invensys
Eurotherm

nanodac™

User Guide Addendum

nanodac™ recorder/controller
Versions 2.3 and later

HA031164/1
Aug 2011

1 INTRODUCTION

This document describes enhancements to the nanodac instrument, which have been introduced since issue three of the main manual was produced. These enhancements are described in the following sections:

2 Dual channel inputs.

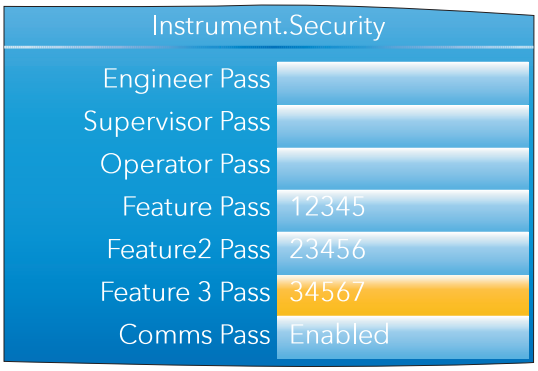
3 Sensor break detection for mA inputs.

4 Errata - corrections to and omissions from the main manual

References to 'the main manual' refer to issue 3 of the nanodac user guide HA030554.

2 DUAL CHANNEL INPUTS

This is a cost option, enabled on a channel-by-channel basis by means of entering the relevant password in the 'Feature3 Pass' field in Instrument.Security menu. (Similar to 'Feature2 Pass' described in section 4.1.6 (Security menu) of the main manual.)

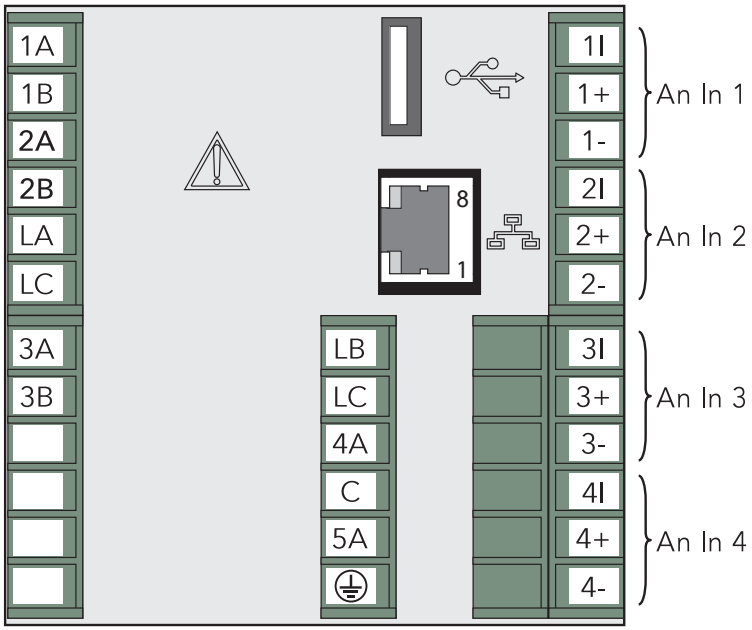


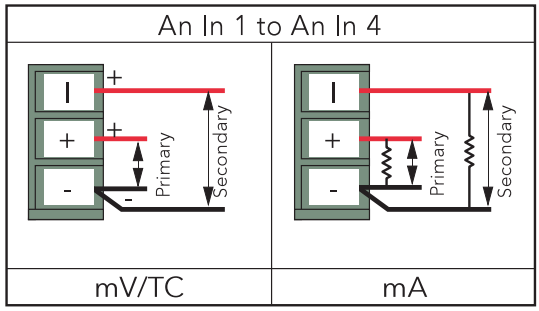
For each enabled channel, a pair of mV or mA inputs can be terminated at the analogue input terminals (An In1 to An In 4 in figure 2.2 in the main manual), Thermocouple inputs are also available - please contact the supplier for advice.

For each enabled channel, the inputs are called 'primary' and 'secondary', terminated as shown in 'Wiring', below. The primary inputs 1 to 4 are assigned to channels 1 to 4, as normal. Each secondary input must be soft wired to a maths channel configured as Operation = 'Copy' if it is to be recorded/displayed/alarmed etc. Soft wiring is described in Section 7 of the main manual (User wiring) and maths channels are described in section 4.5.1 (Maths channel configuration) in the same document.

2.1 WIRING

The figure below gives wiring details for the four analogue input channels. See figure 2.2 of the main manual for wiring details for other inputs.





Primary and secondary inputs are not electrically isolated from one another.

Note: For maximum accuracy, it is recommended that separate returns are used to the negative terminals.

2.2 CHANNEL (MAIN) CONFIGURATION

Figure 2.2, below shows a typical channel configuration page for the case where channel type is set to 'Dual mA;. Dual mV and Dual T/C (if fitted) are similar. See section 4.4.1 of the main manual for further details.

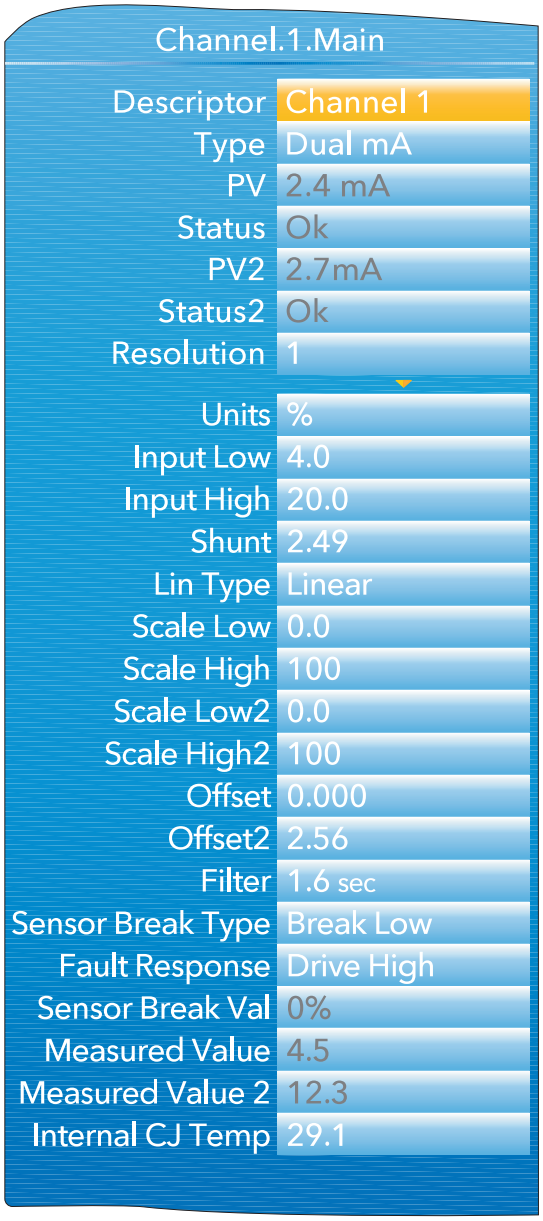


Figure 2.2 Typical channel configuration page.

2.2.1 Channel Main parameters

Descriptor	Allows a (20 character max.) descriptor to be entered for the channel. Some thought should be given to ensure that the descriptor is meaningful because in some display screens it is truncated. For example, 'Furnace 1 area 1' and 'Furnace 1 area 2' might both appear as 'Furnace 1 a' and thus be indistinguishable from one another, except in background colour.
PV	Read only. Displays the current value of the primary input.
Status	Read only. Shows the primary input status as one of: 'Good', 'Channel Off', 'Over range', 'Under range', 'HW error', 'Ranging', 'HW (capability) exceeded'.

2.2.1 CHANNEL MAIN PARAMETERS (Cont.)

PV2	Read only. Displays the current value of the secondary input.
Status2	Read only. Shows the secondary input status as one of: 'Good', 'Channel Off', 'Over range', 'Under range', 'HW error', 'Ranging', 'HW (capability) exceeded'.
IP Adjust State	Appears only if the relevant primary channel has been adjusted using the 'Input Adjust' procedure described in section 4.1.8 of the main manual and section 2.3, below.
IP Adjust State2	As 'IP Adjust State', above but for secondary channels.
Resolution	Allows the number of decimal places to be defined for the channel. Valid entries are zero to nine.
Units	Allows a units string of up to five characters to be entered.
Type	Allows the user to select an input type for the channel. Available selections are: 'Off', 'Thermocouple', 'mV', 'V', 'mA', 'RTD', 'Digital', 'Test' or 'Ohms', Dual mV, Dual mA, Dual T/C (if enabled).
Test signal	Appears only if 'Test' is selected as 'Type'. Allows either a sinusoidal or a triangular waveform to be selected at one of a number of cycle times between 40 seconds and five hours.
Input Low*	For Type = mV, Dual mV, V, mA, Dual mA or Ohms, the lowest value of the applied signal in electrical units.
Input High*	As 'Input Low', but the highest value of the applied signal in electrical units.
Shunt value	For mA and Dual mA input types only, this allows the value of the shunt resistor (in Ohms) to be entered. The recorder does not validate this value - it is up to the user to ensure that the value entered here matches that of the shunt resistor(s) fitted. For Dual mA input type, both primary and secondary inputs must have independent shunts each of the same value.
Lin type	Linear, Square root, x3/2, x5/2, User Lin. Thermocouple types (alphabetical order): B, C, D, E, G2, J, K, L, N, R, S, T, U, NiMo/NiCo, Platinel, Ni/MiMo, Pt20%Rh/Pt40%Rh. User 1 to User 4 Resistance thermometer types: Cu10, Pt100, Pt100A, JPT100, Ni100, Ni120, Cu53. See Appendix A of the main manual for input ranges, accuracies etc. associated with the above thermocouple and RTD types. See section 4.9 of the manual for details of user linearisations.
Range Low*	For thermocouples, RTDs, User linearisations and retransmitted signals only, the lowest value of the required linearisation range.
Range High*	For thermocouples, RTDs, User linearisations and retransmitted signals only, the highest value of the required linearisation range.
Range Units	For thermocouples only and RTDs, Select °C, °F or K.
Scale Low/High	Maps the process value of the primary input to (Scale High - Scale Low). For example, an input of 4 to 20mA may be scaled as 0 to 100% by setting Scale low to 0 and Scale High to 100.
Scale Low2/High2	As 'Scale Low/High but for the secondary input (PV2).
Offset	Allows a fixed value to be added to or subtracted from the value of the primary process variable.
Offset2	The nature of the secondary input results in an offset being introduced into the process variable value. For mA inputs this offset is removed automatically, without user intervention. For mV inputs the offset depends on the value of the voltage source impedance and is equal to 199.9µV/Ω. This offset can be compensated for eithrer by using this Offset2 parameter, or by carrying out the 'Input Adjust' procedure.** For Dual T/C inputs, it is recommended that the 'Input Adjust' procedure** be used instead of Offset2 as the use of Offset2 results in an offset which is non-linear over the thermocouple range.

* See section 4.9 of the main manual for details of the configuration of Range High/Low and Input High/Low when 'Type' = User 1 to User 4.

** The 'Input Adjust' procedure is described in section 4.1.8 of the main manual and section 2.3, below.

2.2.1 CHANNEL MAIN (Cont.)

Input filter — Damping can be used to filter out noise from slowly changing signals so that the underlying trend can be seen more clearly. Valid input values are between 0 and 60 seconds.

Note: Applying a filter to an input channel can affect the operation of any Rate-of-change alarms configured to act on that channel.

CJC Type — For thermocouple input types only, this allows the user to select 'None', 'Internal', 'External' or 'Remote 1' to 'Remote 4'. For Dual T/C inputs, both primary and secondary inputs use the same cold junction.
None: No cold junction compensation applied.
'Internal' uses the recorder's internal cold junction temperature measurement.
'External' means that the cold junction is to be maintained by the user, at a fixed, known temperature. This temperature is entered in the 'External CJ Temp' field which appears when 'External' is selected.
Remote 1 (2) (3) (4) means that the cold junction temperature is being measured by input channel 1 (2) (3) (4) respectively. (This must be a different channel from that currently being configured).

Ext. CJ Temp — Appears only if CJC type is set to 'External', and allows the user to enter the temperature at which the external cold junction is being maintained.

Sensor Break Type — Defines whether the sensor break becomes active for circuit impedances greater than expected.
'Off' disables Sensor Break detection.
Break Low: Sensor break active if measured impedance is greater than the 'Break Low impedance' value given in table 2.2.1.
Break High: Sensor break active if measured impedance is greater than the 'Break High Impedance' value given in table 2.2.1. See also Section 2.6.2 below.

Fault Response — Specifies the behaviour of the instrument if a sensor break is detected or if the input is over driven (saturated high or low).
'None' means that the input drifts, with the wiring acting as an aerial.
'Drive High' means that the trace moves to (Scale High +10%). 'Drive Low' means that the trace moves to (Scale Low -10%), where the 10% values represent 10% of (Scale High - Scale Low).

Sensor Break Val — A diagnostic representation of how close the sensor break detection circuitry is to tripping.

Measured Value — The (read only) measured value of the primary input before any scaling or linearisation is applied.

Measured Value2 — As 'Measured Value', above but for the secondary input.

Internal CJ temp — The (read only) temperature of the internal cold junction associated with this channel.

Range	Break Low impedance	Break High Impedance
40mV	~5kΩ	~20kΩ
80mV	~5kΩ	~20kΩ
2V	~12.5kΩ	~70kΩ
10V	~12.5kΩ	~120kΩ

Table 2.2.1 Minimum impedances for sensor break detection

Note: Break High impedance values would be used typically for sensors which have a high nominal impedance when working normally

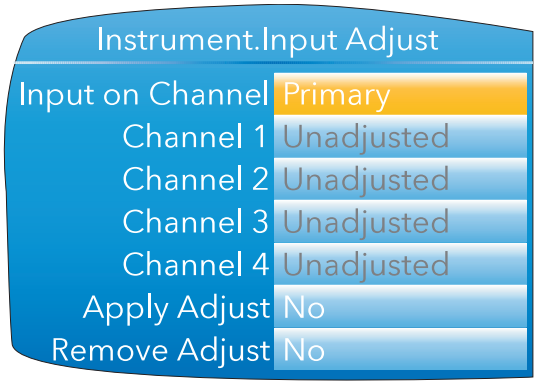
2.2.2 Other channel parameters

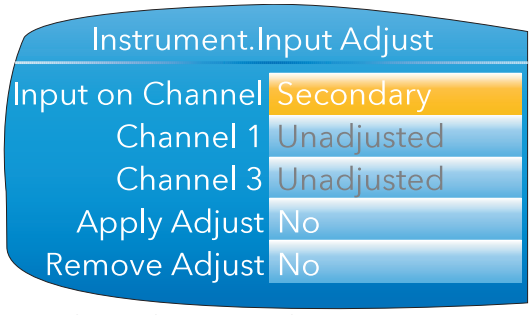
See sections 4.4.2 and 4.4.3 of the main manual for details of channel trend and alarm parameters respectively.

Note: Trend colours and alarm settings for secondary inputs are configured in the maths channels to which they are wired.

2.3 INPUT ADJUST

Input adjust is carried out as described in section 4.1.8 of the main manual, except that where dual inputs are configured, the user must initiate adjustment to primary and secondary inputs separately. As shown in figure 2.3, a new field 'Input on Channel' is introduced for this purpose.





Only those channels with 'Type' set to 'Dual mA', 'Dual mV' or 'Dual T/C' appear in the list of secondary channels. In this example only channels 1 and 3 are configured as dual input.

Figure 2.3 Input adjust top level display

For primary inputs, all four channels are included in the list and can therefore be selected for adjustment. For secondary inputs, only those channels which have been configured as dual input are included.

2.4 NON-VOLATILE PARAMETERS

The following are additional to the non-volatile parameters list in section 5.2.4 of the main manual:
Channel.N.Offset2
Channel.N.ScaleLow2
Channel.N.ScaleHigh2

2.5 PARAMETER LIST

The items listed below are additional to the parameters listed in section 5.3 of the main manual.

Parameter path	Description	Type	Hex	Dec	Resolution
Channel.1.Main.IPAdjustState2	0 = Unadjusted; 1 = Adjusted	bool	181c	6172	Not applicable
Channel.1.Main.MeasuredValue2	Measured value of channel 1 secondary input	float32	1819	6169	Set by Channel.1.Main.Resolution
Channel.1.Main.Offset2	Channel 1 secondary input offset	float32	1818	6168	3dp
Channel.1.Main.PV2	The secondary input process variable (output) of channel 1	float32	0110	272	Set by Channel.1.Main.Resolution
Channel.1.Main.ScaleHigh2	Scale high value for channel 1 secondary input	float32	181b	6171	Set by Channel.1.Main.Resolution
Channel.1.Main.ScaleLow2	Scale low value for channel 1 secondary input	float32	181a	6170	Set by Channel.1.Main.Resolution
Channel.1.Main.Status2	Channel 1 secondary input PV (output) status 0 =Good 1 = Off 2 = Over range 3 = Under range 4 = HW error 5 = Ranging 6 = Overflow 7 = bad 8 = HW exceeded 9 = No data 12 = Comm channel error	uint8	0111	273	Not applicable
Channel.1.Main.Type	Specifies the type of channel 0 = Off 1 = TC 2 = mV 3 = V 4 = mA 5 = RTD 6 = Digital 7 = Test 8 = Ohms 9 = Dual mV 10 = Dual mA 11 = Dual T/C	uint8	1800	6144	Not applicable
Channel.2.Main.IPAdjustState2	0 = Unadjusted; 1 = Adjusted	bool	189c	6300	Not applicable
Channel.2.Main.MeasuredValue2	Measured value of channel 2 secondary input	float32	1899	6297	Set by Channel.1.Main.Resolution
Channel.2.Main.Offset2	Channel 2 secondary input offset	float32	1898	6296	3dp
Channel.2.Main.PV2	The secondary input process variable (output) of channel 2	float32	0114	276	Set by Channel.1.Main.Resolution
Channel.2.Main.ScaleHigh2	Scale high value for channel 2 secondary input	float32	189b	6299	Set by Channel.1.Main.Resolution
Channel.2.Main.ScaleLow2	Scale low value for channel 2 secondary input	float32	189a	6298	Set by Channel.1.Main.Resolution
Channel.2.Main.Status2	Channel 2 secondary input PV (output) status (as channel 1)	uint8	0115	277	Not applicable
Channel.2.Main.Type	Specifies the type of channel (as channel 1)	uint8	1880	6272	Not applicable
Channel.3.Main.IPAdjustState2	0 = Unadjusted; 1 = Adjusted	bool	191c	6428	Not applicable
Channel.3.Main.MeasuredValue2	Measured value of channel 3 secondary input	float32	1919	6425	Set by Channel.1.Main.Resolution
Channel.3.Main.Offset2	Channel 3 secondary input offset	float32	1918	6424	3dp
Channel.3.Main.PV2	The secondary input process variable (output) of channel 3	float32	0118	280	Set by Channel.1.Main.Resolution
Channel.3.Main.ScaleHigh2	Scale high value for channel 3 secondary input	float32	191b	6427	Set by Channel.1.Main.Resolution
Channel.3.Main.ScaleLow2	Scale low value for channel 3 secondary input	float32	191a	6126	Set by Channel.1.Main.Resolution
Channel.3.Main.Status2	Channel 3 secondary input PV (output) status (as channel 1)	uint8	0119	281	Not applicable
Channel.3.Main.Type	Specifies the type of channel (as channel 1)	uint8	1900	6400	Not applicable
Channel.4.Main.IPAdjustState2	0 = Unadjusted; 1 = Adjusted	bool	199c	6556	Not applicable
Channel.4.Main.MeasuredValue2	Measured value of channel 4 secondary input	float32	1999	6553	Set by Channel.1.Main.Resolution
Channel.4.Main.Offset2	Channel 4 secondary input offset	float32	1998	6552	3dp
Channel.4.Main.PV2	The secondary input process variable (output) of channel 4	float32	011c	284	Set by Channel.1.Main.Resolution
Channel.4.Main.ScaleHigh2	Scale high value for channel 4 secondary input	float32	199b	6555	Set by Channel.1.Main.Resolution
Channel.4.Main.ScaleLow2	Scale low value for channel 4 secondary input	float32	199a	6554	Set by Channel.1.Main.Resolution
Channel.4.Main.Status2	Channel 4 secondary input PV (output) status (as channel 1)	uint8	011d	285	Not applicable
Channel.4.Main.Type	Specifies the type of channel (as channel 1)	uint8	1980	6528	Not applicable
Instrument.Security.Feature2Pass*	Features2 pass code (manufacturer supplied)	int32	10c4	4292	Not applicable
Instrument.Security.Feature3Pass	Features3 pass code (manufacturer supplied)	int32	10c5	4293	Not applicable

*Omitted in error from main manual

2.6 OTHER ITEMS

2.6.1 Sample rate

For dual input channels, both primary and secondary sample rate is reduced to 4 Hz (250ms) from the normal 8Hz (125ms).

2.6.2 Sensor break detection

Input sensor break detection is not supported for secondary inputs. The internal circuit acts as a 'pull up' on the secondary input which therefore saturates high in the event of a sensor break.

2.6.3 Dual mA input offset correction

If 'Dual mA' is selected as input type, then an automatic offset correction will be made, according to the entered shunt value.

2.6.4 Input range limitation

There is no 10V range associated with the secondary input. Any input greater than +2Vor less than -2V is deemed to be 'bad range'.

3 MILLIAMP INPUT SENSOR BREAK ACTION

Previous software versions have not supported sensor break detection for mA inputs. With this software issue, mA inputs have limits applied, such that if the process value lies outside these limits, a sensor break is assumed to have occured. These limits are (Input lo - 4% Span) and (Input high + 6% Span).

For example, for a 4 to 20mA signal, an input below 3.36mA or above 20.96mA will trigger a sensor break event.

4 ERRATA

The following items are either incorrect in the main manual or were omitted from it in error.

4.1 LOW VOLTAGE OPTION RANGES

The Low Voltage option is incorrectly specified in Appendix A of the main manual. The correct figures are: 24Vac (-15% +10%) at 48 to 62Hz, or 24Vdc (-15% +20%).

4.2 POWER INTERRUPT INDICATION ON THE CHART

On power up, a red line is drawn across the chart.

On exiting configuration mode, a blue line is drawn across the chart.

When the instrument time is changed (manually - not through daylight saving action) a green line is drawn across the chart.

4.3 DIGITAL INPUT RESPONSE

Digital inputs are sampled every 31.25 ms. These samples are 2-sample debounced resulting in a 62.5ms contact closure response. A 62.5 ms pulse is latched until the next 125ms poll (8Hz). A 4Hz pulse stream is therefore the fastest that can be accurately detected.

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Eurotherm: International sales and service

AUSTRALIA Melbourne
Invensys Process Systems Australia Pty. Ltd.
Telephone (+61 0) 8562 9800
Fax (+61 0) 8562 9801
E-mail info.eurotherm.au@invensys.com

AUSTRIA Vienna
Eurotherm GmbH
Telephone (+43 1) 7987601
Fax (+43 1) 7987605
E-mail info.eurotherm.at@invensys.com

BELGIUM & LUXEMBOURG Moha
Eurotherm S.A./N.V.
Telephone (+32) 85 274080
Fax (+32) 85 274081
E-mail info.eurotherm.be@invensys.com

BRAZIL Campinas-SP
Eurotherm Ltda.
Telephone (+5519) 3707 5333
Fax (+5519) 3707 5345
E-mail info.eurotherm.br@invensys.com

CHINA
Eurotherm China
Shanghai Office
Telephone (+86 21) 61451188
Fax (+86 21) 61452602
E-mail info.eurotherm.cn@invensys.com
Beijing Office
Telephone (+86 10) 5909 5700
Fax (+86 10) 5909 5709/10
E-mail info.eurotherm.cn@invensys.com

FRANCE Lyon
Eurotherm Automation SA
Telephone (+33 478) 664500
Fax (+33 478) 352490
E-mail info.eurotherm.fr@invensys.com

GERMANY Limburg
Eurotherm Deutschland GmbH
Telephone (+49 6431) 2980
Fax (+49 6431) 298119
E-mail info.eurotherm.de@invensys.com

INDIA Mumbai
Invensys India Pvt. Ltd.
Telephone (+91 22) 67579800
Fax (+91 22) 67579999
E-mail info.eurotherm.in@invensys.com

IRELAND Dublin
Eurotherm Ireland Limited
Telephone (+353 1) 4691800
Fax (+353 1) 4691300
E-mail info.eurotherm.ie@invensys.com

ITALY Como
Eurotherm S.r.l
Telephone (+39 031) 975111
Fax (+39 031) 977512
E-mail info.eurotherm.it@invensys.com

KOREA Seoul
Invensys Operations Management Korea
Telephone (+82 2) 2090 0900
Fax (+82 2) 2090 0800
E-mail info.eurotherm.kr@invensys.com

NETHERLANDS Alphen a/d Rijn
Eurotherm B.V.
Telephone (+31 172) 411752
Fax (+31 172) 417260
E-mail info.eurotherm.nl@invensys.com

POLAND Katowice
Invensys Eurotherm Sp z o.o
Telephone (+48 32) 7839500
Fax (+48 32) 7843608/7843609
E-mail info.eurotherm.pl@invensys.com

SPAIN Madrid
Eurotherm España SA
Telephone (+34 91) 6616001
Fax (+34 91) 6619093
E-mail info.eurotherm.es@invensys.com

SWEDEN Malmo
Eurotherm AB
Telephone (+46 40) 384500
Fax (+46 40) 384545
E-mail info.eurotherm.se@invensys.com

SWITZERLAND Wollerau
Eurotherm Produkte (Schweiz) AG
Telephone (+41 44) 7871040
Fax (+41 44) 7871044
E-mail info.eurotherm.ch@invensys.com

UNITED KINGDOM Worthing
Eurotherm Limited
Telephone (+44 1903) 268500
Fax (+44 1903) 265982
E-mail info.eurotherm.uk@invensys.com

U.S.A. Ashburn VA
Invensys Eurotherm
Telephone (+1 703) 724 7300
Fax (+1 703) 724 7301
E-mail info.eurotherm.us@invensys.com

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