



# Phase Sensitive Multimeters

A new generation of versatile measurement instruments

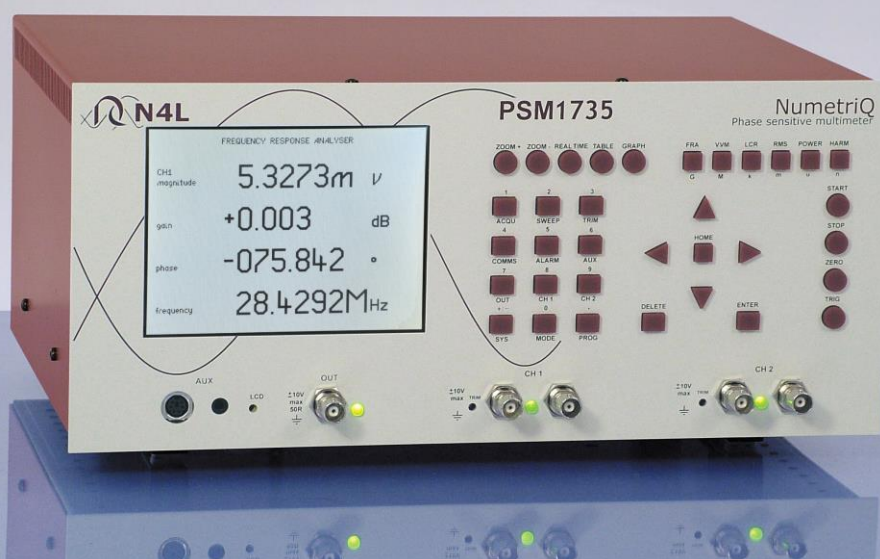
## PSM1700 *PsimetriQ*

10uHz to 1MHz



## PSM1735 *NumetriQ*

10uHz to 35MHz

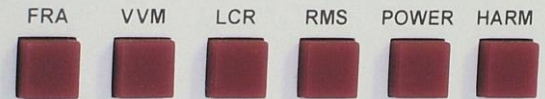


## Versatility without compromise

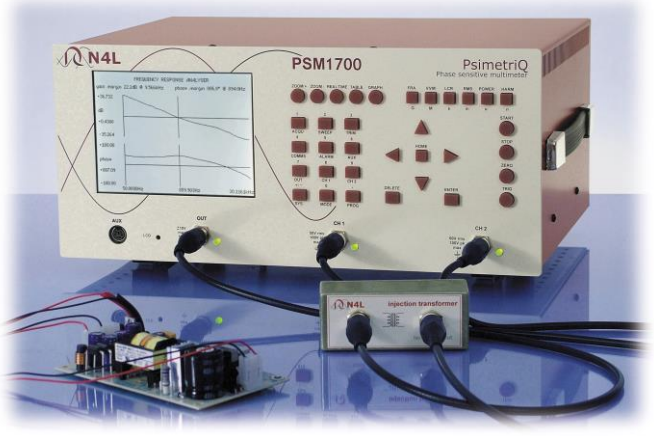
In a world where engineers from many different application areas require ever increasing speed, flexibility and measurement accuracy, N4L introduce a new generation of versatile measurement instruments that offer leading performance in every mode without the compromise on accuracy or the additional cost that is commonly associated with such flexible instruments.

Utilising the latest DSP and FPGA technology to optimise the use of innovative analogue hardware, many measurements functions can be derived with great precision from the basic elements of true rms voltage on two measurement channels plus the phase angle between them. It is from this fundamental relationship between independent voltages and their relative phase angle that the phrase 'Phase Sensitive Multimeter' was derived and this is also the key to the unique combination of performance versatility and value provided by the PSM range.

Whether you will make use of just one or all six of the primary measurement modes included in the PSM1700 and PSM1735, you can be sure of the exceptional accuracy, speed and ease of use that only the latest design technology can provide.



## Frequency Response Analyser



PSM1700 with N4L injection transformer testing an SMPS

Incorporating a digital signal generator, two differential auto-ranging voltmeters, auto-scale frequency plots and intuitive setup stored into non-volatile memory; the PSM range brings accurate and simple to operate frequency response analysis within the grasp of many who could not previously consider an FRA

### Features

- Differential inputs
- Fast sweep with up to 20 frequency steps per second
- DFT analysis giving exceptional noise rejection
- Automatic Gain/Phase margin computation
- Storage of results into non-volatile memory

### FRA Example applications

- Power supply gain and phase analysis
- Electronic filter design and test
- Speaker and amplifier test
- Mechanical vibration analysis
- Electro-Mechanical control loop analysis

gain margin 22.2dB @ 9.56kHz	phase margin 086.8° @ 894.0Hz
26 251.737Hz	+17.44dB
27 268.550Hz	+16.02dB
28 286.487Hz	+15.16dB
29 305.622Hz	+14.53dB
30 326.034Hz	+13.38dB
31 347.810Hz	+13.40dB
32 371.040Hz	+12.68dB
33 395.822Hz	+11.73dB
34 422.260Hz	+10.67dB
35 450.463Hz	+9.59dB
36 480.549Hz	+8.51dB
37 512.645Hz	+7.46dB
38 546.885Hz	+6.45dB
39 583.411Hz	+5.47dB
40 622.378Hz	+4.56dB
41 663.946Hz	+3.67dB
42 708.232Hz	+2.82dB
43 755.599Hz	+1.99dB
44 806.065Hz	+1.19dB
45 859.903Hz	+0.43dB

FRA table with cursor point selected

gain	+0.438	dB
phase	+087.088	°
CH1 magnitude	59.636m	V
frequency	859.903	Hz

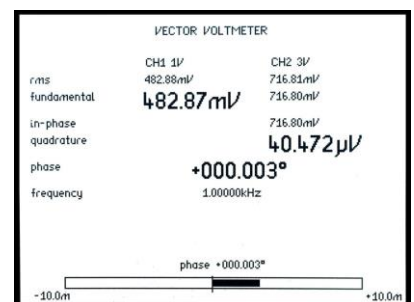
Real time mode at cursor point

Selection of the most suitable display format is very easy, switching between real time, tabular or graphical presentation from any mode with a single key stroke

In real time mode, the display functions are user selectable and can be presented in any order and at any of three zoom levels. Cursor keys can then be used to adjust amplitude and frequency with selectable step size to provide complete control of test conditions.

## Vector Voltmeter

Unique to the VVM mode is a null meter display that provides the feel of traditional analogue instruments while maintaining the precision of a 6 digit phase display and 1 milli-degree phase resolution.



A high stability signal generator with direct digital synthesis, true rms sensing voltmeters and discrete fourier analysis combine to provide phase measurement accuracy beyond any comparable product.

### Features

- Simultaneous measurement of all functions
- Synchronised to internal or external frequency source

### VVM Example applications

- Electrochemical materials analysis
- Current transformer testing
- Phase meter calibration



## LCR Meter



PSM1700 with LCR Active Head



PSM1735 with Impedance Analyser Interface

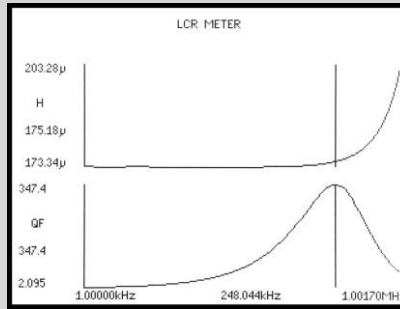
Whether using an external shunt, an LCR Active Head or the Impedance Analyser Interface; LCR mode provides all impedance parameters quickly and accurately either at single frequencies or over a user defined frequency sweep.

LCR Head – 10uHz to 5MHz  
IAI – 10uHz to 35MHz

LCR METER		
magnitude	CH1 1V/ 355.47mV	CH2 30mV/ 1.7724μA
capacitance	series 693.6pF	parallel 693.6pF
resistance	12.55Ω	4.1950Ω
tan δ	0.00005	
phase	-089.997°	
frequency	1.00000kHz	

6 digit resolution and exceptional phase stability permit testing of the most demanding components such as low ESR capacitors

Any point in a sweep can be selected with a cursor and viewed in a detailed results table.



## Features

Wide frequency range  
Freq, Phase and Tan Delta to 6 digits  
Passive shunt or active head options  
Graph or table of any function  
Sweep results store to memory

## LCR Example applications

- Component testing
- Electrochemistry
- Circuit impedance analysis
- Testing resonance

## RMS Voltmeter

In addition to providing the raw data from which all other functions are derived, each channel can be used directly for applications requiring precision rms measurement. Unlike many voltmeters, AC and DC components are quantified separately and dBm, peak, CF and surge values are displayed.

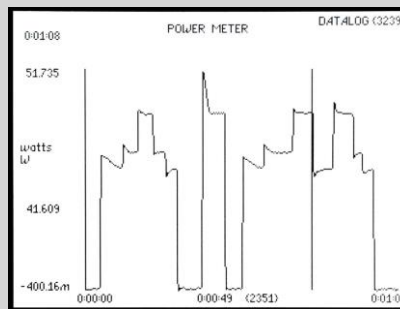
Both units utilise independent differential circuits permitting simultaneous analysis of two points at a different potential. For example, the input and output on voltage converter or two windings on a transformer.

## Harmonic Analyser

The Harmonic Analyser mode simultaneously measures individual harmonic components and total harmonic distortion values on both measurement channels.

Discrete Fourier Transform algorithms permit fundamental harmonic components to be quantified accurately even in the presence of noise and distortion.

## Power Meter



Watts graph with cursor at log no. 2351

POWER METER		
	true	fundamental
watts	30.233W	30.095W
V/A	33.988V/A	33.394V/A
pf	0.890	+0.901
CH1	241.96V	241.95V
CH2	140.47mA	138.02mA
frequency	49.910Hz	+0.025682°
H3	11.558mW	0.038%
W hours	478.45mWh	430.74mWh
V/A hours	523.11mVh	463.21mVh
pf average	0.915	0.930
A hours	2.1135mAh	2.0265mAh

Real time display after datalog

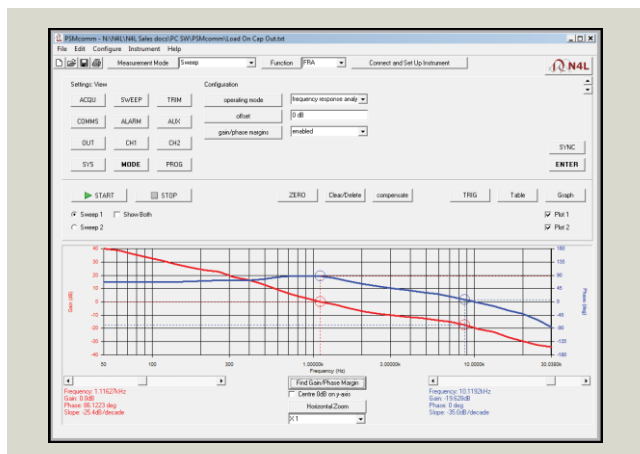
The combination of true rms measurement channels, precision phase analysis, high speed computation and a versatile graphic display provide an ideal solution to many applications that involve rapid changes in power.

## Features

Real time true rms measurement with no missed data.  
Synchronisation with fundamental down to 10ms period.  
Datalog of up to 4 functions stored into non-volatile memory.  
Watch results during datalog capture with scroll display.  
Real time DFT harmonic analysis.

## Power Meter applications

- Power profile testing
- SMPS standby analysis
- Distortion analysis
- PFC testing



## PC control, data capture and file storage

PSMcomm software provides control of all primary PSM functions with graphical or tabular data presentation, dual cursor measurements, an automatic gain phase margin function plus print, copy, save to file and firmware download.

CommVIEW PC software supplied as standard, provides script file instrument control, result storage in .txt format and firmware download.



# PSM1700 and PSM1735

## Accessories and Ports

### Standard accessories

Probes	2 off with PSM1700 – 4 off with PSM1735
Leads	Output, RS232, Power
Software	CommVIEW
Documentation	Calibration Certificate, User Manual



### Ports

RS232	Baud rate to 19200 RTS/CTS flow control
Parallel	8 output, 4 input – 25 Pin D Type
Analog output	0V to +4V on any measured function – BNC
Sync output	Pulse synchronised to generator
Extension ports (N4L accessories)	2
LAN (option L)	15 pin female D type and 6 pin mini-din
LAN (option L)	10/100 base-T Ethernet auto sensing RJ45
GPIO (Option G)	IEEE488.2 compatible



## System specifications

### PSM17xx

#### Datalog

Functions	Up to 4 measured functions user selectable
Datalog Window	From 10ms with no gap between each log
Memory	RAM or non-volatile up to 8000 records

#### High Speed Data Streaming

Rate	1500 readings/s max
Window	660us to 1s Synchronized to waveform
Buffer	8000 results

#### General

Display	320 x 240 dot LCD – white LED backlight
Alarm	Any displayed function
	hi, lo, inside window, or outside window
Program stores	100, one loaded on power up
Sweep stores	30, all parameters in any sweep function
Remote operation	Full capability, control and data
Size	170H x 350W x 250D mm approx
Temperature	5 to 35°C
Weight	4kg approx
Power supply	90-264V rms 47-63Hz 30VA max

All specifications at 23°C +/- 5°C. Due to our policy of continuous product improvement, we reserve the right to change product specifications or designs at any time without notice and without incurring obligations. All Errors and omissions excepted (E&OE)

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## Measurement specifications

### PSM1700

### PSM1735

#### Frequency Response Analyser

Measurement	Magnitude, gain (CH1/CH2 or CH2/CH1), gain (dB), offset gain (dB), phase (°)
Frequency range	10uHz to 1MHz 20mHz to 500kHz with ext source
Gain accuracy in dB	0.02dB < 1kHz 0.05dB < 10kHz 0.1dB + 0.001dB/kHz < 1MHz
Phase accuracy	0.02° < 10kHz 0.02° + 0.003°/kHz < 1MHz
Frequency source	Generator or CH1 input
Measurement	Real-time DFT, no missing data
Speed	Up to 100 readings per second
Filter	Selectable from 0.2 seconds
Resolution	5 or 6 digits

#### Vector Voltmeter

Measurement	In-phase, quadrature, tan Ø, magnitude, phase, in-phase ratio, rms, rms ratio, LVDT differential, LVDT ratiometric
Frequency range	10uHz to 1MHz 20mHz to 500kHz with ext source
Basic accuracy (ac)	0.05% range + 0.05% reading + 0.05mV < 1kHz Basic + 0.02%/kHz < 10kHz Basic + 0.2% + 0.002%/kHz < 1MHz
	10uHz to 35MHz 20mHz to 35MHz with ext source Basic + 0.001%/kHz < 10kHz Basic + 0.002%/kHz < 1MHz Basic + 1.6% + 0.4%/MHz < 35MHz

#### LCR Meter

Functions	L, C, R (ac), Q, tan delta, impedance, phase – Series or parallel circuit
Frequency range	10uHz to 1MHz
Current shunt	External or N4L active head or Impedance Analysis Interface
Ranges (LCR Head or IAI)	Inductance – 100nH to 10kH Capacitance – 10pF to 1000uF Resistance – 10mΩ to 100MΩ
Basic accuracy	0.1% + tolerance of selected current shunt
Sweep capability	All ac functions

#### True RMS Voltmeter

Channels	2
Frequency range	DC to 1MHz DC to 1MHz 1MHz to 35MHz fundamental only
Measurement	rms, ac, dc, peak, cf, surge, dBm
Basic accuracy (ac)	As VVM + 0.2mV
Accuracy (dc)	0.1% range + 0.1% reading + 1mV

#### Power Meter

Measurements	W, VA, PF, V, A, - total, fundamental and integrated, power harmonics
Frequency range	20mHz to 1MHz 20mHz to 1MHz 1MHz to 35MHz fundamental only
Current shunt	External or use N4L power adaptor
Current accuracy	As voltage + external shunt tolerance
Watts accuracy	0.15% VA range + 0.15% reading + external shunt tolerance

#### Harmonic Analyser

Scan	Single or series
Frequency range	10uHz to 1MHz
Measurement	Harmonic, series THD or difference THD
Max harmonic	50

### PSM1700

### PSM1735

#### Input Ranges

Inputs	2 differential
Connectors	Isolated BNC
Coupling	ac or ac+dc
Max input	100Vpk from earth
Input ranges	100V, 30V, 10V, 3V, 1V, 300mV, 100mV, 30mV, 10mVpk
Scaling	1 x 10 <sup>-9</sup> to 1 x 10 <sup>-9</sup>
Ranging	Full auto, up only or manual
Input impedance	1M // 50pF (exc. leads)

#### Signal Generator

Type	Direct digital synthesis
Frequency	10uHz to 1MHz
Waveforms	Sine, triangle, square, sawtooth
Accuracy	Frequency ±0.05%
Open loop (with no trim)	Amplitude ±5% < 100kHz / ±10% < 1MHz
Closed loop (with trim)	Amplitude ±5% < 100kHz / ±1% < 1MHz
Impedance	50Ω ±2%
Output voltage	0V to ±10Vpk (Open Circuit)
Output resolution	5mV
Offset	0V to ±10Vpk
Offset resolution	±10mV
Clock rate	11.52MHz
Connector	Grounded BNC