

# 486 and 487 Picoammeters

AMMETER			ANALOG OUTPUT	
RANGE	RESOLUTION	ACCURACY (1 Year)*	Rise Time	
		18°–28°C	(10%–90%)	
		±(%rdg + offset)	OFF	ON
2 nA	10 fA	0.3 + 500 fA	12 ms	70 ms
20 nA	100 fA	0.2 + 3 pA	4 ms	17 ms
200 nA	1 pA	0.15 + 20 pA	800 μs	4 ms
2 μA	10 pA	0.15 + 200 pA	380 μs	2 ms
20 μA	100 pA	0.1 + 2 nA	160 μs	370 μs
200 μA	1 nA	0.1 + 20 nA	160 μs	370 μs
2 mA	10 nA	0.1 + 200 nA	160 μs	370 μs

\* When properly zeroed.

**MAXIMUM OVERLOAD:** 350V peak on nA ranges and 2µA range; 50V peak on 20µA, 200µA, and 2mA ranges. Higher voltage sources must be current limited at 3mA.

**INPUT VOLTAGE BURDEN:** <200µV (18°–28°C) for inputs <100µA; <2mV for 2mA input; 20µV/°C temperature coefficient.

**TEMPERATURE COEFFICIENT (0°–18°C & 28°–50°C):** ±(0.15 × applicable accuracy specification) / °C.

**NMRR:** >60dB at 50Hz (LINE 50Hz integration) or 60Hz (LINE 60Hz integration).

**ANALOG OUTPUT:**

**Range:** ±2V for full range input (non-inverting).

**Accuracy:** ±(2.5% + 3mV); resistive loads >2kΩ; 18°–28°C.

**Impedance:** <100Ω, DC–2kHz.

**RANGING:** Automatic or manual.

**AUTORANGING TIME:** <200ms to final range (analog filter OFF).

MAXIMUM READING RATES (readings/second):				
INTEGRATION SETTING	RESOLUTION	CONTINUOUS INTO DATA STORE	EXTERNAL TRIGGERED INTO DATA STORE	TRIGGERED VIA IEEE-488 BUS**
FAST	4½-Digit	100	180	16
LINE 60Hz	5½-Digit	40	44	14
LINE 50Hz	5½-Digit	33	38	12

\*\* One-shot on TALK, G7 data format.

VOLTAGE SOURCE (487 only):				
RANGE (maximum value)	STEP SIZE (typical)	ACCURACY (1 Year) 18°–28°C ±(%setting + offset)	NOISE (p-p)*** 0.1–10Hz	TEMPERATURE COEFFICIENT 0°–18°C & 28°–50°C
±505.00 V	10 mV	0.15 + 40 mV	<1.5 mV	80 ppm + 2 mV/°C
±50.500 V	1 mV	0.1 + 4 mV	<150 µV	50 ppm + 200µV/°C

\*\*\* With LO terminal connected to chassis.

**SELECTABLE CURRENT LIMIT:** 2.5mA ±0.5mA or 25µA ±5µA.

**WIDEBAND NOISE:** <60/400mV p-p ±50/±500V range, 0.1Hz to 20MHz.

**TIME STABILITY:** ±(0.003% + 1mV) over 24 hours at constant temperature.

**OUTPUT RESISTANCE:** <2.5Ω.

## V/I OHMS (487 only)

Used with voltage source; resistance calculated from voltage setting and measured current. V/I OHMS accuracy equals voltage source accuracy plus ammeter accuracy. Typical accuracy better than 0.6% for readings between 1kΩ and 1TΩ.

IEEE-488 BUS IMPLEMENTATION
<b>MULTILINE COMMANDS:</b> DCL, SDC, GET, GTL, UNT, UNL, SPE, SPD.
<b>UNILINE COMMANDS:</b> IFC, REN, EOI, SRQ, ATN.
<b>INTERFACE FUNCTIONS:</b> SH1, AH1, T5, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT1, C0, E1.
<b>PROGRAMMABLE PARAMETERS:</b> All parameters programmable except for IEEE-488 bus address and frequency for line integration.
<b>TRIGGER TO FIRST BYTE:</b> <50ms (trigger on TALK, ATN false to talker DAV true, G7 data format).

GENERAL
<b>DATA STORE and MIN/MAX:</b> Stores up to 512 readings and identifies minimum and maximum reading.
<b>PROGRAMMABLE READING INTERVAL:</b> 10ms to 999.999s in 1ms increments.
<b>TRIGGER:</b> One-shot or continuous from front panel, IEEE-488 bus, and rear panel BNC.
<b>PROGRAMMABLE TRIGGER DELAY:</b> 1ms to 999.999s in 1ms increments.
<b>DISPLAY:</b> One ten character plus one eight character alphanumeric LED displays with normal/dim/off intensity control.
<b>MAXIMUM VOLTAGE BETWEEN VOLTAGE SOURCE AND CURRENT METER:</b> 500V DC.
<b>MAXIMUM VOLTAGE BETWEEN CHASSIS AND VOLTAGE SOURCE OR CURRENT METER:</b> 500V DC.
<b>REAR PANEL CONNECTORS:</b>
<b>Input Connector:</b> 3-lug triax.
<b>Analog Output:</b> 5-way binding post.
<b>External Trigger and Meter Complete:</b> BNC connectors.
<b>IEEE-488 Connector:</b> Chassis grounded.
<b>Voltage Source Output (487 only):</b> 5-way binding post.
<b>Interlock Connector (487 only):</b> 3-pin miniature DIN.
<b>EMC:</b> Conforms to European Union Directive 89/336/EEC.
<b>SAFETY:</b> Conforms to European Union Directive 73/23/EEC (meets EN61010-1/IEC 1010).
<b>ENVIRONMENT:</b>
<b>Operating:</b> 0°–50°C, <70% RH up to 35°C; linearly derate 3% RH/°C, up to 50°C.
<b>Storage:</b> –25° to 60°C.
<b>WARM-UP:</b> 2 hours to rated accuracy.
<b>POWER:</b> 105–125V AC or 210–250V AC (external switch selectable), 90–110V and 180–220V AC version available. 50Hz or 60Hz, 45VA maximum.
<b>DIMENSIONS, WEIGHT:</b> 90mm high × 213mm wide × 397mm deep (3½ in × 8½ in × 15½ in). Net weight 4.25kg (9.3 lb).
<b>ACCESSORIES SUPPLIED:</b>
Instruction Manual
Quick Reference Guide
Model 236-ILC-3 (487 only): Interlock Cable
Model 7078-ALG: 3-slot Triax to Alligator Clip Cable