



GPS-278

Digital Clamp Meter

2000 A AC and DC · 2000 V AC and DC · inrush

Operating Manual

Part number 622278 · Issue 1

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1 Safety

Read this section before using the instrument. Every item in it is here because ignoring it can injure you or damage the instrument.

- The instrument is rated CAT II 1000 V to IEC 61010-1. The category describes the transient environment it is built to survive, not a measurement range: the 2000 V ranges do not extend it. Do not use the instrument on circuits with a higher transient environment than CAT II.
- Inspect the test leads before every use. Do not use leads with damaged insulation or exposed metal.
- Remove the test leads from the instrument before measuring current with the jaw, and out of the circuit before changing function. Keep your fingers behind the barrier on the case.
- Discharge capacitors before measuring resistance, continuity, diodes or capacitance. Never make these measurements on a live circuit.
- Do not use the instrument if the case is open, the battery cover is off, or it is damp. Replace the battery as soon as the low battery symbol appears; a flat battery gives false readings.
- Clamp a single conductor only. Two conductors in the jaw cancel and the reading means nothing.

Above 1000 A, do not measure continuously for more than five minutes. Let the jaw cool before measuring again.

2 Introduction

The GPS-278 is a handheld clamp meter built around two large numbers: 2000 A through a 55 mm jaw, and 2000 V on the test leads, both AC and DC on each. There is no rotary switch. Functions step round on the POWER key, which keeps the case narrow for a jaw this size, and the four keys beneath the display each carry two jobs.

Those two figures are the reason to choose it. On switchgear, busbar, traction and large motor circuits the ranges of a general purpose clamp run out and this one does not. Behind the jaw it also measures resistance, capacitance, diodes and continuity, and captures inrush current as the RMS of an 80 millisecond window.

The two AC paths differ, and this is worth understanding before the first measurement. AC voltage is measured true RMS. AC current is average responding and calibrated to a sine wave: on a clean mains waveform it reads correctly, and on a chopped or heavily distorted one, such as the output of a variable frequency drive, it reads low. For distorted currents under 1000 A the GPS-276 is the right instrument.

3 Specification

Accuracy is specified for one year after calibration, at 23 °C ±5 °C and 70% relative humidity or less, in the form ±(percent of reading + digits). Resolution is on the lowest range of each function.

Function	Ranges	Accuracy	Resolution
DC voltage	2 V, 20 V, 200 V, 2000 V	±(0.5% + 5); ±(2% + 5) on 2000 V	1 mV
AC voltage	2 V, 20 V, 200 V, 2000 V	±(0.8% + 5). True RMS, 40 Hz to 1 kHz; 40 to 100 Hz on 2000 V	1 mV
DC current	20 A, 200 A, 2000 A	±(1.9% + 10)	10 mA
AC current	20 A, 200 A, 2000 A	±(1.9% + 10). Average responding, sine calibrated, 50 to 60 Hz; nothing shown below 0.3 A	10 mA
Inrush current	AC current ranges, manual	RMS of an 80 ms window	10 mA

Function	Ranges	Accuracy	Resolution
	range only		
Resistance	200 Ω to 20 M Ω , six ranges	$\pm(0.8\% + 5)$; $\pm(1\% + 5)$ on 200 Ω , $\pm(1.5\% + 5)$ on 20 M Ω	0.1 Ω
Capacitance	20 nF to 2000 μ F, six ranges, automatic only	$\pm(3\% + 10)$; $\pm(5\% + 10)$ on 2000 μ F	10 pF
Diode	Forward voltage, also reads an LED	0.5 mA forward, about 3.2 V open circuit	—
Continuity	Buzzer below about 60 Ω	About 0.6 V open circuit	—

AC current shows nothing below 0.3 A. AC voltage on the 2000 V range is specified from 40 to 100 Hz only.

General

Item	Specification
Display	1999 count LCD, automatic polarity, overload shown as OL, low battery indication, backlight
Jaw	Opens to 55 mm, single conductor, centred in the jaw
Controls	No rotary switch. Functions step round on the POWER key; separate select, range and hold keys; reset key for recovery after a shock
Ranging	Automatic, with a manual override on voltage, current and resistance. Capacitance is automatic only
AC response	Voltage true RMS, sine calibrated. Current average responding, sine calibrated
Inrush	RMS of an 80 ms window, manual range only
Hold and power off	Data hold. Automatic sleep after ten minutes, woken on the POWER key
Overload protection	2000 V DC or AC peak on the voltage ranges; 220 V rms on resistance, capacitance, diode and continuity
Duty	Above 1000 A, no more than five minutes of continuous measurement
Compliance	IEC 61010-1, CAT II 1000 V, CE (EMC and LVD)
Power	One 9 V battery, IEC 6F22, NEDA 1604, JIS 006P or equivalent
Operating conditions	0 $^{\circ}$ C to 40 $^{\circ}$ C, relative humidity below 75%
Storage conditions	-10 $^{\circ}$ C to 60 $^{\circ}$ C, relative humidity below 80%
Dimensions and weight	270 $\times$ 100 $\times$ 46 mm, about 460 g with the battery fitted
Part number	622278

4 The instrument

Jaw and trigger

The jaw opens to 55 mm with the trigger on the left of the case and closes fully around a single conductor. A light on the clamp head illuminates the conductor in a dark enclosure. The conductor should sit centred in the jaw and at right angles to it; off-centre or angled, the reading is low.

POWER

Press to switch on. With the instrument on, each press steps to the next function; the display shows the unit of the function selected. The instrument sleeps after ten minutes without a key press, and a press of POWER wakes it. Hold POWER to switch off.

HOLD / LIGHT

A short press holds the reading on the display; press again to release. A long press switches the display backlight and the clamp head light on and off. Both drain the battery faster.

RANGE / LED

On voltage, current and resistance, RANGE takes the instrument out of automatic ranging and steps through the manual ranges; hold it to return to automatic. On the diode function the same key selects the LED test, which puts enough voltage across an LED to light it and reads its working voltage.

Ω , continuity, diode, capacitance / DCA-ZERO

On the lead functions, each press steps between resistance, the continuity buzzer, the diode test and capacitance. On DC current, a press nulls the display, which must be done before every DC current measurement.

V / A INR

Steps between the voltage functions and the current functions on the display. On AC current a press enters inrush capture, described in section 5.4.

Display

1999 counts with automatic polarity. AUTO shows when the instrument is ranging for itself and goes out in manual range. OL shows for an over-range input, DH for a held reading, and the battery symbol when the battery needs replacing. The unit and multiplier for the selected function show beside the digits.

Terminals

Three terminals, and the red lead moves between two of them. COM in the centre takes the black lead for every measurement. ACV DCV on the left takes the red lead for voltage; its silkscreen reads MAX 2000 V and that is the limit. The right-hand terminal, marked with the resistance, capacitance, continuity and diode symbols, takes the red lead for those four functions. There is no current terminal; all current is measured through the jaw.

Reset

A recessed reset key restores the instrument if it stops responding after an electrical shock or a static discharge. Press it with the tip of a pen and switch on again. Settings are not stored, so nothing is lost.

5 Operation

5.1 Switching on, selecting a function, switching off

Press POWER to switch on. Press POWER again to step to the function you need, watching the unit on the display, and use the V / A INR key to move between the voltage and current families. The instrument sleeps after ten minutes without a key press; press POWER to wake it. Hold POWER to switch off when you have finished.

5.2 AC current

1. Remove the test leads from the instrument.
2. Select AC current: the display shows A with the AC symbol. The instrument ranges automatically; press RANGE to fix a range if the reading is unstable at a range boundary.
3. Press the trigger, put the jaw round one conductor, and release it so the jaw closes fully. Centre the conductor.
4. Read the current.

The AC current path is average responding and calibrated to a sine wave. It reads correctly on a clean mains waveform and low on a distorted one. Do not use it to size protection on a drive output or a switch-mode load; nothing is shown below 0.3 A.

5.3 DC current

1. Remove the test leads from the instrument.
2. Select DC current: the display shows A with the DC symbol.
3. Hold the instrument in the orientation and position you intend to measure in, with the jaw closed and empty, and press DCA-ZERO. The display goes to zero.
4. Put the jaw round one conductor and read the current. Polarity follows the direction of current relative to the arrow on the jaw; a negative sign means the current flows the other way.

Zero before every DC current measurement, and zero in the position you will measure in. The jaw is magnetised by the earth's field and by every current it has measured, and whatever the display shows unzeroed is added to the reading. This matters most on the 20 A range.

5.4 Inrush current

A motor or compressor draws several times its running current for the first few cycles after it starts. The inrush function captures the RMS of an 80 millisecond window and holds it, so the figure is the one a protection device sees rather than a single-cycle peak. On this instrument it works in manual range only.

1. Select AC current and clamp the conductor with the load switched off.
2. Press RANGE to select the range the starting current falls in. If you do not know the magnitude, select 2000 A: a reading on a range that is too low shows OL and tells you nothing.
3. Press INR. The display shows that it is waiting for a trigger.
4. Start the load. The instrument captures the first 80 ms after the current rises and holds the RMS value on the display.
5. Press INR again to release, or to arm for the next start.

5.5 AC and DC voltage

1. Plug the black lead into COM and the red lead into ACV DCV.
2. Select AC or DC voltage on the display.
3. Connect the leads across the circuit and read the voltage. AC is measured true RMS. Ranging is automatic from 2 V to 2000 V; press RANGE to fix a range.

Input resistance is about 10 M Ω . On the 2000 V range, AC accuracy is specified from 40 to 100 Hz.

2000 V on the leads is the measurement limit, not a licence. The instrument remains a CAT II device: use it on circuits with a CAT II transient environment only, and never with the leads plugged into the wrong terminal.

5.6 Resistance, continuity and diode

Make these measurements only on a circuit that is switched off and discharged. Protection on these functions is 220 V rms; the instrument may survive a mistake, the reading will not.

1. Plug the black lead into COM and the red lead into the right-hand terminal.
2. Press the Ω key to step to resistance, continuity or diode test.
3. Resistance ranges automatically from 200 Ω to 20 M Ω ; the display shows OL for an open circuit. Press RANGE to fix a range. On the 200 Ω range, short the leads together and note the reading; subtract it from low-value measurements.
4. Continuity sounds the buzzer below about 60 Ω , with about 0.6 V across open leads.
5. Diode test shows the forward voltage of a junction with 0.5 mA flowing, red lead on the anode. A good silicon diode reads 0.5 to 0.8 V forward and OL reversed. Press RANGE / LED for the LED test, which lights an LED and reads its working voltage.

5.7 Capacitance

1. Discharge the capacitor.
2. Plug the leads in as for resistance and press the Ω key to step to capacitance.
3. Connect the leads across the capacitor, red to positive for an electrolytic, and read the capacitance. Ranging is automatic from 20 nF to 2000 μ F and cannot be fixed; large values take several seconds to settle.

5.8 Data hold and lights

Press HOLD to freeze the reading, and again to release it. The DH symbol shows while the reading is held. A long press of HOLD / LIGHT switches on the display backlight and the clamp head light; another long press switches them off.

6 Care and maintenance

Battery

Replace the 9 V battery when the battery symbol appears. Switch off and remove the test leads, open the battery compartment on the rear of the case, fit a fresh battery of the type listed in section 3 observing polarity, and close the compartment before use.

Cleaning

- Clean the case with a damp cloth and a mild detergent. Do not use solvents or abrasives, and do not let liquid into the case or the jaw.
- Keep the mating faces of the jaw clean. Dirt or corrosion between the faces raises the reading error on current.
- Store the instrument dry, within the storage conditions in section 3, and with the battery removed if it will not be used for some months.

Calibration

The calibration interval is one year. Calibration, with or without a certificate, and repair are available from GPS; contact us with the model and part number.

7 Supplied with the instrument

- GPS-278 digital clamp meter
- Test lead set
- 9 V battery
- Carrying case
- This manual

Calibration certification is available separately. The declaration of conformity is supplied with any quotation on request.

8 Warranty

One year from the date of purchase, subject to product registration with GPS. The warranty covers defects in materials and workmanship and does not cover damage caused by operation outside the rated conditions, by connection to a circuit outside the stated limits, by a flat or leaking battery, or by unauthorised repair.

For service, calibration or technical support contact GPS at sales@gpslimited.com or +44 (0) 203 093 0914.