

- Pince ampéremétrique AC/DC
- AC/DC current clamp
- AC/DC Zangenstromwandler
- Pinza amperometrica CA/CC
- Pinza amperimetrica CA/CC

E3N



海洋儀器

致力于电子测试、维护领域!



ENGLISH

User's manual

 **CHAUVIN[®]
ARNOUX**
CHAUVIN ARNOUX GROUP

PRECAUTIONS FOR USE

This device is compliant with safety standard IEC 61010-2-032, for voltages up to 600V in category III. Failure to observe the safety instructions may result in electric shock, fire, explosion, or destruction of the instrument and of the installations.

- The operator and/or the responsible authority must carefully read and clearly understand the various precautions to be taken in use. Sound knowledge and a keen awareness of electrical hazards are essential when using this instrument.
- If you use this instrument other than as specified, the protection it provides may be compromised, thereby endangering you.
- Do not use the instrument on networks of which the voltage or category exceeds those mentioned.
- Do not use the instrument if it seems to be damaged, incomplete, or poorly closed.
- Before each use, check the condition of the insulation on the leads, housing, and accessories. Any item of which the insulation is deteriorated (even partially) must be set aside for repair or scrapping.
- Use only the leads and accessories supplied. Using leads (or accessories) of a lower voltage or category reduces the voltage or category of the combined instrument + leads (or accessories) to that of the leads (or accessories).
- Use personal protection equipment systematically.
- All troubleshooting and metrological checks must be performed by competent and accredited personnel.

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1. PRESENTATION

The E3N clamp is a current probe based on a Hall effect cell and intended for use with an oscilloscope; it can be used to measure direct or alternating current without making any changes to the installation (without opening the circuit).

It can measure currents from 50mA to 100 Apeak.

It provides 2 ranges and has 2 indicators to report:

- correct power supply to the clamp, **ON**,
- values above the range used (inducing saturation or clipping), **OL**.

It also has a thumbwheel with which to adjust the zero to match the measurement environment as closely as possible.

This clamp can be connected to any measuring instrument having a BNC input and an impedance of $1M\Omega$, $<100pF$.

2. DESCRIPTION

Switch

The switch has 3 positions:

- **OFF**: the clamp is not powered.
- **10mV/A** range: measurement of the peak direct or alternating current on the basis of 10mV per Ampere.
- **100mV/A** range: measurement of the peak direct or alternating current on the basis of 100mV per Ampere. This range increases the sensitivity of the clamp and reduces the measurement range.

Battery indicator

This indicator is off when the switch is set to **OFF**. In normal operation, the green indicator is lit. If the indicator is off when the switch is not set to **OFF**, either the battery voltage is too low or the cell is no longer powered because of a clamp fault.

Adjustment of the “zero” of the clamp

The thumbwheel can be used to set the output voltage to zero. This makes it possible to compensate for various errors due to thermal drift, the earth's magnetic field, the environment, and remanence.

Range exceeded indicator

This indicator, represented by the **OL** symbol, lights in red when the signal to be measured exceeds the range limit. It may also indicate the presence of a pulse that exceeds the measurement capability of the range, or indicate that the measurement made on the clamp is not valid.

3. PROCEDURE

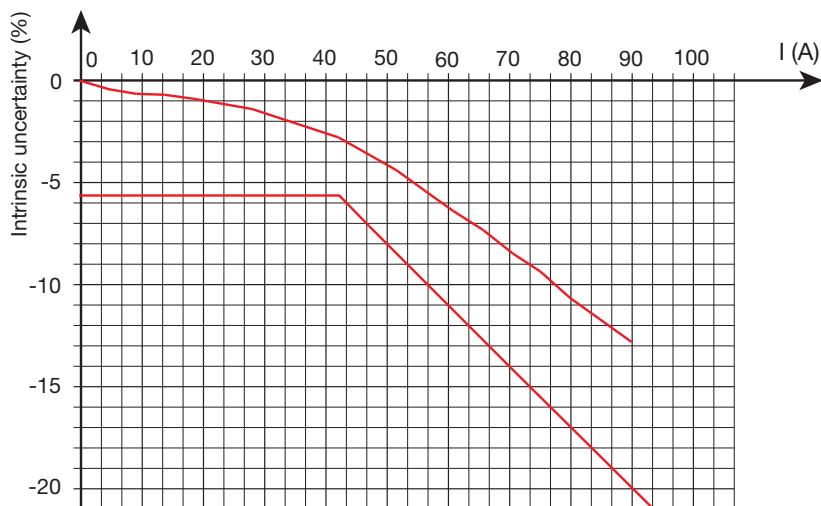
- To make a current measurement, switch the clamp on by selecting the 100mV/A range. Check that the **ON** battery indicator (green) is lit and that the **OL** indicator is off.
- Connect the clamp to the oscilloscope. With the clamp closed and not on a conductor, select the highest sensitivity (for example 1mV/cm) on the oscilloscope and 100mV/A on the clamp, then use the thumbwheel to adjust the zero of the clamp with respect to a reference chosen on the oscilloscope. The zero of the oscilloscope is used to refine this adjustment.
- Select the measurement sensitivities of the clamp and of the oscilloscope.
- Choose the coupling best suited to the measurement on the oscilloscope.
- Identify the direction of the primary current using the arrow marked on the top and bottom of the housing.
- Insert the conductor carrying the current to be measured in the clamp and make the measurement. Keep the cable or bar correctly centred in the clamp and the clamp quite perpendicular to the conductor. Keep away from other conductors that might induce perturbing fields.
- If necessary, check the origin of the trace again without the conductor in the jaws and repeat the measurement.

4. SPECIFICATIONS

4.1. ELECTRICAL CHARACTERISTICS

Range	Measurement range	Intrinsic uncertainty
100mV/A range	50mA to 10A peak	3% +50mA
10mV/A range	50mA to 40A peak	4% +50mA
10mV/A range	40A to 100A peak	See curve below

Linearity for a DC signal (10mV/A range)



Typical noise level on output (peak-to-peak value)

Frequency band	DC - 100kHz
10mV/A range	480μV
100mV/A range	3mV

- These data assume an ambient temperature of $23\pm 3^{\circ}\text{C}$, a relative humidity of 20 to 75%, a frequency from DC to 1kHz, a load impedance of $1\text{M}\Omega/100\text{pF}$, and a conductor that is centred and parallel to the mark.
- Pass band: DC to 100kHz.
- The pass band of the associated oscilloscope depends on the frequency of the signal to be measured. A pass band greater than four times the frequency of the signal to be measured is sufficient.
- Frequency of use (not entailing an additional error of more than 3% with respect to the reference

- domain): DC to 20kHz.
- Cutoff frequency: -3dB at 100kHz.
- Rise or fall time: <4μs.

Input/output quantities

- Typical noise level at output (peak-to-peak value) measured with a Tektronix 7603 oscilloscope with 7A22 plug-in (pass band 100kHz).

Frequency band	DC - 100kHz
10mV/A range	480μV
100mV/A range	3mV

- Zero offset: 1 Amax.

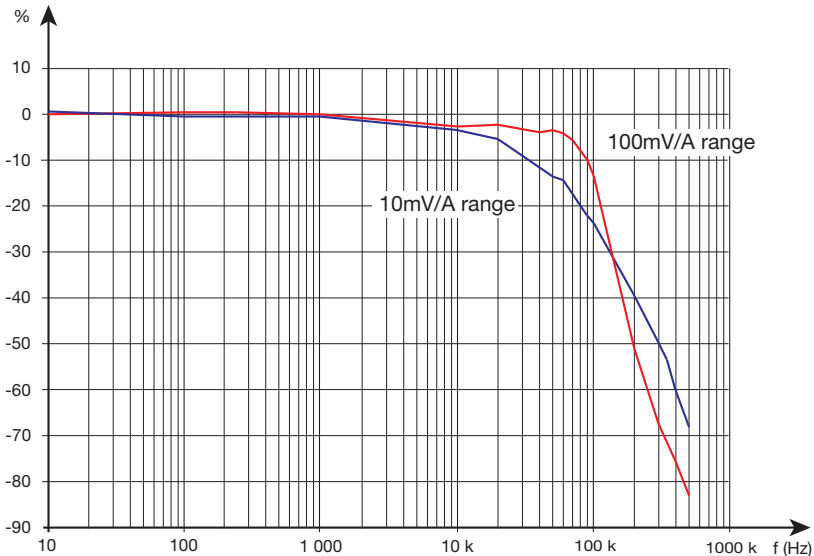
The **ZERO** thumbwheel is used for a rough correction of this offset. The correction can be refined by adjusting the zero of the measuring instrument.

Note: We recommend checking the zero offset after measuring a very strong current. To do this, mark a reference on the oscilloscope in the GND setting, then couple in DC; if too large an offset is observed, it means that the clamp is magnetized.

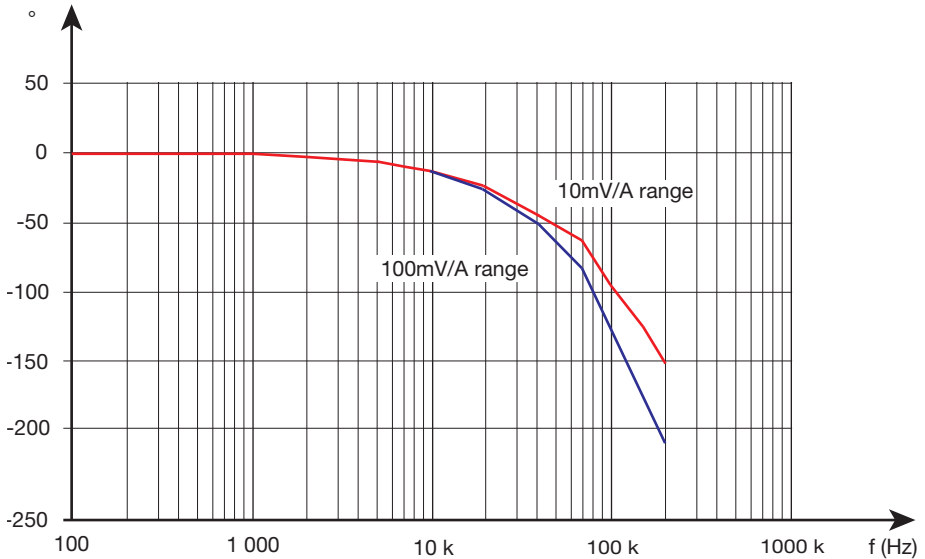
To demagnetize the clamp, simply open and close it several times without the conductor or apply a decreasing magnetic field to it.

Note: The frequency response may in certain cases be > 0 dB. It will always be < 3 %.

Typical frequency response curves for a measured current of 1Apeak



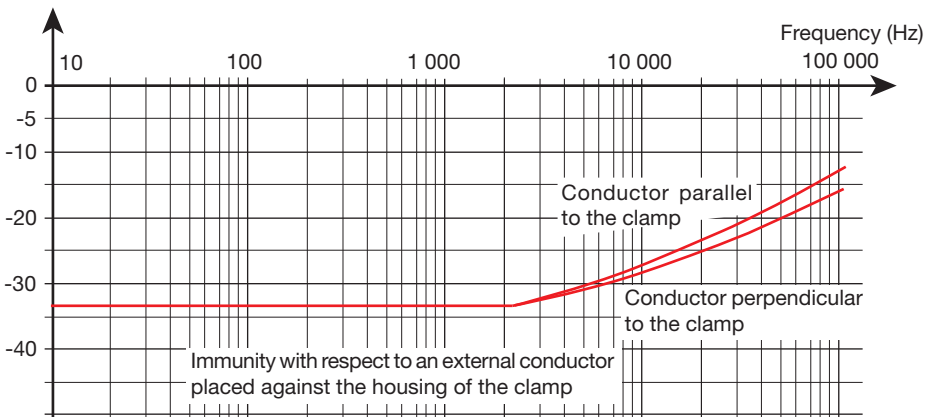
Typical phase shift curves for a measured current of 1Apeak



Quantities of influence

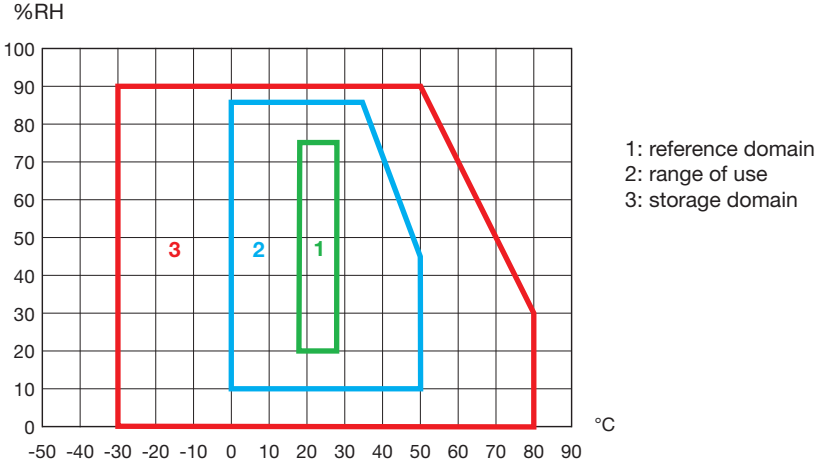
- Battery voltage, from 6.5 to 10V: $\pm 6\text{mA/V}$ typical, $\pm 10\text{mA/V}$ max.
- Temperature, from 0 to 50°C: ± 2000 ppm/°C max.
- Position of the conductor in the window (AC signal at frequency of 1kHz): max $\pm 0.5\%$ of the reading.
- External magnetic field generated by an AC or DC current of 1A in a conductor in the immediate vicinity (see typical curve below).
- Allowance must be made for the linearity, uncertainty, temperature drift, and other errors characteristic of the oscilloscope when making a measurement.

Attenuation (dB)



4.2. GENERAL CHARACTERISTICS

Environmental conditions



Battery: alkaline, 9V, type 6 LR 61

Consumption: 8.6mA typical, 12mA max.

Life: 55h typical, 40h minimum

ON indicator: green indicator light off for a battery voltage <6.5V

Protection class: class II

Dielectric strength: 4 kV

Leakage current: <0.5mA

4.3. MECHANICAL CHARACTERISTICS

Dimensions:

231x67x36mm.

Two-wire (coaxial) cord 2 metres long terminated by an insulated and encapsulated BNC connector.

Maximum conductor size:

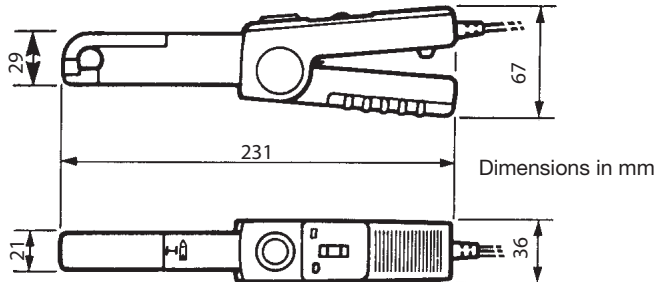
Ø11.8mm

Opening of the jaws:

12.5mm maximum.

Weight:

330g with the battery.



Inrush protection:

IP20 per IEC 529.

Shock protection:

100g, 6ms, half-period, per IEC 68-2-27.

Drop height, all angles:

1 metre.

Vibration resistance:

10/55/10Hz, 0.15mm, per IEC 68-2-6.

Bumps:

40g, 6ms, 4,000 bumps, per IEC 68-2-29.

4.4. ELECTRIC SAFETY

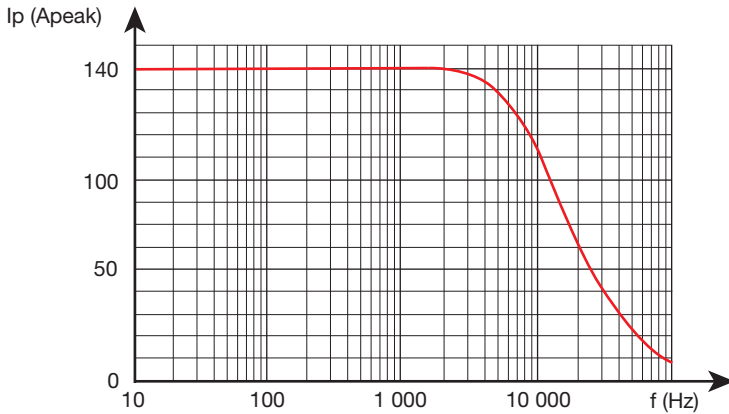
Protection against electric shocks

Per IEC 61010-2-032, 600V, CAT III, pollution degree 2.

Electromagnetic compatibility

Emissions and immunity in an industrial setting compliant with IEC 61326-1.

Nondestructive peak current limit as a function of frequency



5. MAINTENANCE



Except for the battery, the instrument contains no parts that can be replaced by personnel who have not been specially trained and accredited. Any unauthorized repair or replacement of a part by an “equivalent” may gravely impair safety.

5.1. CLEANING

Disconnect the instrument completely and turn the rotary switch to **OFF**.

Use a soft cloth, dampened with soapy water. Rinse with a damp cloth and dry rapidly with a dry cloth or forced air. Do not use alcohol, solvents, or hydrocarbons.

The air gaps of the clamp must always be kept clean. Take care to clean them and oil them lightly to prevent oxidation.

Do not leave the clamp in very damp places, or exposed to spattering with water.

5.2. REPLACEMENT OF THE BATTERY

The batteries must be replaced when the **On** indicator fails to light when the clamp is switched on.

- Disconnect everything connected to the device and set the switch to **OFF**.
- Use a screwdriver to unscrew the captive screw of the battery compartment cover, then pull the cover out of the handle.
- Replace the spent battery with a new battery.



Spent batteries must not be treated as household wastes. Take them to the appropriate collection point for recycling.

- Place the battery in its compartment, with the correct polarity.
- Close the compartment and check that it is completely and correctly closed.
- Screw the screw back in.

5.3. METROLOGICAL CHECK



Like all measuring or testing devices, the instrument must be checked regularly.

This instrument should be checked at least once a year. For checking and calibration, contact one of our accredited metrology laboratories (information and contact details available on request), at our Chauvin Arnoux subsidiary or the branch in your country.

5.4. REPAIR

For all repairs before or after expiry of warranty, please return the device to your distributor.

6. WARRANTY

Except as otherwise stated, our warranty is valid for **twelve months** starting from the date on which the equipment was sold. Extract from our General Conditions of Sale provided on request.

The warranty does not apply in the following cases :

- Inappropriate use of the equipment or use with incompatible equipment;
- Modifications made to the equipment without the explicit permission of the manufacturer's technical staff;
- Work done on the device by a person not approved by the manufacturer;
- Adaptation to a particular application not anticipated in the definition of the equipment or not indicated in the user's manual;
- Damage caused by shocks, falls, or floods.

7. TO ORDER

E3N clamp**P01120043A**

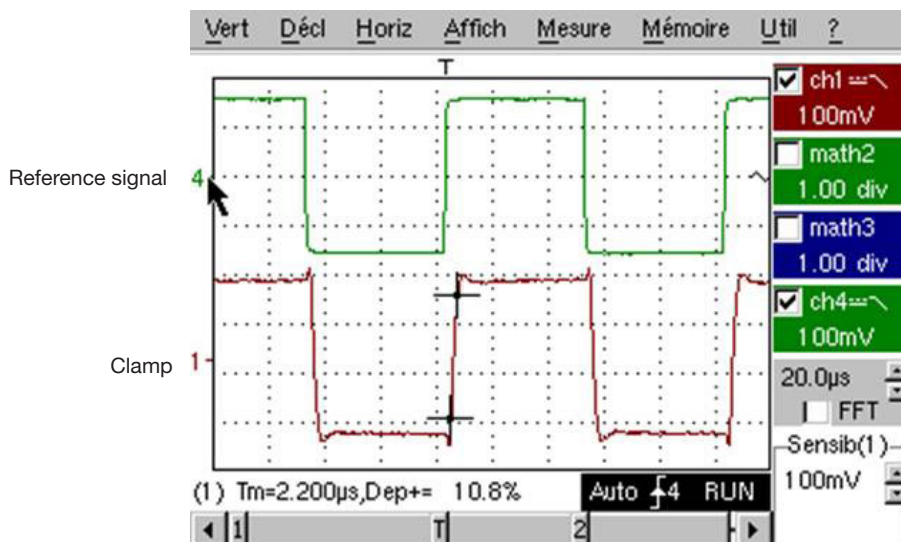
Delivered in a cardboard box with:

- one 9V battery,
- one multilingual safety sheet,
- one user's manual in 5 languages,
- one verification certificate.

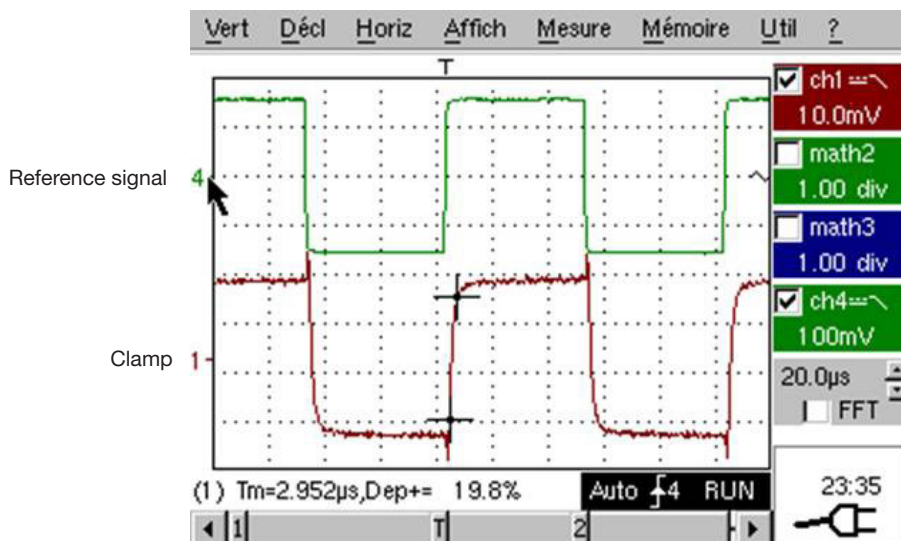
8. APPENDIX

Examples of the response limits of the clamp

f=100 Hz I=100 mApeak 100 mV/A range



f=10 kHz I=100 mApeak 10 mV/A range











DEUTSCH

Sie haben einen **Gleichstrom-Wechselstromzange E3N** erworben, wir danken Ihnen für das damit entgegengebrachte Vertrauen.

Um die optimale Benutzung Ihres Gerätes zu gewährleisten, bitten wir Sie:

- diese Bedienungsanleitung **sorgfältig zu lesen**,
- die Benutzungshinweise **genau zu beachten**.

	ACHTUNG, GEFAHR! Sobald dieses Gefahrenzeichen irgendwo erscheint, ist der Benutzer verpflichtet, die Anleitung zu Rate zu ziehen.
	Das Gerät ist durch eine doppelte Isolierung geschützt.
	Praktischer Hinweis oder guter Tipp.
	Darf auf nicht isolierten Leitern unter gefährlicher Spannung angewendet werden. Stromsonde Typ A gemäß IEC 61010-2-032.
	Batterie.
	Zum Bestimmen der Stromphase.
	Die CE-Kennzeichnung bestätigt die Übereinstimmung mit den europäischen Richtlinien, insbesondere der Niederspannungs-Richtlinie und der EMV-Richtlinie.
	Der durchgestrichene Mülleimer bedeutet, dass das Produkt in der europäischen Union gemäß der WEEE-Richtlinie 2002/96/EG einer getrennten Elektroschrott-Verwertung zugeführt werden muss.

Definition der Messkategorien:

- Die Kategorie IV bezieht sich auf Messungen, die an der Quelle von Niederspannungsinstallationen vorgenommen werden.
Beispiele: Anschluss an das Stromnetz, Energiezähler und Schutzeinrichtungen.
- Die Kategorie III bezieht sich auf Messungen, die an der Elektroinstallation eines Gebäudes vorgenommen werden.
Beispiele: Verteilerschränke, Trennschalter, Sicherungen, stationäre industrielle Maschinen und Geräte.
- Die Kategorie II bezieht sich auf Messungen, die direkt an Kreisen der Niederspannungs-Installation vorgenommen werden.
Beispiele: Stromanschluss von Haushaltsgeräten oder tragbaren Elektrowerkzeugen.