

SUMMARY

	page
1 Presentation	15
2 Description	15
3 Operating procedure	16
3.1 Switching on	16
3.2 DC zero adjustment	16
3.3 Measurement	16
3.4 Overload indication	16
3.5 Auto off	17
4 Specifications	17
4.1 Reference conditions	17
4.2 Operating conditions	18
4.3 Metrological specifications	19
- 100 A range (10 mV/A)	19
- 1000 A range (1 mV/A)	19
- Distortion parameters	20
4.4 Mechanical specifications	20
4.5 Electrical specifications	21
- Operating limits	21
- Electric shocks	21
4.6 Electromagnetic compatibility	21
5 Maintenance	22
5.1 Replacing the battery	22
5.2 Cleaning	22
5.3 Calibration	22
5.4 Repair	22
6 To order	23
7 Appendices	57

1/ PRESENTATION

The PAC 22 current clamp measures DC or AC currents, without opening the circuit they are flowing in. The current clamp is used as an accessory for multimeters, recorders, etc.

This clamp measures DC currents up to 1500 A and AC currents up to 1000 A. It outputs the form and amplitude of the current measured as a voltage image of the primary current.

The PAC 22 has two ranges, 1 mV/A and 10 mV/A, a zero adjust push button, auto off feature to economise the battery power supply and two light indicators, one for faults (over-range incorrect zero reset), the other for power supply.

2/ DESCRIPTION

See descriptive diagram at the end of the User Manual.

- ① Passage of the conductor
- ② Jaws
- ③ Protective non-slip guard
- ④ Automatic zero DC button
- ⑤ Red fault light (over range / incorrect zero adjustment)
- ⑥ Green light indicating correct power supply
- ⑦ 3-position sliding switch (off / selection of 1 mV/A or 10 mV/A ranges)
- ⑧ Hand-held parts
- ⑨ Fitted lead 1.5 m
- ⑩ BNC plugs

3/ OPERATING PROCEDURE

3.1/ SWITCHING ON

Set the sliding switch ⑦ to the appropriate position (range with 1 mV/A or 10 mV/A sensitivity). Correct operation is indicated by a green light ⑤ indicating that the battery is in good condition. After approximately 10 minutes of operation of the clamp without manipulation of the controls, the power supply cuts off automatically (see "Auto off" below). If this green indicator does not come on when the clamp is switched on, or goes out before it has operated for 10 minutes, it is necessary to replace the battery (see MAINTENANCE chapter).

3.2/ DC ZERO ADJUSTMENT

Ensure that the jaws of the clamp are correctly closed and that they do not enclose any conductor. Connect the clamp to your measurement instrument. Press the auto zero button ④. The red light ⑥ comes on for approximately three seconds to indicate that the instrument is on zero calibration. If zero can not be obtained, this indicator light remains lit to indicate the fault.

3.3/ MEASUREMENT

After having switched on the clamp, connected it to the measurement instrument on the appropriate range, and followed the auto zero procedure (see the two paragraphs above), enclose the conductor to be measured ① in the jaws of the clamp.



On DC current measurement, ensure that the arrow located on the external edge of the jaws corresponds to the direction of the current flowing in the conductor (source ⇒ receiver).

3.4/ OVERLOAD INDICATION

Detection of overload of the range of the clamp is indicated by the red light ⑧. This indicator comes on for a peak current greater than 150 A on the 100 A (10 mV/A) range or 1500 A on the 1000 A (1 mV/A) range.

3.5/ AUTO OFF

The PAC 22 has an Auto Off feature which switches approximately 10 minutes after the clamp has been switched on. Any operation of the switch or the auto zero button reinitialises the Auto Off function.

When the clamp is switched off by this automatic function, the switch ⑦ must first be set to the OFF position before being switched on again.

This function can be overridden by the user when switching on. Simply press the auto zero button ④ at the same time as setting the switch ⑦ from the OFF position to the 1 mV/A or 10 mV/A position.

If the green indicator ⑤ flashes whilst the zero reset button is being pressed, this indicates that the auto off function has been inhibited.

4/ SPECIFICATIONS

Ranges	Input/output ratio	Measurement extent		
		A AC rms	A peak max	A DC
100 A	10 mV/A	0.2...100	0.2...150	0.4...150
1000 A	1 mV/A	0.5...1000	0.5...1400	0.5...1400

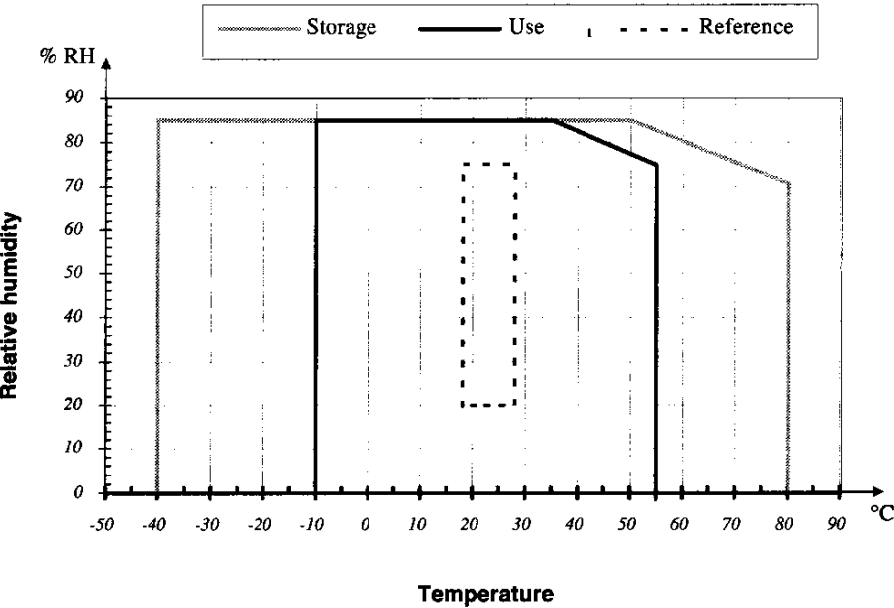
4.1/ REFERENCE CONDITIONS

- Temperature: 18...28°C
- Humidity rate: 20...75% RH
- Battery voltage: 9 V ± 0.1 V
- Position of conductor: centred on the markings of the clamp
- Magnetic field: earth's DC field
- Absence of external AC magnetic field
- Absence of electric field
- Measurement for a DC current or an AC sinusoidal current ≤ 65 Hz
- Impedance of the measurement instrument: ≥ 1 MΩ and ≤ 100 pF

4.2/ OPERATING CONDITIONS

The instrument must be used in the following conditions to satisfy the safety of the user and the metrological performance:

- Use indoors
- Working altitude: ≤ 2000 m
- Transportation altitude: ≤ 12 000 m
- Environmental conditions : see graph below



4.3/ METROLOGICAL SPECIFICATIONS

All the errors are indicated as a % of Vs (valor of the output voltage)

- Output impedance: 100 W
- zero adjustment: ±10 A by automatic step from 25 to 40 mA approx.

100 A range (10 mV/A)

■ Intrinsic error in the field of reference

Primary current	0.5...20 A	20...100 A	100...150 A (on DC only)
Accuracy	≤ 1.5% + 5 mV	≤ 1.5%	≤ 2.5%

Graphs of typical relative error: see appendices, page 57,58.

■ Phase error (45...65 Hz)

Primary current	10...20 A	20...100 A
Phase shift	≤ 3°	≤ 2°

- Rise time from 10 to 90% Vs: ≤ 100 μs
- Fall time from 90 to 10% Vs: ≤ 100 μs
- Output noise: from DC...1 kHz ≤ 8 mV or 0.8 A DC
from DC...5 kHz ≤ 12 mV or 1.2 A DC
from 0.1 Hz...5 kHz ≤ 2.0 mV rms or 0.2 A rms
- Residual magnetism: < 4 mA/A

1000 A range (1 mV/A)

■ Intrinsic error in the reference range

Primary current	0.5...100 A	100...1000 A	800 ... 1000 A AC 800 ... 1400 A DC 800 ... 1400 A peak
Accuracy	≤ 1.5% + 1 mV	≤ 2.5%	≤ 4%

Graphs of typical relative error: see appendices, page 61, 62.

■ Phase error (45...65 Hz)

Primary current	10...200 A	200...1000 A
Phase shift	≤ 2°	≤ 1.5°

Graph of typical phase shift as a function of a 50 Hz AC primary current:
see appendices, page 63.

- Rise time from 10 to 90% Vs: ≤ 70 μs
- Fall time from 90 to 10% Vs: ≤ 70 μs
- Output noise: from DC...1 kHz ≤ 1 mV or 1 A DC
from DC...5 kHz ≤ 1.5 mV or 1.5 A DC
from 1 Hz...5 kHz ≤ 500 μV rms or 0.5 A rms

Distortion parameters

- Maximum distortion of the frequency on the measurement (to be added to the error in the reference range): 1% rdg from 65 to 440 Hz, 3.5% rdg from 440 to 2000 Hz and -3 dB from 2 kHz to 10 kHz. See graph of typical error as a function of the frequency, in appendices, page 66.
- Battery voltage: ≤ 0.1% / V
- Temperature: ≤ 300 ppm /°C or 0.3% rdg /10°C
- Humidity 10...85 % RH at ambient temperature: ≤ 0.5%
- Position of a conductor of Ø 20 mm : from DC...440 Hz < 0.5%
from DC...1 kHz < 1%
from DC...2 kHz < 3%
from DC...2 kHz < 10%
- Adjacent conductor carrying an AC current 50 Hz, at 23 mm from the clamp: < 10 mA/A
- Distortion of an external field of 400 A/m (50 Hz) on centred cable: < 1.3 A
- Common mode rejection: > 65 dB A / V
- Residual magnetism: < 4 mA/A

4.4/ MECHANICAL SPECIFICATIONS

- Watertightness: IP 30 in accordance with IEC 529
- Clamping capacity: 1 cable Ø 39 mm (or 2 cables Ø 25 mm)
1 busbar of cross section 50 x 12.5 mm
- Outside dimensions of clamp: 237 x 97 x 44 mm
- Fitted lead: 1.5 m
- Weight: 520 g

- Drop height: to IEC 68 -2-32
- Protection from shocks: 100 g in accordance with IEC 68-2-27
- Vibrations: to IEC 68-2-6

4.5/ ELECTRICAL SPECIFICATIONS

Power supply: 9 V battery (type 6LR61, 6LF22 or NEDA 1604)

Battery life: approx 50h with an alkaline battery

Operating limits

On DC current: 3000 A permanent

On AC: 1000 A permanent up to 1 kHz

The max permitted AC overload current from 1 kHz is defined by the graph shown in the appendices (page 67) and is accordance with the following formula:

$$I_p \text{ max} = \frac{1000}{F \text{ (kHz)}}$$

Electric shocks

Instrument with dual insulation or strengthened insulation in accordance with IEC 1010-2-03. Between the primary, the secondary and the hand-held part located below the guard dielectric test voltage: 7850 V DC.

Maximum common mode voltage between the conductor on which the measurement is made and the earth, or the output and the earth:

600 V for installations of category III and degree of pollution 2

Installation category and degree of pollution in accordance with IEC 664 and 664A

4.6/ ELECTROMAGNETIC COMPATIBILITY

Susceptibility to EN 50082-2 (most severe case) and EN 50082-1:

Electrostatic discharge to IEC 1000-4-2 (1995):

- Test voltages: 4kV level 2 contact, aptitude criteria B
8 kV level 3 in the air, aptitude criteria B

Radiated fields to IEC 1000-4-3 (1995):

- no disturbance: 3 V/m level 2, aptitude criteria A
- with a max distortion of 50% of the measurement range: 3 V/m level 2, aptitude criteria A

Rapid transients to IEC 1000-4-4 (1995):

- test voltage: 1 kV level 2, aptitude criteria B

Magnetic fields at the frequency of the network to IEC 1000-4-8 (1995):

- with a max distortion of 0.5 A: 30 A/m 50 Hz level 4, aptitude criteria A

Emissions to EN 50081-1:

- Conducted and radiated emission to EN 55022 (1994): class B

5/ MAINTENANCE



For maintenance, only use specified spare parts. The manufacturer will not be held responsible for any accident occurring after a repair made other than by its after sales service or approved repair services.

5.1/ REPLACING THE BATTERY

- Completely disconnect the clamp from the circuit to be measured from your oscilloscope
- Unscrew the tool release screw holding the cover of the battery compartment.
- Replace the 9 V battery (type 6LF22, 6LR61 or NEDA 1604).
- Replace the cover of the battery compartment.

5.2/ CLEANING

Keep the jaw faces and mechanism perfectly clean.

The body of the clamp should be cleaned with a cloth moistened with soapy water.

Rinse with a cloth moistened with clean water.

Never expose the clamp to running water.

5.3/ CALIBRATION

It is essential that all test or measurement instruments are regularly calibrated.

For occasional daily use, we recommend that an annual calibration be carried out.

When the instrument is used continuously every day, we recommend that a calibration is carried out every 6 months.

For calibration and repair of your instrument, please contact our COFRAC BNM accredited laboratories:

- CHAUVIN ARNOUX Pont l'Evêque- France: (33) 31 64 51 11

- MANUMESURE Lyon - France: (33) 78 26 68 04

Or the CHAUVIN ARNOUX subsidiary or Agent in your country

5.4/ REPAIR

Maintenance, repairs under or out of guarantee: Please return the product to your distributor.

6/ TO ORDER

Oscilloscope Clamp PAC 22 CVH 1000/1 P01.1200.1
Supplied with a 9 V alkaline battery, a set of labels in 5 languages
to stick to the instrument, and a User Manual.

Spare:
- 9 V alkaline battery (6LF22) P01.1006.1