CPSHR2 – CRYO POSITIONING STAGE HIGH RESONANCE 2



Features

- xyz motion for very stable cavity measurements
- Parallel kinematics for optimized stiffness
- High resonance frequencies
- Coarse motion using Cryo Linear Actuators
- Position feedback option -COE
- Scanning motion integrated
- 20mK to 375K, vacuum compatible
- Compatible with CVIP2 vibration isolator

Description / Applications

The Cryo Positioning Stage High Resonance (CPSHR) is a XYZ positioning stage developed for operation in a cryo-vacuum environment, especially suited for very stable cavity measurements. Parallel kinematics result in a light and stiff stage with very high internal resonance frequencies, making it less sensitive to floor vibrations. The CPSHR2 has a large stroke and the phosphor bronze construction offers the optimal combination of thermal conductance and high resonances at mK temperatures.

Specifications

General info	
Type of motion	xyz with parasitic angular motion
Parasitic angle from xy stroke	14 mrad/mm, about the x and y axis
1st natural frequency	xy: 1,2 kHz / z: 2,2 kHz (xy: 0,55 kHz for the -S models)
Dimensions	See drawings below
Operational environmental conditions	20 mK to 375 K, ambient to UHV
Weight	1230 g, -COE adds 30 g
Stepping motion	
Travel range	x ±10,1 mm / y ±11,6 mm / z ±3,0 mm (not simultaneously)
Actuator	CLA2601, see drawings for calculating actuator outputs to system motion
Minimal step size @ 300 K	5 nm
Minimal step size @ 4 K	1 nm
Scanning motion	
Actuator	Piezo actuators, see drawings for calculating piezo outputs to system motion
Scanning range @ 300 K, typical	x 46 µm / y 53 µm / z 8 µm (not simultaneously)
Scanning range @ 4 K, typical	x ±18,4 µm / y ±21.3 µm / z ±1,6 µm (not simultaneously)
Minimal step size	Sub-nm
Drive voltage @ 300 K	-30 V to 120 V
Drive voltage @ 4 K	-150 V to 150 V
Forces and load capacity	
Load capacity	200 g
Materials	
Main body	Phosphor bronze
CLA2601	Stainless steel, ceramic, piezo actuator*
Scanner	Piezo actuator*
*Piezo actuator	Low voltage multilayer, ceramic insulated
Model specific information	
-S	xyz scanner added, see above for range
-COE	Optical Encoder on each CLA2601, 850 pulses per revolution, equivalent to 294 nm axial displacement
-V, -HV or -UHV	Level of vacuum compatibility, see the glossary on the homepage for details
Electronics CPSC	
Controller Base Cabinet	CAB
Driver for stepping and scanning	CADM or PSM (scanning only)
Position readout	OEM

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Ordering Information

Available Models

CPSHR2-V	Cryo Positioning Stage High Resonance 2
CPSHR2-S-V	Cryo Positioning Stage High Resonance 2-Scanner
CPSHR2-COE-V	Cryo Positioning Stage High Resonance 2-Cryo Optical Encoder
CPSHR2-S-COE-V	Cryo Positioning Stage High Resonance 2-Scanner-Cryo Optical Encoder

Available Options

-HV	Upgrade to High Vacuum compatibility
-UHV	Upgrade to Ultra High Vacuum compatibility

Accessories

AKM1	Accessory Kit Mechanical 1
AKE1	Accessory Kit Electrical 1

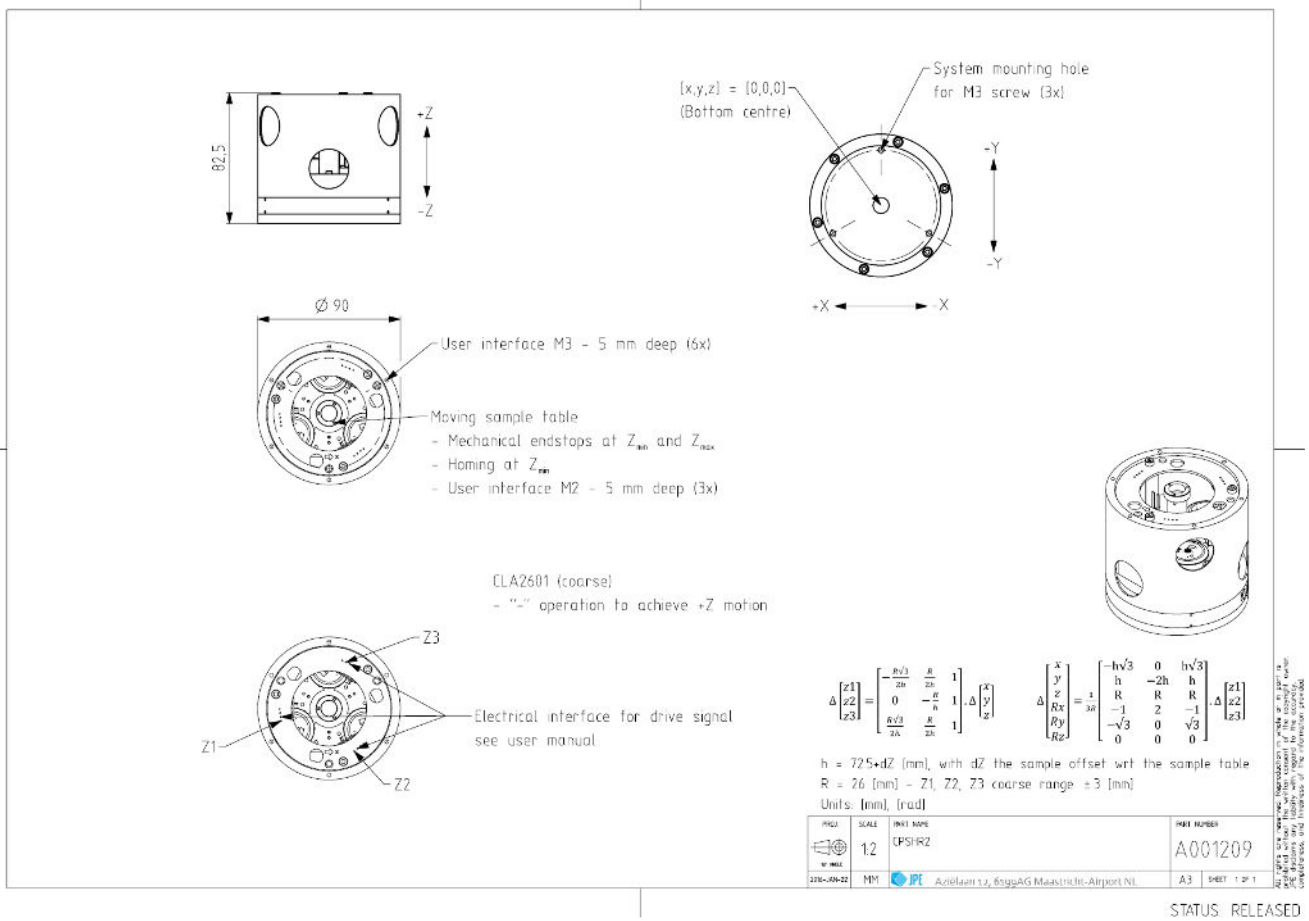
Mechanical and electrical information

Download 3D step files and manuals from:
https://www.jpe-innovations.com/cryo-nano-products/

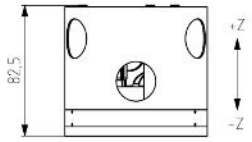
Contact

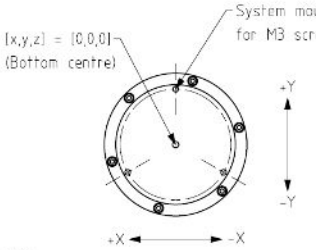
For quotations, specials, or engineering services, please contact us at:
https://www.jpe-innovations.com/contact/

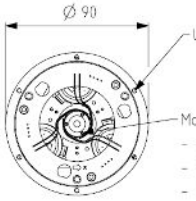
Drawings



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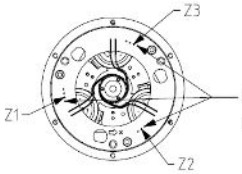








CLA2601 (coarse)
- "-" operation to achieve +Z motion
SCANNING
- A positive voltage will result in +Z motion



$$\Delta\begin{bmatrix}z1\\z2\\z3\end{bmatrix}=\begin{bmatrix}-\frac{R\sqrt{3}}{2h} & \frac{R}{2h} & 1\\ 0 & -\frac{R}{h} & 1\\ \frac{R\sqrt{3}}{2h} & \frac{R}{2h} & 1\end{bmatrix}.\Delta\begin{bmatrix}x\\y\\z\end{bmatrix} \qquad \Delta\begin{bmatrix}x\\y\\z\\Rx\\Ry\\Rz\end{bmatrix}=\frac{1}{3R}\begin{bmatrix}-h\sqrt{3} & 0 & h\sqrt{3}\\ -h & 2h & -h\\ R & R & R\\ -1 & 2 & -1\\ -\sqrt{3} & 0 & \sqrt{3}\\ 0 & 0 & 0\end{bmatrix}.\Delta\begin{bmatrix}z1\\z2\\z3\end{bmatrix}$$

h = 72,5+dZ [mm], with dZ the sample offset wrt the sample table
R = 26 [mm] - Z1, Z2, Z3 coarse range ±3 [mm]
Units: [mm], [rad]

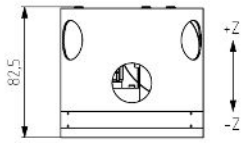
$$\Delta\begin{bmatrix}z1\\z2\\z3\end{bmatrix}=\begin{bmatrix}-\frac{R\sqrt{3}}{2h} & -\frac{R}{2h} & 1\\ 0 & \frac{R}{h} & 1\\ \frac{R\sqrt{3}}{2h} & -\frac{R}{2h} & 1\end{bmatrix}.\Delta\begin{bmatrix}x\\y\\z\end{bmatrix} \qquad \Delta\begin{bmatrix}x\\y\\z\\Rx\\Ry\\Rz\end{bmatrix}=\frac{1}{3R}\begin{bmatrix}-h\sqrt{3} & 0 & h\sqrt{3}\\ -h & 2h & -h\\ R & R & R\\ 1 & -2 & 1\\ -\sqrt{3} & 0 & \sqrt{3}\\ 0 & 0 & 0\end{bmatrix}.\Delta\begin{bmatrix}z1\\z2\\z3\end{bmatrix}$$

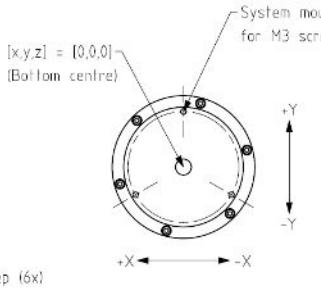
h = 67,35+dZ [mm], with dZ the sample offset wrt the sample table
R = 6,75 [mm] - Z1, Z2, Z3 scan range ±16e-3 [mm] (at 4K)
Units: [mm], [rad]

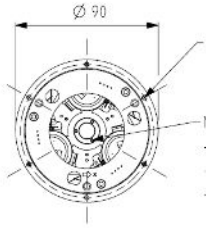
PROJ.	SCALE	PART NAME	PART NUMBER
1st ANGLE	1:2	CPSHR2-S	A001252
2016-JUN-22	MM	JPE Aziëlaan 12, 6199AG Maastricht-Airport NL	A3 SHEET 1 OF 1

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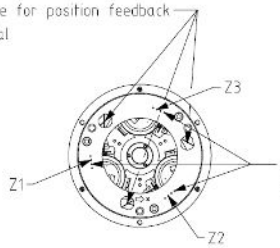






Optical interface for position feedback
see user manual

CLA2601 (coarse)
"-" operation to achieve +Z motion



$$\Delta\begin{bmatrix}z1\\z2\\z3\end{bmatrix}=\begin{bmatrix}-\frac{R\sqrt{3}}{2h} & \frac{R}{2h} & 1\\ 0 & -\frac{R}{h} & 1\\ \frac{R\sqrt{3}}{2h} & \frac{R}{2h} & 1\end{bmatrix}.\Delta\begin{bmatrix}x\\y\\z\end{bmatrix} \qquad \Delta\begin{bmatrix}x\\y\\z\\Rx\\Ry\\Rz\end{bmatrix}=\frac{1}{3R}\begin{bmatrix}-h\sqrt{3} & 0 & h\sqrt{3}\\ h & -2h & h\\ R & R & R\\ -1 & 2 & -1\\ -\sqrt{3} & 0 & \sqrt{3}\\ 0 & 0 & 0\end{bmatrix}.\Delta\begin{bmatrix}z1\\z2\\z3\end{bmatrix}$$

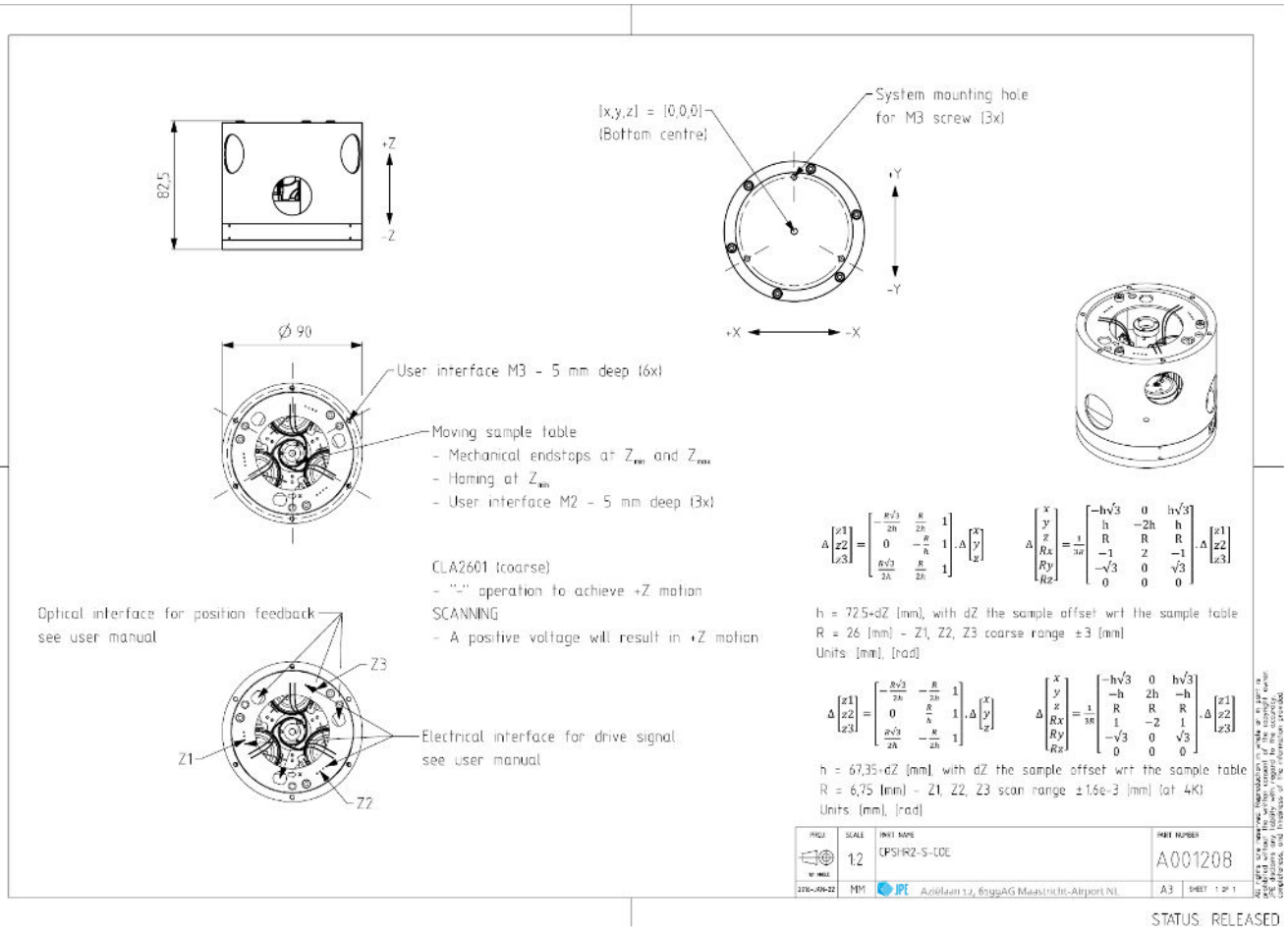
h = 72,5+dZ [mm], with dZ the sample offset wrt the sample table
R = 26 [mm] - Z1, Z2, Z3 coarse range ±3 [mm]
Units: [mm], [rad]

PROJ.	SCALE	PART NAME	PART NUMBER
1st ANGLE	1:2	CPSHR2-COE	A001253
2016-JUN-22	MM	JPE Aziëlaan 12, 6199AG Maastricht-Airport NL	A3 SHEET 1 OF 1

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