DigiFlex MA400D

User's manual

- Observe the conditions of use, namely the temperature, the relative humidity, the altitude, the level of pollution, and the place.
- Before each use, check the integrity of the insulation on the coil, the cords and the housing. Do not use the instrument if it is open, damaged, or poorly reassembled, or its accessories if they appear damaged.
- The sensor must not be applied to or removed from uninsulated conductors at dangerous voltages.
- Use personal protection equipment systematically.
- All troubleshooting and metrological checks must be performed by competent and accredited personnel.

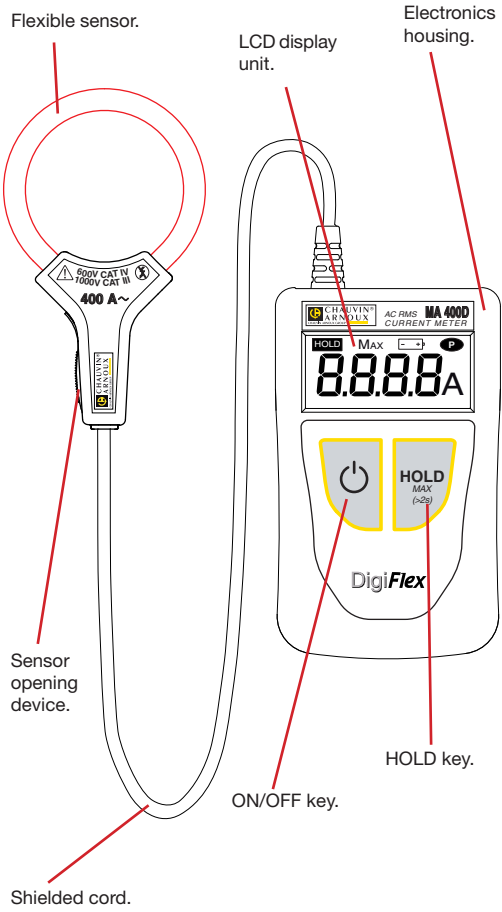
CONTENTS

1. PRESENTATION

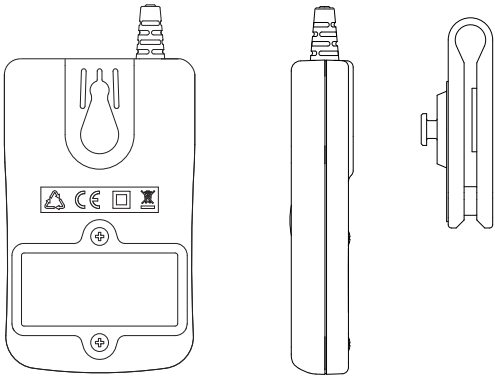
The Digi*FLEX* is used for RMS measurements of current, from 20 mA to 400 A.

The sensor takes the form of a flexible coil 17 or 25 cm long, connected by a shielded cord to a small housing containing the signal processing electronics, supplied by a battery.

The flexibility of the sensors makes it easier to wrap them round the conductor to be measured, whatever its type (cable, bar, strand, etc.) and its accessibility. The design of the snap-action coil opening and closing device allows it to be handled while wearing protective gloves.

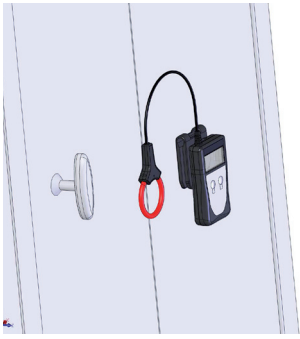


On the back of the electronics housing is a notch for the attachment of a belt clip (optional).



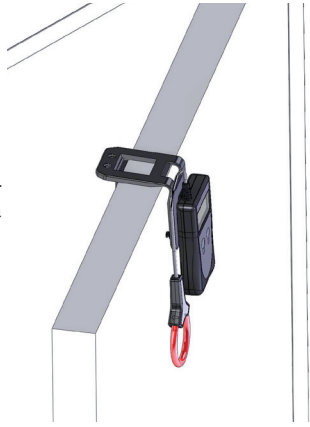
The multi-function belt clip can be used:

- to carry the electronic housing on your belt,



- to attach it to a metal surface using the built-in magnet,

- to hook it to a door or the edge of a table.



2. CURRENT MEASUREMENT

2.1. MEASUREMENT PRINCIPLE

The flexible sensor is based on the Rogowski coil.

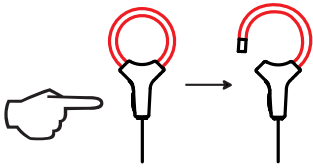
It combines:
- very good linearity with no saturation effect (and so no heating);
- light weight (no magnetic circuit).

2.2. USE

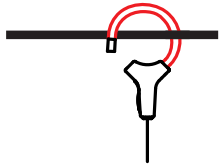
2.2.1. CONNECTION

First of all, use the appropriate means of protection.

- Press the yellow opening device to open the flexible coil.



- Open it, then place it round the conductor through which the current to be measured flows (only one conductor in the sensor).
- Close the coil.



In order to optimize measurement quality, it is best to centre the conductor in the coil and to make the shape of the coil as nearly circular as possible.

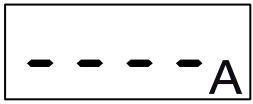
- Press the ⏻ key to switch the device on. The display unit lights.

2.2.2. MEASUREMENT

Read the measurement on the display unit. The current is given in ARMS.

If the measurement exceeds the display capacity (400 A), the device displays 399.9, blinking.

If the measurement is too low (see § 3.2), the device displays dashes.



If the edges of the signal are too steep or its peak factor is too large, the device displays OL.

2.2.3. FREEZING THE MEASUREMENT

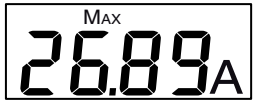
If you want to freeze the display of a measurement, press the **HOLD** key.

The **HOLD** symbol is displayed.

The device continues to make measurements, but the display is frozen. To release it, press the **HOLD** key again.

2.2.4. SEARCH FOR MAXIMUM

To search for a maximum, for example a spike lasting at least 100 ms, press the **HOLD (MAX > 2s)** key for more than two seconds.



The **MAX** symbol is then displayed; the device starts making measurements a few seconds later.

The device compares each new measurement to the one displayed. If the new measurement is greater than the old, it replaces it in the display.

To return to the real-time display mode, press the **HOLD (MAX > 2s)** key again.

2.2.5. DE-ACTIVATION OF AUTOMATIC SWITCHING OFF

In order to save the batteries, the device switches itself off automatically at the end of 10 minutes if the user has not pressed a key (unless the **MAX** function is active).

It is possible to deactivate automatic switching off. To do this, when you switch the device on, press the ⏻ and **HOLD** keys simultaneously. The **P** symbol (lit steadily) is then displayed.

To reactivate automatic switching off, switch the device off, then back on.

2.2.6. BATTERIES LOW

When the battery voltage drops and the remaining battery life of the device is only about one hour, the [– +] symbol blinks on the display unit.

When the battery voltage is too low to guarantee the accuracy of the measurements, the [– +] symbol lights steadily. The batteries must then be replaced (see § 4.2).

2.2.7. DISCONNECTING

- Switch the device off by pressing the ⏻ key.
- Press the yellow opening device to open the flexible core.
- Remove the flexible core from the conductor.

3. CHARACTERISTICS

3.1. REFERENCE CONDITIONS

Quantity of influence	Reference values
Temperature	23 ± 3°C
Relative humidity	45 to 75% RH
Frequency of the signal measured	40 to 65 Hz
Peak factor of the signal measured	$\sqrt{2}$
Conductor diameter	≤ 5 mm
Battery voltage	2.8 - 3.2 V
External electric field	none
External DC magnetic field (earth field)	<40 A/m
External AC magnetic field	none
Position of the conductor	centred in the measurement coil
Shape of the measurement coil	nearly circular

3.2. ELECTRICAL CHARACTERISTICS

Display range (A)	4	40	400
Specified measurement range (A)	0.020 - 3.999	4.00 - 39.99	40.0 - 399.9
Resolution	1 mA	10 mA	100 mA
Intrinsic uncertainty	±(2% + 10 ct)	±(1.5% + 2 ct)	±(1.5% + 2 ct)

In MAX mode:

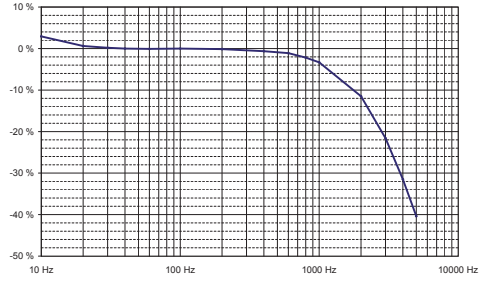
Display range (A)	4	40	400
Specified measurement range (A)	0.100 - 3.999	4.00 - 39.99	40.0 - 399.9
Resolution	1 mA	10 mA	100 mA
Typical error	±(2% + 10 ct)	±(1.5% + 2 ct)	±(1.5% + 2 ct)

3.3. VARIATIONS IN RANGE OF USE

Quantity of influence	Range of influence
Battery voltage	1.8 to 2 V
Temperature	0 °C to 50 °C
Relative humidity	10 to 90% RH
Frequency response	10 to 20 Hz 20 Hz to 30 Hz 30 Hz to 400 Hz 400 to 1000 Hz 1000 to 3000 Hz
Position of the conductor in the sensor (f<400 Hz)	Any position on the interior perimeter of the sensor
Adjacent conductor carrying alternating current	Conductor touching the exterior perimeter of the sensor
Peak factor	1.4 to 3.5 limited to 600 Apeak
Serial mode rejection ratio in AC	0 to 400 A_{DC}
Common mode rejection, 50/60 Hz	0 to 600 V_{RMS}
Influence of a 50/60 Hz external magnetic field	0 to 400 A/m

3.4. TYPICAL FREQUENCY RESPONSE CURVES

at 39 A_{AC}



Error on the measurement	
Typical	**Maximum**
< 1 ct	±(2% + 1 ct)
± 0.25 % / 10 °C	±(0.5 % / 10 °C + 2 ct)
0.2%	± (0.3 % + 2 ct)
See § 3.4	± (5 % + 1 ct) ± (1 % + 1 ct) ± (0.5 % + 1 ct) ± (6 % + 1 ct) - 3 dB typical
± 0.5 %	± (1.5 % ± 1 ct)
Away from opening: 33 dB At opening: 30 dB	Away from opening: ≥ 28 dB At opening: ≥ 25 dB
at 16.66 Hz : ± (2 % + 1 ct) at 50 Hz : ± (0.5 % + 1 ct) at 440 Hz : ± (30 % + 1 ct)	± (6 % + 1 ct) ± (3 % + 1 ct) -
< 1 ct	≥ 50 dB
< 1 ct	≥ 60 dB
Housing: 43 dB Sensor: 50 dB	Housing: ≥ 30 dB Sensor: ≥ 40 dB

3.5. POWER SUPPLY

The device can be powered:
- either by two 1.5 V R03 (AAA) alkaline batteries,
- or by two NiMH storage batteries of the same size.

The nominal operating voltage is between 1.8 and 3.2 V.
The battery life in continuous operation is:
- 70 hours with super-alkaline batteries,
- 50 hours with NiMH storage batteries having a capacity of 1200 mAh.

The low battery condition is reported by the blinking symbol on the display unit. When it is lit steadily, the batteries must be replaced (see § 4.2).

3.8. ENVIRONMENTAL CONDITIONS

The instrument must be used in the following conditions:
- Temperature in use: 0°C to +50°C
- Storage temperature: -20°C to +70°C (without batteries)
- Relative humidity in use: 80% RH to 50°C
- Relative humidity in storage: 90% RH (up to 45°C)

The sensor can withstand a temperature of 90°C.

For indoor use.
Level of pollution: 2.
Altitude: <2000 m.

3.7. CHARACTERISTICS OF CONSTRUCTION

Overall dimensions
- Housing: 100 x 60 x 20 mm
- Connecting cable: 0.70 m
- Sensor
  - Length (mm) 170 mm 250 mm
  - Clamping diameter 45 mm 70 mm

Mass of the device: approximately 130 g.

Index of protection: IP 40 per IEC 60529
IK 04 per IEC 50102

Afterflame time: V0 (per UL 94)

The flexible coil is resistant to oils and aliphatic hydrocarbons.

3.8. COMPLIANCE WITH INTERNATIONAL STANDARDS

Electrical safety per IEC 61010-2-032 for type B sensors. Rated voltage 600 V with respect to earth in category IV.

Double insulation: 

3.9. ELECTROMAGNETIC COMPATIBILITY

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

4. MAINTENANCE

⚠ **Any unauthorized repair or replacement of a part by an "equivalent" may gravely impair safety.**

4.1. CLEANING

Disconnect everything connected to the instrument and switch it 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.

Make sure that no foreign body interferes with the operation of the snap device of the sensor.

4.2. REPLACEMENT OF THE BATTERIES

The battery must be replaced when the green indicator flashes or remains off when the instrument is switched on.

- Disconnect everything connected to the instrument and and switch it off.
- Use a screwdriver to unscrew the two closing screws of the housing.
- Replace the old battery with a new battery (1.5 V R03 or AAA super-alkaline batteries).
- Close the housing; make sure that it is completely and correctly closed.
- Screw both screws back in.

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

4.3. METROLOGICAL CHECK

⚠ **Like all measuring or testing devices, regular instrument verification is necessary.**

This instrument should be checked at least once a year. For checks and calibrations, 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.

4.4. REPAIR

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

5. 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.

6. TO ORDER

Digi*FLEX* MA400D-170 ..... P01120575Z
Digi*FLEX* MA400D-250 ..... P01120576Z
Delivered in a blister pack with:
- two 1,5 V piles alkaline battery (AAA),
- one Velcro fastener
- one user's manual in 5 languages,
- one certificate of verification.

6.1. ACCESSORIES

Carrying bag 120x200x60 ..... P01298074
Multi-function belt clip P01102100Z

6.2. REPLACEMENT PARTS

Set of 5 Velcro fasteners P01102113