The nanodac™ recorder/controller offers the ultimate in graphical recording combined with PID control 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 display to bring a crystal clear operator interface to even the smallest of machines.

Crystal clear, colour display
The 3.5” TFT display offers incredibly clear visualisation 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 utilises 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 utilising the 50MB onboard Flash memory, removable USB and data transfer via FTP to a specified server. The four universal input channels provide high accuracy (suitable for use in Nadcap applications) and 125ms parallel sampling. An additional 30 virtual channels can be utilised to provide maths, counter, slave communications and totaliser functionality within the instrument.

Bigger Better Smaller

- Secure data recording
- 2 PID control loops
- Dual programmer
- High accuracy universal inputs
- USB removable data storage facility
- Compact design
- 50MB flash memory
- Ethernet communications
- ¼ VGA crystal clear display
- 30 virtual channels
- Steriliser Application Block
- Relative Humidity Application Block
- Multiple I/O options
- Cascade with auto-tune
- Multi-language support (French, German, Italian and Spanish)
- Webserver
PID Control Loops

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

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 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.

Specification

General

I/O types Analogue 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)
USB configuration save/restore
Programmer (optional)
Two control loops (optional)
Zirconia probe support (optional)
3D Virtual channels (each configurable as counter, maths, totaliser or comms input)
Steriliser (optional)
Relative humidity (optional)
Customised start up screen
EtherNet/IP

Environmental performance

Ambient temperature range:
Operating: 0 to 55°C
Storage: –20 to +70°C
Humidity range Operating: 5% to 85% RH non condensing
Storage: 5% to 85% RH non condensing
Protection: Front panel: IP65
Front panelwashdown: IP66, NEMA 12 (International)
Behind panel: IP10 (International)
Shock/Vibration: T (see scope)
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

Other approvals and compliance details

General: CE and cUL, EN61010
PV input: 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)
Depth behind panel: 90 mm (3.54 in) excluding wiring

Operator interface

Display: 3.5” TFT colour display
(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: 24V ac (+10% -15%) at 48 to 62Hz
Low voltage: 24V dc (+20% -15%) at 48 to 62Hz
Power dissipation 9W (max.)
Fuse type: No internal fuse fitted
Interrupt protection: Time, date
Replacement period: Three years typical

Battery backup

Stored data: Time, date
Clock (real-time clock) data:
Support time: Minimum of 1 year with unit unpowered
Temperature stability: 0 to 55°C ±3.5ppm
RTC Aging: 62.5kΩ for input voltages > 5.6V
Type: Poly-carbonmonofluoride/lithium (BR2330) (PA260195)

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)
Transmission speeds: 10MBit/sec
Maximum current: <100mA
Peripherals supported: Memory stick (8GB max), Bar code reader, QWERTY keyboard

USB port

Number of ports: One at rear of instrument
Standard: USB1.1
Transmission speeds: 1.5MBit/sec (low speed device)
Sample rate: 8Hz

Update/Archive rates

Sample rate (input/output): 8Hz
Trend update: Latest value at archive time
Display value: Latest value at display update time

Analogue Input

General

Number of inputs: Four/eight
Input types: dc Volts, dc mV, dc mA, dual mA (external
shunt required), dual mV, dual TC,
Thermocouple, RTD (2-wire and 3-wire),
Digital (Contact closure)
Input type mix: Freely configurable
Sample rate: 8Hz

Common mode: 16 bit delta sigma

Clock (real-time clock) data:
Series mode: > 95dB
Common mode: >179dB
Series mode voltage: 280mV at lowest range; 5V peak to peak at
Highest range
Input Impedance: 40mV, 80mV, 2V ranges > 100MΩ;
Series mode voltage: > 95dB
30 Virtual channels (each configurable as
counter, maths, totaliser or comms input)
Sample rate (input/output): 8Hz

PV input: BS611326 Class B – Light industrial
Series mode voltage: 280mV at lowest range; 5V peak to peak at
Highest range
Input Impedance: 40mV, 80mV, 2V ranges > 100MΩ;
Series mode voltage: > 95dB

Minimum break resistance: 62.5kΩ for input voltages > 5.6V
Shunt (mA inputs only): 1Ω to 1KΩ mounted externally
Additional error due to shunt: 0.1% of Input

Input ranges: See Table 1 and Table 2
Common mode voltage: 250V ac max.
Input type mix: Freely configurable
Sample rate: 8Hz

Other approvals and compliance details

General: CE and cUL, EN61010
PV input: 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)
92 mm x 92 mm (both -0.0 +0.8)
Depth behind panel: 90 mm (3.54 in) excluding wiring

Sample rate: 8Hz

Memory: 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.

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

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 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.

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Isolation:
- Channel to Channel: 300V RMS or dc (Double insulation)
- 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 test
- Channel to Channel: 2500V ac
- Channel to Ground: 1500V ac

<table>
<thead>
<tr>
<th>Low Range</th>
<th>High Range</th>
<th>Resolution</th>
<th>Maximum error (Instrument at 25°C)</th>
<th>Temperature Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>–40°C</td>
<td>40°C</td>
<td>1.9µV</td>
<td>4.5µV + 0.003% of reading</td>
<td>13ppm of input per °C</td>
</tr>
<tr>
<td>–20°C</td>
<td>20°C</td>
<td>3.2µV</td>
<td>7.5µV + 0.052% of reading</td>
<td>13ppm of input per °C</td>
</tr>
<tr>
<td>–5°C</td>
<td>5°C</td>
<td>426mV + 0.044% of reading</td>
<td>13ppm of input per °C</td>
<td></td>
</tr>
</tbody>
</table>

Table 1 Voltage input ranges

Note: Restricted to 2000mV if dual input mode enabled

Resistance input ranges

| Temperature scale: | IT950 |
| Types, ranges and accuracies: | See Table 3 |
| Maximum source current: | 200µA |
| Pt100 figures | Range: 0 to 4000 (–200 to +850°C) |
| Resolution: | ±0.05°C |
| Calibration error: | ±0.023% of measurement in °C at 25°C ambient |
| Temperature coefficient: | ±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 |

Table 2 Ohms (RTD) input ranges

Thermocouple data

<table>
<thead>
<tr>
<th>CJC Type</th>
<th>Overall range (°C)</th>
<th>Standard</th>
<th>Max. linearity error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cu10</td>
<td>–20 to +600</td>
<td>General Electric Co.</td>
<td>0.02°C</td>
</tr>
<tr>
<td>Cu50</td>
<td>–70 to +200</td>
<td>Price–Waterhouse</td>
<td>0.01°C</td>
</tr>
<tr>
<td>JPT100</td>
<td>–220 to +630</td>
<td>JIS C1604:1989</td>
<td>0.01°C</td>
</tr>
<tr>
<td>N100</td>
<td>–50 to +250</td>
<td>DIN43760:1987</td>
<td>0.01°C</td>
</tr>
<tr>
<td>N120</td>
<td>–50 to +170</td>
<td>DIN43760:1987</td>
<td>0.01°C</td>
</tr>
</tbody>
</table>

Table 3 T/C type defaults

 Relay and Logic I/O

**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 o/p 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.)

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)

**Current outputs (O/P1, O/P2 and O/P3)**
- Output ranges: Configurable within 0 to 20mA
- Load resistance: 500Ω max.
- 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 instrument and other I/O
- Resolution: >11 bits
- Thermal drift: <1000ppm/°C

* Consult Factory
† Refer to Manual
### Rear Terminals

**Termination details**

The screw terminals accept wire sizes in the range:

- Single wire 0.205 to 2.08mm² (14 to 24 AWG)
- 2 wires 0.205 to 1.31mm² (16 to 24 AWG) inclusive.

Screw terminals should be tightened to a torque not exceeding 0.4Nm (3.54 lb in).

<table>
<thead>
<tr>
<th>O/P1</th>
<th>Logic O/P (active high)</th>
<th>Relay output</th>
<th>Isolated DC O/P (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact closure</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>O/P2</th>
<th>Logic O/P (active high)</th>
<th>Relay output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolated DC O/P (mA)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Use copper conductors only.**

The power supply input is not fuse protected. This should be provided externally.

Each wire connected to LA, LB and LC must be less than 30 metres in length.

<table>
<thead>
<tr>
<th>O/P3</th>
<th>Digi In A</th>
<th>Digi In B</th>
<th>O/P4, O/P5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relay output</td>
<td>Isolated DC O/P (mA / V)</td>
<td>Contact closure</td>
<td>Contact closure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>O/P3</th>
<th>Digi In A</th>
<th>Digi In B</th>
<th>O/P4, O/P5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relay output</td>
<td>Isolated DC O/P (mA / V)</td>
<td>Contact closure</td>
<td>Contact closure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>An In 1, An In 2, An In 3, An In 4</th>
<th>Dual An In 1 to An In 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>T/C, Volts, millivolts</td>
<td>mV/TC</td>
</tr>
<tr>
<td>Milliamp</td>
<td>mA</td>
</tr>
</tbody>
</table>
**Isolation**

- Single (50V ac)
- Double (300V ac)

**Installation**

- Panel cutout: 92mm (3.62in) x 92mm (3.62in) (both -0 + 0.8mm (0.03in))
- Minimum inter-unit spacing: Horizontal (‘x’) = 10mm (0.4in)
  Vertical (‘y’) = 38mm (1.5in)

**Order Code**

<table>
<thead>
<tr>
<th>Basic Product</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>NANODAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Supply Voltage**

<table>
<thead>
<tr>
<th>VH</th>
<th>VL</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-230V ac ±15% at 48-62Hz</td>
<td>24V ac (+10% -15%) at 48-62Hz, or 24V dc (+20% -15%)</td>
</tr>
</tbody>
</table>

**Controller**

<table>
<thead>
<tr>
<th>X</th>
<th>C</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>None (default)</td>
<td>2 Control loops Advanced control loop (includes 2 control loops)</td>
<td></td>
</tr>
</tbody>
</table>

**Application Blocks**

<table>
<thead>
<tr>
<th>XX</th>
<th>ZC</th>
<th>RH</th>
<th>ST</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Zirconia</td>
<td>Humidity</td>
<td>Steriliser</td>
</tr>
</tbody>
</table>

**Communications Protocol**

<table>
<thead>
<tr>
<th>TS</th>
<th>TM</th>
<th>ES</th>
<th>TE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus TCP/IP slave (default) Modbus TCP/IP master EtherNet/IP* client/server</td>
<td>Modbus TCP Master and EtherNet/IP*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Bezel**

<table>
<thead>
<tr>
<th>SV</th>
<th>WD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver (standard)</td>
<td>Wash down front*</td>
</tr>
</tbody>
</table>

**Toolkit Blocks**

<table>
<thead>
<tr>
<th>XXXX</th>
<th>XXX</th>
<th>BASIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Basic toolkit blocks</td>
<td></td>
</tr>
</tbody>
</table>

**Operating Language**

<table>
<thead>
<tr>
<th>ENG</th>
<th>FRA</th>
<th>GER</th>
<th>ITA</th>
<th>SPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>English (default)</td>
<td>French</td>
<td>German</td>
<td>Italian</td>
<td>Spanish</td>
</tr>
</tbody>
</table>

**Dual Input Channels**

<table>
<thead>
<tr>
<th>XX</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>5 inputs enabled</td>
<td>6 inputs enabled</td>
<td>7 inputs enabled</td>
<td>8 inputs enabled</td>
</tr>
</tbody>
</table>

**Dual Thermocouple Support**

<table>
<thead>
<tr>
<th>XX</th>
<th>TC</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Dual T/C support enabled</td>
</tr>
</tbody>
</table>