

# PXM(e)7810 Advanced Multi-Measurement Device



## TECHNICAL DATA SHEET

PXI

### Features

VXI

LAN

cPCI

PXIe

GPIB

USB

RS232  
485

external  
PCIe

- High voltage range with up to 500 V<sub>pp</sub>
- 16 Bit Waveform Digitizer 64 MS, 10 MS/s
- High precision Digital Multimeter with 16 Bit resolution
- Fully isolated design
- >1 GΩ || <20 pF input impedance up to 8V range
- 10 MΩ || <20 pF for all other ranges
- Extremely low switching time of <1 ms for ranges and functions
- 2- and 4-wire resistance measurement
- Highly configurable trigger matrix
- Trigger engine for instrument synchronization
- Built-in timer/counter engine
- Electronic protection against overcurrent and overvoltage
- Memory segmenting
- Available with PXI or PXIExpress interface

## Product Information

### General

The PXM(e)7810 High Speed Multi-Measurement Device combines a 16 Bit DMM, a 10 MS/s Digitizer with a resolution of 16 Bit, a timer/counter and a trigger card. One special feature of the PXM(e)7810 is a very high input impedance of  $10\text{ M}\Omega \parallel <20\text{ pF}$  also in all AC ranges. Therefore the influence on DC and AC signals is reduced to a minimum. A trigger input and output is provided as well as electronic protection against overvoltage and overcurrent.

### High voltage, high resolution Waveform Digitizer

The PXM(e)7810 High Speed Multi-Measurement Device features waveform sampling with 10 MS/s, 16 Bit resolution, input voltages up to  $\pm 250\text{ V}_p$  and a bandwidth up to 5 MHz. This allows the measurement of high voltage signals without additional signal conditioning. Data can be acquired before and after the trigger event with a programmable sample counter that controls a number of up to 64 million data points. The memory segmenting function allows to save different digitizing events in the memory. A great amount of trigger capabilities results in multiple instrument and channel synchronization possibilities.

### High precision Digital Multimeter

The PXM(e)7810 High Speed Multi-Measurement Device features a high precision Digital Multimeter (DMM) for high performance measurements with 16 Bit resolution. It provides measurement of DC voltage up to 250 V, AC voltage up to  $250\text{ V}_p$ , DC current up to 1 A and AC current up to  $2\text{ A}_p$ .

### High resolution timer/counter

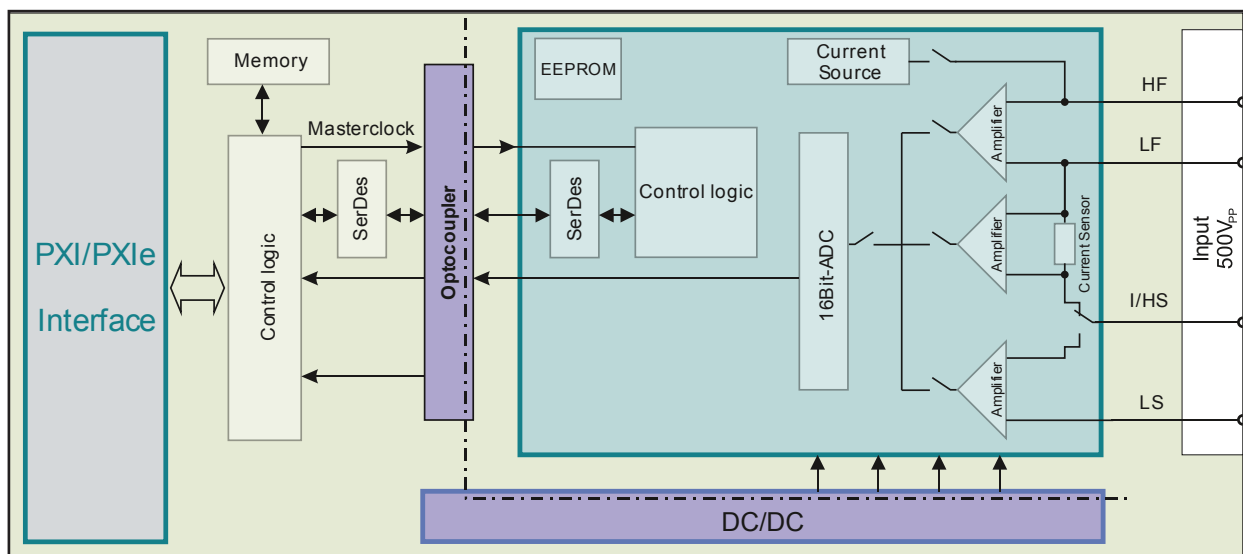
The PXM(e)7810 High Speed Multi-Measurement Device features a high precision timer/counter for high performance measurements of frequency, period time, interval and pulse width and rise and fall times with a resolution of up to 100 ns.

### Configurable trigger matrix

The PXM(e)7810 High Speed Multi-Measurement Device features a complex trigger matrix. The trigger connector on the front panel, internal trigger events and all trigger lines on the backplane can be connected individually.

### High throughput design for many applications

The PXM(e)7810 High Speed Multi-Measurement Device is designed for high throughput production testing. One key feature is the extremely low switching time of  $<1\text{ ms}$  for the changing of ranges and functions like switching from AC to DC.



General	Specification	Comment
Module size	1 slot, 3U	
Module weight	<0.4 kg	
Front connector type	FM5W5P	
Storage temperature range	-25... 70°C	
Operating temperature	0... 40°C	
Operating altitude	<2 000 m	
Relative humidity	Up to 85% at 35°C	
Electrical safety	According EN61010-1	
Isolation input to PE	250 V CAT I, Pollution Degree 2	

## Waveform Digitizer

Acquisition	Specification	Comment
Maximum sample rate	10 MS/s	
<b>Bandwidth</b>		
Range 250 mV <sub>p</sub> , 500 mV <sub>p</sub>	>2 MHz	0.5 V <sub>pp</sub> input signal; no filter
Range 1 V <sub>p</sub> , 2 V <sub>p</sub> , 4 V <sub>p</sub> , 8 V <sub>p</sub>	>5 MHz	2 V <sub>pp</sub> input signal; no filter
All other ranges	>1 MHz	20 V <sub>pp</sub> input signal; no filter
Vertical resolution	16 Bit	
Sampling interval	100 ns... 1 s	Software selectable
Input impedance	10 MΩ // <20 pF	
Input coupling	DC or AC	Software selectable
Maximum input voltage	f < 40 kHz: 250 V <sub>p</sub> 40 kHz < f < 1 MHz: 10 <sup>7</sup> V <sub>p</sub> / f 1 MHz < f < 5 MHz: 10 V <sub>p</sub>	Input voltage may not exceed selected input voltage range
Input ranges	250 mV <sub>p</sub> , 500 mV <sub>p</sub> , 1 V <sub>p</sub> , 2 V <sub>p</sub> , 4 V <sub>p</sub> , 8 V <sub>p</sub> , 16 V <sub>p</sub> , 32 V <sub>p</sub> , 64 V <sub>p</sub> , 128 V <sub>p</sub> , 250 V <sub>p</sub>	5% overrange 5% overrange
<b>DC accuracy<sup>1</sup></b>		
Range 250 mV <sub>p</sub>	0.2 + 0.2	±(% of input + % of full scale)
Range 500 mV <sub>p</sub>	0.15 + 0.15	±(% of input + % of full scale)
All other ranges	0.1 + 0.1	±(% of input + % of full scale)
Filter	1 kHz, 10 kHz, 100 kHz, 1 MHz	Software selectable
Waveform memory	64 MS	

Time Base	Specification	Comment
Accuracy	1 ppm	In operating temperature range
Aging per year	1 ppm	In operating temperature range

<sup>1</sup> DC accuracy specified for an average value of 100 samples with a sample rate of 5 kS/s and active 10 kHz filter performed within 24 hours after an offset correction.

**Notes:** All product data are specified for 1 year at an ambient temperature of 23°C ±5°C (after 1 hour warm-up time). Product specification and description in this document are subject to change without notice.

# Trigger

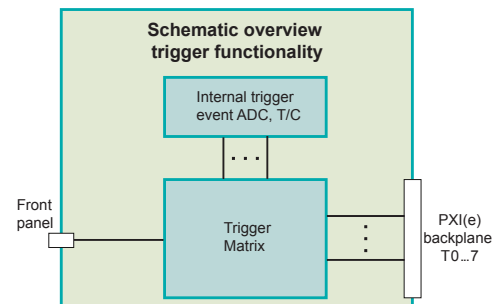
Trigger System	Specification	Comment
<b>Input from</b>		
Internal function module	Module can trigger itself	
Software	Via software command	
Front connector	Front trigger input (TTL level)	
PXI trigger	Trigger 0...7 and star trigger	From the PXI backplane
<b>Output to</b>		
Internal function module	Module can trigger itself	
Front connector	Front trigger output (TTL level)	
PXI trigger	Trigger 0...7	To the PXI backplane
<b>Level resolution</b>	16 Bit	
<b>Level accuracy</b>	0.6 + 0.3	±(% of programmed value + % of full range)
<b>Trigger delay</b>	0...200 s	Programmable delay, 100 ns resolution
<b>Trigger slope</b>	Positive or negative	
<b>Trigger hysteresis</b>	0... 100% of signal range	Programmable via software
<b>Pre-Trigger</b>	0... 100% of full record length	Trigger is armed after all pre-samples are captured; post-samples are captured after trigger
<b>Post-Trigger</b>	0... 100% of full record length	Number of samples captured after trigger event
<b>Trigger Mode</b>	Asynchronous, synchronous level, synchronous slope	

# Timer/Counter

T/C Measurement Modes	Specification
<b>Frequency</b>	
Counter width	32 Bit
Range	0.1 Hz... 2.5 MHz
Minimum pulse width	200 ns
Gate time	1 μs... 10 s
<b>Period</b>	
Resolution	100 ns
Accuracy <sup>1,2</sup>	±100 ns
Range	1 μs... 10 s
<b>Time interval and pulse width</b>	
Resolution	100 ns
Accuracy <sup>2</sup>	±100 ns
Range	1 μs... 10 s
<b>Rise and fall time</b>	
Resolution	100 ns
Accuracy <sup>2</sup>	±100 ns
Range	1 μs... 10 s
<b>Totalize</b>	
Minimum pulse width	1 μs
Range	0... 2 <sup>32</sup> -1

<sup>1</sup> Square wave signal with  $T_{\text{Rise}} < 1 \text{ ns}$  and  $T_{\text{Fall}} < 1 \text{ ns}$ .

<sup>2</sup> Trigger comparator error not included.



# Digital Multimeter (DMM)

DC Voltage Measurement	Specification	Comment
<b>Resolution</b>	16 Bit	
<b>Maximum input voltage</b>	±250 V	
<b>Overrange</b>	5% of range	
<b>Filter frequencies</b>	100 Hz, 1 kHz, 10 kHz, 100 kHz	Software selectable
<b>DC accuracy<sup>1,2,5,7</sup></b>		
Range 250 mV	0.08 + 0.02	Input resistance >1 GΩ
Range 500 mV	0.08 + 0.015	Input resistance >1 GΩ
Range 1 V	0.08 + 0.01	Input resistance >1 GΩ
Range 2 V	0.08 + 0.01	Input resistance >1 GΩ
Range 4 V	0.08 + 0.01	Input resistance >1 GΩ
Range 8 V	0.08 + 0.01	Input resistance >1 GΩ
Range 16 V	0.08 + 0.01	Input resistance 10 MΩ
Range 32 V	0.08 + 0.01	Input resistance 10 MΩ
Range 64 V	0.08 + 0.01	Input resistance 10 MΩ
Range 128 V	0.08 + 0.01	Input resistance 10 MΩ
Range 250 V	0.08 + 0.01	Input resistance 10 MΩ

AC Voltage Measurement	Specification	Comment
<b>Resolution</b>	16 Bit	
<b>Input impedance</b>	10 MΩ // <20 pF	
<b>Maximum input voltage</b>	$f < 40 \text{ kHz}: 250 V_p$ $40 \text{ kHz} < f < 1 \text{ MHz}: 10^7 V_p / f$ $1 \text{ MHz} < f < 5 \text{ MHz}: 10 V_p$	Input voltage may not exceed selected input voltage range
<b>Overrange</b>	5% of range	

AC Voltage Accuracy <sup>1,2,3,4,5,8</sup>	1 ... 40 Hz <sup>6</sup>	40 Hz ... 20 kHz	20 ... 50 kHz	50 ... 100 kHz
<b>Range 250 mV<sub>RMS</sub></b>	0.4 + 0.1	0.4 + 0.1	0.3 + 0.15	0.8 + 0.1
<b>Range 500 mV<sub>RMS</sub></b>	0.3 + 0.1	0.2 + 0.1	0.2 + 0.1	0.8 + 0.1
<b>Range 1 V<sub>RMS</sub></b>	0.15 + 0.1	0.15 + 0.1	0.2 + 0.1	0.8 + 0.1
<b>Range 2 V<sub>RMS</sub></b>	0.15 + 0.1	0.1 + 0.1	0.2 + 0.1	0.8 + 0.1
<b>Range 4 V<sub>RMS</sub></b>	0.15 + 0.1	0.1 + 0.1	0.2 + 0.1	0.8 + 0.1
<b>Range 8 V<sub>RMS</sub></b>	0.15 + 0.1	0.1 + 0.1	0.2 + 0.1	0.8 + 0.1
<b>Range 16 V<sub>RMS</sub></b>	0.15 + 0.1	0.1 + 0.1	0.2 + 0.1	0.8 + 0.1
<b>Range 32 V<sub>RMS</sub></b>	0.15 + 0.1	0.1 + 0.1	0.2 + 0.1	0.8 + 0.1
<b>Range 64 V<sub>RMS</sub></b>	0.15 + 0.1	0.1 + 0.1	0.2 + 0.1	0.8 + 0.1
<b>Range 128 V<sub>RMS</sub></b>	0.15 + 0.1	0.1 + 0.1	0.2 + 0.1	0.8 + 0.1 <sup>9</sup>

<sup>1</sup> For measurements >10% of range.

<sup>2</sup> ±(% of reading + % of full scale).

<sup>3</sup> For sine wave signals >5% of range.

<sup>4</sup> Maximum peak input voltage = 2x full scale (e.g. maximum input voltage for 128 V<sub>RMS</sub> range = ±256 V<sub>p</sub>).

<sup>5</sup> With auto offset correction.

<sup>6</sup> With DC coupling.

<sup>7</sup> 5 PLC.

<sup>8</sup> Measurement aperture greater than  $5/f_{\text{Low}}$ , where  $f_{\text{Low}}$  is the lowest frequency component of the signal being measured.

<sup>9</sup> Maximum input voltage must be satisfied.

DC Current Measurement	Specification	Comment
<b>Resolution</b>	16 Bit	
<b>Maximum input current</b>	$\pm 1$ A	
<b>Overrange</b>	5% of range	
<b>Filter frequencies</b>	100 Hz, 1 kHz, 10 kHz, 100 kHz	Software selectable
<b>DC accuracy</b> <sup>1,3,4</sup>		
Range 10 mA	0.2 + 0.05	
Range 100 mA	0.2 + 0.05	
Range 1 A	0.2 + 0.05	

AC Current Measurement	Specification	Comment
<b>Resolution</b>	16 Bit	
<b>Maximum input current</b>	$\pm 2 A_p$	
<b>Overrange</b>	5% of range	

AC Current Accuracy <sup>2,3,4,5,6</sup>	40 Hz ... 5 kHz	5 kHz ... 20 kHz
<b>Range 10 mA<sub>RMS</sub></b>	0.3 + 0.1	0.5 + 0.3
<b>Range 100 mA<sub>RMS</sub></b>	0.1 + 0.02	0.2 + 0.04
<b>Range 1 A<sub>RMS</sub></b>	0.1 + 0.02	0.3 + 0.04

<sup>1</sup> For measurements >8% of range.

<sup>2</sup> For sine wave signals >8% of range.

<sup>3</sup> With auto offset correction.

<sup>4</sup>  $\pm$ (% of reading + % of full scale).

<sup>5</sup> Maximum peak input current = 2x full scale (e.g. maximum input current for 1 A<sub>RMS</sub> range =  $\pm 2 A_p$ ).

<sup>6</sup> With DC coupling.

# Resistance

Resistance Measurement	Specification	Comment
<b>Resolution</b>	16 Bit	
<b>Overrange</b>	5% of range	
<b>Resistance accuracy</b> <sup>1,2,3,4</sup>		
Range 100Ω	0.1 + 0.01	Test current 8 mA
Range 1 kΩ	0.1 + 0.01	Test current 8 mA
Range 10 kΩ	0.1 + 0.01	Test current 800 μA
Range 100 kΩ	0.1 + 0.01	Test current 80 μA
Range 1 MΩ	0.1 + 0.01	Test current 8 μA
Range 10 MΩ	0.1 + 0.01	Test current 800 nA

# PXI(e) Trigger

PXI Capabilities	Specification	Comment
<b>PXI(e) TTL/trigger usage</b>	Possible	PXI(e) trigger 0...7; input and output
<b>PXI(e) star trigger usage</b>	Possible	Input only

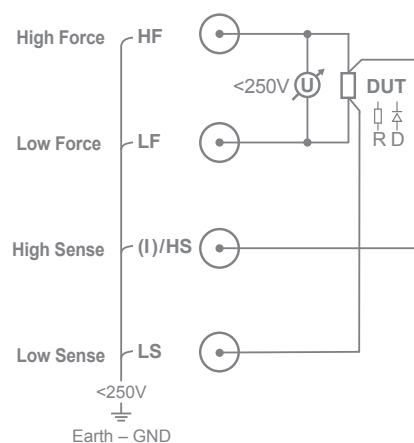
# Operating Times

Scope of Application	Specification	Comment
<b>Ranges</b>	<1 ms	
<b>Functions</b> <sup>5</sup>	<1 ms	For all U-, I-, R-Ranges <sup>5</sup>

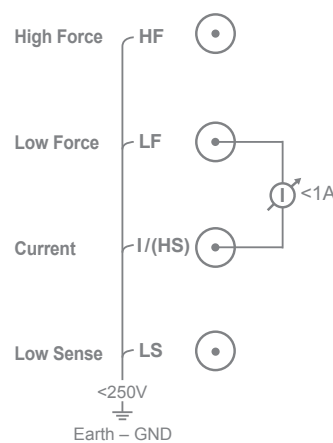
- <sup>1</sup> For measurements >8% of range.
- <sup>2</sup> Only 4 wire measurement.
- <sup>3</sup> With auto offset correction.
- <sup>4</sup> ±(% of reading + % of full scale).
- <sup>5</sup> For AC modes with DC coupling.

# Pin Assignment

## U/R-Measurement



## I-Measurement



## Trigger Line

