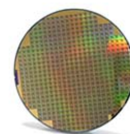
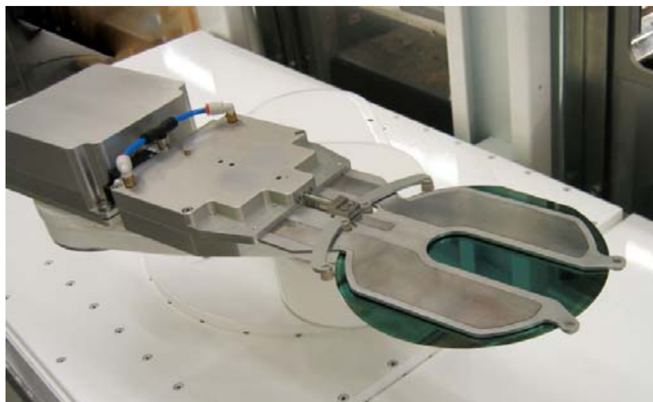
Advanced Design Engineering & Manufacturing

ADEM

Intelligent Vortex End Effector

For Warped & Thin Wafer Handling





- Handles **ultra-thin** (50~700µm, possible warped) and standard wafers of similar sizes with a single device
- Picks "**potato-chip**" & warped wafers with offsets up to ±4mm and warpage and sag up to 5 mm
- **Fail-safe** mechanism; available in both top- and bottom-pick

How does the Vortex End Effector work for you?

This vortex end-effector provides superior handling of all types of wafers, including thin-wafers, with no contact between the wafer and the end-effector.

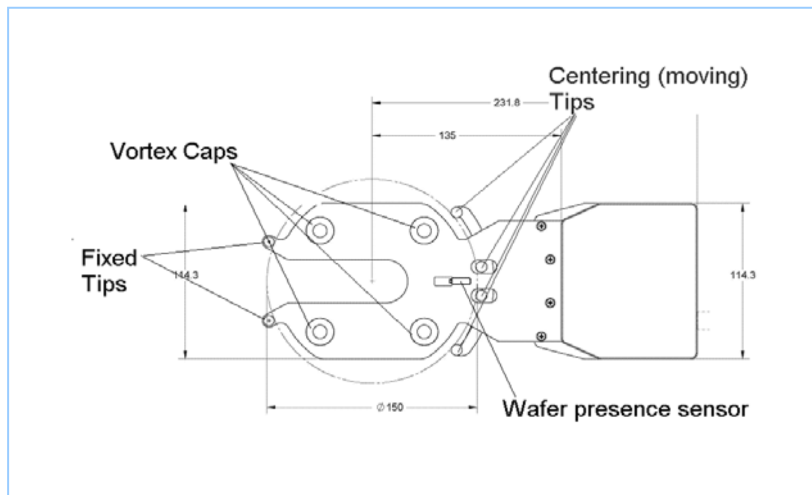
This vortex type end-effector is contactless: the compressed air arrives in a vortex cup tangent to the circumference and creates an area of very low pressure in the center of the cup. The low pressure provides a lifting force similar to a vacuum section cup. At the same time, air needs a space to escape and creates gap between the wafer and edge of the cup.
The exiting laminar air flow prevents the wafer from contacting the blade while the low pressure at the center of the cups holding the wafer in place.

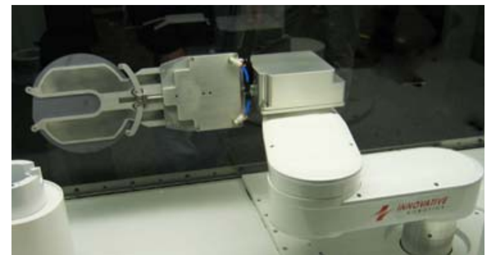
The gripper's minimal airflow requirements and patented Contactless Intelligent Edge Gripping (CIEG) soft-touch mechanism clearly distinguish it from other wafer handling products.

The minimal required airflow means that the air exhaust creates no more disturbance in the working environment than is created by the robot's own motion.

By integrating our patented CIEG soft-touch mechanism, the end effector overcomes any potential problems associated with thin wafer handling such as sideward shifting or rotation, while sparing the wafer the harsh handling of a pneumatic edge grip.

An optional optical wafer presence sensor, integrated within the end-effector, allows the robot to activate the soft touch mechanism at precisely the right time. The grip mechanism lets the robot know that the grip was successful, and can report the wafer's actual diameter for improved placement precision.





Above: Vortex cups hold the wafer firmly without contact with blade, and the wafer gets flattened

- Modular design allows use of common a drive box for 150mm & 200mm wafers. Blade replacement takes only a few minutes.
- Serial communication with the robot allows the following:
  - Adjustment of airflow to accommodate different wafer sizes and thicknesses
  - Activation of air flow at wafer detection by presence sensor
  - Active control of the wafer presence sensor can eliminate the need for a mapper
  - Measuring of wafer diameter for accurate aligning
  - Easy teaching and flexibility of operation

TECHNICAL SPECIFICATION

Gripper blade thickness	3.5 mm (allows the use of standard cassettes with 10mm pitch)
Wafer spacing to end effector:	~100µm
Grip time/release time:	1.2 sec/ 0.5 sec
Interface requirements: Power: Communication via:	 12 V or 24 V, 350mW I/O (4 to 6 wires total), RS-232, RS-485, or CAN
Conpressed air	60 PSI
Application	▪ Loading and unloading of thin wafers in FOUP or cassettes ▪ Thin-wafer placement and pick-up on chuck and aligner stations ▪ Single wafer transfer between process stations ▪ Solar cell and other thin substrate handling ▪ Reticle handling

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