

AVATAR PORT

4DOF haptic device for laparoscopic VR simulation

DATA SHEET



The Avatar Port is the force feedback device of **Haptic Avatar**, Follou's system for virtual reality simulation training in laparoscopic, arthroscopic and thoracoscopic surgery. Representations of surgical instruments, called Tools, are introduced in the Port's trocar-like insertion part. The Port provides sensing and force feedback in all degrees of movement around the pivot point (the virtual incision point). Tools are detected and identified upon insertion, so the trainee can focus on the procedural steps, and the slim design allows for a narrow portal placement.

FEATURES

- **Four degrees of freedom** with haptics.
- **Retractable and insertable** tools.
- **Detection and identification** of tools.
- Simple and accurate **calibration**.
- **>6 kHz** external force loop.
- **Integrated** power, amplifiers, motor control, cooling and haptics computer.
- **Modular mounting system** for simple setup and customization.
- The tool insertion part is **lit for didactic purposes**, auto or user controlled.
- **USB-connected** and **USB-charged**.

$\pm 90^\circ$

Yaw range, side to side

$\pm 60^\circ$

Pitch range, back and forth

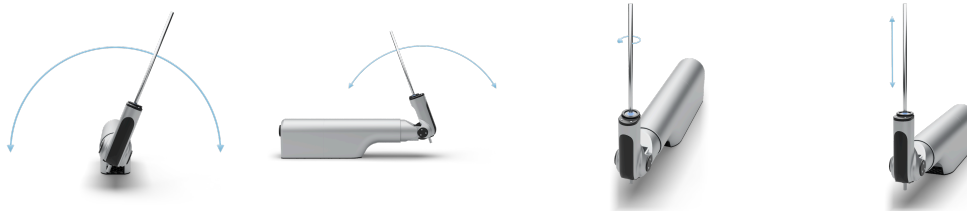
18_N

Peak insertion force

50_{mm}

Minimum distance between Ports

HAPTICS PERFORMANCE



	YAW	PITCH	ROTATION	INSERTION
Motion	Side to side	Back and forth	Twist	In and out
Range	$\pm 90^\circ$	$\pm 60^\circ$	Unlimited	Unlimited
Resolution	0.0055°	0.0055°	0.01°	$5\ \mu\text{m}$
Peak strength	0.8 Nm	1.0 Nm	0.10 Nm	18 N

Peak strength can be held for a limited time. The Port is over-temperature protected and cooled by an internal fan. With an instrument inserted 100 mm, the sideways position resolution at its tip is roughly $20\ \mu\text{m}$.

SPECIFICATIONS

PROPERTY	SPECIFICATION	CONDITIONS
Applications	Laparoscopy, arthroscopy, thoracoscopy	Virtual reality simulation training
Communication	USB (Micro-B to A)	To a USB 3.0 hub or directly to the computer. Current requirement 0.9 A.
Force loop	>6 kHz external	Through the simulation.
Power	Internal Li-Ion battery	Four 3.7 V cells, 37 Wh in total, charged via USB. An external 16.8 V charger (provided) charges four times faster.
Calibration	Automatic zero angle	Yaw and pitch. The Port blinks fast when it needs calibration; move it in a small circle around the zero position.
Minimum distance	50 mm	Between Ports, without mechanical interference.
Weight	1.75 kg	

INTEGRATION

Follou's device library connects the Port to your simulation, whatever language it is written in. It finds and identifies every connected Follou device; your simulation reads positions and orientations and sets forces, at up to **7000 Hz** for several devices and about **35 μs** per update. For Unity, a ready-made prefab connects the devices automatically.

Your simulation

Python, C++, C#, Unity or any other environment



FROM FOLLOU

Follou device library

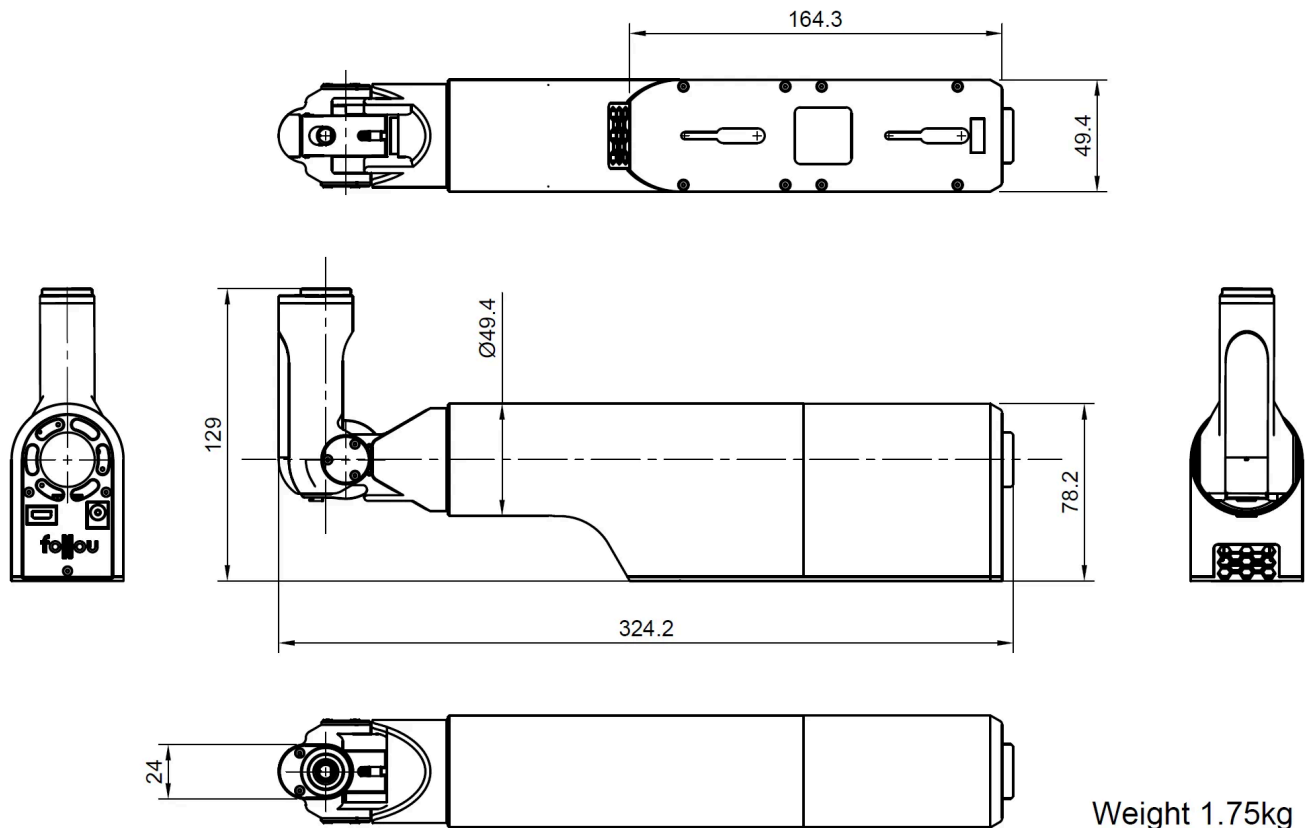
A DLL on Windows, dylib on macOS, .so on Linux. Download from follou-haptics.com



Avatar Port

And other Follou devices: IBox, Scope, T-RHEX. One USB cable per device.

DIMENSIONS



Dimensions in mm.

INSTRUMENTS

The Port works with Avatar instrument handles on interchangeable shafts. Every shaft has an identification tip, so the Port knows which instrument is inserted. Handles connect to an IBox, which measures the handle and drives force feedback in the handles that have it. Special instruments are made on request, e.g. real instruments adapted for the Haptic Avatar system. For more information, see the Avatar Instruments data sheet.



Grasper

With handle force feedback



Needle Driver

Handle sensing



Clip Applier

With handle force feedback



Straight Tool

Pushbuttons, e.g. hook or suction



Scope

Zoom knob and camera angle sensor