

Supply electronics for piezo actuators and motors.

In previous editions of Flux Magazine, we have presented some of the range of piezo actuators developed by CEDRAT RECHERCHE. These actuators cover a whole range of displacements from a few centimetres to sub-micrometric distances and from low to ultrasonic frequencies. The fields of application are expanding rapidly and use the latest developments in electronics for their power supply and control.

Piezoelectric devices behave like capacitive loads when the majority of power amplifiers available are adapted for inductive loads. The introduction of piezoelectric actuators therefore requires specially adapted electronic devices. Besides, each type of actuator calls upon certain characteristics with respect to its operation. Schematically they can be divided into two main groups; non-resonant actuators and ultrasonic resonant actuators.

The non resonant group of actuators is made up of **APA's** and **DPA's** (Amplified or Direct Piezo Actuators). They are characterised by the following specifications;

- Operating frequency from 0 to a few hundredths of a Hertz.
- Operating voltage up to 200V
- Positioning servo-control (sub-micrometric scale) by strain gauge or by sensor.

The first electronic ones developed, the **SA's**, fulfil their requirements. They are based on the principle of a switching supply and provide good efficiency,



SA75 manufacturer batch.

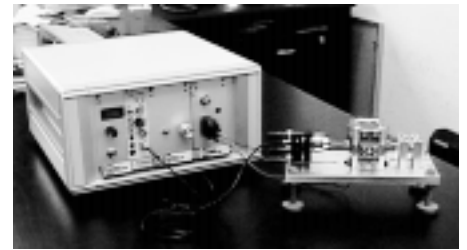
recovery of energy as well as being small.

The ultrasonic resonant group of actuators is made up of **UPA**, **UPD**, **LPM**, **RPM** (Ultrasonic Piezo Actuators and Linear or Rotational Piezo Motors). They provide the following characteristics:

- Operating frequency greater than 20kHz,
- Operating voltage between 5 and 15V,
- Possible need for automatic frequency searching,
- Positioning servo-control (micrometric scale, millimetric stroke) for the **LPM's** and **RPM's**

For these more complex needs, electric ones given the name **UPS** have been developed in the form of independent printed boards to ensure the modularity and the evolution of the product. They are based on the principle of an inverted rectifier, to which a DC supply board and a control board are associated.

In the two cases, the versions available can be set up in frames for normalised cases (DIN41612) or in instrumentation boxes in the laboratory. The finished products are sub-contracted by manufacturers batches in order to ensure

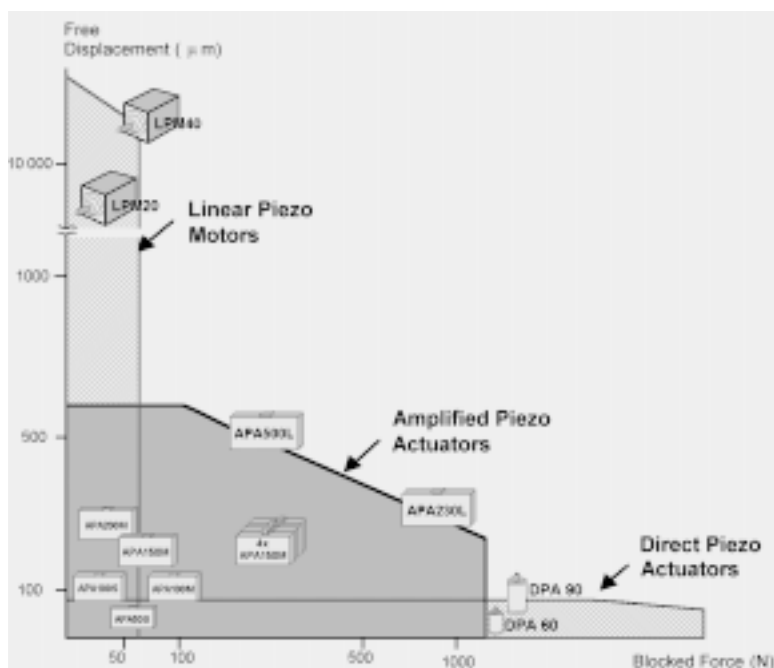


Vue of a switching supply UPS100 and a piezo motor LPM20-3.

the highest quality and reliability. The current developments and projects in the pipeline will reach out to the present range (bipolar power electronics, new controllers), in order to better respond to the market's needs.

Correlatively, the staff resources and the laboratory capabilities of CEDRAT RECHERCHE have been expanded during these past two years in order to be able to continue the internal developments of this standard range of electronics, while responding efficiently to the special study needs and to prototypes for external clients.

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Comparison of free displacements and blocked forces of some linear piezo actuators (DPA, APA, LPM) of CEDRAT RECHERCHE.