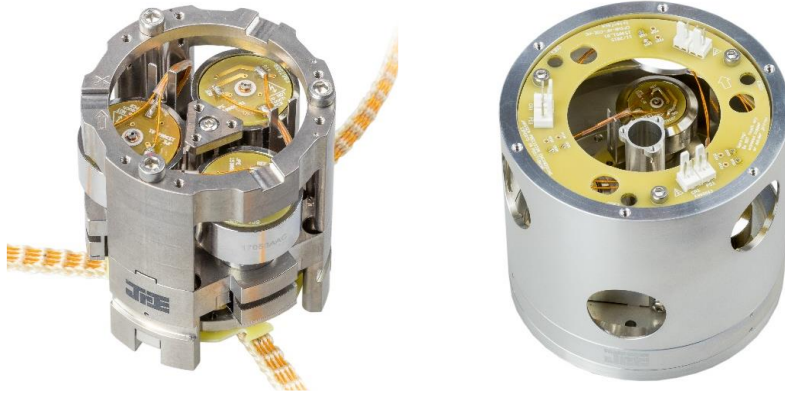# CRYO POSITIONING STAGE HIGH RESONANCE (CPSHR)

## Features

- Parallel kinematics, high stiffness design
- High internal resonances, up to 4kHz
- Coarse motion using Cryo Linear Actuators
- 20mK to 375K, vacuum compatible
- CPSHR1: compact, high resonances, titanium
- CPSHR2: large stroke, lower resonances, higher thermal conductivity, phosphor bronze
- CPSHR3: large stroke, high resonances, optimal thermal conductivity, aluminium
- Scanner option "S"
- Cryo Optical Encoder option "COE"

## Description / Applications

The Cryo Positioning Stage High Resonance (CPSHR) is a XYZ positioning stage developed for use in a cryo-vacuum environment. Parallel kinematics result in a light and stiff stage with very high internal resonance frequencies, making it less sensitive to floor vibrations. The CPSHR 1 is the most compact design with small stroke and high resonances. The CPSHR2 has large stroke and improved thermal conductivity but lower resonances. The CPSHR3 combines the best of both worlds with large stroke, further optimized thermal conductivity and high resonances.

## Specifications

| specs | unit | CPSHR1-S | CPSHR2 | CPSHR2-S | CPSHR2-COE | CPSHR2-S-COE | CPSHR3 | CPSHR3-S | CPSHR3-COE | CPSHR3-S-COE |
|---|---|---|---|---|---|---|---|---|---|---|
| **SYSTEM SPECIFICATIONS** | | | | | | | | | | |
| Active axes | - | 3 | | | | | | | | |
| Type of motion | - | x, y, z with parasitic RxRy | | | | | | | | |
| System Range * | mm^3 | approx. 1x1x1 | approx. 10x10x4 | | | | approx. 8x8x4 | | | |
| System scan range @4K | µm^3 | approx. 1x1x0.5 | N/A | approx. 10x10x1.6 | N/A | approx. 10x10x1.6 | N/A | approx. 8x8x1.6 | N/A | approx. 8x8x1.6 |
| Parasitic angle from xy stroke | mrad/mm | 20 | 14 | | | | 17 | | | |
| Coarse actuator | - | CLA2201 | CLA2601 | | | | | | | |
| Scanning actuator | - | Piezo ceramic | N/A | Piezo ceramic | N/A | Piezo ceramic | N/A | Piezo ceramic | N/A | Piezo ceramic |
| Endstops ** | - | at z -0.5mm | at z -3mm and z +3mm | | | | | | | |
| Main construction material | - | Titanium | Phosphor Bronze (improved thermal conductivity, lower resonances) | | | | Aluminium (optimal thermal conductivity, high resonances) | | | |
| 1st natural frequency | kHz | xy:1.5 / z:4,0 | xy: 1.2 / z: 2.2 | xy: 0.55 / z: 2.2 | xy: 1.2 / z: 2.2 | xy: 0.55 / z: 2.2 | xy: 2 / z: 3.7 | xy: 1.5 / z: 3.7 | xy: 2 / z: 3.7 | xy: 1.5 / z: 3.7 |
| **ACTUATOR SPECIFICATIONS** | | | | | | | | | | |
| Specifications are given for individual actuators unless otherwise mentioned. See interface drawing for transformation matrix from actuator outputs to system motion | | | | | | | | | | |
| Coarse range | mm | ±0.5 | ±3 | | | | | | | |
| Scan range @ 293 K | µm | 2.5 | N/A | 8 | N/A | 8 | N/A | 8 | N/A | 8 |
| Scan range @ 4 K | µm | 0.5 | N/A | 1.6 | N/A | 1.6 | N/A | 1.6 | N/A | 1.6 |
| Coarse step size @ 293 K | nm | 5-25 | | | | | | | | |
| Coarse step size @ 4 K | nm | 1-5 | | | | | | | | |
| Scanner sensitivity @ 293 K | nm/V | 25 | N/A | 66 | N/A | 66 | N/A | 66 | N/A | 66 |
| Scanner sensitivity @ 4 K | nm/V | 5 | N/A | 13 | N/A | 13 | N/A | 13 | N/A | 13 |
| Load capacity | grams | 100 | 200 | | | | | | | |
| Operating temperature | K | 0.8-375 | 0.02-375 | | | | 1.5-375 | | | |
| Mass | grams | 300 | 1230 | | 1450 | | 510 | | 570 | |
| Coarse actuator spindle pitch | mm/turn | 0,25 | | | | | | | | |
| Coarse actuator encoder resolution *** | PPR | N/A | N/A | | 850 | | N/A | | 850 | |
| **DRIVE ELECTRONICS** | | | | | | | | | | |
| Controller/driver | - | CAB-230(115), CADM2 | | | | | | | | |
| Encoder readout | - | N/A | N/A | | OEM2 | | N/A | | OEM2 | |
| Scanner module **** | - | Only for sytems with -S option : CADM2 or PSM,PSMIL | | | | | | | | |

\* Typical volume for positioning. Due to the parallel kinematics the indicated max values are not necessarily simultaneously achievable. On the other hand max values can be bigger when strokes along other axes are limited.

\*\* Endstops are placed close to, but not coincident with each actuator motion axis. Together they define a system z-position, with x and y being 0. Touching multiple endstops in an uncontrolled manner with x and y not being 0 can cause the system to jam and could require manual action to free it.

\*\*\* Linear resolution can be found by dividing the spindle pitch by PPR (pulses per revolution)

\*\*\*\* Specified scan ranges assume use of CADM2 -20V to +130V, 10 bits resolution, setpoint rate approx. 10Hz. Alternative: PSM amplifier with PSMIL -20V to +130V. By disconnecting the PSMIL high voltage bipolar operation is possible to increase the range. This is only allowed at cryogenic temperatures and -120V to +120V is not to be exceeded!