HEXANT

fancy footwork

6DOF MINIATURE ROBOT

- Wide linear and angular working range
- Sub-micron resolution
- 35N load capacity
- User friendly web-server user interface
- Easy web-server user interface
- Free pivot-point setting
- Scalable design

HexAnt
(Open and Closed Loop)

HexAnt is based on Ant Rail linear translation stages wich can be either open loop or integrated with contactless linear measurement system for high resolution closed loop control.

Where accuracy is mandatory we can perform a robot calibration in working conditions upon request.

FAB CREA

We propose solutions for laboratory, industrial applications, Vacuum-UHV, CRYO… and more.

HexAnt is a six axis manipulator based on a proprietary design of FAB Crea, the parallel kinematic hexaglide concept: 6 parallel sliders are moving an end effector connected with rigid legs and spherical joints.

The precision of six sliders, combined with zero-play spherical joints, make this 6DOF robot precise and stiff

The main advantages of this kinematics compared with the Stewart Platform, commonly known as hexapod, are:

- low profile,
- possibility to extend indefinitely the stroke in the X direction and
- flexibility to use a wide variety of linear translation stages which are available for any possible specification requirements and environmental condition.

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HexAnt
Open and Closed Loop

Degrees of freedom	Axis						pivot point coordinates freely settable via software
Specification	**X**	**Y**	**Z**	**THX**	**THY**	**THZ**	**Remark**
Travel tange **M**	**± 25mm**	**± 35mm**	**+ 15mm - 40mm**	**± 20°**	**± 20°**	**± 15°**	extra stroke for X axis, every degree of freedom limit the others: variable upon working conditions
Travel tange **S**	**± 12,5mm**	**± 15mm**	**+ 7mm - 20mm**	**± 10°**	**± 10°**	**± 7°**	
Travel tange **XS**	**± 12,5mm**	**± 15mm**	**+ 7mm - 20mm**	**± 10°**	**± 10°**	**± 7°**	
				FX	**FY**	**FZ**	
Holding Force TG: **M - S**						**35N**	vertical force on horizontal platform, self locking
				± 15N			any orientation
Holding Force TG: **XS**						**10N**	vertical force on horizontal platform, self locking
				± 5N			any orientation

Technical note: specifications depend on load and dynamics of the application, these are typical values.
We can measure actual performances in working conditions upon request.
Fill in the questionnaire at the end of this data-sheet

HexAnt
Open Loop

Degrees of freedom	Axis						pivot point coordinates freely settable via software
	X	**Y**	**Z**	**RX**	**RY**	**RZ**	
Resolution	**1 µm**	**10 µm**	**1 µm**	**0.01 °**			minimum incremental motion, single axis in open loop
Repeatability	**± 1 µm**	**± 10 µm**	**± 1 µm**	**± 0.01 °**			uni-directional, single axis in open loop
Speed	**20 mm/s**	**10 mm/s**	**10 mm/s**	**5 °/s**			x axis represent the maximum speed, all of the other axis move by interpolation of 6 actuators therefore the achievable speed is a result of the motion required

HexAnt
Closed Loop

Degrees of freedom	Axis						pivot point coordinates freely settable via software
	X	**Y**	**Z**	**RX**	**RY**	**RZ**	
Resolution	**0.1 µm**	**< 1 µm**	**0.1 µm**	**0.001 °**			minimum incremental motion, single axis in closed loop
Repeatability	**< 1 µm**	**< 1 µm**	**< 1 µm**	**<= 0.001 °**			uni-directional, single axis in closed loop
Speed	**5 mm/s**	**5 mm/s**	**5 mm/s**	**2,5 °/s**			x axis represent the maximum speed, all of the other axis move by interpolation of 6 actuators therefore the achievable speed is a result of the motion required

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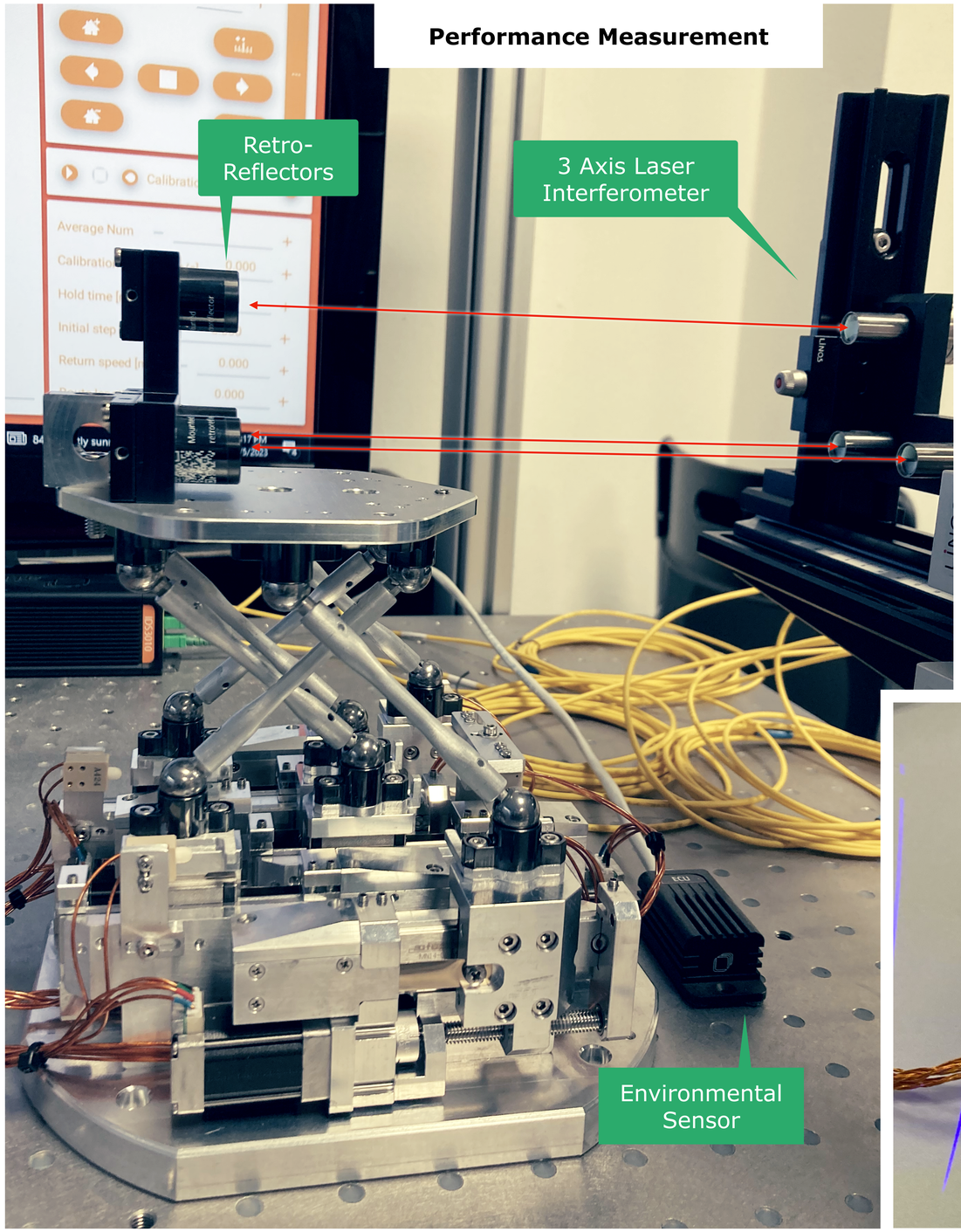
Performance Measurement



There is a special care in the production of the HexAnt robots which are singularly measured in order to achieve the best possible quality and performance.

Mechanics 3D measurement

Once finished the robot assembly we do a 3D non contact precision measurement in order to detect the actual position of every spherical joint as well as the homing sensor position.

These data are then stored in the controller software for a perfect kinematic computation.

Performance measurement

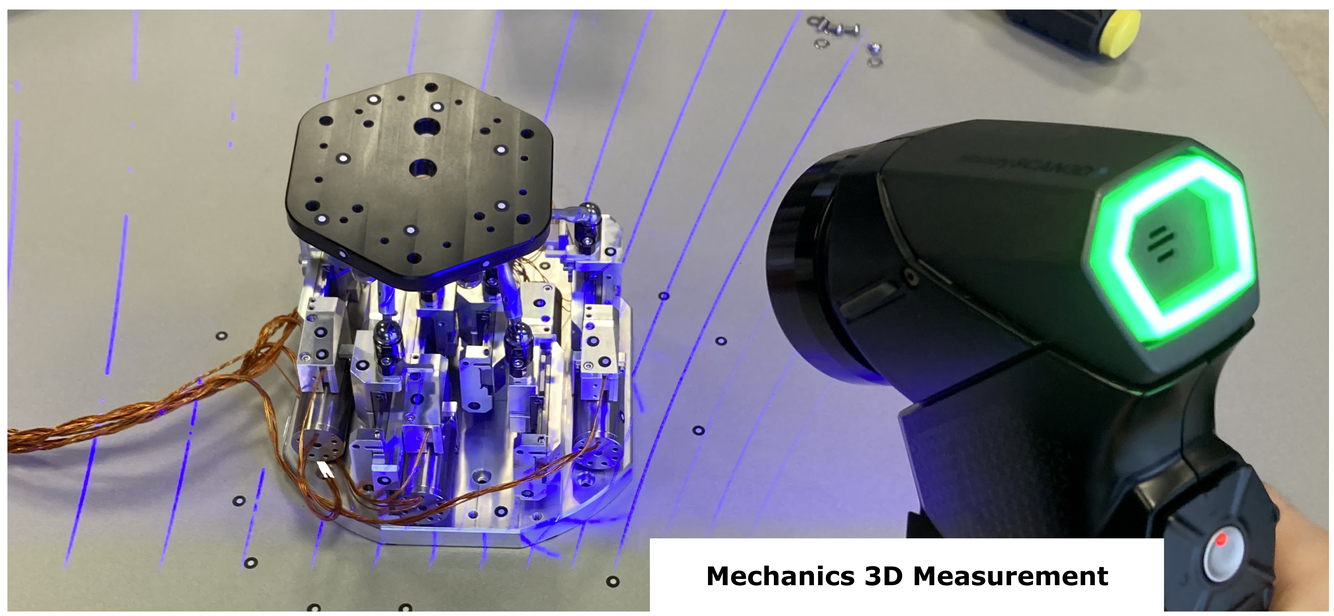
After the mechanics 3D measurement and software parameters settings we measure the actual mechanics performances with a 3 axes laser interferometer and eventually an electronic autocollimator.

As a first step the leadscrew pitch is measured carefully and the actual value is stored in the software parameters.

The typical measurement includes per each degree of freedom:

- homing repeatability
- triangular wave
  - uni and bidirectional repeatability
  - backlash
- staircase
  - motion linearity
  - minimum incremental motion

Accuracy calibration upon request



Mechanics 3D Measurement

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Control		
Motor type	**2 phase stepper motor Open or Closed Loop**	point to point precision positioning with integrated mathematics algorithm for interpolation
Contoller	***6 axis stand alone controller***	Stepper motor smooth drive with current/load optimization
Control Interface	**Wi-Fi and ETHERNET**	compatible with any operating system and device
GUI	**Web Server**	no need of any software installation, includes access to Web Services for integration in users' application software
Power supply	**24 VDC**	included

HexAnt series Ordering Information

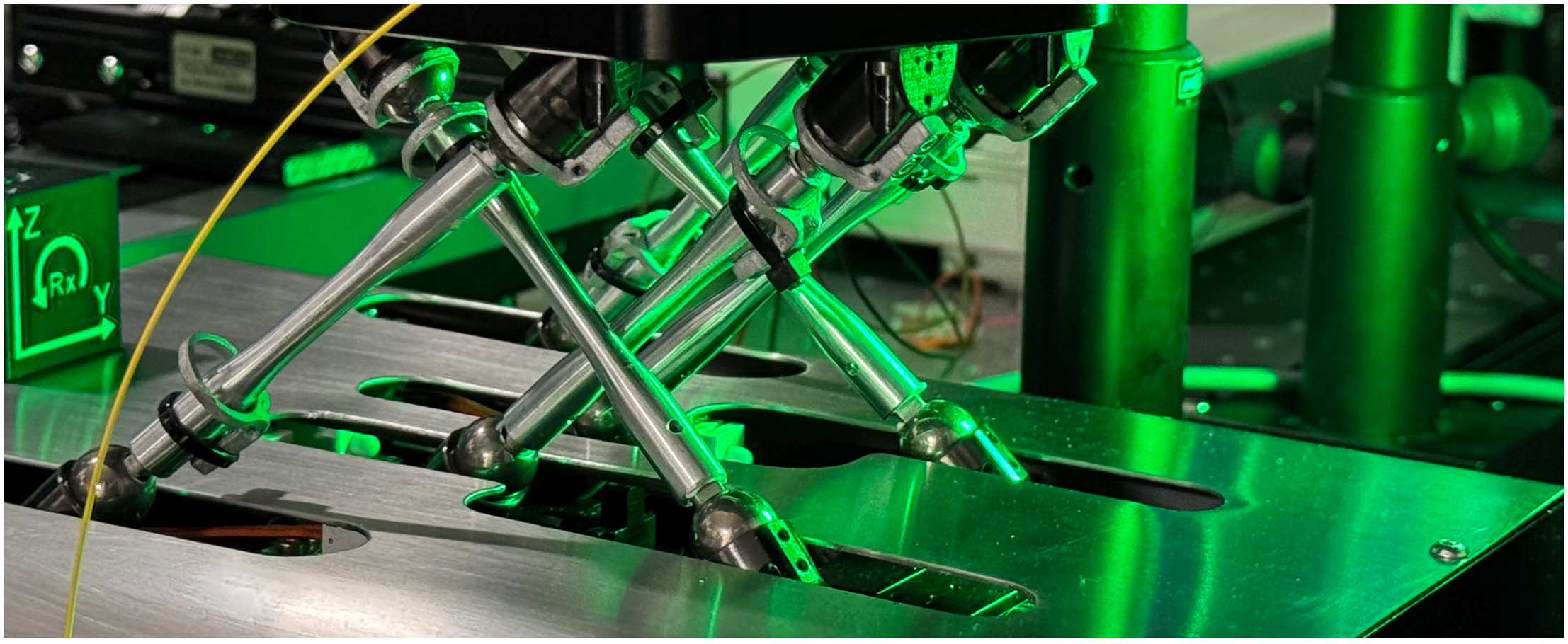
HexAnt	Size	Loop
HA	M	O
		C
	S	O
		C
	XS	O
		C

e.g.:

HA-S-C *= HexAnt Short size, Closed Loop;*

HA-L-O *= HexAnt Long size, Open Loop*

Cable		
Cable Type		
HexAnt → Controller	**3m shielded motor cables and encoder cables**	D-sub 25 shielded cords 3m long, 2 pieces for Open Loop, 4 pieces for Closed Loop



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User Interface depending on the specific application requirements, a user can decide to express absolute coordinates with respect
- to the robot base frame,
- to the home position,
- or to the world frame, i.e. the absolute origin of the setup.

Actual hexapod coordinates are computed in real time by applying forward kinematics computation to measured motor coordinates, and are shown in the interface with respect to both the user-chosen reference system, and to the base reference system.

Relative movements can be done either in a moving or in a fixed reference frame. Moving and fixed frame coordinates should be defined by the user with respect to the end-effector system and to the world system, respectively.
In the same panel it is also possible to define the coordinates of the base frame (with respect to the world reference) and of the hexapod home position (with respect to the base).

HexAnt system offers an easy to use web interface which allows to perform positioning tasks.
Robot target position can be set either by the specification of absolute rototranslational coordinates (*), or as the result of a relative movement in a user defined reference system.

(*) Each particular hexant configuration can be unequivocally described by a set of six rototranslational coordinates representing the pose of a reference system integral to the end-effector platform, with respect to a reference system integral to the base of the robot, assuming that a specific rotation sequence among the 24 possible existing conventions (Euler or Tait Bryan angles, intrinsic or extrinsic rotations) has been chosen.
In our system, rotation coordinates always stick to Tait-Bryan XYZ extrinsic rotation convention, meaning that, given a set of coordinates (x, y, z, thx, thy, thz) describing the pose of system {B} with respect to system {A}, {B} final position is coincident with the one obtained by the following sequence of steps (starting from a configuration coincident with the one of frame {A}):
1. Rotation of thx degrees around fixed X axis
2. Rotation of thy degrees around fixed Y axis
3. Rotation of thz degrees around fixed Z axis
4. Translation of the origin of {B} to the point of coordinates (x, y, z) in {A}

This convention is used when describing either the coordinates of the end-effector with respect to a given reference system, or the coordinates of a reference system with respect to another.

If a relative movement leads to a forbidden position, a shorter displacement is suggested as an alternative solution.
Obtained final coordinates can be selected to perform a movement, or can be stored as absolute coordinates in a list of saved positions, and used in a second time.

Web services are available upon request for customer's software integration.
For any further details please do not hesitate to contact us, we are willing to support you in the analysis of your positioning task in order to propose the best possible solution.

Write to:
ufficiovendite@fabcrea.it

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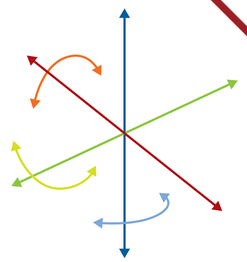
Questionnaire



Fill in this questionnaire and mail it to ufficiovendite@vacuumfab.it to get our consultancy for the positioning system design, free of charges:

CUSTOMER'S REFERENCE

Name, surname: Institute/company:

Phone Number: Email:

WEIGHT/SPECIMEN INFORMATION

Dimensions (mm):	lenght	width	height
Shape: (description or better attach drawing)			
Weight (g):			
Center of gravity coordinates from the center of the carrier (mm):	X	Y	Z

Notes:

POSITIONING REQUIREMENT

HexAnt orientate	Horizontal		Vertical (x or Y)		UPsidedown	
Travel range required (mm):						
Positioning resolution required (µm):	X	Y	Z	Rx	Ry	Rz
Repeatability required (µm):	uni-directional		bi-directional			
Applied force (N):	Fx		Fy		Fz	
Applied Moment (Nm):	Mx		My		Mz	
Speed required (mm/s):						
Acceleration required (mm/s²):						
Duty Cycle:						

Other degrees of freedom required: please specify and possibly add a sketch and a description f the application

WIRING REQUIREMENT

Cable lenght in air from the mechanics to the controller (m):

Notes:

• please specify the environment: laboratory, industrial, vacuum… temperature

Date and signature: