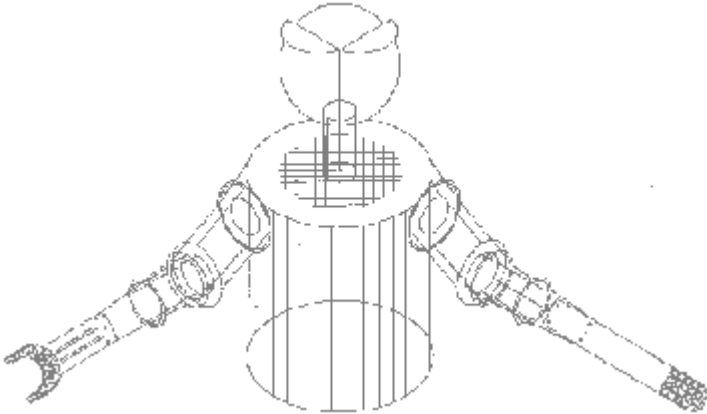


**END EFFECTORS, INC.**

**WWW.FJAIN.COM**

**SANTA CLARA, CALIFORNIA**



*"Giving Robotics A Hand"*



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## Table of Contents

1. Introduction
2. Historical
3. Guarantee

### **Ceramic Vacuum Clamping End-Effectors**

4. Vacuum Clamping Factors
5. Ceramic End-Effector Product Line
6. SC Series - Standard Ceramic Designs
7. CC Series - Custom Ceramic Designs

### **Pneumo Mechanical End-Effectors**

8. Talon End-Effector Product Line
9. Talon I
10. Talon II
11. Talon III
12. Talon IV
13. Talon V
14. Talon VI

### **End-Effectors Accessories**

15. LDP-10 - Load Distribution Plate
16. CMA series - Standard Mounting Adapters
17. TMA Series - Standard Mounting Adapters
18. CEA Series - Custom Mounting Adapters
19. FSC-10 Fail-Safe Clamp - Vacuum
20. TWA-10 Series - Talon Wafer Aligner
21. WTP-10 Series - Wafer Transport, Fail-Safe
22. MMS-70 Mini Micro-Switch
23. EEB-10 - The End-Effector Bible

### **Price Lists and Reference Information**

24. Price Lists
25. End-Effector Comparison Chart
26. Talon End-Effector Operating Instructions
27. TMA/CMA Mounting Instructions



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## **End-Effectors, Inc.**

### ***Introduction***

This catalog has been prepared as an informational tool. Its aim is to provide both general information on end-effectors as well as specific information to assist the user of robotic devices in the selection of end-effectors. We have attempted to provide all the information required to understand the role of each end-effector design. However should additional information be needed, please call us and we will attempt to answer any remaining questions.

The unique processes and designs developed by End-Effectors Inc., have made the use of ceramic and pneumo-mechanical end-effectors economically feasible for manufacturers of automated process equipment. Our unique processes allow the fabrication of parts which were not previously producible. In addition to the strength, rigidity, purity, wear resistance, high temperature operation and chemical resistance of ceramic, an additional factor of cost to purchase and operate is available. This combination of properties and techniques can provide solutions for many problems which were here-to-fore unsolvable, now solutions are available and implementable. Short of stating ceramic is "the" material of choice for end-effector construction, it is an excellent choice in many applications and most in the semiconductor industry..

#### The Semiconductor Industry:

The evolution of robotics in the semiconductor industry has highlighted two issues as major concerns: 1) damage to the active circuits located on the top (front) side of a wafer, and 2) the creation of particle contaminants when handling.

The immediate fixes were the restriction of contact to the top surface and the modification of contact material for contacting the back surface. The solutions were interim and now final solutions are available and implementable.

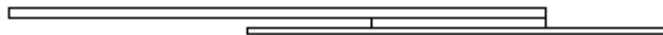
Currently, products are available which can grip on the back of wafers, the edge of wafers, the sides of wafers and without touching the wafer at all, other than for location restrength (not holding). The creation of scratches requires contact and motion - eliminate contact and you eliminate damage to the substrate and the creation of particulates.

The current trend since the year 2000, has been the use of backside clamping in test and assembly, while the use of edge and side gripping has been predominant in the fab areas. With the exception of ultra-thin wafer, the foregoing is still true today. There are always special requirements which will demand changes to materials and methods; these are responded to on a project by project basis. Please see the next page for capture methods.

## CAPTURE METHODS

1. TOP

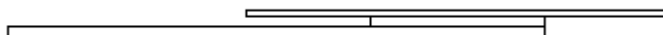
FRONT SIDE  
VACUUM CAPTURE



Uses vacuum and “O” ring seal - non critical surface contact requirement

2. BOTTOM

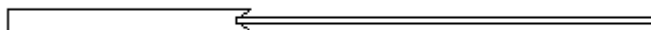
BACK SIDE  
VACUUM CAPTURE



Uses vacuum and smooth sealing surface - critical surface contact for top, not backside.

3. EDGE

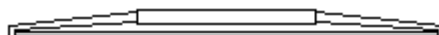
EDGE-GRIPPING  
OF PERIPHERY



Uses pressure and minimal contact area - very critical surfaces top and bottom, plus low particle count.

4. SIDE

SIDE-GRIPPING  
(NO SURFACE CONTACT)



No top or bottom surface contact, minimal gripping area - very critical surfaces and critical particle count.

5. NON-CONTACT

NON-CONTACT  
WAFER CAPTURE



Part is suspended by differential pressure - critical surfaces and/or fragile structure, non-critical positioning.

6. COMBINATION



Non-contact capture and side clamping for positioning are shown - several combinations can exist including spraying for surface cleaning or prep.



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## End-Effectors, Inc. *Historical*

Begun in 1994 for the specific purpose of supplying ceramic end-effectors under a pending patent, EEI has become the pre-eminent world wide supplier of ceramic and pneumatically actuated end-effectors.

EEI has developed and supplied numerous complex ceramic products using a proprietary process which permits the assembly of components that continually operate at temperatures in excess of 500°C. Ceramic end-effectors are produced using a proprietary high temperature assembly technique and are designed for high strength and rigidity. End-effectors can be supplied with vacuum or mechanical clamping; vacuum, electro-mechanical, capacitive or optical sensing; electro-static discharge and optional heating or cooling systems. Most ceramic designs are available as *fail-safe* systems; a fact which has added to the popularity of our products and the growth of our business.

EEI has supplied components to fit all of the major manufacturers of robots and continues to design products for OEM as well as “after-market” applications. Our products are used by most of the major semiconductor companies throughout the world. EEI ceramic fabrication technology permits *any* configuration to be fabricated regardless of complexity.

In addition to vacuum clamping end-effectors, EEI designed and patented a series of pneumatically actuated edge gripping end-effectors. Our patented end-effectors exceed SEMI® specifications for holding semiconductor wafers outside the non-intrusion area. The Talon series of end-effector products has become the world standard for edge gripping of semiconductor wafers and has numerous applications in other areas.

Adding to our vacuum clamping end-effectors and edge-gripping end-effectors, are our patent pending side-gripping and non-contact end-effectors. EEI's product line is the most complete, high tech line of robotic handling devices in the world. We welcome your comments and inquiries.

All EEI custom designed products are engineered, manufactured and sold by company personnel located at our Santa Clara facilities. Standard products are shipped from stock in most cases, see price list for products which are stocked. All custom product development is done on premises with marketing research and new product development conducted by FJA Industries, Inc.



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## **End-Effectors, Inc.**

We refer you to the literature that follows, confident that you will find each product reliable in application, exhibiting superior workmanship, and consisting of only the finest quality materials. To this end we here state our attitude concerning equipment guarantees.

### **GUARANTEE**

End-Effectors, Inc. warrants and guarantees all its products to have the functional capacity and performance characteristics stated in the current technical data issued on or with the product. We further unconditionally guarantee all materials and workmanship for a period of one year from the date of purchase, or for the specified life. Should malfunctions occur during the term of this Guarantee, the equipment will be repaired or replaced without charge to the customer when it is determined that the cause of such malfunction lies with the manufacturer and was not a result of misuse. End-Effectors, Inc. reserves the right to examine and determine cause of equipment failure either through its representatives or at its engineering offices. The cost, if any, of shipping and examination will be born by End-Effectors, Inc. when the failure lies in manufacture or design; however, when failure cause lies in misuse, normal wear, or improper care and maintenance, all costs incurred to repair (including shipping, examination, replacement parts, labor, etc.) will be billed to the customer. Our obligation as stated above applies to all End-Effector, Inc. produced equipment. Any and all components produced by other manufacturers and contained within our equipment shall carry the manufacturer's guarantee which will be enforced by End-Effectors, Inc. and in no case can the guarantee term be shorter than thirty days or longer than one year. End-Effectors, Inc., or its offices, representatives, distributors, affiliates, etc., are not liable for consequential damages arising from the use of any components or equipment supplied by or through us or our associates. There are no other guarantees, warranties or obligations implied, suggested or made, other than here stated.

Respectfully,

The Management