High precision products

Motion control applications

- Opto-mechanics and active optics
- Precision mechanics, multi-axis Kinematics
- Precision machines and robotics

Technologies mastered

- Guidance and motion transmission
- Flexible unit guidance
- Support and kinematics engineering for optic
  - Active deformable mirrors
- Motorization: Stepper motor, brushless motor, CC motor, electromagnetic coils...
  - Motor drive control (embedded or in rack)
  - Position, displacement or stress servo control.

Extended capabilities

- Displacement precision
- Straightness defect: from 10µm to 1nm.
- Stress resolution: (for electric stress actuators): from 100mN to 1mN
- Rotating precision: from 100 mrd to 10 nrd
- Mechanic bandwidth: according application; from almost static to 1 kHz.
- High thermo mechanic stability
- Compatible with electronics client

Suitable for extreme conditions

- Application in high reliability
- Hardening to harsh environments (ionizing ray, electromagnetic fields, temperature, vibration...)
- Vacuum version in UHV compatible products.
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Micro positioning stage (TMP)

TMP allows relocating with high precision equipment, a piece, a sample ... This product range is used also for multi axis translations. Their conception is especially adapted to applications requiring keeping and high mechanic stability. ISP SYSTEM develops and realizes a product range of translation stage used to opto-mechanic sector dedicated for optics or sensors positioning.

- Irreversible screw-nut system with backlash compensation
- Device: stability of position without power
- Geared Stepper Motors
- Linear Cross Roller guides without recirculation
- Two limit contacts switches
- 1 incremental linear encoder
- Material: aluminum and Stainless steel alloy

Specifications:

- Travel range: from +/-2 to +/-100mm
- Minimum Incremental Motion: 25nm min
- Repeatability: <1µm
- Speed: until 10mm/s
- Accuracy: <0.5% of displacement

Datasheet available on www.isp-system.fr

Special application: Our engineering remain at your disposal to study yours projects
Miniature Micro Positioning Stage (µTMP)

µTMP allows relocating with high precision equipment, a piece, a sample... This product range is used also for multi axis translations. Their conception is especially adapted to applications requiring keeping and high mechanic stability. The position is maintained without electric power.

- Irreversible screw-nut system with backlash compensation
- Device: stability of position without power
- Geared Stepper Motor
- Crossed roller linear slide guides without recirculation
- Origin switch
- Material: aluminum and stainless steel alloy

Specifications:

- External dimensions: 25x25x15mm
- Travel range until 20mm
- Minimum Incremental Motion: 25nm min
- Repeatability: <1µm
- Speed: until 10mm/s
- Accuracy: <1% of displacement

Datasheet available on www.isp-system.fr

Special application : Our engineering remain at your disposal to study yours projects
Nano Positioning stage (TNP)

Additionally to deformable mirrors system, ISP has developed a range of nano positioning stage can be used for samples or sensors handling in observation area. Two lines products have been developed by ISP SYSTEM:

Stages like TNP: High travel range with electro-mechanic motorization

Stages like NLS: High accuracy with electromagnetic or piezoelectric motorization

TNP with high travel range

Axis TNP stage with high travel range are moved thanks to ball screw, a tight and irreversible gearing and a stepper motor drive mechanism.

• High travel range.
• Precise adjusting of tilt thanks to screws (according to need).
• Stages are machined from stress-relieved steel ensuring long-term strength and stability.
• Smooth linear ball guidance without recirculation, precise and without friction.

Specifications:

• Displacement straightness: 200nm
• Travel range: high travel range
• Minimum incremental motion: from 5 to 50nm
• Speed: from 1µm/s to 2mm/s
• Configuration: X, Y, Z
• Repeatability: 30 nm

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Datasheet available on www.isp-system.fr
NLS Stage: Nanometric positioning stage

NLS stages are especially designed for high precision nano positioning or scanning applications. These stages feature by sub-nanometer positioning resolution for a millimeter travel range. NLS straightness on 2mm travel range reaches noteworthy values of ±25nm.

Axes are moved by linear electromagnetic motor without iron.

NLS stages are controlled with open or closed loop motion controller, with this configuration the sensor is integrated into the stage.

• Flexible, high precise and without friction guidance.
• Excellent repeatability and very good straightness.
• No wear and backlash-free
• Compatible with Atmospheric, Low Vacuum, High Vacuum or Ultra High Vacuum until 10⁻¹⁰ bar.
• No friction and no cogging effect
• Excellent linearity, nearly no backlash and infinite resolution

Specifications:

• Travel range: from 0.5 to 5 mm
• Static resolution: 0.375 nm for a travel range of 0.5mm at 2Hz
• Dynamic resolution: 10 nm for a travel range 0.5mm at 8 KHz
• Straightness: ±25nm for 2mm travel range
• Embedded mass: 250g
• Travel Axes: Horizontal

Datasheet available on www.isp-system.fr
Micrometric rotating stage (TRM)

TRM generates an irreversible high precision rotation. The design is especially suitable for applications requiring a high mechanical stability.

These stages can be integrated with the micro positioning TMP stages.

• Geared stepper motor
• Irreversible gearing system based on Worm gearing
• Backlash compensation device: stability of the position without power
• Two limit switches
• Optical incremental encoder for direct acquisition and rotation servo control.

Specifications:

• Travel range: endless
• Resolution: 5μrad min
• Repeatability: <10μrad
• Speed: Until 10°/s

Datasheet available on www.isp-system.fr
Miniature rotating stage (µTRM)

TRM generates an irreversible high precision rotation. The design especially suitable for applications requiring a high mechanical stability.

These stages can be integrated with the micro positioning TMP stages.

- Small size.
- Geared stepper motor
- Irreversible gearing system based on:
  Worm gearing
- Backlash compensation device:
  stability of the position without power
- Origin and limit switches
- Optical incremental encoder for direct acquiring and rotation closed-loop control

Specifications:

- Travel ranges: endless
- Resolution: 5µrad min
- Repeatability: <10µrad
- Speed: until 20°/s

Datasheet available on [www.isp-system.fr](http://www.isp-system.fr)

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Motorized Mount – Miniature series

This standard mount is motorized by two miniatures actuators.

This equipment allows an accurate positioning and orientation for optics devices, sensors or samples...

Specifications:

• Minimal external dimensions but high guidance quality
  - Minimal external dimensions: 58mm x 32mm x 32mm for ½” optical mount
  - Mass and material : 100 g, stainless steel main part
  - Compatible for optical mount ½” ; 1” ; 2”

• Performance (mount ½”)
  - Angular travel range : +/- 3 degrees
  - Speed : 0.25 deg/s
  - Driving by stepper motor : rated current 200mA
  - Manufacturing resolution : 4µrad by step
  - Position Stability without power
  - Repeatability : < 10µrad on open-loop

• A design for extended capabilities:
  - Packing for cleanliness needs ISO6, high vacuum...
  - Addition to positioning sensor or limit switches
  - Change of technical specifications, mounting, switches...
  - Combinations with other actuators types
  - Different drive mechanisms are available: DC, Brushless...

• Driving: electronic driver for biphasic hybrid stepper motor (feel free to contact us in order to know our products related box or OEM).

Datasheet available on [www.isp-system.fr](http://www.isp-system.fr)

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Micro positioning positioners (VMP)

These linear positioners allow positioning with high precision a mechanism, an optic or a sensor.

Their design is especially suitable for applications requiring radial loads strength and high mechanical stability

The generic model is designed on the use of accuracy screw-nut system combined with linear preloaded guidance which allows supporting radial loads.

- Equipped with a high precision no-rotating system rod.
- Hybrid geared stepper motor
- Accuracy screw-nut system
- Linear preloaded guidance recirculation ball free
- Two limit switches
- Cable: length 3m

Specifications:

- Travel range: from +/-2 to +/-20mm
- Resolution: 25nm min
- Repeatability: <1µm
- Speed: until 10mm/s
- Accuracy: <0.5% of displacement

Datasheet available on www.isp-system.fr

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Date: 20/05/2013
Multi-axes positioner

ISP adapts itself to a customer request through applications engineering, either by developing unparalleled new product, or by proposing one of its standard product.

For example: Nanoscopium

Nanoscopium is a positioner for mirror M1 and M2 head of line.

Specifications:

- Motorized two sets in UHV
- 5 DDL: 3 rotations and 2 translations

Translation axes:
- Needle guidance recirculation free
- Irreversible precision screw-nut system
- Stepper motorization

Rotation axes:
- Micro positioning actuator
- Travel range: +/- 4mm
- Resolution: <100nm
- Flexible blade guide device

Data sheet available on www.isp-system.fr

Special application: Our engineering remain at your disposal to study your projects
Rotational stage

Rotational stage can generate rotational motions according to 3 axes in compact external dimensions.

The mechanical design consists using jointed plate, operated by 3 micrometric thrust.

Structural parts are made of aluminum alloy.

The guidance is ensured by central kneecap. Rotations on RX, RY and RZ axes are generated by 3 micrometric thrust must be arranged in order to not exceed of installation plan and to ensure a good ergonomics.

Thrusts are equipped with angular gearbox at 90° so that operating switches’ axes are horizontal and placed in lateral reachable areas of system.

Kneecap is located on center of top plate.

The plate is polarized force on thrusts’ contact point by tension spring.

Rotating displacement sensitivity is about 1 µrad.

A travel range of +/-1mm on each setting pin could be considered a rotating motion of 20mrad (+/- 10mrad).

This equipment is available in motorized version.

Data sheet available on www.isp-system.fr

Special application: Our engineering remain at your disposal to study yours projects
**Micrometric alignment positioner (VAM)**

VAM allows to place **bulky devices** (about 1 to 100 m length) and **massive devices** (from 1 to 100 ton) **according to 6 freedom degrees with micrometric resolution.**

Devices requiring a complementary support (due to a lack of rigidity), this one is achieved by astatic actuators system. This assembly allows preserving isostatic rule, and ease of adjustment.

- High axial stiffness allowing a load capacity of 5 KN and a high stability combined with resolution of 1 µm.
- The no-rotating system rod actuator ensures an ease execution.
- Extremity of positioner rod is made up of jointed plate system allowing a tilt of 2°.
- Extended capabilities. For example, it can be equipped with motorized positioner on Z using a kneecap, XY micrometric planar stage and electronic control box.

**Specifications:**

- Travel range on X axis: +/- 15 mm
  
  On Y axis: 50 mm
  
  On Z axis: from +/- 30 mm to +/-45 mm
- Load on FX axis: 15 to 100 % FY
  
  On FY axis: From -13, 5 KN to 62, KN
  
  On FZ axis: 15 to 380 % FY
- Manufacturing Resolution: 1µ à 5µ
- Rotating plate: (+ / - 2°)

Datasheet available on [www.isp-system.fr](http://www.isp-system.fr)

*Special application : Our engineering remain at your disposal to study yours projects*
Precision Actuators

Micrometric Stress Actuator (AME) and µAME

Patented product, AME generates a stable and accurate drive force, without need in continuous power supply. The actuator is astatic and provides bidirectional stress. The stress is transmitted by a floating head system allowing transmission without parasitic friction, even with angular and radial misalignments. µAME external dimension can be reduced with external diameter of 6 mm. In such case, motion drivers are deported.

• Designed with economic and reliable motion technologies.

• Motorized by stepper motor or DC motor:
The stress maintaining is stable and accurate without continuous power supply.

• The interface fixing allows an optimal applied force distribution on the part surface

• The floating head system allows angular and radial misalignments with incurring parasitic friction.

• Very low droop level: stress produced scarcely depend on travel range

Specifications:

• Stress Developed (depends on the version): +/- 7N to +/-50N
• Travel range: ±100 µm
• Resolution: 1 to 10mN
• Frequency: 1Hz max
• Permissible misalignment: 0.2mm

Data sheet available on www.isp-system.fr

Special application : Our engineering remain at your disposal to study yours projects
Electromagnetic Actuator (AE) and High Frequency (AEHF)

AE and AEHF allow positioning or moving with high frequency an item or a valve. They can also motorize a mechanism or deviate a drop jet. It depends on searched application.

- The HFEA is a very small dimension actuator which is able to generate high frequency motion 1 000 Hz

- Application:
  - Precision quantity determination
  - Sending drop on the demand print

- These actuators, when assembled on a print head, allow sending Drop On Demand prints (DOD). This type of print consists in sending ink drop on substrat which moves on a conveyor.

Specifications:
- Useful travel: from 0.1mm to 2mm
- Holding force: until 100N
- Frequency: until 500Hz

Ordering Information:

Datasheet available on www.isp-system.fr

Special application: Our engineering remain at your disposal to study yours projects
Micro Displacement and Micro Force Electromagnetic Actuator (AEMDF)

Patented product, AEMDF allows positioning or moving with precision small size objects by managing perfectly low stress. Guidance technology by distorted elements allows a servo control displacement. Stress control can be made without force sensor. This solution offers reliability and robustness for applications on harsh environment.

- Linear electromagnetic motor and guidance by distorted elements systems.

**Advantages:** no parasite friction, precision and repeatability, no maintenance...

- The actuator can be set on bearings and can easily be motorized in rotation.

- Stress control can be realized without stress sensor: reliability and robustness
- It can also be equipped with a suction nozzle for parts prehension.

**Specifications:**

- Travel range: until 2 mm (actuator version) and until 10 mm (nanometric stage version)
- Displacement Precision: 2 µm
- Displacement resolution: From 100 nm (actuator) and to 5nm (nanometric stage)
- Stress precision: 50 mN without stress sensor and 10 mN with stress sensor
- Stress resolution: until 1mN
- Stress: +5 N to -5N
- Dynamic: Acquisition frequency of displacement measuring ≥ 500 Hz. Time responses for 100µm displacement: 10 µm. Time responses for 1 N force: 20 ms

Data sheet available on [www.isp-system.fr](http://www.isp-system.fr)

*Special application: Our engineering remain at your disposal to study yours projects*
For this line product, ISP SYSTEM builds on micro & nano positioning devices. The combination of know-how and technologies allows us developing opto-mechanical sub-system, for example: motorized mount, optical flat mirror, optical bench, and targetry and adjustment tool.

**Deformable mirror for wave front surface correction**

This active mirror with small diameter is deformable thanks to actuators network (50 µAME: patented product of ISP SYSTEM).

- Excellent linearity of area correction (Default lower of 1%).
- No gate and footprint effect of actuators on the area.
- Position maintained while electrical feed off
- Excellent thermo-mechanical stability
- Hysteresis is reduced to a low value (0, 1%).

**Specifications:**

- Mirror diameter: to 40mm from 300mm
- Correction of wave front by AME:
  - Step: from 6 mm to 50 mm
  - Stress +/- 3 N to +/- 50 N
- Residual error: lower than 0.2µrad RMS
- Long-term stability: until 0, 1 µrad

Datasheet available on [www.isp-system.fr](http://www.isp-system.fr)

*Special application : Our engineering remain at your disposal to study yours projects*
Nano focus mirror of XUV Beam to SYNCHROTRON

This equipment, assembled on KB mounting, allows the XUV beam focus with an extreme accuracy. It is combined with two deformable active mirrors which each have one line of ten “AME 30 actuators” and one bender (ISP SYSTEM product). Functions performed enable a high precision focus but also a high correction of basic shape mirror.

• An extreme thermo-mechanical stability without gate and footprint effect.
• An extremely weak backlash.

Specifications:

• Mirror diameter: 100 to 1700mm
• Correction of wave front by AME
  - Step: 6 mm to 50mm
  - Stress +/- 3 N to +/-50 N
• Residual error: lower than 0.2µrad RMS
• Long-term stability: until 0, 1 µrad

Data sheet available on www.isp-system.fr

Special application : Our engineering remain at your disposal to study yours projects
Active Bender

It is an X-ray active optic assembled on KB mounting on beamline. Thanks to several astatic actuators, this optical device holds an important curvature range.

This equipment allows a correction of polishing defects and mirror aberrations.

• Less hysteresis than system with Piezo actuators.
• No footprint effect on the beamline.
• High stability
• The floating head system allows angular and radial Misalignments without incurring parasitic friction.

Specifications:

• Mirror diameter: 100 to 1,700 mm
• Correction of wave front by AME
  - Step : 6 mm à 50mm
  - Stress +/- 3 N to +/- 50 N
• Residual error lower than 0.2 µrad RMS
• Long-term stability: until 0.1 µrad

Datasheet available on www.isp-system.fr

Special application: Our engineering remain at your disposal to study yours projects
Alignment video telescope

Video telescope allows an alignment adjusting or accurate measurements (in the range of 2/10mm) at an important distance (40 meters for example). According to customers’ needs, these devices are integrated on stage allowing translations and/or rotations. They are motorized and can be piloted by radio control.

ISP SYSTEM fulfills complete sets allowing alignment.

For example: Structure alignment tool

Alignment tool allows of structures to control over long distances (30m) the alignment of several points with a precision of +/-0.3mm.

Specifications:

• The setting up is easy and fast: connection control panel to 220Vac sector, targets are equipped of backlight battery.
• Possibility to adapt itself for specific application need (target definitions and fixing interface supports).
• Easy transport on site (two-wheel hand truck).
• Low maintenance (optics cleaning)
• Free operator workspace: video-telescope remote-controlled for the target display selected.
• Direct display of gaps on screen by the operator.

Datasheet available on www.isp-system.fr

Special application : Our engineering remain at your disposal to study yours projects
Motion controllers & Drivers

OEM motion driver

Motion control board with two axis stepper bipolar motor including encoder reading.

- Motor current: from 100mA to 4A
- Integrated on rack or on boxed according to customers ‘definitions.
- I/O Modules: incremental encoder, absolute ENDAT
- Communication: CANOPEN, RS485, RS232
- IHM on PC: Ethernet, Profinet, USB, RS232
- Interfaces: LABVIEW, Visual Basic, C++, QT

Specifications:

- Rated current: 2A by phase
- Motor voltage: 24VDC or 48VDC
- Motor connector (1 axis with digital I/O): SUBD 15 F
- Encoder connector (1 axis): SUBD 15 M
- Power & communication connector: DIN 41612 B/2 32 channels
- Digital input: Input voltage: 24VDC
  Rated current: between 5 and 15mA
  Maximal current: up to 30mA
- Digital Output: Output voltage: 24VDC
  Maximum current: up to 300mA
  Inrush current: 2A (timing <10ms)

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Special application: Our engineering remain at your disposal to study yours projects
**Motion controller**

The whole control stepping motor consists of a backplane card ISP FDP6C2AMPP allows receiving until six motion control board, thereby the device can drive 12 motors. Encoders can be incremental or absolute, ENDAT2.2 or 2.1 with adjustable power. Input signal is a 0-5V quadrature type.

- Communication: Ethernet, Profinet, USB, CANOPEN...
- Relative and absolute displacement
- Motor driving by whole step or half-step
- Velocity profile type On/Off or with acceleration ramp
- Speed and acceleration value adjustable until 4 kHz
- Collisions management:
  - Limit the backlash on the end of movement
  - Homing on original encoder with collisions and origin offset value settable
- Voluntary motion towards limit switches.

**Specifications:**

- Rated current: 2A by phase
- Motor voltage: 24VDC to 48VDC
- Encoder supply: 5VDC (adjustable to +/- 0.5V)
  - 250mA maximum by axis
- Reliability: Card 2 axis and encoder: 300 000 h
  Communication backplane Profinet: 380 000 h

Datasheet available on [www.isp-system.fr](http://www.isp-system.fr)

*Special application: Our engineering remain at your disposal to study yours projects*
Services

Design and unit production

- Feasibility study
- Draft
- Design
- Manufacturing
- Assembly
- Calibration
- Receipt
- Packaging / transport
- Onsite Installation

Continuous and unit production

Annual volume: until 5 000 items/ref/an
Special production for unit volume
Product manufacturing compatible with harsh environments or clean room.

Maintenance contracts & after sales services

- Management spare parts
- Repair, periodic checking
- Product returned on ISP SYSTEM company