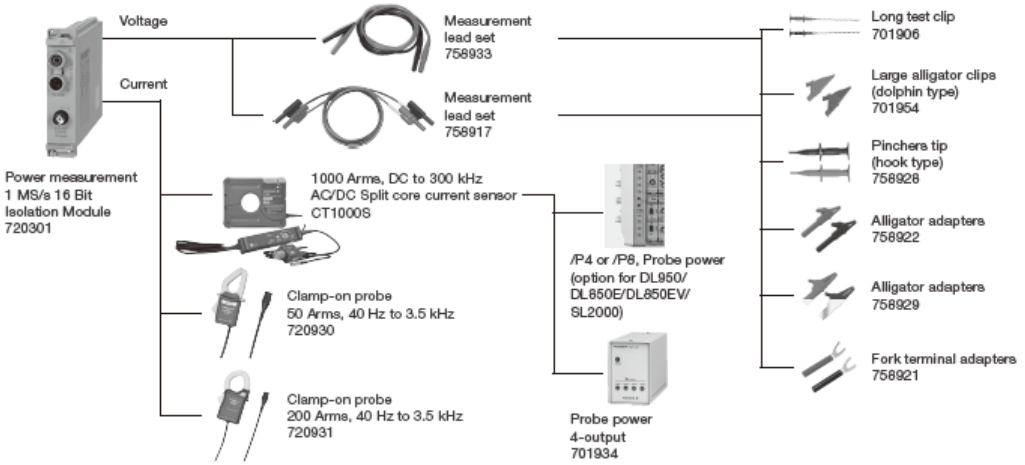
Using Power measurement 1 MS/s 16 Bit Isolation Module (720301)

720301 Power measurement
1 MS/s 16 Bit
Isolation Module

Combination of modules and probe/accessories

*To perform calculations for RMS values or power values with guaranteed accuracy, the /G05 or /MT1 option is required.



Specification

Refer to *1 and 12 on page 4.

Input impedance	2 MΩ ±1%, Approx. 15 pF	
Common mode rejection ratio	80 dB (50/60 Hz) or more (Typ.)	
Maximum sample rate	1 MS/s	
Frequency range (–3 dB)*1	DC to 300 kHz	
A/D conversion resolution	16 bit (2400 LSB/div)	
Voltage-axis sensitivity setting*12	20 mV/div to 200 V/div (1-2-5 steps)	
Current-axis sensitivity setting*12	5 mA/div to 1 A/div (1-2-5 steps) (when selected 1 V/1 A)	
Maximum input voltage (1 kHz or less)	Voltage	1000 Vrms (1000 VDC or 1414 Vpeak Max.) Non-compliant cable with safety standards 42 V (DC + ACpeak)
	Current sensor	10 V (DC + ACpeak)
Maximum rated voltage to earth (1 kHz or less)	Voltage/Current sensor	1000 Vrms (CAT Ⅱ), 600 Vrms (CAT Ⅲ) Direct input (non-compliant cable with safety standards) 42 V (DC + ACpeak) (CAT Ⅱ, 30 Vrms)
Channel to channel to phase error (Typ.)	Between volage to current sensor: 100 ns or less (0.04° @1 kHz, 0.002° @50 Hz)	
Delay adjustment for current sensor	–999 ns to 0 ns *Phase and frequency- based settings are also possible.	
–3 dB point when AC coupled low frequency attenuation point	1 Hz or less	
Temperature coefficient	Zero point: Add ±(0.03% of reading)/°C Gain: Add ±(0.03% of reading)/°C	
Bandwidth limit	Full/Auto/400 Hz/4 kHz/40 kHz (3rd-order Bessel characteristic)	

Vertical-axis accuracy (*1)

Condition: input waveform: Sine ware, input range: DC 0% to 100% of 10 div, AC 1 to 100% of 10 div, Defined using rms values for AC. for the case AC RMS, 1 to 70% of 10 div.
Frequency filter: OFF, Sample rate: 1 MS/s.
*for 5 mV/div, the AC range begins at 2%.
*DC Timer setting of 1 ms or more
*when using 5 mV/div, add 0.13% of ±10 div
*when using 10 mV/div, add 0.07% of ±10 div

Voltage direct input and current sensor input
*For current accuracy, add the accuracy of the current sensor used to the values shown below.

DC	±(0.07% of reading + 0.07% of 10 div)
0.1 Hz ≤ f < 45 Hz	±(0.07% of reading + 0.07% of 10 div)
45 Hz ≤ f ≤ 66 Hz	±(0.05% of reading + 0.05% of 10 div)
66 Hz < f ≤ 1 kHz	±(0.15% of reading + 0.1% of 10 div)
1 kHz < f ≤ 10 kHz	±[(0.05 × f) % of reading + 0.2% of 10 div] 5 mV/div, 10 mV/div: ±[(0.15 + 0.05 × f) % of reading + 0.2% of 10 div]
10 kHz < f ≤ 100 kHz	±[(0.4 + 0.02 × f) % of reading + 0.3% of 10 div]

When using frequency filter

40 kHz	Add ±0.1% of reading (DC to 1 kHz)
4 kHz	Add ±0.1% of reading (DC to 100 Hz)
400 Hz	Add ±0.1% of reading (DC to 10 Hz)

Power math function

Condition: Same as the conditions for vertical axis accuracy.
Note: (% of range) is equivalent to (% of 10 DIV).
The RMS range is calculated using the following formula: (RMS range) = (10 DIV) × (V/div setting) × (probe setting) ÷ (CF).
CF: Crest Factor. When a filter is used, add ±0.1% of reading. The unit of f in the accuracy calculation formula is kHz.

RMS Accuracy (Voltage, Current)

DC	±(0.07% of reading + 0.07% of range)
0.1 Hz ≤ f < 45 Hz	±(0.07% of reading + 0.07% of range)
45 Hz ≤ f ≤ 66 Hz	±(0.05% of reading + 0.05% of range)
66 Hz < f ≤ 1 kHz	±(0.15% of reading + 0.1% of range)
1 kHz < f ≤ 10 kHz	±[(0.05 × f) % of reading + 0.2% of range] 5 mV/div, 10 mV/div: ±[(0.15 + 0.05 × f)% of reading + 0.2% of range]
10 kHz < f ≤ 100 kHz	±[(0.4 + 0.02 × f) % of reading + 0.3% of range]

Active Power Accuracy
Condition Same as the conditions for vertical axis accuracy.
Note: Add the accuracy of the current sensor used to the power accuracy.
When a filter is used, add ±0.2% of reading. The unit of f in the accuracy calculation formula is kHz.

DC	±(0.07% of reading + 0.07% of range)
0.1 Hz ≤ f < 45 Hz	±(0.2% of reading + 0.07% of range)
45 Hz ≤ f ≤ 66 Hz	±(0.07% of reading + 0.07% of range)
66 Hz < f ≤ 1 kHz	±(0.2% of reading + 0.15% of range)
1 kHz < f ≤ 10 kHz	±[(0.2 + 0.07 × f) % of reading + 0.2% of range] [0.07 × f] % of reading 5 mV/div, 10 mV/div: ±[(0.3 + 0.07 × f) % of reading + 0.2% of range]
10 kHz < f ≤ 100 kHz	±[(0.4 + 0.08 × f) % of reading + 0.3% of range]

Frequency Accuracy

Condition: Measurement range: 0.1 Hz to 100 kHz, input waveform: sine wave, input waveform level: 30% or more of 10 div
*When using 5 mV/div, input signal level must be 50% or more of 10 div.
High-speed stability function: ON (effective at 500 Hz or higher), edge noise filter: ON

0.1 Hz ≤ f ≤ 100 kHz	±(0.1% of reading ±0.1 mHz)

Power factor (λ) influence	When λ = 0 and (S: apparent power) 45 Hz ≤ f ≤ 66 Hz: ±0.1% of S reading Up to 100 kHz: ±{(0.1 + 0.45 × f) % of S} When 0 < λ < 1 (φ: phase angle between voltage and current) (Power reading) × [(power reading error %) + (power range error%) × (power range / indicated apparent power value) + {tan φ × (influence when λ = 0) %}]
Accuracy of phase difference φ	±[{|φ –cos⁻¹(λ/1.0002)| +sin⁻¹{(Influence of Power Factor on Power at λ = 0)% /100}}]°
Lead and lag detection	Phase difference: ±(5° to 175°) Frequency: 20 Hz to 2 kHz
Time accuracy	±4.6 ppm (DL950/SL2000 follows main unit specification.)
Integrated Power Accuracy	±(power accuracy + time accuracy)