DATA SHEET

OVERVIEW

PRENSILIA s.r.l.

Versatile forearms for
multiple research scenarios
& biorobotics

Anthropomorphic
Human sized hand and forearm
Multipurpose platform
6 active axes

EH1 MILANO SERIES

Add value to your choice: modularity is the key

The EH1 Milano series is a programmable anthropomorphic human-sized forearm able to grasp a variety of objects and to sense them through multiple force and position sensors.

Modular actuation units are placed in the forearm, making a perfect solution for desktop and anthropomorphic robots applications. Thanks to the bowden cable transmission, custom solutions with remote actuation units are also available on request, thus enabling the employment of low payload robotic arms. The hand alone weighs just 250g! Each actuator contains a CPU, firmware, sensor acquisition electronics, communication electronics, servo-controllers, and one brushed DC motor.

The forearm communicates through RS232 or USB and is ready to be easily integrated with your application within multiple research scenarios ranging from prosthetics to neuroscience, human-robot interaction, rehabilitation, etc...

The EH1 Milano series firmware routines allow to perform grasps automatically, by just sending a single byte from your application. Alternatively advanced users may implement completely customized control schemes, taking advantage of the embedded 1 kHz servo-control loops.

Milano series is the perfect tool for boosting your lab research: ***are you ready for it?***

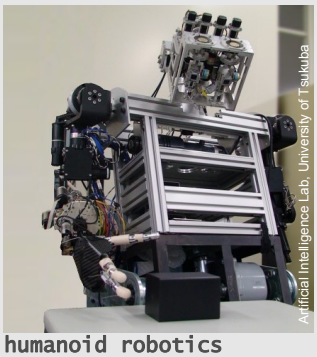
Enfant prodige

EH1 series is the firstborn hand of Prensilia, but is already a small piece of history in bioengineering. The previous version of this hand, developed by Scuola Superiore Sant'Anna, Italy in collaboration with research institutes around Europe, was the first multi-articulated hand controlled by a volunteer's mind in 2008. Connected via peripheral neural electrodes to an amputee, the hand was able to perform complex movements and was controlled by thought alone.

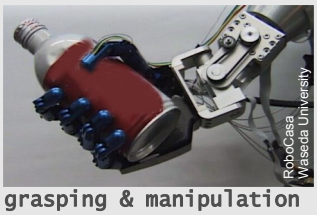
Such technology is now available to all research institutes, and universities involved in various fields of research.

Starting from your requirements Prensilia will manufacture your Milano hand customizing it to your needs. Just plug-in the USB cable to your PC and take advantage of the firmware and control functions provided. Building your application has never been so easy!

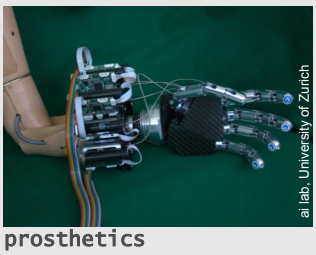
Milano hand is easy to maintain and to reconfigure for multiple research scenarios and lab experiments.



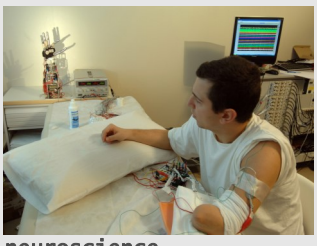
humanoid robotics

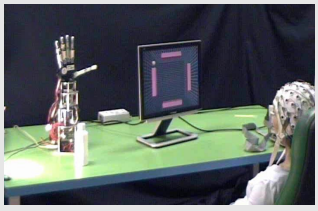


grasping & manipulation



prosthetics


neuroscience




brain-computer interface

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Boost your research potential contact us on www.prensilia.com

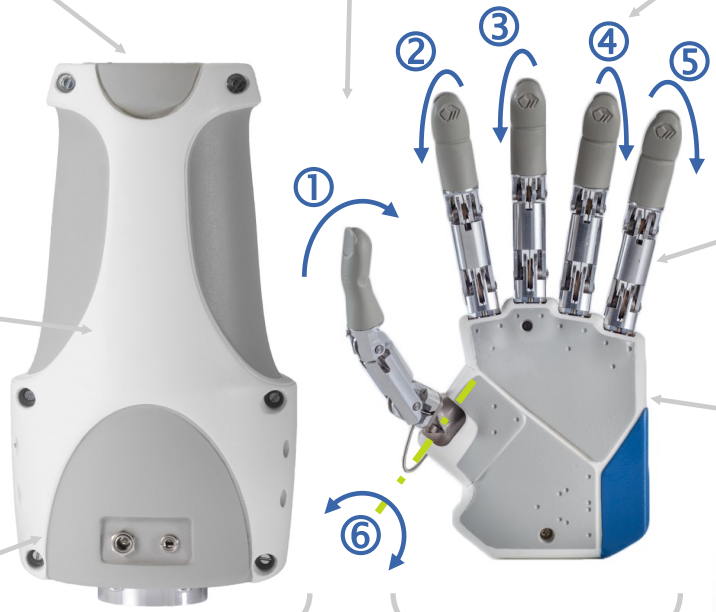
DATA SHEET

STD-FEATURES

Rotating wrist (on request)

Independent f/e of each finger and independent thumb ab/ad

Compliant fingertips



CPU with **1kHz** current and position servo-control loops. Sensor reading delays **< 1ms**

Underactuated self-adaptive fingers with manually adjustable stiffness

Fingers automatically wrap around objects

Non-back-drivable tendon actuation in bowden cable transmission

3-wire communication bus based RS232 protocol (USB compatible)

Grasp-force[1], position and motor current sensors on each finger

(Remote) Actuation Module

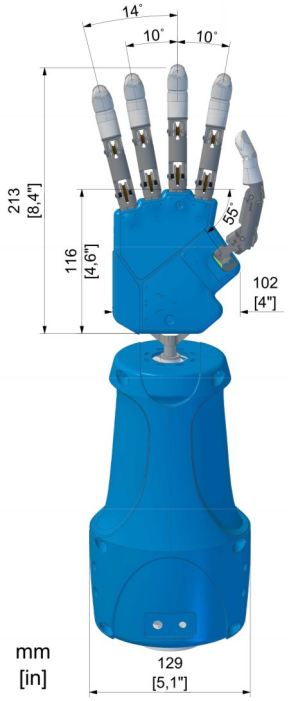
Hand Module

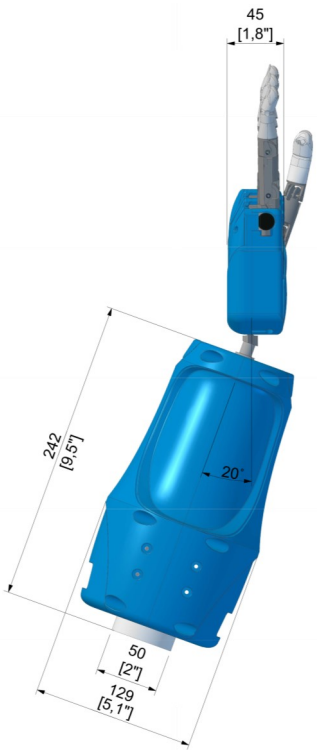
EH1 Specifications

Weight	Hand & actuation	1420 g
Speed	Full flexion from full extension	1 sec
	Full abduction from full adduction	1 sec
Grasp ability	Tendon max active force	40 N
	Cylindrical power grasp	50 N
	Lateral grip	7 N
	Lifting	5 kg
Kinematics	Total fingers	5
	Opposing fingers	1
	Total degrees of freedom	16
	Total hand motors	6
Range of motion	PID - DIP Joint	110 deg
	MCP Joint	90 deg
Actuation	Type	Brushed DC motors with non-back-drivable mechanism (failsafe, object remains secure without power)
	Transmission	Steel tendons (180 N max force) and Bowden cables (max length 2 meters)
Sensory system	Total force sensors[1]	5 (~200 mN res.)
	Total position sensors	6 (180 pulses/deg res.)
	Total current sensors	6 (1 mA res.)
	Total limit switch sensors	12
Embedded servos	Implemented control loops	Position, Current, Force[1] (1kHz) for each finger/motor
	Reading delays	< 1ms
	Security features	Logic electronics with fuses; continuous motor over-current monitoring and shut-off
	High level controller board, implementing automatic grasps (easily programmable by the non-expert user) also available	
Communication	Enjoy the plug and play features!	115200 Baud rate RS232 (USB compatible) controllable by all kind of PC or microcontroller based devices
Power requirements		8 V, 7 A (full strength grip)

Sensory System

	Number and location	Type	Max resolution	Notes
Grasp force[1]	5 thumb, index, middle, and one on RL fingers	Analog	~200 mN (10 bit)	Detect force applied on the tendon, thus gives an objective measure of the grasping force applied by the hand
Position	5 (one on each active axis)	Digital encoder	1000 pulses/deg	Digital encoder to monitor the amount of tendon released proportional to the degree of flexion/extension of the fingers. For thumb abduction axis measures the abduction angle
Motor Current	5 (one on each active axis)	Analog	1 mA (10 bit)	Analog sensors to monitor motor current consumption
End sensors	10 (two on each active axis)	Digital	-	Detect when motor axis is fully flexed or extended





[1] Five grasp-force sensors will soon be included in the EH1 Milano forearm series: one for each finger (flexion/extension)

