

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
Electronics CPSC	
Controller Base Cabinet	CAB
Driver for stepping and scanning	CADM or PSM (scanning only)
Position readout	OEM

Ordering Information

Available models

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

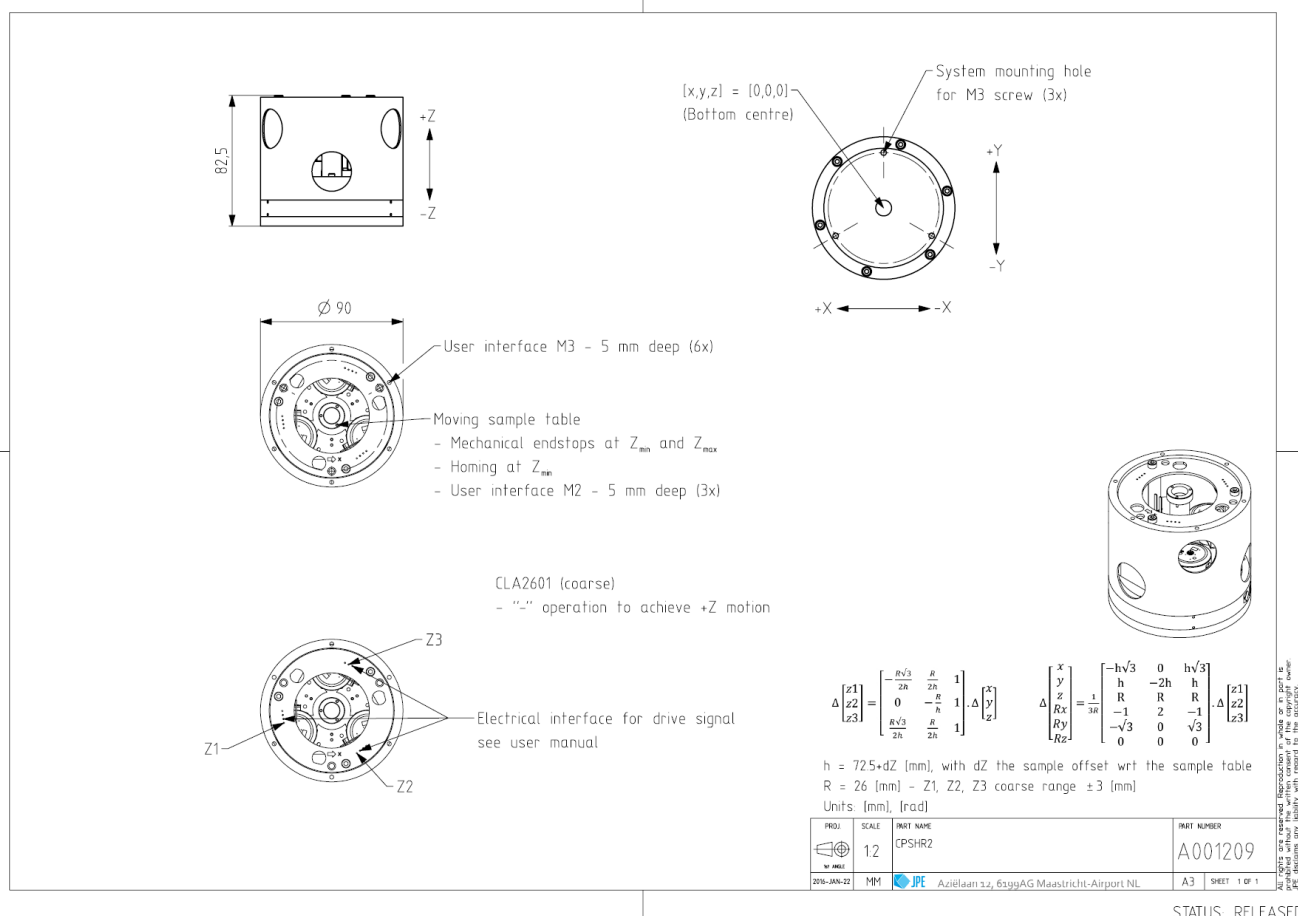
Mechanical and electrical information

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



82,5

+Z

-Z

$[x,y,z] = [0,0,0]$
(Bottom centre)

System mounting hole for M3 screw (3x)

+Y

-Y

+X

-X

Ø 90

User interface M3 - 5 mm deep (6x)

Moving sample table

- Mechanical endstops at Z_{min} and Z_{max}
- Homing at Z_{min}
- User interface M2 - 5 mm deep (3x)

CLA2601 (coarse)

- "-" operation to achieve +Z motion

SCANNING

- A positive voltage will result in +Z motion

Z3

Z1

Z2

Electrical interface for drive signal see user manual

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

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

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

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

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$h = 67,35 + dZ$ [mm], with dZ the sample offset wrt the sample table
 $R = 6,75$ [mm] - Z1, Z2, Z3 scan range $\pm 1,6-3$ [mm] (at 4K)
 Units: [mm], [rad]

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

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82,5

+Z

-Z

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(Bottom centre)

System mounting hole for M3 screw (3x)

+Y

-Y

+X

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Ø 90

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CLA2601 (coarse)

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Optical interface for position feedback see user manual

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Z1

Z2

Electrical interface for drive signal see user manual

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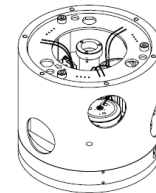
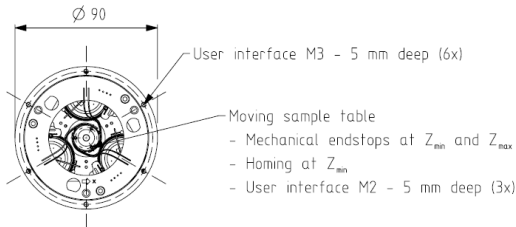
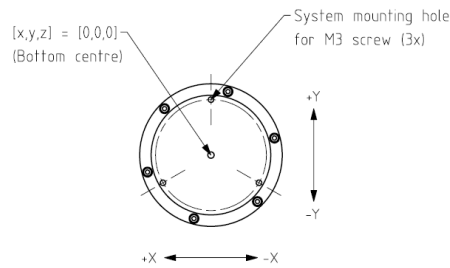
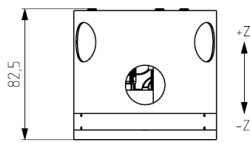
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$h = 72,5 + dZ$ [mm], with dZ the sample offset wrt the sample table
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 Units: [mm], [rad]

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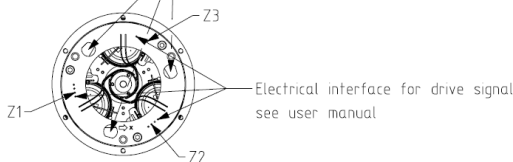
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CLA2601 (coarse)
 - "-" operation to achieve +Z motion
 SCANNING
 - A positive voltage will result in +Z motion

Optical interface for position feedback
 see user manual



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$h = 72.5 + dZ$ [mm], with dZ the sample offset wrt the sample table
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$h = 67.35 + dZ$ [mm], with dZ the sample offset wrt the sample table
 $R = 6.75$ [mm] - Z1, Z2, Z3 scan range $\pm 1.6 \times 10^{-3}$ [mm] (at 4K)
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PROJ.	SCALE	PART NAME	PART NUMBER
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