HD² HIGH DEFINITION HAPTIC DEVICE

The HD² High-Definition Haptic Device is a high-fidelity six degrees of freedom (DOF) haptic interface for advanced research in haptics as well as robotics. Combined with Quanser's powerful control design environment, it provides a flexible development test bed for various emerging applications such as virtual medical simulators and teleoperation.

EXPERIENCE THE REAL FEEL OF A VIRTUAL WORLD

As a dexterous haptic device, HD² enables researchers to interact with virtual or remote environments using programmable force feedback. Compared to other commercially available haptic devices, HD² has a large workspace and very low intervening dynamics. This parallel mechanism is highly back-drivable with negligible friction. The heavy-duty capstan drive and high performance motors within the device reduces the perceived inertia while maintaining rigidity of the device structure. This type of drive also makes the HD² one of the most power haptic devices in the academic community. Important features like the high-resolution optical encoder, high-performance DC motors and accurate kinematics allow for a high-precision robotics and haptics implementations that might have been more challenging to achieve in the past.

HD² applications potential spans from space and undersea expeditions to advanced teleoperation platforms where dexterity and precision is essential. Robotic-assisted surgery, virtual reality training simulators, human rehabilitation systems and gaming systems are some other modern applications of HD² high-definition haptic device.

HOW IT WORKS

Using seven high resolution optical encoders, the operator's motion can be tracked in six DOF (i.e. X, Y, Z, roll, pitch and yaw). The device can apply force to the user in five DOF (i.e. X, Y, Z, roll and pitch)*. In order to minimize the perceived weight over the entire workspace, adjustable brass counterbalances are mounted on each base. This state-of-the-art device is equipped with six built-in, high-bandwidth linear current amplifiers which, along with the smart mechanical design, make it possible to achieve stiffness coefficients as high as 3,000 N/m. A foot push pedal is provided with the device as a digital input for switching applications.

The system is controlled via PC using Quanser's QIDe superior-performance hardware-in-the-loop (HIL) control board. Quanser rapid control prototyping software QUARC for MATLAB®/Simulink® creates an intuitive yet extremely flexible controller design environment.

*HD² is also available in configurations with 6 DOF sensed/6 DOF actuated (with actuated roll at end-effector) and 7 DOF sensed/7 DOF actuated (with pincher). For details or to inquire about customization to your specific needs, email sales@quanser.com.

System specifications on reverse page.

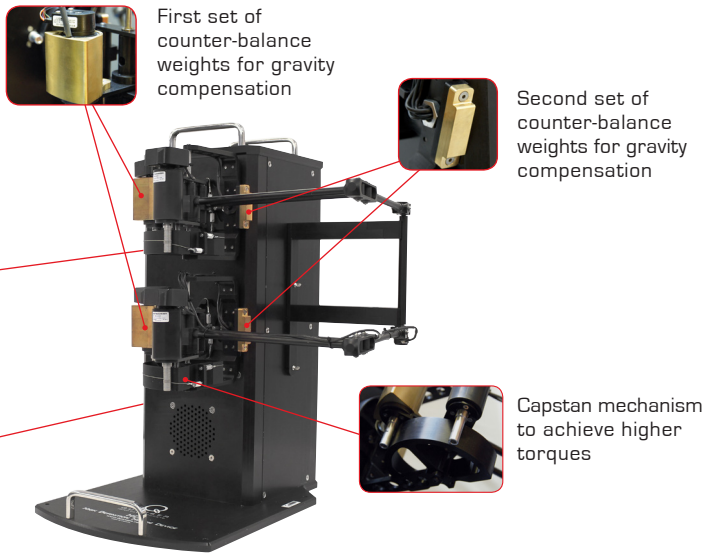
HD² HIGH DEFINITION HAPTIC DEVICE WORKSTATION COMPONENTS:

HD² High Definition Haptic Device
QPIDe data acquisition device
QUARC real-time control software for MATLAB®/Simulink®
Single pedal (optional: double pedal)
User Manual (provided in digital format)
Sample pre-built controllers

The Health Research Innovation Centre of the University of Calgary is using HD² for research and development of the neuroArm, a robotic arm used for telesurgery.

SYSTEM SPECIFICATIONS

HD² High Definition Haptic Device



Foot push pedal for auxiliary digital input

FEATURES

- Highly back-drivable joints and very low intervening dynamics
- Highly rigid structure with low friction and inertia
- Capstan drive mechanism to achieve higher torques
- Counterweights designed to eliminate the effects of gravity
- Emergency-stop switch is included for safe operation
- Auxiliary analog and digital inputs available on the side panel for peripheral accessories
- Reconfigurable handle position to attain different workspace
- High resolution optical encoders
- Built-in linear current amplifiers
- Easy connectivity to the data acquisition control board through SCSI cable
- Seamless integration with MATLAB®/Simulink® for a flexible control design environment

DEVICE SPECIFICATION

	X	Y	Z	Roll	Pitch	Yaw
Workspace	800 mm	250 mm	350 mm	180 deg	180 deg	continuous
Tip infertia	300 g	300 g	300 g	2.29 g.m²	2.29 g.m²	0.79 g.m²
Back drive frictions	0.353 N	0.353 N	0.353 N	61.775 N/mm	61.775 N/mm	0.5 N/mm
Maximum force/torque at 2 amps	19.71 N	19.71 N	13.94 N	1.72 N.m	1.72 N.m	1.72 N.m
Continuous force/torque at 1.1 amps	10.84 N	10.84 N	7.67 N	0.948 N.m	0.948 N.m	0.948 N.m
Position resolution	0.051 mm	0.051 mm	0.051 mm	0.033 deg	0.033 deg	0.088 deg
Stiffness at 10 kHz	3000 N/m	3000 N/m	3000 N/m	3.4 N.m/rad	3.4 N.m/rad	0.05 N.m/rad (torque at 0.6 A)
Dimensions (H x W x L)	0.53 m x 0.3 m x 0.5 m					
Mass, including the amplifiers	22 kg					

COMPLETE WORKSTATION COMPONENTS

Plant	HD² High Definition Haptic Device
Control design environment	Quanser QUARC® add-on for MATLAB®/Simulink®
Documentation	User Manual
Real-time targets	Microsoft Windows®
Data acquisition devices	QPIDe
Amplifier	Built-in linear current amplifier

Sample controller(s) are supplied

About Quanser:

Quanser is the world leader in education and research for real-time control design and implementation. We specialize in outfitting engineering control laboratories to help universities captivate the brightest minds, motivate them to success and produce graduates with industry-relevant skills. Universities worldwide implement Quanser's open architecture control solutions, industry-relevant curriculum and cutting-edge work stations to teach Introductory, Intermediate or Advanced controls to students in Electrical, Mechanical, Mechatronics, Robotics, Aerospace, Civil, and various other engineering disciplines.