



## Recorder/Controller Specification Sheet

- Secure data recording
- 2 PID control loops
- High accuracy universal inputs
- USB removable data storage facility
- Compact design
- 50MB flash memory
- Ethernet communications
- ¼ VGA crystal clear display
- 14 virtual channels

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 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 14 virtual channels can be utilised to provide maths, counter, slave communications and totaliser functionality within the instrument.

Review software can also be utilised to automatically initialise pulling of data to a Review database over the Ethernet network. Both Review and Dream Report™ software can be used for report generation that meets the needs of your process.

### PID Control Loops

The nanodac instrument can also provide two 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.

imagine bigger better smaller

# Specification

## General

### General

I/O types	Analogue i/p: Four
	Digital i/o: One
	Digital i/p: Two
Relay o/p (Standard fit):	Two + two with shared common connection or
Relay o/p (with DC o/p option):	One + two with shared common connection
	DC o/p: One
Features:	CSV archive format
	File transfer protocol (FTP) Messages
	Modbus TCP (Slave)
	uhh (history file) archiving
	USB port at rear of instrument
	User linearisation tables (four)
	Two control loops (optional)
	Zirconia probe support (optional)
	14 Virtual channels (each configurable as counter, maths, totaliser or comms input)

### 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, NEMA4X (International)
	Behind panel: IP10 (International)
Shock/Vibration:	To 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	
Emmissions (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) 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 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:	100 to 230V ac $\pm 15\%$ at 48 to 62Hz
Low voltage:	24V ac (+20% -15%) at 48 to 62Hz, or 24V dc (+10% -20%)
Power dissipation:	9W (max.)
Fuse type:	None
Interrupt protection:	Holdup >10ms at 85V RMS supply voltage or 20.4V ac for low voltage

### Battery backup

Stored data:	Time, date
Support time (for real-time clock):	Minimum of 1 year with unit unpowered
Replacement period:	Three years typical
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 slave, FTP, DHCP
Cable type:	Category 5
Maximum length:	100metres (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:	USB1.1
Transmission speeds:	1.5MBit/sec (low speed device)
Maximum current:	<100mA
Peripherals supported:	Memory stick (8GB max)

### 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

## Analogue Input

### General

Number of Inputs:	Four
Input types:	dc Volts, dc mV, dc mA (external shunt required), Thermocouple, RTD (2-wire and 3-wire), Digital (Contact closure)

Input type mix:	Freely configurable
Sample rate:	8Hz (125ms)
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 > 100M $\Omega$ ; 62.5k $\Omega$ for input voltages > 5.6V 667k $\Omega$ for input ranges < 5.6V

Overvoltage protection	
Continuous:	$\pm 30V$ RMS
Transient (<1ms):	$\pm 200V$ 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: 5k $\Omega$ ; other ranges: 12.5k $\Omega$
Shunt (mA inputs only):	1 $\Omega$ to 1K $\Omega$ mounted externally
additional error due to shunt:	0.1% of Input

Isolation:	
Channel to Channel:	300V RMS or dc (Double insulation)
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

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

Table 1 Voltage input ranges

### Resistance input ranges

Temperature scale:	ITS90
Types, ranges and accuracies:	See Table 3
Maximum source current:	200 $\mu A$
Pt100 figures	Range: 0 to 400 $\Omega$ (-200 to +850°C)
Resolution:	0.05°C
Calibration error:	$\pm 0.31^\circ C \pm 0.023\%$ of measurement in °C at 25°C ambient
Temperaure coefficient:	$\pm 0.01^\circ C/^\circ C \pm 25ppm/^\circ C$ 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 22 $\Omega$ matched lead resistances
Bulb current:	200 $\mu A$ nominal

Low Range	High Range	Resolution	Maximum error (Instrument at 25°C)	Temperature Performance
0 $\Omega$	400 $\Omega$	20m $\Omega$	120m $\Omega$ + 0.023% of reading	25ppm of input per °C

Table 2 Ohms (RTD) input ranges

RTD Type	Overall range (°C)	Standard	Max. linearisation 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: An input or maths 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  
 Types, ranges and accuracies: See Table 4

T/C Type	Overall range (°C)	Standard	Max. linearisation error
B	0 to +1820	IEC584.1	0 to 400°C = 1.7°C 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 (to IPTS68)	0.02°C
N	-270 to +1300	IEC584.1	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	DIN43710:1985	0.08°C
NiMo/NiCo	-50 to +1410	ASTM E1751-95	0.06°C
Platinel	0 to +1370	Engelhard	0.02°C
Mi/NiMo	0 to +1406	Ipsen	0.14°C
Pt20%Rh/Pt40%Rh	0 to +1888	ASTM E1751-95	0.07°C

Table 4 Thermocouple types, ranges and accuracies

### Relay and Logic I/O

I/O1, OP/2 and OP/3 logic I/O and relay specification

#### Active I/O1 (current on) current sourcing logic output

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

#### Inactive I/O1 (current off) current sourcing logic output

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

#### Active I/O1 (current on) contact closure sourcing logic input

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  
 Min. 100mA at 12V  
 Current through terminals: 2A (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)

OP3 DC analogue outputs

#### Current outputs

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

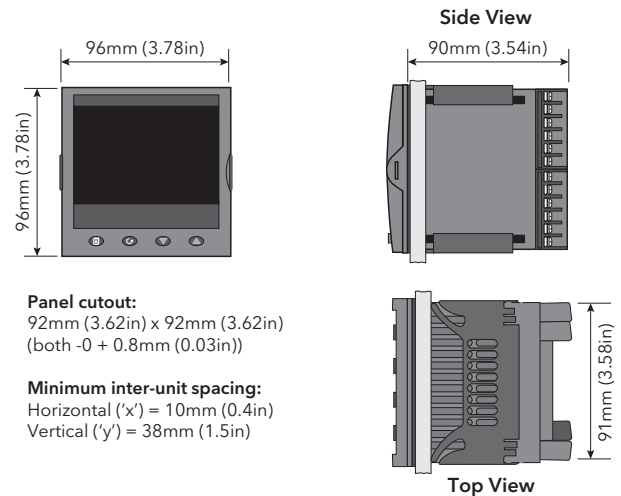
#### Voltage outputs

Output ranges: Configurable within 0-10V  
 Load resistance: 500Ω min.  
 Calibration accuracy: <±50mV ±1% of reading

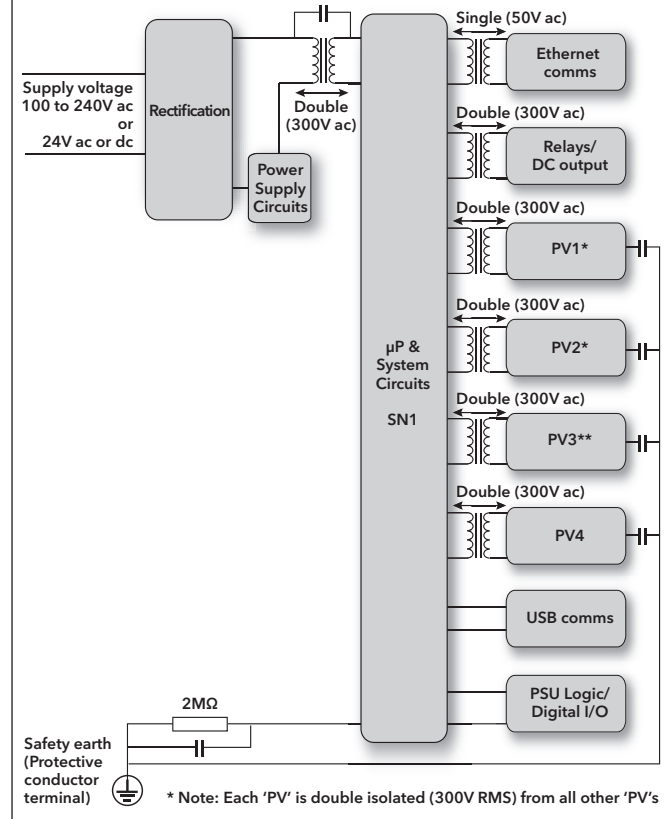
#### General

Isolation: 300V ac double insulated from instrument and other I/O  
 Resolution: >11 bits  
 Thermal drift: <100ppm/°C

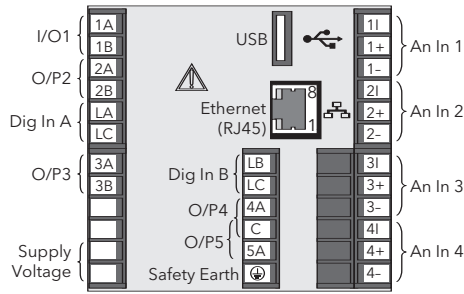
### Installation



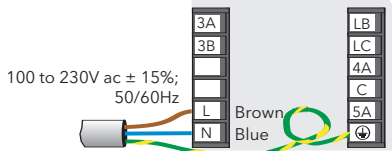
### Isolation



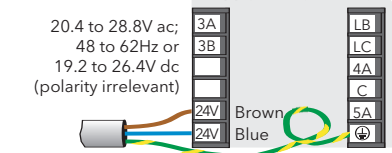
## Rear Terminals



### Mains (Line) supply voltage wiring

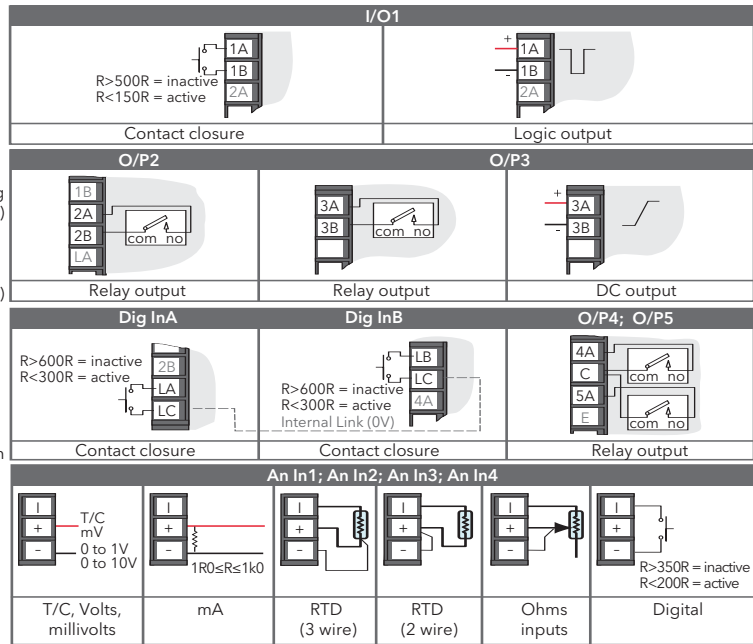


### Low voltage option supply voltage wiring



Relay switching details: (per terminal)  
2A max at 264V ac  
100mA min. at 12V dc  
(Both resistive)

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



## Order codes

NANODAC	1	2	3	4	5	6	7	8	9
---------	---	---	---	---	---	---	---	---	---

<b>Basic Product</b>	<b>2 Controller</b>	<b>5 Application Blocks</b>	<b>7 Spare</b>
NANODAC Graphical Recorder/Controller	X None (default) C 2 Control loops	XX None ZC Zirconia	XXXX Spare
<b>1 Supply Voltage</b>	<b>3 Spare</b>	<b>6 Communications Protocol</b>	<b>8 Spare</b>
VH 100-230V ac ±15% at 48-62Hz VL 24V ac (+20% -15%) at 48-62Hz, or 24V dc (+10% -20%)	X None (default)	TS Modbus TCP/IP slave (default)	XXXXX Spare
<b>4 Output Options 1-2-3</b>	<b>9 Operating Language</b>		
LRR Local/Relay/Relay (default) LRD Local/Relay/Iso DC output	ENG English (default)		

## Eurotherm: International sales and service [www.eurotherm.com](http://www.eurotherm.com)

**AUSTRALIA** Sydney  
T (+61 2) 9838 0099  
E [info.eurotherm.au@invensys.com](mailto:info.eurotherm.au@invensys.com)

**AUSTRIA** Vienna  
T (+43 1) 7987601  
E [info.eurotherm.at@invensys.com](mailto:info.eurotherm.at@invensys.com)

**BELGIUM & LUXEMBOURG** Moha  
T (+32) 85 274080  
E [info.eurotherm.be@invensys.com](mailto:info.eurotherm.be@invensys.com)

**BRAZIL** Campinas-SP  
T (+5519) 3707 5333  
E [info.eurotherm.br@invensys.com](mailto:info.eurotherm.br@invensys.com)

**CHINA**  
T (+86 21) 61451188  
E [info.eurotherm.cn@invensys.com](mailto:info.eurotherm.cn@invensys.com)

Beijing Office  
T (+86 10) 5909 5700  
E [info.eurotherm.cn@invensys.com](mailto:info.eurotherm.cn@invensys.com)

**DENMARK** Copenhagen  
T (+45 70) 234670  
E [info.eurotherm.dk@invensys.com](mailto:info.eurotherm.dk@invensys.com)

**FINLAND** Abo  
T (+358) 22506030  
E [info.eurotherm.fi@invensys.com](mailto:info.eurotherm.fi@invensys.com)

**FRANCE** Lyon  
T (+33 478) 664500  
E [info.eurotherm.fr@invensys.com](mailto:info.eurotherm.fr@invensys.com)

**GERMANY** Limburg  
T (+49 6431) 2980  
E [info.eurotherm.de@invensys.com](mailto:info.eurotherm.de@invensys.com)

**INDIA** Chennai  
T (+91 44) 24961129  
E [info.eurotherm.in@invensys.com](mailto:info.eurotherm.in@invensys.com)

**IRELAND** Dublin  
T (+353 1) 4691800  
E [info.eurotherm.ie@invensys.com](mailto:info.eurotherm.ie@invensys.com)

**ITALY** Como  
T (+39 031) 975111  
E [info.eurotherm.it@invensys.com](mailto:info.eurotherm.it@invensys.com)

**KOREA** Seoul  
T (+82 31) 2738507  
E [info.eurotherm.kr@invensys.com](mailto:info.eurotherm.kr@invensys.com)

**NETHERLANDS** Alphen a/d Rijn  
T (+31 172) 411752  
E [info.eurotherm.nl@invensys.com](mailto:info.eurotherm.nl@invensys.com)

**NORWAY** Oslo  
T (+47 67) 592170  
E [info.eurotherm.no@invensys.com](mailto:info.eurotherm.no@invensys.com)

**POLAND** Katowice  
T (+48 32) 2185100  
E [info.eurotherm.pl@invensys.com](mailto:info.eurotherm.pl@invensys.com)

**SPAIN** Madrid  
T (+34 91) 6616001  
E [info.eurotherm.es@invensys.com](mailto:info.eurotherm.es@invensys.com)

**SWEDEN** Malmo  
T (+46 40) 384500  
E [info.eurotherm.se@invensys.com](mailto:info.eurotherm.se@invensys.com)

**SWITZERLAND** Wollerau  
T (+41 44) 7871040  
E [info.eurotherm.ch@invensys.com](mailto:info.eurotherm.ch@invensys.com)

**UNITED KINGDOM** Worthing  
T (+44 1903) 268500  
E [info.eurotherm.uk@invensys.com](mailto:info.eurotherm.uk@invensys.com)

**U.S.A.** Ashburn VA  
T (+1 703) 724 7300  
E [info.eurotherm.us@invensys.com](mailto:info.eurotherm.us@invensys.com)

ED60

© Copyright Eurotherm Limited 2010

Invensys, Eurotherm, the Eurotherm logo, Chessell, EurothermSuite, Mini8, Eycon, Eyris, EPower nanodac and Wonderware are trademarks of Invensys plc, its subsidiaries and affiliates. All other brands may be trademarks of their respective owners.

All rights are strictly reserved. No part of this document may be reproduced, modified, or transmitted in any form by any means, nor may it be stored in a retrieval system other than for the purpose to act as an aid in operating the equipment to which the document relates, without the prior written permission of Eurotherm limited.

Eurotherm Limited pursues a policy of continuous development and product improvement. The specifications in this document may therefore be changed without notice. The information in this document is given in good faith, but is intended for guidance only.

Eurotherm Limited will accept no responsibility for any losses arising from errors in this document.

**invensys**  
Operations Management