display screen (Page, Scroll, Lower and Raise) |

### Power requirements

| | | |
|---|---|---|
| Supply voltage: | Standard: | 100 to 230V ac ±15% at 48 to 62Hz |
| | Low voltage: | 24V ac (+10% –15%) at 48 to 62Hz, |
| | or | 24V dc (+20% –15%) |
| | Power dissipation: | 9W (max.) |
| | Fuse type: | No internal fuse fitted |
| Interrupt protection: | | |
| | Standard: | Holdup >10ms at 85V RMS supply voltage |
| | Low voltage: | Holdup >10ms at 20.4V RMS supply voltage |

### Battery backups

| | |
|---|---|
| Stored data: | Time, date |
| Replacement period: | Three years typical |
| Clock (real-time clock) data: | |
| Support time: | Minimum of 1 year with unit unpowered |
| Temperature stability: | 0 to 55°C ≤±3.5ppm |
| RTC Aging: | First year to 10 year <± 5ppm |
| Type: | Poly-carbonmonofluoride/lithium (BR2330) (PA260195) |

Replace battery with Panasonic BR2330/BE only. Use of another battery may present a risk of fire or explosion. See owners manual for safety instructions.

Caution Battery may explode if mistreated. Do not recharge, disassemble or dispose of in fire.

### Ethernet communications

| | |
|---|---|
| Type: | 10/100baseT Ethernet (IEEE802.3) |
| Protocols: | Modbus TCP/IP master/slave, EtherNet/IP client/server |
| Cable type: | Category 5 |
| Maximum length: | 100metres (110 yards) |
| Termination: | RJ45.<br>Green LED illuminated = link connected; Amber LED flashing shows link activity |

### USB port

| | |
|---|---|
| Number of ports: | One at rear of instrument |
| Standard: | USB1.1 |
| Transmission speeds: | 1.5MBit/sec (low speed device) |
| Maximum current: | <100mA |
| Peripherals supported: | Memory stick (8GB max), Bar code reader, QWERTY keyboard |

### Update/Archive rates

| | |
|---|---|
| Sample rate (input/output): | 8Hz |
| Trend update: | 8Hz max. |
| Archive sample value: | Latest value at archive time |
| Display value: | Latest value at display update time |

## Analog Input

### General

| | |
|---|---|
| Number of Inputs: | Four/eight |
| Input types: | dc Volts, dc mV, dc mA, dual mA (external shunt required), dual mV, dual TC†,<br>Thermocouple, RTD (2-wire and 3-wire),<br>Digital (Contact closure) |
| Input type mix: | Freely configurable, Sample rate: 8Hz (125ms)<br>4Hz (250ms) if dual input enabled |
| Conversion method: | 16 bit delta sigma |
| Input ranges: | See Table 1 and Table 2 |
| Mains rejection (48 to 62Hz) | |
| Series mode: | > 95dB |
| Common mode: | >179dB |
| Common mode voltage: | 250V ac max. |
| Series mode voltage: | 280mV at lowest range; 5V peak to peak at highest range |
| Input Impedance: | 40mV, 80mV, 2V ranges > 100MΩ;<br>62.5kΩ for input voltages > 5.6V<br>667kΩ for input ranges < 5.6V |
| Overvoltage protection | |
| Continuous: | ±30V RMS |
| Transient (<1ms): | ±200V pk-pk between terminals |
| Sensor break detection type: | ac sensor break on each input giving quick response with no associated dc errors |
| Recognition time: | <3 seconds |
| Minimum break resistance: | 40mV, 80mV ranges: 5kΩ; other ranges: 12.5kΩ |
| Shunt (mA inputs only): | 1Ω to 1KΩ mounted externally |
| additional error due to shunt: | 0.1% of Input |

Isolation

| | |
|---|---|
| Channel to Channel: | 300V RMS or dc (Double insulation)<br>Note: If Dual Channel mode enabled primary and secondary inputs are not electrically isolated from each other. |
| Channel to common electronics: | 300V RMS or dc (Double insulation) |
| Channel to ground: | 300V RMS or dc (Double insulation) |
| Dielectric strength Test: | BS EN61010, 1 minute type |
| Channel to Channel: | 2500V ac |
| Channel to Ground: | 1500V a |

| Low Range | High Range | Resolution | Maximum error (Instrument at 25°C) | Temperature Performance |
|---|---|---|---|---|
| –40mV | 40mV | 1.9µV | 4.6µV + 0.053% of reading | 13ppm of input per °C |
| –80mV | 80mV | 3.2µV | 7.5µV + 0.052% of reading | 13ppm of input per °C |
| –2V | 2V | 82µV | 420µV + 0.044% of reading | 13ppm of input per °C |
| –3V | 10V | 500µV | 1.5mV + 0.063% of reading | 45ppm of input per °C |

*Table 1 Voltage input ranges*

Note: Restricted to 2000mV if dual input mode enabled

## Resistance input ranges

| | |
|---|---|
| Temperature scale: | ITS90 |
| Types, ranges and accuracies: | See Table |
| 3 Maximum source current: | 200µA |
| Pt100 figures Range: | 0 to 400Ω (–200 to +850°C) |
| Resolution: | 0.05°C |
| Calibration error: | ±0.31°C ±0.023% of measurement in °C at 25°C ambient |
| Temperature coefficent: | ±0.01°C/°C ±25ppm/°C measurement in °C from 25°C ambient |
| Measurement noise: | 0.05°C peak-peak with 1.6s input filter |
| Linearity error: | 0.0033% (best fit straight line) |
| Lead resistance: | 0 to 22Ω matched lead resistances |
| Bulb current: | 200µA nominal |

| Low Range | High Range | Resolution | Maximum error (Instrument at 25°C) | Temperature Performance |
|---|---|---|---|---|
| –40mV | 40mV | 1.9µV | 4.6µV + 0.053% of reading | 13ppm of input per °C |

*Table 2 Ohms (RTD) input ranges*

| RTD Type | Overall range (°C) | Standard | Max. linearization error |
|---|---|---|---|
| Cu10 | –20 to +400 | General Electric Co. | 0.02°C |
| Cu53 | –70 to +200 | RC21-4-1966 | 0.01°C |
| JPT100 | –220 to +630 | JIS C1604:1989 | 0.01°C |
| Ni100 | –60 to + 250 | DIN43760:1987 | 0.01°C |
| Ni120 | –50 to +170 | DIN43760:1987 | 0.01°C |
| Pt100 | –200 to + 850 | IEC751 | 0.01°C |
| Pt100A | –200 to + 600 | Eurotherm Recorders SA | 0.09°C |

*Table 3 RTD type details*

## Thermocouple data

| | |
|---|---|
| Temperature scale: | ITS90 |
| CJC Types: | Off, internal, external, remote. |
| Remote CJC source:I | Any input channe |
| Internal CJC error: | <1°C max., with instrument at 25 °C |
| Internal CJC rejection ratio: | 40:1 from 25°C |
| Upscale/downscale drive: | High, low or none independently configurable for each channel's sensor break detection |
| Types, ranges and accuracies: | See Table 4 |

| T/C Type | Overall range (°C) | Standard | Max. linearization error |
|---|---|---|---|
| B | 0 to +1820 | IEC584.1 | 0 to 400°C = 1.7°C<br>400 to 1820°C = 0.03°C |
| C | 0 to +2300 | Hoskins | 0.12°C |
| D | 0 to +2495 | Hoskins | 0.08°C |
| E | –270 to +1000 | IEC584.1 | 0.03°C |
| G2 | 0 to +2315 | Hoskins | 0.07°C |
| J | –210 to +1200 | IEC584.1 | 0.02°C |
| K | –270 to +1372 | IEC584.1 | 0.04°C |
| L | –200 to +900 | DIN43710:1985 | 0.02°C |
| N | –270 to +1300 | (to IPTS68) | 0.04°C |
| R | –50 to +1768 | IEC584.1 | 0.04°C |
| S | –50 to +1768 | IEC584.1 | 0.04°C |
| T | –270 to +400 | IEC584.1 | 0.02°C |
| U | –200 to +600 | IEC584.1 | 0.08°C |
| NiMo/NiCo | –50 to +1410 | DIN43710:1985 | 0.06°C |
| Platinel | 0 to +1370 | ASTM E1751-95 | 0.02°C |
| Mi/NiMo | 0 to +1406 | Engelhard | 0.14°C |
| Pt20%Rh/Pt40%/Rh | 0 to +1888 | Ipsen | 0.07°C |

*Table 4 Thermocouple types, ranges and accuracies*

# Relay and Logic I/O

O/P1, O/P2 and O/P3 logic I/O and relay specification

## Active (current on) current sourcing logic output

(O/P1 or O/P2 only)

| | |
|---|---|
| Voltage o/p across terminals: | +11V min.; +13V max. |
| Short circuit output current: | 6mA min. (steady state); 44mA max. (switch current) |

## Inactive (current off) current sourcing logic output

(O/P1 or O/P2 only)

| | |
|---|---|
| Voltage output across terminals: | 0V (min.); 300mV (max.) |
| Output source leakage current into short circuit: | 0µA (min.); 100µA (max.) |

## Active (current on) contact closure sourcing logic input

(O/P1 only)

| | | |
|---|---|---|
| Input current | Input at 12V: | 0mA (min.); 44mA (max.) |
| | Input at 0V: | 6mA min. (steady state); 44mA max. (switch current) |
| Open circuit input voltage: | | 11V (min.); 13V (max.) |
| Open circuit (inactive) resistance: | | 500Ω (min.); ∞ (max.) |
| Closed circuit (active) resistance: | | 0Ω(min.); 150Ω (max.) |

## Relay contacts

| | |
|---|---|
| Contact switching power (resistive): | Max. 2A at 230V RMS ±15%<br>Min. 100mA at 12V |
| Current through terminals: | 2A |

# Digital Inputs

Dig InA and Dig InB contact closure logic input

## Contact closure

| | |
|---|---|
| Short circuit sensing current (source): | 5.5mA (min.); 6.5mA (max.) |
| Open circuit (inactive) resistance: | 600Ω (min.); ∞ (max.) |
| Closed circuit (active) resistance: | 0Ω (min.); 300Ω (max.) |

# DC Output (option)

O/P1, O/P2, O/P3 DC analog outputs

## Current outputs

(O/P1, O/P2 and O/P3)

| | |
|---|---|
| Output ranges: | Configurable within 0 to 20mA |
| Load resistance: | 500Ωmax. |
| Calibration accuracy: | <±100µA ±1% of reading |

## Voltage outputs

O/P3 only

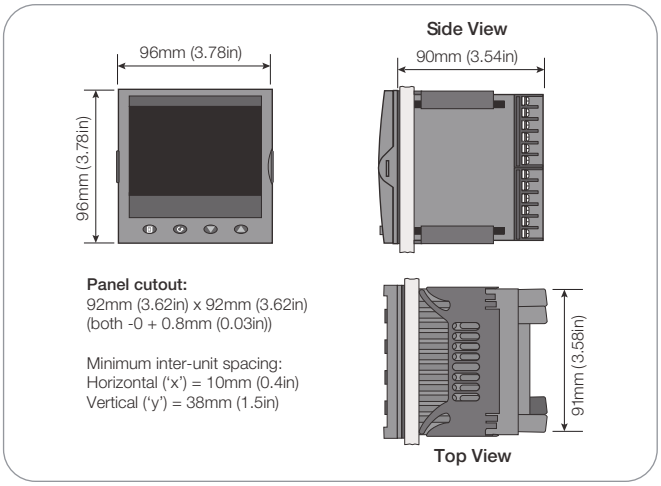
| | |
|---|---|
| Voltage output across terminals: | 0V (min.); 300mV (max.) |
| Output source leakage current into short circuit: | 0µA (min.); 100µA (max.) |

## General

| | |
|---|---|
| Isolation: | 300V ac double insulated from |
| Resolution: | >11 bits |
| Thermal drift: | <100ppm/°C |

* Consult Factory
† Refer to Manual

## Installation




## Order Code

NANOCAC | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14

### Basic Product

| | |
|---|---|
| **NANODAC** | Graphical Recorder/ Controller |

### 1 Voltage

| | |
|---|---|
| **VH** | 100-230V ac ±15% at 48-62Hz |
| **VL** | 24V ac (+10% –15%) at 48-62Hz, or 24V dc (+20% –15%) |

### 2 Controller

| | |
|---|---|
| **X** | None (default) |
| **C** | 2 Control loops |
| **A** | Advanced control loop (includes 2 control loops) |

### 3 Programmer

| | |
|---|---|
| **X** | None (default) |
| **P** | Dual programmer |

### 4 Output Options 1-2-3

| | |
|---|---|
| **LRR** | Logic/Relay/Relay (default) |
| **LRD** | Logic/Relay/Iso DC output |
| **LLR** | Logic/Logic/Relay |
| **RDD** | Relay/Iso DC/Iso DC |
| **DDD** | Iso DC/Iso DC/Iso DC |
| **LDD** | Logic/Iso DC/Iso DC |

### 5 Application Blocks

| | |
|---|---|
| **XX** | None |
| **ZC** | Zirconia |
| **RH** | Humidity |
| **ST** | Sterilizer |

### 6 Communications Protocol

| | |
|---|---|
| **TS** | Modbus TCP/IP slave (default) |
| **TM** | Modbus TCP/IP master |
| **ES** | EtherNet/IP* client/server |
| **TE** | Modbus TCP Master and EtherNet/IP* |

### 7 Bezel

| | |
|---|---|
| **SV** | Silver (standard) |
| **WD** | Wash down front* |

* Consult Factory

### 8 Toolkit Blocks

| | |
|---|---|
| **XXXXX** | None |
| **BASIC** | Basic toolkit blocks |

### 9 Operating Language

| | |
|---|---|
| **ENG** | English (default) |
| **FRA** | French |
| **GER** | German |
| **ITA** | Italian |
| **SPA** | Spanish |

### 10 OEM Security

| | |
|---|---|
| **XXX** | None |
| **OEM** | OEM Security enabled |

### 11 Labels

| | |
|---|---|
| **XXXXX** | No custom labels |

### 12 Special

| | |
|---|---|
| **XXXXX** | Default |

### 13 Dual Input Channels

| | |
|---|---|
| **XX** | None |
| **05** | 5 inputs enabled |
| **06** | 6 inputs enabled |
| **07** | 7 inputs enabled |
| **08** | 8 inputs enabled |

### 14 Dual Thermocouple Support

| | |
|---|---|
| **XXX** | None |
| **TC** | Dual T/C support enabled |

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