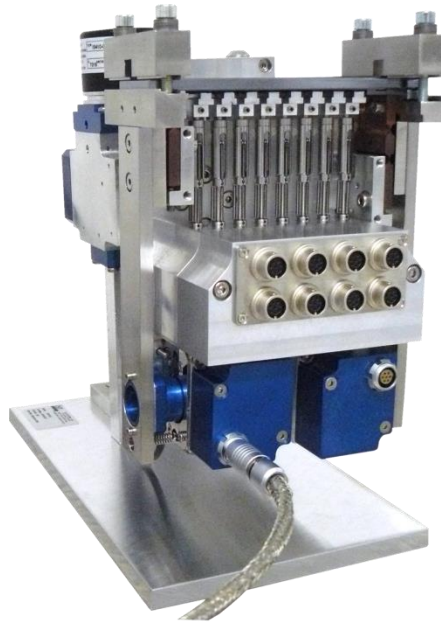


Update : 12/20/2022



**AMXF is the ISP System's concept for an active mirror for X ray micro and nano focusing**

- High range of elliptic shapes adjuster by bender
- Mirror defaults due to polishing and optical system aberrations corrected by micro strengths actuators
- No "grid effect" on the Xray beam

2 AMXF are jointed up to build a KB system. Each AMXF mirror is activated by 2 kinds of actuators: 1 or 2 bender and a line of micro strength actuators for correction. The ISP active mirror is patented.

The AME (micro strength actuators) apply correction strengths to the initial form in order to obtain best focalisation. The line of AME disposed all along the mirror allows the correction of manufacturing defaults of mirror and X-ray beam aberrations.

## 1 - Avantages of ISP System's Active Mirror : AMXF

- Less hysteresis than piezo-actuators (from 10% to 0.1%)
- No "grid effect" due to discontinuities of the mirror and observed with piezo-actuators
- Astatic floating head of the AME actuator ensures a ball joint connection to the mirror without friction
- Soft mirror pads suppress local prints on the mirror
- AME actuators disposed all along the mirror compensate the manufacturing low space frequency mirror's defaults and X-ray aberration
- High long-term stability (no drift)
- Focalization stability without power supply (mechanic irreversibility of AME actuators)
- Very high immunity to electromagnetic perturbations during experimentations (no power supply)
- Open loop motion control (sensor only necessary during shape set up)
- Easy maintenance (AME individually removable)

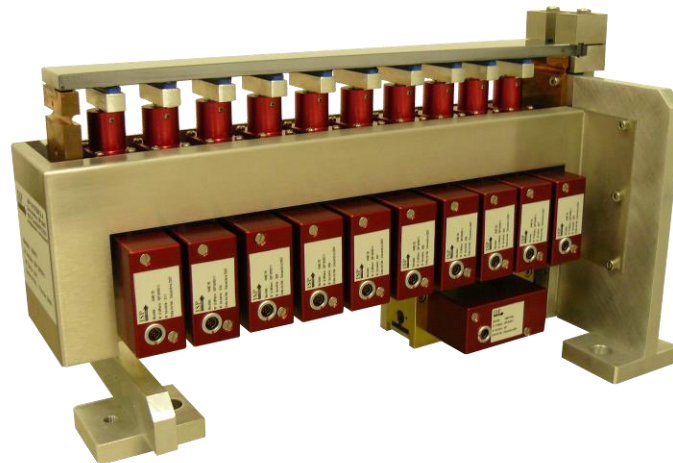
## 2 - Features

Features of deformable mirror vary dramatically depending on experiment type and we are always interested in advancing new/existing technologies to satisfy market needs. Please don't hesitate to contact one of our representatives to discuss your specific requirements.

AMXF's characteristics are specified according to the customer's requests.

- Mirror length 100 to 1700mm
- Bender actuators : 0 to 2 actuators
- Wave front error corrected by micro strength actuators (AME).
  - Pitch 6 mm to 50 mm
  - Force +/- 3 N to +/-50 N
- Elliptic shape error : less than 0.2 $\mu$ rad RMS
- Long term stability : up to 0,1  $\mu$ rad

*As example, hereafter AMXF delivered for MARX project (delivered to Synchrotron SOLEIL – France – 2007)*



### Features of MARX project

- Mirror :  
Rectangular plate made with silicon  
Size : 400mm x 32mm x 8mm (L. W .T)
- Actuators :  
  
1 bender  
10 micro strength actuators (AME) : Force : +/- 30 N
- Minimum elliptic curvature : beam 50m
- Focus distance : setting up from infinity to 300 mm
- Elliptic shape error less than 0.2 $\mu$ rad RMS
- Vacuum compatible (10<sup>-6</sup> mbar)

### The active bender is associated with

- 1 translation stage: stroke +/-10mm - resolution 1 $\mu$ m
- 1 rotation stage: stroke +/- 30mrad - resolution 5  $\mu$ rad

The 2 motions allow the adjustment of incidence angle and the translation normal to optical surface

The translation stage has 2 fixation points on the side, allowing to use it as KB-mirror configuration.

## 3 - Control Rack

### Rack size 19 ” including

- AME actuators controllers with integrated microcontroller and power driver
- Bender actuator controller with integrated microcontroller and power driver
- Communication from a PC via RS232
- Power supply

Every actuator controller includes an algorithm of movement with a mathematical grading of each actuator.

A dedicated S/W can also be supplied providing control of each axis from a 19” rack PC via RS232.