NetPod 4004 Series Instrumentation

Data Acquisition & Controls System

Download this catalogue at **http://www.aquabat.net/downloads/NetPod4004Cataloguev106.pdf**

Windows 7

Linux

- Fully synchronised measurements - internal & network
- Software-defined processor
- Individual ADC 20KHz sampling / channel
- Surge protection
- Software selected output types - current / voltage
- Current loop measurement & excitation
- Preset startup / boot time output port settings
- Temperature-controlled fan for low-noise cooling
- Windows 7 / Unix\ / Linux support
- Ethernet network connection
- Hot swap capability
- Modular assembly: 4-channel building blocks
- Options for 1000V opto-isolation
- Voltage measurements to 500V
- Analogue output to 600V
- Large range of interface boards
- 12V DC / 220V AC auto-select power supply
- Automatic packet timing system

CE

Updated :Aug 2010

Introduction:

The NetPod 4004 is the latest member of the Keynes Controls' series of instruments that have been designed from the outset to offer everything needed for local and distributed synchronised measurement solutions. The NetPod 4004 can be directly connected to a pc, or for distributed applications onto a suitable network.

The 4004 offers high levels of data synchronisation, both between channels within an instrument, and instruments across a network. This makes the instrument ideal for both static and dynamic measurement applications.

All configuration and manufacturers details are stored within the instrument, not on a data-processing computer. Information is downloaded only when required. There are no configuration files to be maintained. Simply swap cards and only a few key presses are required for the new configuration details to be updated.

NetPod 4004 System

Features:

Software-defined processor
16 individually-isolated analogue inputs
4-channel building blocks
Integrated sensor excitation
Hot-swap support
16-bit ADC resolution per channel
Preset initialisation conditions.
Option for 2000V DC opto-isolation
Automatic interface identification - memory ID
Digital interface options: 8-channel relay board
8/16-channel input cards

Sensor inputs:

Thermocouples	**t**ypes B,C,J,K,R,S,T
Thermistor	
Voltage inputs from	5 to 600V - additional ranges upon request
Resistance	customised - details on request
Current Interface	0-20 mA, 4-20, 0-60 mA loops including excitation
Strain Gauge	Full-, ½- and ¼- bridges 120, 350, 500 and 1K Ohm gauge
ICP Accelerometer	
Sensor Excitation:	options for +/- 12V supply - other ranges on request.

Since Keynes Controls is the manufacturer of the NetPod4004, and undertake all operations in-house, additional interfaces and customisation can be incorporated to create systems to match additional specifications even if not currently shown in the catalogue.

Software support:

The NetPod 4004 is supported by drivers for most modern data acquisition and SCADA software such as:

National Instruments Labview
DASYLab
SCADA ... Spreadsheets

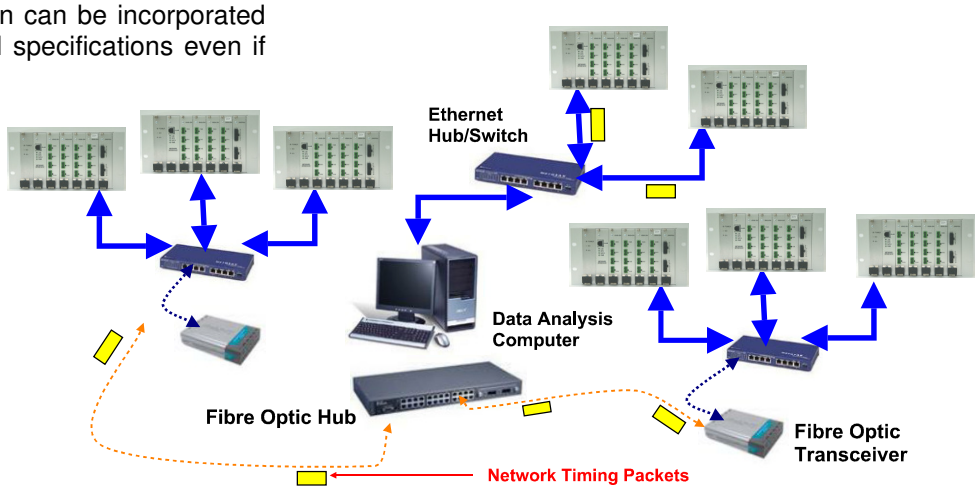
Full Software developers kit is available for the **Microsoft Windows** and **Linux** / **Unix o**perating systems. Operation with any third-party package supporting DLL calls with can be undertaken using only a few simple commands.

Unix / Linux multi-user operations upon request.

Preset initialisation / boot conditions:

The analogue and digital output interfaces all support preset output level operations. This makes the NetPod 4004 ideal for use with large control and monitoring systems. Since the output condition of any output is known in advance then the effect of the instruments on a system can be easily determined.

The analogue output channels settle to their preset conditions within 1 sec of initialisation. The digital output ports and relay cards settle to their states immediately upon being switched on.



Software-defined processor:

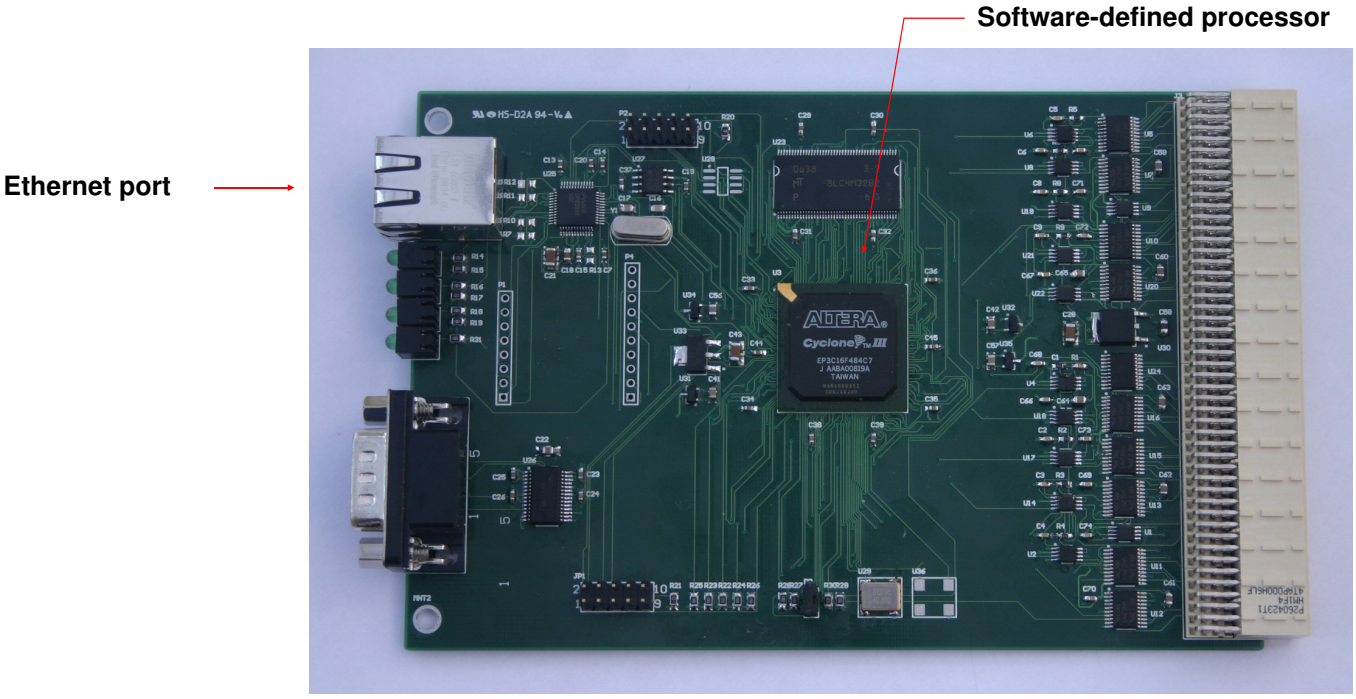
The NetPod 4004 uses the new high speed NP-SF4000-100T software-defined processor card. This processor card offers high speed network operations and connects to an external network using its onboard Ethernet port.

The NP-SF4000-100T does not contain a dedicated microprocessor, as would be expected on any similar product, but creates the processor in software at the time of initialisation. The core of the processor is stored in memory and copied into the programmable logic unit where in all purposes it acts just like the dedicated hardware device.

Currently the NP-SF4000-100T uses a 32-bit processor core optimised for Ethernet packet handling. The NP-SF4000-100T now undertakes, in hardware, the data handling and synchronisation operations as if it is a dedicated device and operates faster, with improved error correct and recovery with lower power than previous devices.

Systems advantages:

The main advantage of using software defined processor is that it cannot go obsolete or out of production and can easily be adjusted. There is plenty of spare capacity with the programmable logic unit to add up to four cores or a high speed DSP.



NP-SF4000-100T Processor Card

The NP-SF4000-100T uses a standard 32-bit core processor for general purpose communications operations. The core has been optimised for Ethernet data packet processing and as such reduces the overall processing required by the data logger computer system is reduced when control loop operations are required.

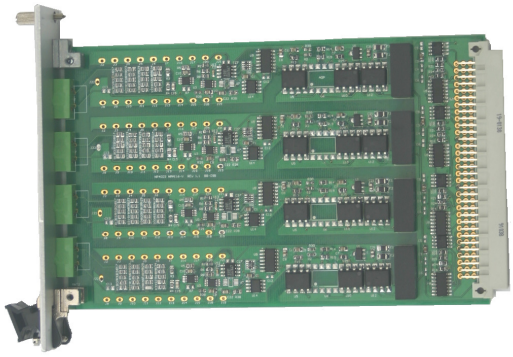
Software-defined processing enables customisation of the NP-SF4000-100T card to be easily carried out to suit industrial applications.

Product life cycle:

The NP-SF4000-100T uses a general purpose programmable device, and a software core, to create the microprocessor for this card. This has the advantage over similar products in that the microprocessor can be created from compatible parts from several different manufacturers, without the need to change any system parts. The additional semiconductor parts for the processor can be second-sourced from a range of manufacturers, enabling this card to be available for many years to come.

The project life cycle is thus extended as no dedicated processor for this card is required from a single manufacturer and Keynes Controls will not require expensive obsolete parts to be procured to maintain this design.

Analogue input cards:



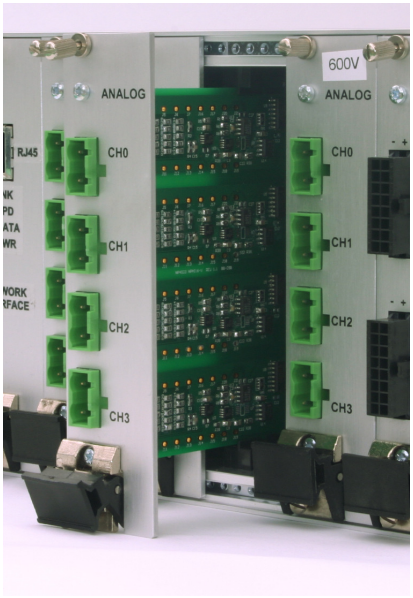
The analogue cards are supplied on the same quick mount chassis for installation and removal. The cards simply push into the rack and are secured with the mounting screws. It takes just a few seconds to insert and secure a card.

The analogue cards support 4 input channels and contain individual analogue converters for each channel, and signal conditioning where appropriate. Each analogue card provides simultaneous scanning. All analogue input cards contain their own memory to store calibration and manufacture information.

Isolation input operations

Each individual channel is isolated from its neighbour and every other input within the instrument. Each input operates as if it is has its own local ground connection even if this level is different from its neighbour. So long as the input range is with the common mode range of the input then the measurements will be accurate.

Different analogue inputs can be operating at different potentials within the isolation range without affecting the results. Should any channel fail then it will have no effect on the rest of the inputs operating within the instrument.



Maintenance and upgrades are easy. Simply slot in the new cards into the frame.

Connectors:

The interface cards use 7.5mm terminal connectors supporting up to 2.5mm^2 cable entry and automatic pin alignment. The sockets can only be released by pressing the release catch making them ideal for long-term stand-alone operations, even under the action of high vibration.

Once the sensor input cables are terminated within the sockets they can be fastened to the instrument and removed very quickly, ensuring fast upgrade and maintenance.

Hot-swap capability:

The NetPod 4004, like all other instruments in this range, has hot-swap capability. An instrument can be removed and an identically-configured device replaced into a system without any changes to the application software being required. The driver software will identify the new instrument and start acquisition operations automatically.

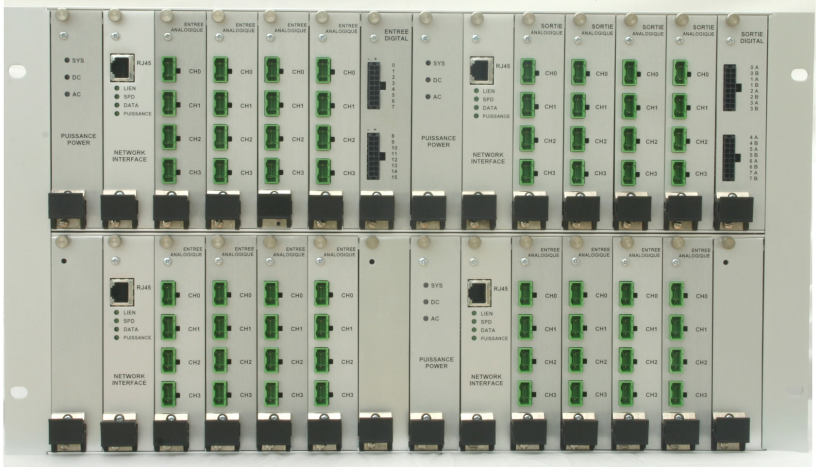
Memory ID:

All of the analogue input and output channels, along with most of the digital interface cards, contain a memory ID. The driver software can be used to identify which type of interface card is located in a particular slot and is ideal for maintaining systems management records.

NP-RACK-04 - 64 Channel System:

The image opposite shows a complete 64-channel analogue input/output system with digital input/output capability.

The NP-RACK-04 supports up to 64 analogue input/outputs and 4 x digital interface cards. All inputs are synchronised.

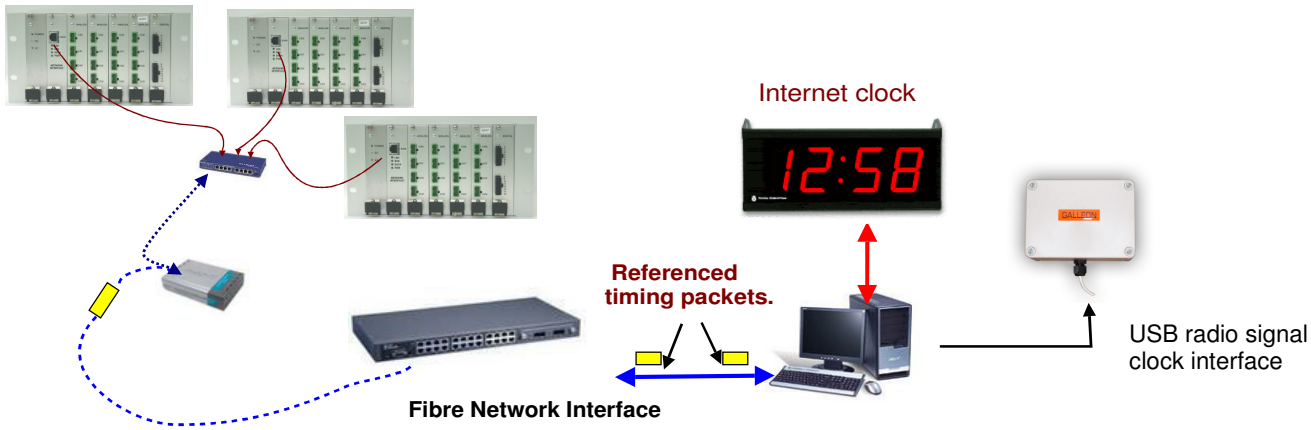


Analogue Output Specification - **NPAO16-1030**

No. of channels	4	**Isolation**	to 2 KV DC
Range	+/- 10V +/- 30 mA	**Protection**	short circuit < 1 min
Resolution	0.3 mV 0.001 mA	**Error**	1 LSB
Power	< 1 W / channel		

Enhanced synchronisation:

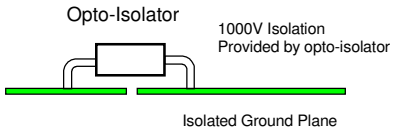
Improved synchronisation can be obtained by connection to the World Time Clock via an internet radio time signal using a suitable interface .



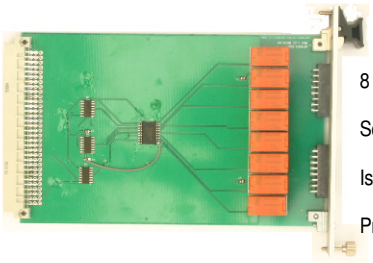
Opto-isolation:

The analogue input board is electrically in two halves but is physically a single board. The two halves are electrically isolated using an opto-coupler which provides the high voltage insulation.

The input stage of the analogue card provides an individual isolated ground plane and it is to this ground plane that the input signals and screens are physically connected. No input signal passes directly into the instrument, and all inputs are individually isolated.



Sample interface cards:



8 x relay channels

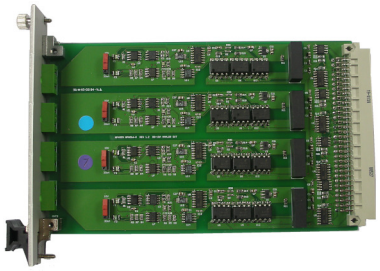
Software-selectable switch positions

Isolation 2000V DC

Pre-set initialisation / boot time relay positions

NP4004-RLY-8 -Relay card

NPAO16-10/30 -Analogue Output card



4 x 16-bit analogue output channels

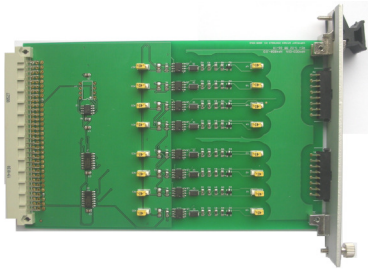
Software-selectable voltage/current outputs

Isolation 2000V DC

Individual channel configurations

Pre-set initialisation / boot time levels

+/- 10 V / +/- 30 mA output



8 input channels

50Hz mains filter

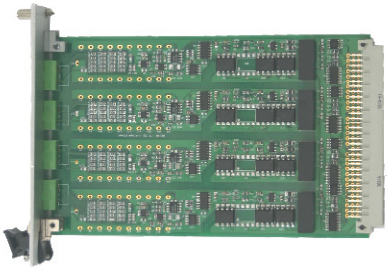
Isolation 2000V DC

High / low switched input trigger setting

18V default trigger level

Memory ID

NP4808-JIO Digital input card



4 x 16-bit analogue input channels

5 - 600V measurement range (standard)
- other ranges on request

Isolation 2000V DC

Simultaneous sampling all channels

NPAI16-V1HI-4 -Analogue input card

Analogue card timing:

Each of the analogue input and digital interface cards within the instrument receive the same timing pulses. This pulse controls the acquisition and data control operations to the processor card in the 4004 and is undertaken automatically, even allowing for different network configurations by the driver software. No user setup needed for synchronised readings.

Technical Specifications:

The following tables summarise the technical parameters for the various input modules that can be supplied for use within the NetPod instrumentation.

Table 1

Specifications	High speed 16-bit card
Sample rate	0.1 - 5 KHz / channel
Isolation	2000 V RMS
Dynamic range	96 dB
Typical noise	See Note 1
Gain accuracy (accuracy as % reading)	0.05 % or better
Settling time	100 nS
Input range: V1	± 12V
V2	± 50V
V3	± 600V
Resolution: V1	0.3 mV
V2	1.5 mV
V3	20.0 mV
Input offset: V1	± 1 □V/℃
V2	± 10 □V/℃
V3	±100 □V/℃
Input Impedance V1	20 M□ typically
V2	20 M□ typically
V3	20 M□ typically
Current input	0-20 mA 0-60 mA, 4-20 mA Other ranges on request
Overload	250 V RMS
Converter type	Successive approximation
Linearity (accuracy as % of range)	0.01 %

Digital interface specifications:

The table below shows standard digital input card specifications. These cards can be modified to have different switching levels upon request.

All digital cards have the same isolation.

Interface	Specification
Isolated Digital Input	2000V DC
No. Channels/Board:	16
Low Level (0):	0-1V, 0-2V, 12V,
High Level (1):	4-30V, 6-300V
High Level (2)	18V
	Trigger levels customised upon request
Switch Rate:	5KHz,
No.Channels/Board	8
Low Level (0):	3V / 12V / user-defined
High Level (1):	5V / X user-defined at time of manufacture
Switch Rate:	5KHz
Drive Current	20 mA / channel

Analogue input channels:

The analogue input channels use individual successive approximation converters.

Note 1

+/- 12V noise typically	Peak-peak	9 mV
	RMS	1.5 mV
+/- 600V noise typically	Peak-peak	350 mV
	RMS	48 mV

Note 2

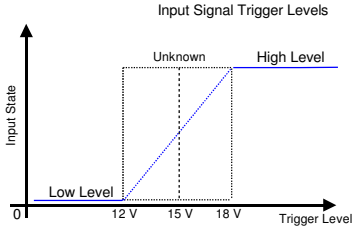
The maximum input range can be changed to suit most user requirements.

Note 3

High voltage amplifiers are used to increase the analogue output range

High Level (2)

Digital card NP4808-JIO-18 switches high on a signal of 18V or greater input signal.



The drawing opposite demonstrates the switching operations for the 18V level for the NP4808-JIO card.

Part Number	Description
NPAI16-V1HI-4	4 Channel ± 12V. 16-bit ADC board
NPAI16-V2HI-4	4 Channel ± 50V. 16-bit ADC board
NPAI16-V3HI-4	4 Channel ± 600V. 16-bit ADC board
NPAI16-V4H1-4	4 channel ± 50 mV. 16-bit ADC board
NPAI16-SC1-4	4 Channel of 16-bit current loop 4-20mA, 0-60mA
NPAI16-SC5A-4	4 Channel of 16-bit current Input 5A
NPAI16-SG1-4	4 Channel of 16-bit ¼- and ½-bridge strain gauge card
NPAI16-SG2-4	4 Channel of 16-bit full-bridge strain gauge card
NPAI16-SG3-4	4 Channel of 16-bit full-bridge strain gauge - no excitation
NPAI16-TC-B-4	4 Channel of 16-bit thermocouple type B
NPAI16-TC-C-4	4 Channel of 16-bit thermocouple type C
NPAI16-TC-E-4	4 Channel of 16-bit thermocouple type E
NPAI16-TC-K-4	4 Channel of 16-bit thermocouple type K
NPAI16-TC-N-4	4 Channel of 16-bit thermocouple type N
NPAI16-TC-R-4	4 Channel of 16-bit thermocouple type R
NPAI16-TC-S-4	4 Channel of 16-bit thermocouple type S
NPAI16-TC-T-4	4 Channel of 16-bit thermocouple type T
NPAI16-RT1-4	4 Channel of 16-bit RTD - type A & B
NPAI16-PUL-4	16-bit pulse counter card - high speed pulse counter
NPAO16-10/30	

Part Number	Description
NP4808-JIO-X	8-channel input card - 18V option - isolated X - high level
NP4808-JIO-18	8 channel input card - 18V option - isolated 18 - high Level
NP4809-JIO	16 input TTL input channel
NP4810-JIO	16 input, jumper select TTL/300 V isolated digital input
NP4004-RLY-8	8-channel relay switch card 3A @ 240V A/C

Enclosures

NP-RACK-04-4004	4-instrument rack system with power supplies
NPCAB-4004	**6U x 42 HP mini-case**
NPRCK-01	**Standard 6U x 84HP rack**
NPCASE-4004	Desk top case