

# Intelligent Edge Grippers

## Features Overview

### Standard Features

#### Soft-touch Mechanism

The patented soft-touch mechanism sets apart MultiMetrixs Intelligent Edge Grippers (IEGs) from its competitors'. This unique feature means that gripping tips do not shoot on the wafer, but gently touch (hug) the wafer edge. The slightest contact between gripper tips and the wafer edge sends a signal to the device control mechanism, which in turn calculates and applies the applicable pre-programmed gripping force. Regardless of wafer diameter deviations, this feature prevents particle generation and enables secure hold with constant gripping force.

#### Programmable Gripping Force

The patented programmable gripping force feature enables specification of the desirable gripping force. With its closed loop force-feedback, the mechanism prevents wafer stress while holding the wafer gently and securely. This feature can help achieve higher throughput, by allowing optimization of gripping force while factoring in variables such as robot speed and wafer stiffness.

#### Motion Control and Communication

For precise motion control, MultiMetrixs Intelligent Edge Grippers (IEGs) utilize electrical step motors and drive-box enclosed miniature controllers. The electrical step motors enable control of gripping force, operation of multiple wafer grippers on same robotic arm, and status definition of each individual gripper. The electrical drives used in IEGs are significantly more reliable in comparison with pneumatic ones; they are cleaner in operation and do not require an exhaust line. IEG can communicate with host robot via RS-232, RS-484, and CAN or as specified by the customer. In most cases, including multiple wafer edge grippers, IEG requires only 4-6 electrical wires.

#### Safe Lock

In case of EMO or power disconnect, the safe lock feature will automatically lock the gripping prisms in place holding the wafer securely. After the power is resumed, the mechanism verifies wafer presence preventing accidental wafer drop.

#### Rotating Distal Gripping Tips

Rotating distal gripping tips is a feature that allows for random access of 200mm wafers into small pitch cassette, boat or any narrow gates. In 300mm edge grippers this is an optional feature.

#### Modular Design

IEG modular design enables MultiMetrixs to manufacture edge gripper with superb reliability qualities. Additionally, the modular design reduces our manufacturing and testing time, enabling you to receive your custom-designed IEGs within two months of product order. To date, MultiMetrixs has built and successfully integrated over a dozen designs into customers' wafer handling solutions.

### Optional Features

#### Self-centering

MultiMetrixs IEGs can be configured to include a self-centering mechanism, which simultaneously moves the three gripping tips toward wafer center for holding, or away from wafer center releasing. This unique feature greatly reduces the numbers of particles generated during picking and placing of wafers, as it prevents them from sliding in a cassette or boat. In addition, the self-centering mechanism dramatically improves wafer placement accuracy, reduces wafer positioning time and allows for wafer misalignment of up to 5 mm.

#### Top-approach

IEG can be configured to lift wafers from the top, while holding the wafer 0.5mm from its edge. This feature allows simplification of wafer handling in some processes (e.g. picking of hot wafer with increased sagging). As well, it eliminates necessity of lifting pins on OEM equipment.

#### Thru-beam Mapping

MultiMetrixs has developed laser Class 1 thru-beam sensors that are easily integrated in its family of intelligent grippers. U-shape and Spade-type IEGs can be equipped with thru-beam for mapping in the FOUF or cassette. The top-approach IEG can be equipped with thru-beam to define wafer's elevation for safe pick.

#### Rotating Distal Gripping Tips

Rotating distal gripping tips can be incorporated into any 300 mm edge gripper to allow random access into small pitch cassette, boat or any narrow gates.

#### IEG Leveling Posts and Adapter Plate

For simple mounting and horizontal leveling of grippers, MultiMetrixs offers a variety of leveling posts and custom adapter plates tailored for a specific application and host robot's mounting bracket.



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## Advantages of Electrically Actuated Edge Grippers

### Edge Gripper Comparison Table

Electrical Edge Gripper	Pneumatic Edge Gripper
Requires only electrical wires (6 max), simplifies robot and equipment design.	Requires air line, exhaust line and electrical wires to send conformation signals.
Implemented active gripping force.	Active gripping force control is difficult and expensive to implement.
Programmable gripping force available via RS-232, RS-485 or Ethernet. Feature is important for handling thin and thick wafers with the same device.	Impossible to program gripping force.
Wafers with variable diameter, ranging from 298mm to 302mm, are held with the programmed constant gripping force.	Impossible to hold wafers with different outside diameter with the constant force, which could result in wafer damage due to overstress or unsecured holding.
Allows implementing of soft-touch mechanism, thus practically eliminating generation of particles and stress.	Wafers grip via spring with noticeable hit that could cause a stress and/or particle generation. Imposable to profile speed of plunger.
Sealed mechanism/control box allows usage in any type of harsh environment and vacuum.	Not reliable in harsh environment.
Works with any robot. Tested with 6 coordinate robot, with 5G acceleration.	Not suitable for high speed 4+ coordinate robots.
Certified for cleanness ISO Class 1.	Hard and expensive to achieve cleanness ISO Class 1.

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