

Product Information Sheet

Neuchrometer

Model: **NPM-3100E**

The NPM3100 series product is a digital neutron pulse monitor for use with proportional gas tube neutron detectors. The NPM3100 includes high voltage source, charge sensitive amplifier, shaping amplifier, variable gain, discriminators (upper/lower), ADC, microcontroller, digital counter, multichannel analyzer (MCA), real-time clock, data logging and SD card storage.

It is also capable of time stamping individual neutron counts and tagging data for use in coincidence counting detector arrays. The NPM3100 is controlled by a simple command set within a terminal window or GUI software in an HTTP browser.

The following specification sheet includes all available functionality for this model.



Components & Features	Description
NPM-3100E (Neuchrometer)	Neutron pulse monitor (NPM) with Power Over Ethernet interface. For use with gas proportional neutron detectors including Helium-3, BF ₃ and Boron-lined types.
Mechanical	
Dimensions	1in OD x 5.2in Length (2.54cm OD x 13.2cm). Cylindrical profile.
Enclosure Finish	Anodized aluminum.
High Voltage Connector	HN (male).
Communication and Power Connector	RJ45.
LED	Indicator LED (red) on rear panel.
Electrical	
Analog Components	
High Voltage (HV)	0 to 3,000V. RMS noise 0.010V. HV level user adjustable.
Detector Capacitance Range	Compatible with detector capacitance of 5 to 100pF. Custom ranges available.
Charge Sensitive Amplifier (CSA)	Integrates input charge pulse and converts to voltage. Sensitivity: 1V / pC or custom.
Pulse Shaping Electronics	Pulse shaping time constant 1 to 10us (typical). Pulse shaping decay time 10 to 100us (typical).
Dead Time	Minimum time between successive counts, 10 to 100us (typical).
Neutron Counting Rate	100kHz (maximum).
Amplifier Electronics	Gain range 1.0 to 20.0, user selectable.
Digital Components	
Microcontroller & Timer	ARM Processor, 160MHz.
Nonvolatile memory	Up to 128Gb.
Analog-to-Digital Converter (ADC)	12 bit, 8Msps (mega samples per second).
Temperature & Humidity Sensor	Temperature: range -40C to 124C; resolution 0.01C; accuracy +/- 1C. Humidity: range 0 to 100% RH; resolution 0.03% RH; accuracy +/- 3%.

Components & Features	Description
Features	
Shaped Pulse Waveform Capture	Shaped neutron pulse waveform digitized and stored. Up to 256 points per waveform, 25ns timing resolution.
Pulse Height Measurement	Firmware algorithms measure pulse height. Noise rejection algorithms can also be applied.
Discriminators (Digital)	Standard upper and lower digital discriminator levels are user selectable. Multiple discriminator values that allow for multiple regions of interest (ROIs) are possible through firmware customization.
Digital Timer	25nsec resolution, timing up to 7.6 hours.

Digital Counter	Counts neutron events within user specified Region of Interest (ROI). Capacity 4 billion counts.
Multichannel Analyzer (MCA)	Signal pulse height spectrum (histogram) is generated and stored. Histogram resolution 64 to 4096 bins, 4 billion counts per bin.
Differential Pulse Arrival Time Spectrum	Differential arrival time (Delta-t) histogram is generated and stored. Records time between successive neutron counts. Variable resolution from 25ns to 1ms.
Coincidence Counting	
Time Stamping	Time stamps each neutron count. 25ns resolution. 100kHz rate. Run duration 7.6 hours before clock wrap around. Accomplished with 40 bit counter.
Pulse Height	Stores pulse height for each neutron count. 12 bit resolution.
Source Tagging	Time stamped data is tagged with device identifier. For use in arrays of up to 256 devices.
External Master Clock Operation	Operate up to 256 devices synchronously with a Quaesta-supplied master clock/synchronizer. Master clock injected through existing Ethernet interface.
External Synchronizer Operation	Synchronize the time stamp clock of up to 256 devices with a Quaesta-supplied master clock/synchronizer. Synchronizing pulse injected through existing Ethernet interface.
Diagnostics	
Internal Pulse Simulator	Diagnostic mode. NPM internally produces known simulated pulses to test pulse shaper, amplifier, ADC, pulse height measurement algorithms and time stamping.
Power Monitoring	Monitors NPM power consumption.
Performance Monitoring	(Coming soon). Monitors gas tube spectrum and looks for changes indicative of detector failure.
Data Logging	
Real-Time Clock	Accurate time to 1s per day.
Internal SD Card	Micro SD card, up to 128Gb.
Data Stored	User configurable. Stores list mode data. Also stores neutron counts and elapsed time, pulse height spectrum histogram, coincidence (Delta-t) histogram, device operating parameters, temperature/humidity (optional). Data stored in FAT 32 file format.
Real-Time Clock Battery	48mA-hours. Estimated 6 year life.

Components & Features	Description
Interface	
Communication Type	Power Over Ethernet, IEEE 802.3af.
TCP/IP Terminal Interface	Command line interface. Configure device and download data.
GUI (web browser)	HTTP web browser, 100Mbaud. Configure device, display and download numerical and graphical data. Communicate with device from multiple computers simultaneously.
Quick Specifications	
Power	Power Over Ethernet, IEEE 802.3af.
High Voltage (internal)	0 to 3,000VDC
Amplifier Gain	1.0 to 20.0
Dead Time	10us to 100us (typical)
Neutron Counting Rate	100kHz maximum
Timing resolution	25ns