



GPS-276

Digital Clamp Meter

1000 A AC and DC · true RMS · inrush, temperature and frequency

Operating Manual

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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. Do not use it on circuits with a higher transient environment than that, and never above 1000 V between the terminals or between either terminal and earth.
- 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 keep your fingers behind the barrier on the case.
- Select the function before connecting to the circuit, and disconnect before changing function. Do not switch the rotary switch with the leads on a live circuit.
- 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 30 V, do not measure frequency at the frequency position of the rotary switch. Select AC voltage and step to Hz with SELECT instead. The frequency position is a low-voltage input and can be damaged.

2 Introduction

The GPS-276 is a handheld clamp meter reading AC and DC current to 1000 A through a 52 mm jaw, on a 3999 count display, with true RMS conversion on both the current and the voltage paths. Behind the jaw it is a full digital multimeter: AC and DC volts from 400 mV, resistance to 40 M Ω , capacitance to 10 mF, frequency to 40 MHz with duty cycle, diode and continuity, and temperature from -50 to 1000 °C on the supplied K type probe.

The inrush function is what sets it apart from a simpler clamp. It captures the true RMS of an 80 millisecond window rather than a peak, which is the shape a motor or compressor start actually has, and a starting current you can put a number to is the difference between sizing a protection device and guessing at one.

Ranging is automatic with a manual override on voltage, current and resistance. Data hold, a display backlight and a clamp head light are provided, and the instrument switches itself off after ten minutes unless told not to.

3 Specification

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

Function	Ranges	Accuracy	Resolution
DC voltage	400 mV, 4 V, 40 V, 400 V, 1000 V	$\pm$ (0.8% + 2); $\pm$ (1% + 3) on 1000 V	0.1 mV
AC voltage	400 mV, 4 V, 40 V, 400 V, 700 V	$\pm$ (1.2% + 5); $\pm$ (1.5% + 5) on 700 V. True RMS, 10 Hz to 1 kHz	0.1 mV
DC current	40 A, 400 A, 1000 A	$\pm$ (2% + 10) on 40 A	10 mA
AC current	40 A, 400 A, 1000 A	$\pm$ (2% + 10) on 40 A. True RMS, 50 to 60 Hz	10 mA
Inrush current	AC current ranges	True RMS of an 80 ms window	10 mA

Function	Ranges	Accuracy	Resolution
Resistance	400 Ω to 40 M Ω , six ranges	$\pm(1\% + 3)$; $\pm(1.5\% + 5)$ on 40 M Ω	0.1 Ω
Capacitance	10 nF to 10 mF, seven ranges	$\pm(3\% + 20)$ on 10 nF	1 pF
Frequency	100 Hz to 40 MHz, seven ranges	$\pm(0.5\% + 3)$, 1 V rms sensitivity	0.01 Hz
Duty cycle	1% to 99%	$\pm(0.5\% + 3)$, 1 V rms sensitivity	0.1%
Temperature	-50 to 1000 $^{\circ}\text{C}$ (-58 to 1832 $^{\circ}\text{F}$)	$\pm 1\% \pm 5$ to 300 $^{\circ}\text{C}$	1 $^{\circ}\text{C}$
Diode	Forward voltage	1.5 mA forward, about 3 V open circuit	—
Continuity	Buzzer below 90 $\pm 20 \Omega$	About 0.5 V open circuit	—

Two limits worth knowing before relying on the figures: AC voltage accuracy on a square wave is specified only from 10 Hz to 400 Hz, against 10 Hz to 1 kHz on a sine; and AC current accuracy is specified at 50 to 60 Hz only.

General

Item	Specification
Display	3999 count LCD, automatic polarity, overload shown as OL, low battery indication, backlight
Jaw	Opens to 52 mm, single conductor, centred in the jaw
Ranging	Automatic, with a manual override on voltage, current and resistance
Inrush	True RMS of an 80 ms window, on a key shared with the DC current zero
Hold and power off	Data hold. Automatic power off after ten minutes, defeated by holding DH while switching on
Overload protection	1000 V DC or AC peak on the volt ranges; 250 V rms on millivolt, capacitance, frequency, duty cycle and temperature; 220 V rms on resistance
Compliance	IEC 61010-1, CAT II 1000 V, CE
Temperature sensor	K type bare-bead thermocouple, supplied
Power	One 9 V battery, IEC 6F22, NEDA 1604, JIS 006P or equivalent
Operating conditions	0 $^{\circ}\text{C}$ to 40 $^{\circ}\text{C}$, relative humidity below 75%
Storage conditions	-10 $^{\circ}\text{C}$ to 60 $^{\circ}\text{C}$, relative humidity below 85%
Dimensions and weight	249 $\times$ 89 $\times$ 38 mm, about 360 g with the battery fitted
Part number	622276

4 The instrument

Jaw and trigger

The jaw opens to 52 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.

Rotary switch

Reading clockwise from the top, the positions are:

- OFF
- °C °F — temperature on the K type probe. SELECT steps between Celsius and Fahrenheit.
- Hz DUTY — frequency and duty cycle on the test leads, for signals below 30 V. SELECT steps between them.
- Ω, continuity, diode — SELECT steps between resistance, the continuity buzzer and the diode test.
- CAP, mV — capacitance and the millivolt ranges. SELECT steps between capacitance, DC millivolts and AC millivolts.
- ≈V — voltage on the test leads. SELECT steps between DC, AC, and frequency and duty cycle of the AC voltage.
- ~A — AC current through the jaw.
- ⇄A — DC current through the jaw.
- OFF

Keys

SELECT steps between the functions that share a switch position, as listed above. On the voltage and current positions it also steps between AC and DC where both are available.

RANGE takes the instrument out of automatic ranging and steps through the manual ranges on voltage, current and resistance. Hold RANGE to return to automatic ranging. The decimal point moves as the range changes, so watch it.

ZERO / INRUSH does two jobs. On DC current a short press nulls the display, which must be done before every DC current measurement. On AC current a short press enters inrush capture. Both are described in section 5.

DH holds the reading on the display; press again to release. A long press switches the backlight and the clamp head light on and off. Holding DH while switching the instrument on defeats the automatic power off for that session.

Display

3999 counts with automatic polarity. AUTO shows when the instrument is ranging for itself; it 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 on the right of the digits.

Terminals

COM takes the black lead. VΩ takes the red lead for every lead-based measurement: voltage, resistance, continuity, diode, capacitance, frequency, duty cycle and temperature. There is no current terminal; all current is measured through the jaw. The silkscreen reads CAT II MAX 1000 V, and that is the limit.

5 Operation

5.1 Switching on and off

Turn the rotary switch from OFF to any function. The instrument switches off after ten minutes without a key press or a change of range. To keep it running, for a measurement you need to leave in place, hold DH while turning the switch

from OFF; the power off is defeated until the instrument is switched off. Turn the switch to OFF when you have finished.

5.2 AC current

1. Remove the test leads from the instrument.
2. Turn the rotary switch to $\sim A$. 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 conversion is true RMS, so a distorted waveform from a drive or a switch-mode load reads correctly.

Accuracy is specified at 50 to 60 Hz. Readings on other frequencies are indicative only.

5.3 DC current

1. Remove the test leads from the instrument.
2. Turn the rotary switch to $\rightarrow A$.
3. Hold the instrument in the orientation and position you intend to measure in, with the jaw closed and empty, and press 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 40 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 true 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.

1. Turn the rotary switch to $\sim A$ and clamp the conductor with the load switched off.
2. If you already know the magnitude, press RANGE to select the range it falls in. If not, leave the instrument in automatic ranging.
3. Press INRUSH. 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 INRUSH 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 V Ω .
2. Turn the rotary switch to V. Press SELECT for AC or DC as required.
3. Connect the leads across the circuit and read the voltage. AC is measured true RMS.

For AC voltage above 30 V, frequency is read here too: with AC voltage selected, press SELECT again and the display shows the frequency of the voltage on the leads, and once more for duty cycle. This is the safe way to read mains frequency; the frequency position of the rotary switch is not.

For voltages below 400 mV use the mV ranges at the CAP position, selected with SELECT. Input resistance on the volt ranges is about 10 M Ω .

5.6 Resistance, continuity and diode

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

1. Plug the leads in as for voltage.
2. Turn the rotary switch to the Ω position. Press SELECT to step to continuity or diode test.
3. Resistance ranges automatically from 400 Ω to 40 M Ω ; the display shows OL for an open circuit. Press RANGE to fix a range. On the 400 Ω range, short the leads together and note the reading; subtract it from low-value measurements.
4. Continuity sounds the buzzer below 90 Ω , give or take 20 Ω , with about 0.5 V across open leads.
5. Diode test shows the forward voltage of a junction with 1.5 mA flowing, red lead on the anode. A good silicon diode reads 0.5 to 0.8 V forward and OL reversed. Open circuit voltage is about 3 V, enough to light an LED and read its forward voltage.

5.7 Capacitance

1. Discharge the capacitor.
2. Turn the rotary switch to CAP and connect the leads across the capacitor, red to positive for an electrolytic.
3. Read the capacitance. Ranging is automatic from 10 nF to 10 mF; large values take several seconds to settle.

About 20 pF cannot be resolved on the 10 nF range: the leads and the instrument itself account for it. Note the reading with the leads open and subtract it from small values.

5.8 Frequency and duty cycle

Two ways, depending on the signal level.

- Below 30 V: turn the rotary switch to Hz DUTY, connect the leads, and read frequency from 100 Hz to 40 MHz. Press SELECT for duty cycle, 1% to 99%. Sensitivity is 1 V rms.
- Above 30 V: select AC voltage and step to Hz with SELECT, as described in 5.5.

5.9 Temperature

1. Plug the K type probe into the instrument, observing polarity: the wider blade of the plug goes to COM.
2. Turn the rotary switch to $^{\circ}\text{C}$ $^{\circ}\text{F}$. Press SELECT for Celsius or Fahrenheit.
3. Put the bead in contact with the surface or in the medium to be measured and wait for the reading to settle.

The supplied bead is rated to 1000 $^{\circ}\text{C}$ in still air. It is a fine wire junction and reads the temperature of whatever it touches, so a good thermal contact matters more than the instrument's accuracy. The probe must not be connected to a live circuit.

5.10 Data hold and lights

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

6 Care and maintenance

Battery

Replace the 9 V battery when the battery symbol appears. Turn the rotary switch to 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-276 digital clamp meter
- Test lead set
- K type temperature probe
- 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.