

# High Precision Devices...

**Your Design and Manufacturing Experts in Ultra-Low Temperature Instrumentation**



“cold chambers” for maintaining a constant temperature of  $-272^{\circ}$  Celsius or 0.040 Kelvin! Bill Hollander says, “We built our first cryostat, the Model 102 Denali, for physicists at NIST. They showed it to colleagues from other institutions who then ordered copies for their own labs.” Eventually HPD came out with several sizes of cryostat - 6 to be specific - all named after mountains. HPD still adheres to an original strength of its business: gladly providing custom features on any of the 6 cryostats in HPD’s current line, or building totally unique solutions utilizing the same principles.

HPD has also been awarded numerous Small Business Innovation Research (SBIR) grants. The latest was awarded by NIST for the development of a cryostat to be used with ultra-high-resolution transition-edge sensor (TES) kilopixel array “cameras”. HPD’s cryostat will cool the TES arrays to temperatures below 1 Kelvin for use in sub-mm astronomy. The Phase II SBIR grant is for \$300K over a two-year period, recognizing HPD’s expertise in ultra-low temperature precision instruments.

High Precision Devices (HPD) began in business with a simple business model: designing, manufacturing, and selling precision custom scientific instrumentation: mechanical, cryogenic, optical, and vacuum. The company emphasis has always been superior instrument design and engineering with exceptional quality machined components. HPD products are sold all over the world to some of the most prestigious customers in physics research.

The company, founded in 1993 by Bill Hollander, has a unique set of customers: research physicists at universities (University of Colorado, Caltech, MIT, University of California Berkeley), government labs (Los Alamos, Lawrence Livermore, LIGO, NOAA, and NASA), standards bodies such as the National Institute of Standards and Technology (NIST), and private companies (Boeing, Lockheed Martin, Ball Aerospace, Northrop Grumman) The instruments HPD has built for these customers are typically one-off devices or prototype instruments.

HPD expanded its business model approximately 7 years ago when it entered the ultra-low temperature cryogenics market with the first of a portfolio of cryostats:



The company, by all means a think tank with a highly innovative and experienced team of degreed engineers and journeymen machinists, is evolving yet again. Bill Hollander says, “The standard model cryostats we build are used by research scientists, but new configurations of this technology could be powerful tools for specific industrial or medical applications, with much larger markets. For instance, HPD is working on the design of a cryostat to mount on a scanning electron microscope (SEM). This would benefit semiconductor companies seeking to improve the yield of their chip fab process. Another configuration would be used in medical diagnostics, for ultra-low field magnetic resonance imaging (ULF-MRI). The ULF-MRI technology shows great promise for the detection of prostate and breast cancers that can’t be “seen” by other methods.

HPD has a dedicated instrument/machine shop for the fabrication of components for its cryostats and custom scientific instruments. Asked how HPD selected their Haas CNC mills and lathes, Bill said, "My decision is 50% based upon the best machine to fits our needs, and 50% on the dealer. I started working with George Michel and the Monckton Machine Tool team decades ago, even before there was a Haas brand. I respect and trust the company and the people. Our sales person, Chad Wadsworth, is an ideal sales person for HPD. He listens to our requirements, he doesn't just pitch his machine tools, and he recommends the best machine tool for the application. Chad and the team at Monckton Machine Tools are consultants to our business."

"The Haas machines are a great value. They offer a lot of capability and versatility at a reasonable price. The machines are very reliable, and we rarely have one of the 6 we own go down (HPD has four Haas machining centers, and two Haas lathes). If we have a machine tool problem, the Monckton Machine Tool service people are usually here within a day, and their service is top-notch", Bill said. "Though we do some maintenance in-house, we also use Monckton's preventative maintenance service, therefore ensuring maximum machine uptime," he continued. "There are more exotic machines in the world, but the Haas machine tools are a great value and they come with the superior support from Monckton Machine Tools."

In addition to ultra-low temperature devices, HPD has also designed and manufactures other products, including:

- The Model 126 Heliodon is a product that accurately demonstrates the motion of the sun relative to a building for the purpose of designing solar responsive architecture. It gives architects, teachers, and building planners an extraordinarily engaging means by which to educate clients and students who have an interest in solar responsive design.
- Voltage standard measurement tools, including a low thermal reversing switch and a Josephson array cryoprobe.
- Optical mounting tools for vacuum environments.
- Air sampling systems - the company offers three different air sampling products, used by scientists to determine atmospheric CO<sub>2</sub> levels. HPD's Hermes and Sherpa air samplers are used by National Oceanic and Atmospheric Administration (NOAA) to study global warming.

For more information on HPD's outstanding engineering and manufacturing capabilities contact HPD at 303-447-2558 or go to their website at [www.hpd-online.com](http://www.hpd-online.com).

For more information on Haas machine tools, contact Monckton Machine Tools at 303-571-4933 or visit their website at [www.moncktons.com](http://www.moncktons.com).



# HPD

## The HPD Instrument Development Process

Though each customer project is unique, here is a typical scenario of how HPD supports its instrument-development customers from design to delivery.

- Customers come to HPD with an initial concept (often sketched out with pencil), and HPD begins the process of evaluation and consultation.
- Next, the engineering team at HPD begins their design, utilizing SolidWorks® CAD program.
- Engineers then use finite element analysis software (Cosmos® FEA) to optimize the design for mechanical or thermal characteristics.
- Part drawings are then created , using Geometric Dimensioning and Tolerancing (GD&T), ANSI/ASMEY14.5-1994 standard.
- Once the design is approved, the HPD team uses GibbsCAM® to import the engineering SolidWorks® files, program their CNC equipment, and to run virtual machining operations before actually cutting any material.
- HPD then ports the GibbsCAM® programs directly to their HAAS® CNC mills and lathes. Virtually all machining for the final product is done in-house.
- Once the components are built, technicians inspect them using conventional inspection tools and a state-of-the-art Starrett® Coordinate Measuring Machine (CMM) that compares the machined parts with the original CAD models to ensure consistent high quality.
- Technicians assemble the devices and perform in-house testing prior to final delivery.