



## MagnaTran® Vacuum Robotics

*The Industry Standard for  
Vacuum Robot Performance,  
Reliability and Productivity*

BROOKS AUTOMATION  
MAGNATRAN 8



# *MagnaTran® Vacuum Robots: The Industry Standard for Vacuum Robot Performance and Reliability*



Brooks Automation offers the industry's most advanced and reliable robots for operation in vacuum and isolation environments. Setting the industry standard for vacuum robot automation, Brooks' MagnaTran® 7 and MagnTran® 8 robots deliver unparalleled reliability, repeatability, and throughput. These state-of-the-art vacuum robots, designed specifically for factory automation in semiconductor wafer processing, flat panel display production, and other complex manufacturing environments, enable OEMs to build proven reliability and performance into their automation platforms.

Why is Brooks Automation the leading provider of vacuum handling robots and modules for complex vacuum manufacturing environments? Our unique vacuum robot technology sets us apart. Featuring patented technology that delivers unprecedented levels of reliability and performance, MagnaTran robots have enabled Brooks to capture an impressive 80% share of the vacuum robot market. These active patents include:

- *Static Vacuum Seals* that allow for high vacuum operation and unlimited rotation
- *Direct Drive Technology* with no dynamic seals, drive belts or cables
- *Concentric Drive Dual SCARA Arm* with a high reach/containment ratio

Discover why OEMs across the globe have designed Brooks Automation's MagnaTran vacuum robots into their automation platforms to ensure tool productivity, reliability, and standards compliance.

BROOKS AUTOMATION  
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# Brooks Automation: The Leader in Vacuum Robot Technology

The direct drive vacuum robot technology has best in class reliability by reducing the number of parts and eliminating the need for dynamic seals for vacuum isolation. Repeatability and throughput is also vastly improved by virtually eliminating motion hysteresis, reducing vibration to near imperceptible amounts and by allowing unlimited radial rotational performance. Additionally, reducing frictional wear points, improves particulate performance beyond Semi Standard ISO Class 1. Ultra-high vacuum performance is also enhanced through the elimination of ferro-fluidic vacuum seal technology.

With an installed base in excess of 7,000 units world wide, and a proven MCBF  $\geq 11$  million cycles, the MagnaTran robot is the world standard in radial cluster tool vacuum robot technology.

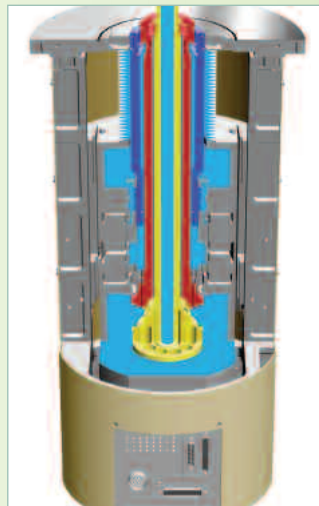
## Direct Drive Vacuum Robot

### No Dynamic Vacuum Seals

- No Seal Friction
- No Hysteresis
- UHV Capable
- Base pressure  $5 \times 10^{-9}$  torr

### Highest Reliability

- > 11 Million MCBF
- Fewest Moving Parts
- Reduced Vibration
- No Maintenance



### Highest Throughput Available

- Infinite Rotation
- Direct Valve Control
- Time Optimized Trajectory
- Time Optimal Path

### Best Long-Term Wafer Positioning

- No Re-Teaching
- No Seal Friction
- No Hysteresis
- Direct Encoding

### High Temperature Tolerant

**Patented Vacuum Robot Drive Configuration**  
(Four Patents Issued)

# MagnaTran<sup>®</sup> Vacuum Robots

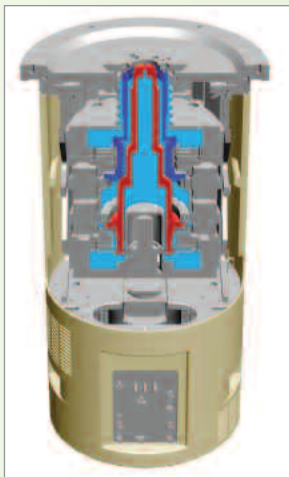
## MagnaTran<sup>®</sup> 7

Since 1997, the MagnaTran 7 family of direct drive vacuum robots have been the industry leaders for performance and reliability in semiconductor handling applications. With over 6,500 units shipped, the MagnaTran 7, with >11 million MCBF, continues to provide proven reliable performance in the most advanced process equipment.

As the pioneer in vacuum robotics, Brooks Automation has a long history of innovation. Representing the 7th generation of development for in-vacuum wafer handling technology, the MagnaTran 7 provides the highest reliability,

accuracy, and cleanliness as a result of its patented drive design that has no dynamic seals, and direct coupling between the drive motors and the end effectors.

The MagnaTran 7 is available with a standard 35mm vertical (Z) axis span, or optional 135mm span. High performance arm configurations include: *SCARA* for general semiconductor applications; *Frogleg* for lower throughput applications; *BiSymmetrik*<sup>®</sup> with dual end effectors for higher throughput applications; and *Leapfrog*<sup>™</sup> with dual, same-side extension end effectors for highest throughput applications.



### MAG 7 3-Axis Drive

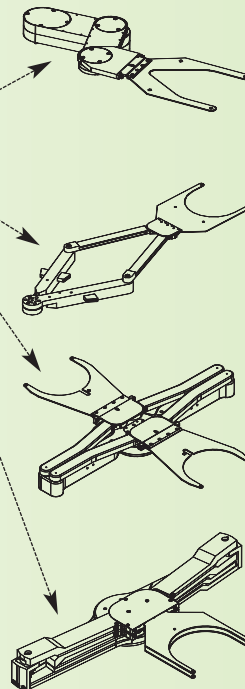
- Internal Controls (Standard)
- EtherNet or RS232 Interface



External Controls (Optional)

### Z Span Options:

- 35mm
- 135mm



### ARM OPTIONS:

#### SCARA Arm

- Typical Reach: 795 mm
- Containment Radius: 310 mm
- Swap Time: 14 sec

#### Frogleg Arm

- Typical Reach: 954 mm
- Containment Radius: 416 mm
- Swap Time: 14 sec

#### BiSymmetrik Arm

- Typical Reach: 954 mm
- Containment Radius: 434 mm
- Swap Time: 9 sec

#### Leapfrog Arm

- Typical Reach: 975 mm
- Containment Radius: 431 mm
- Swap Time: 7 sec

Actual Swap Times may Vary

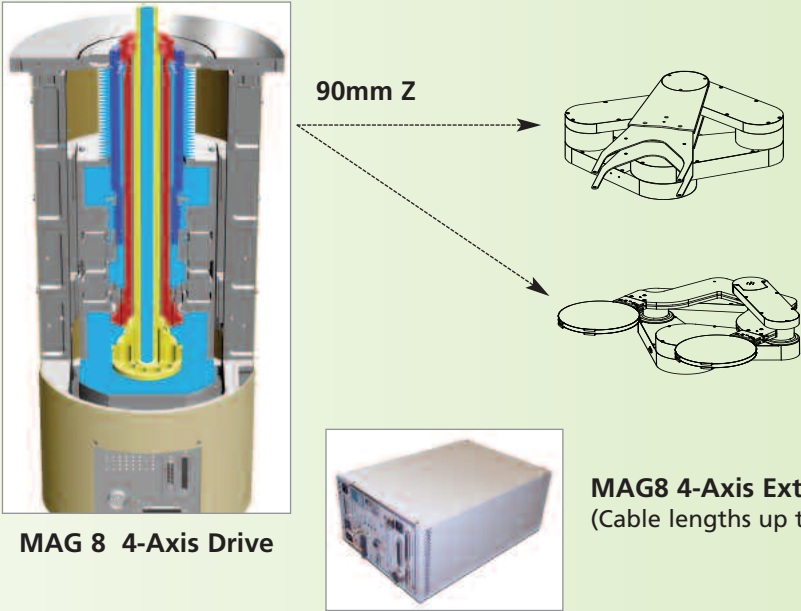
## MagnaTran<sup>®</sup> 8

The MagnaTran 8 family of vacuum robots extends the existing benefits of MagnaTran 7's proven, direct drive technology to a higher payload capacity 4-Axis hot swap robotics platform. MagnaTran 8 provides the highest in vacuum wafer transfer throughput, highest proven reliability, and lowest particles to enable higher tool productivity and wafer throughput.

MagnaTran's direct magnetic drive technology improves robot reliability and enables higher in-vacuum wafer transfer throughput by eliminating the need for a dynamic seal to provide vacuum isolation and reducing wafer exchange times. Eliminating the need for a dynamic seal lowers friction, wear, tear and torque resulting in higher reliability. The direct drive servo also eliminates

stepper motors and transmission coupling mechanisms which reduces vibration and particles and increases positional repeatability and wafer placement accuracy.

Brooks' dual arm MagnaTran 8 Radius vacuum robot incorporates proven SCARA arm and high capacity direct drive technologies to provide sub 4 second fast wafer swaps within a small containment area. Similarly, the MagnaTran 8 QuadraFly vacuum transfer robot deploys a dual SCARA arm with dual end effectors and a high capacity tri-axial drive based on Brooks Automations' patented drive technology to enable the simultaneous exchange of up to 4 wafers in vacuum within a small containment area.



**MAG 8 4-Axis Drive**

90mm Z

**ARM OPTIONS:**

**Radius Arm**

- Typical Reach: 840 mm
- Containment Radius: 316 mm
- Swap Time: Typically Less Than 4.0 Seconds for Single Wafer Exchange

**Quadra-Fly Arm**

- Typical Reach: 954 mm
- Containment Radius: 416 mm
- Swap Time: Typically Less Than 3.5 Seconds for Simultaneous Dual Wafer Exchange

**MAG8 4-Axis External Controller**  
(Cable lengths up to 15 feet)

*Actual Swap Times may Vary*

## MagnaTran® Applications Overview

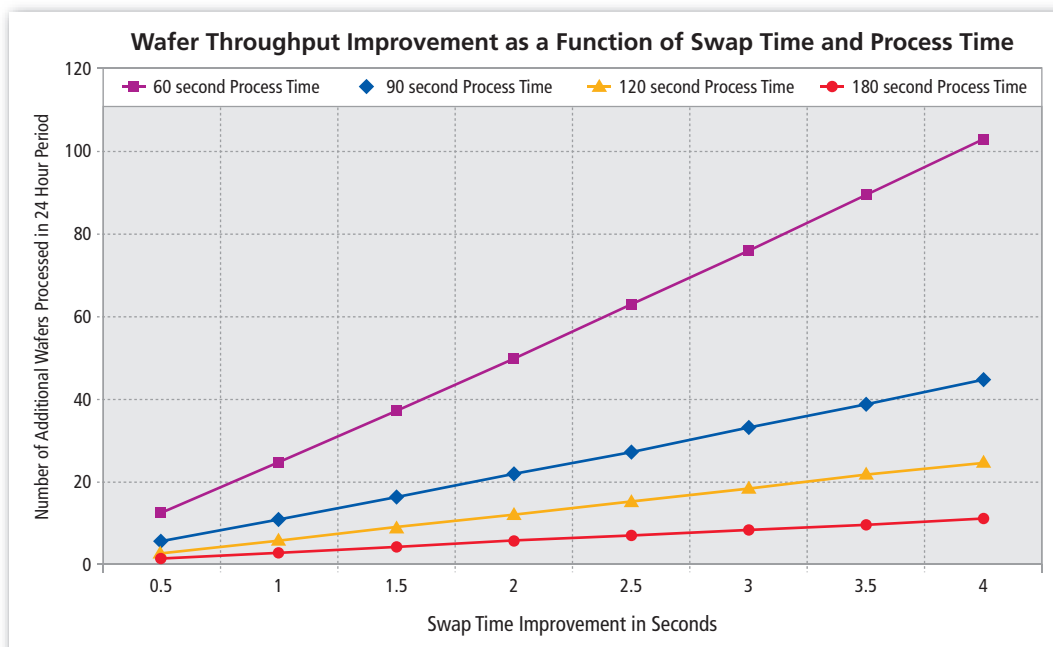
As wafer manufacturing tools continue to strive for higher throughput and reliability, Brooks Automation responds again with market leading 4 axis direct drive radial vacuum robot technology. By enhancing and minimizing swap time, valuable seconds can be cut from the wafer transfer process. This is time during which a process reactor is sitting idle, waiting for a wafer to process. The MagnaTran 8 represents state of the art 4 axis technology, presenting the fastest swap time and highest wafer throughput of any radial vacuum robot in the world today.

Most radial vacuum robots today rotate at comparable speeds, limited by the centrifugal acceleration imparted on the wafer. The Radius robot improves rotational speed by up to 50% by positioning the wafer closer to the center of the axis of rotation, reducing the centrifugal forces imparted to the

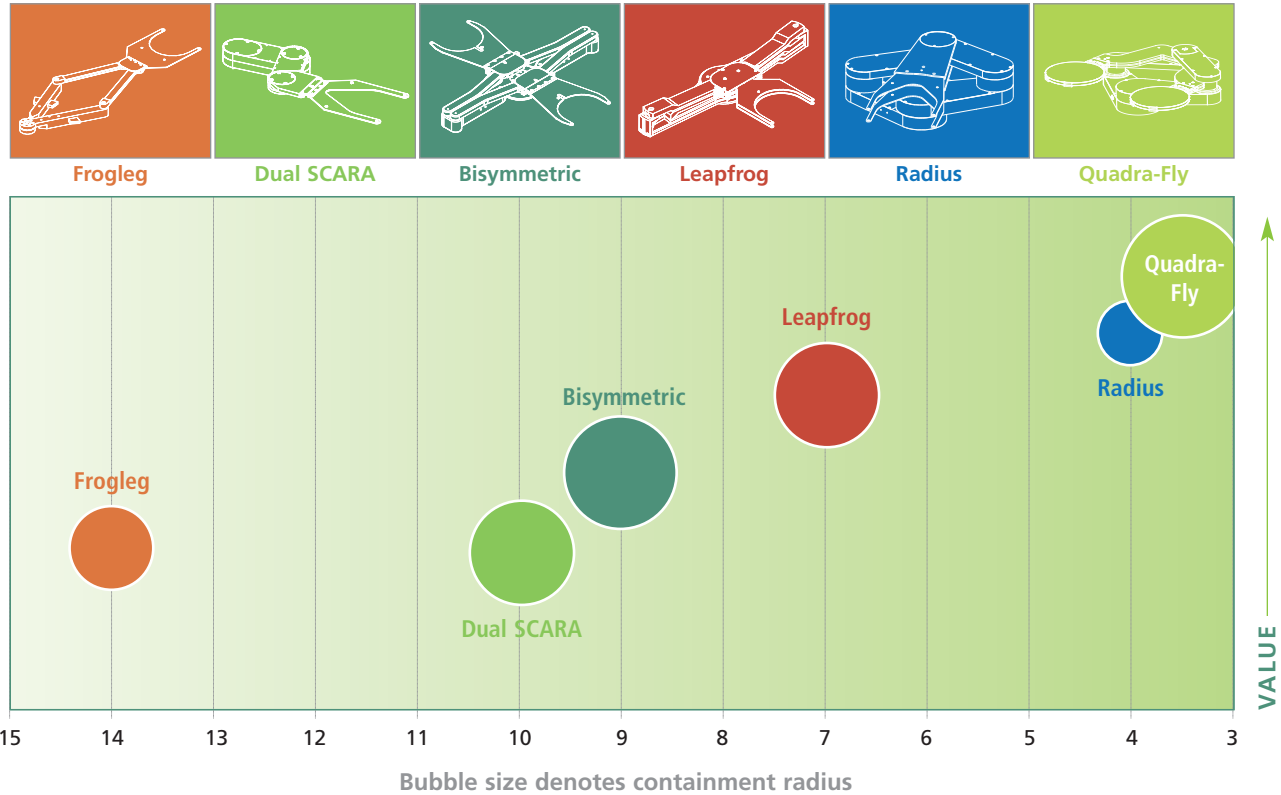
wafer. Wafer swap time is also dramatically improved through the addition of second radial axis, providing two radial axis of motion, a single theta axis and a single Z axis. This four axis of motion combination results in the most advanced vacuum robot in the world; Radius.

### How important is swap time?

Consider a wafer manufacturing process that requires 60 seconds to process a wafer. The MagnaTran 8 robot can, in many cases, save 2 or more seconds on swap time. This equates to processing an additional 100 wafers in a given 24 hour period. Even a process that takes 180 seconds can see a throughput improvement of 10 wafers in the same 24 hour period. At upwards of \$150,000 per wafer this is a true productivity enhancement. (chart below)



# MagnaTran® Product Performance



	MAG7	MAG7	MAG7	MAG7	MAG8	MAG8
Arm Type	Frogleg**	Dual SCARA	Bisymmetric	Leapfrog	Radius	Quadra-Fly
Nuber of Axis	3	3	3	3	4	4
Maximum Extension	954mm	958mm	954mm	975mm	840mm	975mm
Maximum Z	35mm	35mm	35mm	35mm	90mm	90mm
Containment Radius	416mm	431mm	434mm	431mm	316mm	450mm
Swap Time (sec)	N/A	10.0 sec.	9.0 sec.	7.0 sec.	<4.0 sec.	<7.0 sec. (<3.5)
Reach/Containment	2.3	2.2	2.2	2.3	2.7	2.2
Capacity/EE (Kg)	1.0	1.0	1.0	1.0	3.0	3.0
Mounting Diameter (mm)	9.5"	9.5"	9.5"	9.5"	12"	12"
Drive Weight (Kg)	35	35	35	35	70	70
Drive Height (mm)	459	459	459	459	629	629
Controls Mounting	Internal	Internal	Internal	Internal	External	External
Demonstrated MCBF	>11 M	>11 M	>11 M	>11 M	>12.5 M	>12.5 M

# Brooks Automation: *Creating Manufacturing Efficiency. Accelerating Your Profit.*<sup>™</sup>

As semiconductor manufacturers and OEM tool suppliers work to manage rapid change and growing complexity, they rely on Brooks Automation for innovative products and world-class services to help them realize maximum return on their automation investment. Since our inception, Brooks has made quality and innovation top priorities. We leverage the latest enabling technology—from web-based spare-parts management and e-diagnostics to online knowledge management systems—to keep our solutions operating at peak performance. Brooks is ISO 9001 certified to ensure the highest levels of product quality and value.

Leveraging our global service network, Brooks is ready and able to respond to customer needs, ensuring maximum tool uptime. We offer hardware installation and implementation services—from stand-alone equipment installation and qualification to implementation of complex automated systems containing multiple Brooks products—as well as comprehensive technical support, field service, and systems integration. Brooks' GUTS<sup>®</sup> (Guaranteed Up-Time Support) rapid response program is broadly recognized for delivering unsurpassed responsiveness to customer problems whenever and wherever they may occur. Every call to our GUTS line is answered by a capable, empowered Brooks Service professional trained to diagnose and coordinate a response from first call to action plan within 59 minutes or less—guaranteed.

To anticipate customer needs, Brooks is actively involved in the definition and ongoing development of industry standards through its work on SEMI, SEMATECH, and 300mm standards committees. At the same time, we continue to build new levels of innovation and reliability into our products and invest in our global service infrastructure to make sure that we consistently exceed customer expectations for excellence and value.



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