High-Depth Signal Tactile Glove Sensor Factsheet

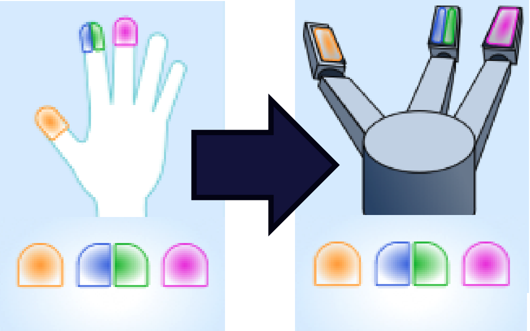
Fact sheet for Glove sensors (GS) and End-Effector sensors (EES)

Imitation Learning for Automation

The glove sensors provide an innovative and accurate way to build a tactile data set. Human operators wear the gloves when performing a task you wish to later automate, such as material transportation, machine tending and gripping complex objects.

The same sensor type set up can be used with most end-effectors to measure, benchmark and train the robot system. You can easily synchronise the data from left and right hand with camera data to create an imitation learning set for both movement and pinch/grip.

The sensors are also proven to be robust and reliable making then ideal for industrial applications where tactile grippers and mechanical hands are constantly changing form due to mechanical bending.



Gloves come with a 2.54mm pitch magnetic pogo pin connector as standard. Rechargeable smart data collector sold separately. One per hand, gloves can be replaced once contaminated, dirty or damaged.

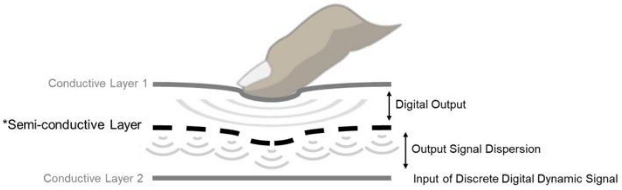
End-Effector sensor kits vary depending on manufacturer. We work with OEMs, system integrators or end-effector suppliers.

Properties

Our first-of-its-kind high-depth signal tactile sensors enable accurate, highly sensitive, real-time measurements.

The patented technology uses a new approach. It uses a semi-conductive layer that provides sensor-level filtering for real-time Voltage differential (V∆) and/or capacitance (C) measurements. Resulting in a multi-modal sensing ability to detect proximity, contact, force and dynamic depth of pressure.

Made fully of fabric, our sensors are lightweight, durable and easy to integrate. They are also fully sustainable and recyclable. The sensors measure accurately even when used on soft surfaces, and subject to bending actions.



Faster cycles | Less damage | Complex tasks

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Performance Data		Comment
Sensing Area	_GS004 20x25 mm , 2 x 8x25mm, 20x30 mm _EED004 20x25 mm , 2 x 8x25mm, 20x30 mm	
Reading	ΔV: 0-5V range (0-1023)	Arduino Serial Monitor readout
Sampling Frequency	88Hz	At 9600 Baud Rate
Material Conductivity	0,7 Ohms / cm	Alternatives available on request
Response Time & Prolonged Pressure Response Time	1.46 ms at 115200 Baud Rate, 3922 Hz, 10-bit ADC. (Can vary based on sampling rate set) Sampling Period (Ts): Ts=1/fs, Tchange= 1/686 Hz, Ts=1/3922 Hz, Ts≈0.0014577 seconds, Ts≈1458 microseconds	Test measures time it takes for values to drop back down to baseline. Including after 45 minutes applied pressure

Mechanical & Environmental Data	
Size	Gloves in medium and large. Various gripper sizes available. Sold as samples to help deternine collection requirements.
Weight	5g per glove
Outer Materials	ANS/AAMi-PB70 AATCC42 (water penetration) AATCC127 (hydrostatic pressure test)
Operating Temperature	-40℃ to +85℃
Relative Humidity	20-100%
Durability of Textile Sensor	Normal operation >50,000 tours ISO12947 compliant
Longevity of Textile Sensor	Normal operation after 10 year ingress/egress impact simulation
Impact	BLUESIGN certified - Lowest possible impact on people and environment
Raw Material	GRS Certified – Global recycled standard
Recyclable	ESG – end of life sensor for secondary use

Electrical Data		Comment
Supply Voltage	As tested	
Power Consumption	1mA-4.8mA	Arduino Nano – Max power consumption based on maximum applied pressure
Analog Outputs	Four per glove	One per sensor
Connectors	2.54mm pitch magnetic pogo pin (glove only)	End Effector connections vary per make Rechargable smart data collector avaiable, one per glove

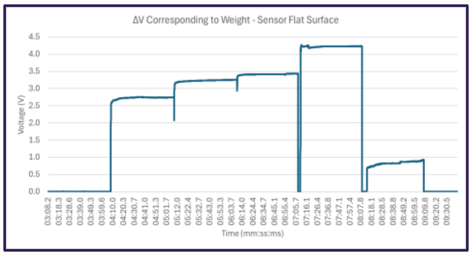
Multi-modal Properties

Below are two graphs demonstrating the same sensor using raw signals of different measurement methods (ΔV *top graph* and Capacitance *bottom graph*).

Direct ΔV measurement with 1KΩ pull-down resistor

Applied force by applying: 0.5kg, 1kg, 1.5kg, 12kg, 50g

High level of sensitivity and immediate recovery after heavy weight



Capacitance (t∝RC) Measurement with 1MΩ resistor

Proximity and contact with sensor.