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.

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 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, 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.

Imagine bigger better smaller
**General**

**I/O types**
- Analogue i/p: Four/eight
- Digital i/p: Two
- Digital (logic) i/p: Two max (see order code)
- Relay o/p: Four 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 counters input)
- Steriliser (optional)
- Relative humidity (optional)
- Customised start up screen
- EtherNet/IP* client/server (optional)
- Webserver

**Environmental performance**

- **Ambient operating 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 panel washdown: IP66, NEMA4X (International)
  - Behind panel: IP10 (International)
- **Shock/Vibration:**
  - To BS EN61326-1-2: ≤±3.5ppm
- **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:
    - 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
- LV input: AM2750D compliant
- RoHS: EU; China

**Physical**

- **Panel mounting:** 1/4 DIN
- **Weight:** 0.44kg (9.76lbs)
- **Panel cutout dimension:** 92 mm x 92 mm (both -0.0 +0.8 in)
- **Depth behind panel:** 90 mm (3.54 in) excluding wiring

**Operator interface**

- **Display:** 3.5” TFT colour display
- **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:** 15W (max.)
- **Fuse type:** No internal fuse fitted
- **Isolator:** 1Ω to 1KΩ mounted externally

**Battery backup**

- **Stored data:**
  - Time, date
  - Three years typical
- **Support time:**
  - Minimum of 1 year with unit unpowered
- **Temperature stability:** 0 to 55°C ±0.3°F
- **RTC Aging:**
  - First year to 10 year < 1.2 ppm
- **Type:**
  - Poly-carbonate monofluoride/lithium
  - BR2330 (PA260195)

**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:** 100 metres (110 yards)
- **Termination:** RJ45.
- **Green LED illuminated = link connected; Amber LED flashing shows link activity**

**USB port**

- **Number of ports:** One at rear of instrument
- **Standard:**
  - USB 1.1
- **Transmission speeds:** 1.5MBit/sec (low speed device)
- **Maximum current:** <100mA
- **Peripherals supported:**
  - Memory stick (8GB max), Bar code reader, QWERTY keyboard

**Analogue output**

- **General**
- **Number of Outputs:**
  - Four/eight
  - 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:**
  - FREely configurable
  - Sample rate: 1kHz (125ms)
  - 4Hz (250ms) if dual input enabled
- **Conversion method:**
  - 16 bit delta sigma
- **Input ranges:**
  - See Table 1 and Table 2
- **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 internal 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
- **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)
- **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 (MAX)</th>
<th>Maximum Error (INSTRUMENT at 25°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40mV</td>
<td>40mV</td>
<td>1.9μV</td>
<td>4.6μV ± 0.053% of reading</td>
</tr>
<tr>
<td>-80mV</td>
<td>80mV</td>
<td>3.8μV</td>
<td>7.5μV ± 0.052% of reading</td>
</tr>
<tr>
<td>-2V</td>
<td>2V</td>
<td>82μV</td>
<td>420μV ± 0.044% of reading</td>
</tr>
<tr>
<td>-3V</td>
<td>3V</td>
<td>100μV</td>
<td>667μV ± 0.063% of reading</td>
</tr>
</tbody>
</table>

**Table 1 Voltage input ranges**

| Note: Restricted to 2000mV if dual input mode enabled |

**Resistance input ranges**

- **Temperature scale:** IT90
- **Types, ranges and accuracies:**
  - See Table 3
  - 200μA
  - 0 to 4000 (±200 to +850°C)
- **Maximum current:**
  - 0.05°C
- **Calibration error:**
  - ±0.31°C ±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>
<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>0Ω</td>
<td>400Ω</td>
<td>20mΩ</td>
<td>±120mΩ + 0.023% of reading</td>
<td>25ppm of input per °C</td>
</tr>
</tbody>
</table>

Table 2 Ohms (RTD) input ranges

<table>
<thead>
<tr>
<th>RTD Type</th>
<th>Overall range (°C)</th>
<th>Standard</th>
<th>Max. linearisation error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cu10</td>
<td>-20 to +400</td>
<td>General Electric Co.</td>
<td>0.02°C</td>
</tr>
<tr>
<td>Cu53</td>
<td>-70 to +200</td>
<td>RC21-4:1966</td>
<td>0.01°C</td>
</tr>
<tr>
<td>JPt100</td>
<td>-220 to +630</td>
<td>JIS C1604:1987</td>
<td>0.01°C</td>
</tr>
<tr>
<td>Ni100</td>
<td>40 to +250</td>
<td>DIN43760:1987</td>
<td>0.011°C</td>
</tr>
<tr>
<td>Ni120</td>
<td>-50 to +170</td>
<td>DIN43760:1987</td>
<td>0.011°C</td>
</tr>
<tr>
<td>Pt100</td>
<td>-200 to +850</td>
<td>IEC751</td>
<td>0.011°C</td>
</tr>
<tr>
<td>Pt100A</td>
<td>-200 to +600</td>
<td>Eurotherm Recorders SA</td>
<td>0.09°C</td>
</tr>
</tbody>
</table>

Table 3 RTD type details

Thermocouple data
Temperature scale: ITS90
CJC Types: Off, internal, external, remote.
Remote CJC source: Any input channel
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

<table>
<thead>
<tr>
<th>T/C Type</th>
<th>Overall range (°C)</th>
<th>Standard</th>
<th>Max. linearisation error</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>0 to +1820</td>
<td>IEC584.1</td>
<td>0 to 400°C = 1.7°C, 400 to 1820°C = 0.03°C</td>
</tr>
<tr>
<td>C</td>
<td>0 to +2300</td>
<td>Hoskins</td>
<td>0.12°C</td>
</tr>
<tr>
<td>D</td>
<td>0 to +2495</td>
<td>Hoskins</td>
<td>0.08°C</td>
</tr>
<tr>
<td>E</td>
<td>-270 to +1000</td>
<td>IEC584.1</td>
<td>0.03°C</td>
</tr>
<tr>
<td>G2</td>
<td>0 to +2315</td>
<td>Hoskins</td>
<td>0.07°C</td>
</tr>
<tr>
<td>J</td>
<td>-210 to +1200</td>
<td>IEC584.1</td>
<td>0.02°C</td>
</tr>
<tr>
<td>K</td>
<td>-270 to +1372</td>
<td>IEC584.1</td>
<td>0.04°C</td>
</tr>
<tr>
<td>L</td>
<td>-200 to +900</td>
<td>DIN43710:1985 (to JPt568)</td>
<td>0.02°C</td>
</tr>
<tr>
<td>N</td>
<td>-270 to +1300</td>
<td>IEC584.1</td>
<td>0.04°C</td>
</tr>
<tr>
<td>R</td>
<td>-50 to +1768</td>
<td>IEC584.1</td>
<td>0.04°C</td>
</tr>
<tr>
<td>S</td>
<td>-50 to +1768</td>
<td>IEC584.1</td>
<td>0.04°C</td>
</tr>
<tr>
<td>T</td>
<td>-270 to +400</td>
<td>IEC584.1</td>
<td>0.02°C</td>
</tr>
<tr>
<td>U</td>
<td>-200 to +600</td>
<td>DIN43710:1985</td>
<td>0.08°C</td>
</tr>
<tr>
<td>NiMo/NiCo</td>
<td>50 to +1410</td>
<td>ASTM E1751:95</td>
<td>0.06°C</td>
</tr>
<tr>
<td>Platinum</td>
<td>0 to +1370</td>
<td>Engelhard</td>
<td>0.02°C</td>
</tr>
<tr>
<td>Ni/NiMo</td>
<td>0 to +1406</td>
<td>Ipsen</td>
<td>0.14°C</td>
</tr>
<tr>
<td>Pt20%Rh/Pt40%/Rh</td>
<td>0 to +1888</td>
<td>ASTM E1751:95</td>
<td>0.07°C</td>
</tr>
</tbody>
</table>

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) contact 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.
Inactive (current off) contact 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.), 44mA max.
Open circuit input voltage: 11V (min.); 13V (max.)
Open circuit (inactive) resistance: 50Ω (min.); 150Ω (max.)
Closed circuit (active) resistance: 150Ω (min.)

Relay Contacts
Contact switching power (resistive): Max. 2A at 230V RMS ±15%
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: 60Ω (min.); ∞ (max.)
Closed circuit (active) resistance: 0Ω (min.), 300Ω (max.)

DC Output (option)
O/P1, O/P2, O/P3 DC analogue outputs
Current outputs (O/P1, O/P2 and O/P3)
Output ranges: Configurable within 0 to 20mA
Load resistance: 5002 max
Calibration accuracy: <±10μA ±1% of reading
Voltage outputs (O/P3 only)
Output ranges: Configurable within 0-10V
Load resistance: 5002 min
Calibration accuracy: <±500mV ±1% of reading
General
Isolation: 300V ac double insulated from instrument and other I/O
Resolution: 11 bits
Thermal drift: <100ppm/°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>O/P2</th>
<th>O/P3</th>
<th>O/P4, O/P5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact closure</td>
<td>Logic O/P (active high)</td>
<td>Relay output</td>
<td>Isolated DC O/P (mA)</td>
</tr>
<tr>
<td>R&gt;500R = inactive</td>
<td>R&lt;150R = active</td>
<td>R&gt;600R = inactive</td>
<td>R&lt;300R = active</td>
</tr>
<tr>
<td>Isolated DC O/P (mA)</td>
<td>Logic O/P (active high)</td>
<td>Relay output</td>
<td></td>
</tr>
<tr>
<td>Relay output</td>
<td>Isolated DC O/P (mA / V)</td>
<td>Contact closure</td>
<td>Contact closure</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>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>Milliamps</td>
</tr>
<tr>
<td>RTD (three wire)</td>
<td>RTD (two wire)</td>
</tr>
<tr>
<td>Ohms inputs</td>
<td>Digital</td>
</tr>
<tr>
<td>mV/TC</td>
<td>mA</td>
</tr>
</tbody>
</table>
### Isolation

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

*Note: Each "PV" is double isolated (300V RMS) from all other "PV"s.*

### Power Supply Circuits

- **Rectification**
- **Sn1**
- **µP & System Circuits**
- **USB comms**
- **PSU Logic/Digital I/O**

### Safety earth (Protective conductor terminal)

### Order codes

<table>
<thead>
<tr>
<th>NANODAC</th>
<th>Basic Product</th>
<th>Programmer</th>
<th>Communications Protocol</th>
<th>Bezel</th>
<th>Toolkit Blocks</th>
<th>Operating Language</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NANODAC</td>
<td>X (None)</td>
<td>TS Modbus TCP/IP slave</td>
<td>SV</td>
<td>XXXX None</td>
<td>ENG English</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Supply Voltage</td>
<td>P (Dual)</td>
<td>TS Modbus TCP/IP master</td>
<td>TM</td>
<td>XXXX None</td>
<td>FRA French</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>100-230V ac ±15%</td>
<td></td>
<td>TE Modbus TCP/ IP master Ethernet/IP* client/server</td>
<td>LRR</td>
<td>XXXX None</td>
<td>ITA Italian</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>at 48-62Hz, 24V ac ±10% -15%</td>
<td></td>
<td>ES Modbus TCP Master and Ethernet/IP*</td>
<td>LRD</td>
<td>XXXX None</td>
<td>SPA Spanish</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>at 48-62Hz, 24V dc ±20% -15%</td>
<td></td>
<td>TM Master and Ethernet/IP*</td>
<td>RDD</td>
<td>XXXX None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Double (300V ac)</td>
<td></td>
<td>EtherNet/IP® client/server</td>
<td>DDD</td>
<td>XXXX None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Double (300V ac)</td>
<td></td>
<td>Modbus TCP Master and Ethernet/IP*</td>
<td>LDD</td>
<td>XXXX None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Double (300V ac)</td>
<td></td>
<td>XXXX None</td>
<td>XXXX None</td>
<td>None</td>
<td>XX None</td>
<td>Eurotherm Part No. HA030686 Issue 6 November 12</td>
</tr>
<tr>
<td>9</td>
<td>Double (300V ac)</td>
<td></td>
<td>None</td>
<td>XXXX None</td>
<td>None</td>
<td>XX None</td>
<td></td>
</tr>
</tbody>
</table>