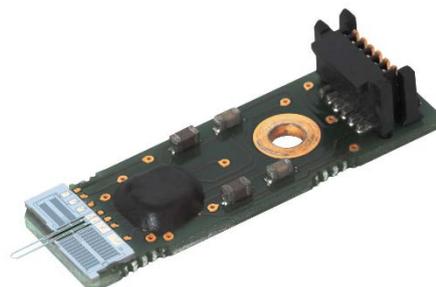# FT-G102
Force Sensing Microgripper

Overview

The Femtotools FT-G102 Force Sensing Microgripper is designed to handle micro- and nanoobjects. The initial opening of the gripper arms is 100μm. The opening can be controlled with nano-meter precision. The maximum stroke is 100μm (fully closed). Due to the electrostatic actuation principle, there is no heating of the gripper arms. The FT-G102 features an integrated force sensor to measure the gripping force. Force feedback greatly enhances the efficiency and reliability of automated micro-handling systems and assembly processes.

Application Areas

- High-precision, pick-and-place operations
- Microassembly, Nanoassembly
- Micro-object sorting

- Sample preparation
- Force-controlled handling of sensitive objects
- SEM in-situ handling and assembly

Performance Characteristics (typical values)

Initial (maximum) gripper arm opening [μm]	100
Stroke [μm]	100
Maximum actuation voltage [V]	170
Sensor gain[1] [μN/V, mg/V]	50, 5
Sensor output signal [V]	0-5
Sensor output voltage at zero load [V]	2.25
Sensor power supply voltage [V]	5
Sensor resolution at 10Hz[2] [μN, mg]	0.005, 0.0005

[1]) Typical value only! For the exact value of the individual sensor refer to the sensor calibration sheet
[2]) Standard deviation of the noise level measured with the FT-GC01

- Handle sub-millimeter objects with nanometer precision
- High-resolution electrostatic actuation
- Highly precise fabricated gripper dimensions for the handling of micro- and nanoscale samples
- No heating of gripper arms
- No performance degradation over more than 100 million load cycles
- High-resolution gripping force measurement (sensors are individually calibrated)
- Handling of fragile samples, detection of successful gripping, object size and mechanical properties
- The gripper arms are insulated from the actuator and can be set to any electrical potential
- Air, liquid (sensor probe) and vacuum compatible (application inside a SEM)

Recommended Microhandling System

- FT-GS1000 Microassembler
- FT-RS1000 Microrobotic System

- FT-GS5000 Microassembly System
- FT-RS5000 Microrobotic Station

Electrical Interface

For interfacing the FT-G Microgrippers a FemtoTools measurement system or controller is highly recommended. However, OEM applications may require the integration into an existing system. The FT-G Microgrippers require a high voltage power supply. A tunable voltage range up to 170V is recommended. Due to the electrostatic actuation principle virtually no current is flowing.

The FT-G102 Force Sensing Microgrippers additionally provide gripping force feedback using the integrated force sensor. To readout the gripping force a 5V DC power supply should be connected to Pin 1 and Pin 2. The output voltage signal is measured differentially between pin3 and pin1.

The gripping force is calculated by the equation $F = \text{Sensor Gain} * (V_{out} - V_{out,0})$, where F is the gripping force, $V_{out,0}$ is the output voltage at zero load and V_{out} is the output voltage as the load is applied.

Connector Pinout

Pin1: Sensor supply voltage low (GND)
Pin2: Sensor supply voltage high (5V)
Pin3: Sensor output voltage (V_{out})
Pin4: Gripper arm potential (GND)
Pin5: Actuation voltage low, A- (GND)
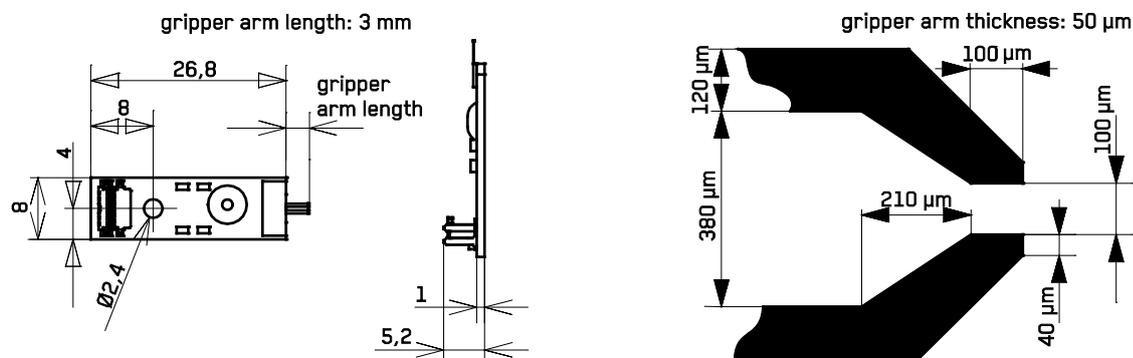Pin6: Actuation voltage high, A+ (0-170V)
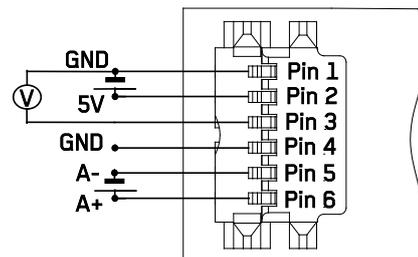
Connector type:
6-pin Erni microstack connector 114711, pitch 0.8mm, hermaphroditic connector mates with itself

Dimensions

Dimensions in mm unless otherwise specified

Important Safety Guidelines

Splinter Hazard: If silicon MEMS devices shatter, a large number of small splinters may be generated. Therefore, wear protection goggles when working with force sensors/grippers. Use the equipment at your own risk. If you have questions related to safety, please contact FemtoTools or our distributors for more information.

Environmental Management and WEEE Recycling Program

FemtoTools is committed to designing and manufacturing products in an environmentally responsible manner. FemtoTools recognizes that eliminating certain hazardous substances from our products is beneficial not only for the environment but also to FemtoTools customers. Please return all FemtoTools products which are at the end of their life cycle, defective or unused back to FemtoTools for recycling. The Waste Electric and Electronic Equipment (WEEE) will be fed to our Recycling Program.