



RADIALLY-COMPLIANT DEBURRING TOOLS

Product Description



ATI's line of Radially-Compliant (RC) Deburring Tools, also known as Flexdebur™, are robust, high-speed and lightweight air turbine-driven deburring units for deburring aluminum, plastic, steel, etc. with a robot or CNC machine. The RC Deburring Tool is especially suited for removal of parting lines and flash from parts.

However, its flexible design allows it to be used in a wide variety of applications.

The RC's pneumatically controlled, articulated design allows the cutting bit to follow the part profile and compensate for surface irregularities, allowing high feed rates with uniform quality in any orientation. The tool also requires no oil, allowing clean exhaust air to be vented directly into the work environment.

Compliance is supported by air pressure applied to the shaft of the unit and is used to perform consistent deburring on irregular part patterns. The motor's internal governor maintains high spindle speeds for optimum surface finish. The tools offer up to ± 9 mm of compliance. The RC Deburring Tool also utilizes standard industrial tungsten-carbide bits which allows for adaptation to changing assembly lines and part requirements.

Features

Designed for removal of parting lines and flash: RC Deburring Tools are particularly adept at flash and parting line removal. Tools also perform edge deburring. The RC Deburring Tool's flexible design allows the tool to perform a variety of deburring tasks.

Quiet turbine motor: Quiet air motor (less than 70 dbA) utilizes clean air (no oil). Exhaust air can be vented to atmosphere without reclamation.

Several operating speeds: Motors are available in 30,000, 40,000, and 65,000 RPM models. A variety of sizes allows you to match the proper RC deburring tool to your application.

Radial compliance: The radial motion of the RC spindle and cutter allow fast and simple programming of the robot.

Flexible mounting options: The RC Deburring Tool can be mounted to a robot, bench or fixture from the side or rear.

Industry standard tungsten-carbide bits: The collet system allows the user to select from a wide variety of standard industrial cutter profiles to fit their deburring needs.

Minimal chattering and vibration: The compliance unit supports the tool to provide stiffness for the cutter, yet allow motion in response to the part profile. Radial compliance allows the unit to perform where other deburring tools have failed.



A variety of radially-compliant deburring tools are available. Clockwise from top-left: RC-300/340, RC-660, RC-150 and RC-340-CNC.



The Radially-Compliant Deburring Tools have a patented design which provides radial compliance, throughout 360 degrees of movement, via internal pneumatic pistons which center the spindle during use.

"The flexibility and consistency of the RC Deburring Tool will allow us to design more efficient cells with a smaller footprint. Also, the system's robot is quicker and easier to train (program) with a more forgiving finishing tool."

Charlie Young
Systems Design Engineer
Hammond RotoFinish

Product Description

ATI's line of Axially-Compliant (AC) Deburring Tools, also known as Speedeburr™, are a patented family of robust, high-speed, low-weight air tools with a floating rotary cutting burr for edge-deburring and chamfering of aluminum, plastic, steel, etc., with a robot or CNC machine. While spinning at high speeds, a rotary cutting burr or file (tungsten carbide, PCD, or CBN coated cutting burr) rides on a cushion of air that provides compliance while maintaining a constant force. Because the rotary burr has a 45° cutting angle, the compliance is both lateral and axial. This patented force control system provides a very high stiffness in the path direction and a low stiffness in the contact force direction that prevents chattering (a common problem with robotic deburring). Due to the extremely low inertia of the cutting burr, AC Deburring Tools can quickly deburr parts, greatly reducing cycle time.

AC Deburring Tools maintain a consistent deburring result from part-to-part. The floating head design reacts quickly to any variances in part position or robot path. As a result, robot programming time can be reduced by up to 75%.

Features

Designed for edge deburring and chamfering: AC Deburring Tools are uniquely and exclusively designed for edge deburring and chamfering.

Reliable vane motor: Robust vane-type motor designed with rugged components provides long service with exceptional power.

High-torque performance: Vane motors increase their torque in response to deburring demands.

Floating axial compliance: Remotely set air pressure controls and maintains the constant axial force on the deburring cutter mounted in the Free Flying Piston (FFP). The axially compliant motion of the FFP allows the cutter to compensate for deviations in the part profile along the robot path.

Mounting options: The AC Deburring Tools use adapter plates which are easily customized for robotic, bench, or fixture mounting.

Simple file-change system: The cutting files mount to the unit using threaded shanks, and can be replaced easily and quickly without removing the tool from the robot.

Easy teaching: The axial motion of the FFP and cutter allow fast and simple programming of the robot. The movement of the cutter compensates for changes in part tolerances, part misalignment, and robot path variation.

Extensive industry use: AC Deburring Tools are being used by hundreds of customers throughout the world. Customers include Pratt & Whitney, Nissan, Volvo, Rolls Royce, Caterpillar, Saab, General Motors, John Deere, and many others.



An array of axially-compliant deburring tools are available. Clockwise from top-left: AC-90, AC-180-CNC, AC-180.



A floating burr rides on a cushion of air to provide compliance and to maintain consistently deburred parts.

“ATI’s [AC Deburring Tool] has proven to be an effective solution. The floating head provides a consistent chamfer around the perimeter of the part, allowing for variations in part tolerances and edge conditions.”

Scot Slosier
Project Engineer
Micron Manufacturing, Inc.

Radial Compliance vs. Axial Compliance: Which Deburring Tool best fits my application?

Radially-Compliant (RC) Deburring Tools use a turbine motor which requires filtered, dry air. Standard industrial burrs may be used.

Axially-Compliant (AC) Deburring Tools use a vane-type motor which requires filtered, lubricated air to operate properly. Use of non-lubricated air will result in motor failure. This design also utilizes specially designed burrs only available from ATI.

Edge deburring in tough-to-reach areas?

Radially-Compliant Deburring Tools, in many cases, can reach deeper and into more confined areas than the AC units. The design allows for a greater range of access points for robot programming.

Removing Parting Lines or Flash?

Radially-Compliant Deburring Tools are the only models designed to remove parting lines and flash.

Edge deburring or chamfering?

Axially-Compliant Deburring Tools are faster and preferred over the RC units for edge deburring.

Applications

ATI Deburring Tools are in use in hundreds of successful applications around the world including:

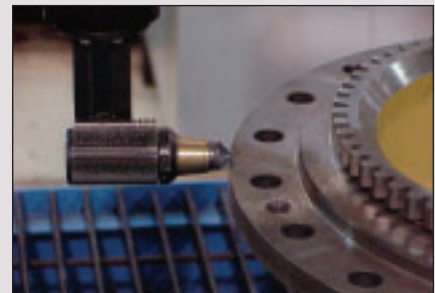
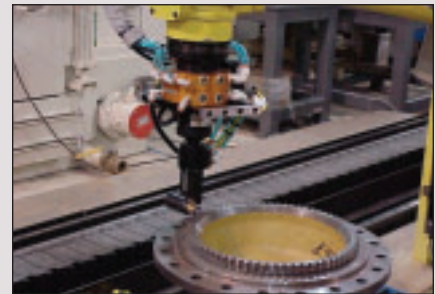
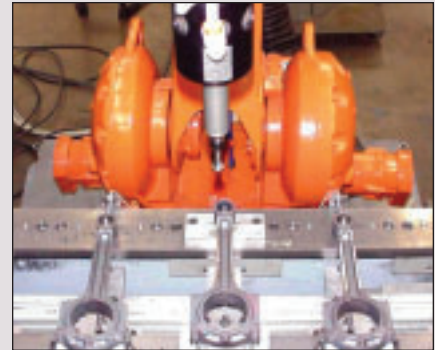
- Crankshafts
- Aluminum bumpers
- Silver spoons
- Steel steering knuckles
- Automobile exhaust manifolds
- Steel and titanium jet engine parts
- Aluminum cylinder heads and casings
- Forged steel brake keys
- Plastic child car seats

“The compliance feature [of the Radially-Compliant deburring tool] was the real selling point as the plates shift a bit from part-to-part. We are quite happy with the units’ performance to date.”

Andy Morwood
Robotics/Welding Engineering
Dana Canada

“ATI has proven itself as a first-rate company with first-rate products. ATI’s automated deburring tools are unchallenged in the industry.”

Mike Olson
Sales Application Engineer
Automated Concepts, Inc.



Radially-Compliant Deburring Tools

Specification	RC-150	RC-300	RC-340	RC-660	RC-340-CNC
Weight (without mounts)	2.4 lb (1.11 kg)	2.54 lb (1.15 kg)	2.54 lb (1.15 kg)	4.9 lb (2.2 kg)	4.0 lb (1.8 kg)
Compliance Travel @ collet	±0.2 in (± 5 mm)	±0.3 in (± 8 mm)	±0.3 in (± 8 mm)	±0.35 in (± 9 mm)	±0.3 in (± 8 mm)
Compliance Travel Recommended	± 0.1 in (± 2.5 mm)	± 0.15 in (± 4 mm)	± 0.15 in (± 4 mm)	± .175 in (± 4.5 mm)	± 0.15 in (± 4 mm)
Compliance Force (Pneumatically Variable)	0.7-1.5 lbf ¹ (3.1-6.7 N) ¹	1.5-9.5 lbf ² (6.7-42.3 N) ²	1.5-9.5 lbf ² (6.7-42.3 N) ²	1.5-9.5 lbf ³ (6.7-42.3 N) ³	1.5-9.5 lbf ² (6.7-42.3 N) ²
Idle Speed	65,000 rpm	30,000 rpm	40,000 rpm	40,000 rpm	40,000 rpm
Air Consumption ⁴ (idle/stall)	3.0 cfm (1.4 l/s) 8.0 cfm (3.8 l/s)	6.0 cfm (2.8 l/s) 21.5 cfm (10.2 l/s)	6.0 cfm (2.8 l/s) 21.5 cfm (10.2 l/s)	11.5 cfm (5.4 l/s) 38.0 cfm (17.9 l/s)	6.0 cfm (2.8 l/s) 21.5 cfm (10.2 l/s)
Air Connections ⁵ (spindle/compliance)	1/8 NPT 1/8 NPT	ø3/8" Tube ø5/32" Tube	ø3/8" Tube ø5/32" Tube	ø1/2" Tube ø5/32" Tube	Single line thru spindle or 1/8 NPT
Collet	ø 1/8" standard (3mm opt.)	ø 1/4" standard (others avail.)	ø 1/4" standard (others avail.)	ø 1/4" standard (others avail.)	ø 1/4" standard (others avail.)
Power	150 W @ 65,000 rpm	300 W @ 30,000 rpm	340 W @ 40,000 rpm	660 W @ 40,000 rpm	340 W @ 40,000 rpm
Mounting Feature	Side & Rear Patterns ⁶	Side & Rear Patterns ⁶	Side & Rear Patterns ⁶	Side & Rear Patterns ⁶	3/4" [19mm] Weldon Shank

1 When supplied 20–60 psi (1.4–4.1 bar) 2 When supplied 5-60 psi (0.3–4.1 bar) 3 When supplied 10-60 psi (0.7–4.1 bar)

4 Dry filtered air 5 Alternate air connections available, contact ATI 6 Accessories Available: Bench mounting plate, Rear interface plate

Axially-Compliant Deburring Tools

Specification	AC-90	AC-180	AC-180-CNC
Weight	1.12 lb (0.51 kg)	1.12 lb (0.51 kg)	1.12 lb (0.51 kg)
Max Burr Compensation	± 0.16 in (± 4 mm)	± 0.16 in (± 4 mm)	± 0.16 in (± 4 mm)
Recommended Burr Compensation	± 0.08 in (± 2 mm)	± 0.08 in (± 2 mm)	± 0.08 in (± 2 mm)
Axial Force Range ¹	0.2-5.6 lb (1-25 N)	0.2-5.6 lb (1-25 N)	0.2-5.6 lb (1-25 N)
Cutting File Surface Speed ²	25-35 ft/sec (7.5-10.5 m/sec)	25-35 ft/sec (7.5-10.5 m/sec)	25-35 ft/sec (7.5-10.5 m/sec)
Air Consumption @ 75 psi, 5 bar ³	14 cfm (6.7 l/s)	14 cfm (6.7 l/s)	14 cfm ⁴ (6.7 l/s) ⁴
Cutting File Rotation Speed ⁵	18,000 to 25,000 rpm	18,000 to 25,000 rpm	18,000 to 25,000 rpm
Sound Pressure Level/Value	75 dB(A) (87 dB(C))	75 dB(A) (87 dB(C))	82 dB(A) (95 dB(C))
Power	250 W @ 20,000 rpm	250 W @ 20,000 rpm	250 W @ 20,000 rpm
Torque at lower speeds	0.30 ft-lb (0.4 Nm)	0.30 ft-lb (0.4 Nm)	0.30 ft-lb (0.4 Nm)

1 When supplied 0–43.5 psi (0–3 bar) 2 Measured at 8mm dia. (halfway between tip and outer rim)

3 Lubricated filtered air 4 At maximum of 87 psi (6 bar) 5 Idle RPM is at 30,000

AC Options

Several optional parts are available:

- Filter-regulator-lubricator designed for the AC, P-No. 9150-FRL-2
- Muffler and oil recovery device, P-No. 9150-XMC
- High precision pressure regulator kit. Includes bracket and gauge, P-No. 9150-P16-B-G
- Spindle extension P-No. 9150-100020
- Adaptor plate (illustrated in model drawings) P-No. 9150-H/T-3178

Radially-Compliant Deburring Tools: FANUC Robotics



“Most large manufacturing companies have a number of deburring needs that warrant the purchase of a robotic cell. The key to success is to assure that the automated deburring operation can satisfactorily and repeatedly perform the deburring task,” says Bob Howard, Systems Integrator for FANUC Robotics Southeast. “Creating a

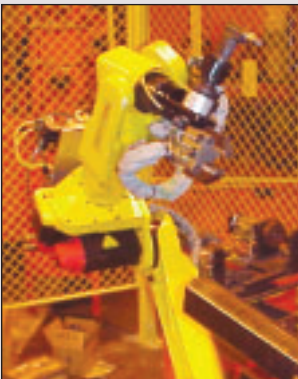
deburring cell that can satisfy more than 90 percent of all industrial applications is our goal.”

“We are convinced that the RC Deburring Tools will provide a 35 to 40 percent gain in productivity due to

improvements in the deburring process. The first successful application is an automotive parts manufacturer in the southeast that had a very complex part. The application needed the flexibility of the deburring tip to access several crevices that were hard to reach, even with manual deburring systems. We can now maneuver the tip to reach all areas of the part and at a pace of two parts every 190 seconds.”

Howard says the RC was the right deburring tool for the job, and the flexibility of the tool opens up a larger world of possible applications. “We must exhibit the ability to handle both large and small burrs and have the built-in compliance and flexibility to satisfy the most challenging jobs.”

Axially-Compliant Deburring Tools: Ellison Machine Tools and Robotics



Ellison engineers, builds, integrates, services, and supports customers who need turnkey integrated systems for a variety of industries.

Aluminum Wheel

Deburring: This system uses an AC deburring tool to deburr the slots on aluminum wheel rims. The burrs, remaining after casting and machining processes, are 0.01 inch thick

with varying heights from zero to 0.1 inch. The requirement is to remove the burrs and break the edge with a chamfer.

A six-axis robot is programmed to track the path of the slot with the AC Deburring Tool mounted on the robot flange. Because of the unit's ± 0.16 inch compliance, the number of points are reduced when following the path around the arcs in the slot.

The AC cutting file length is $5/8$ inch with 24 cutting flutes and a small negative rake angle. The chamfer size is controlled by the path speed and the axial air pressure of the robot. When the robot runs at about 2 inches per second, the chamfer cuts are approximately 0.035 inch. Each rim has approximately 120 inches of edge to deburr, and after 1,000 rims are deburred, the cutting file is still usable, exhibiting very little wear.

RC Collets

Part Number	RC-C-12142	RC-C-12149	RC-C-12442	RC-C-12443	RC-C-12444	RC-C-12445	RC-C-12446
Description	ø 3 mm collet	ø 1/8" collet	ø 3 mm collet	ø 1/8" collet	ø 3/16" collet	ø 6 mm collet	ø 1/4" collet
Fits Model	RC-150 only	RC-150 only	RC-300, RC-340, RC-340CNC, RC-660	RC-300, RC-340, RC-340CNC, RC-660	RC-300, RC-340, RC-340CNC, RC-660	RC-300, RC-340, RC-340CNC, RC-660	RC-300, RC-340, RC-340CNC, RC-660

RC Burrs*

Part Number	RC-B-24033	RC-B-24061	RC-B-24063	RC-B-24065	RC-B-24645	RC-B-24862
Description	Diamond cut, 1/4" Burr Dia., 5/8" Burr Length, 1/4" Shank	Standard cut, 3/8" Burr Dia., 3/4" Burr Length, 1/4" Shank	Diamond Cut, 3/8" Burr Dia., 3/4" Burr Length, 1/4" Shank	Aluminum Cut, 3/8" Burr Dia., 3/4" Burr Length, 1/4" Shank	Aluminum Cut, 3/8" Burr Dia., 5/8" Burr Length, 1/4" Shank	Alt. Diamond Cut, 1/4" Burr Dia., 3/4" Burr Length, 1/4" Shank
Application	For hardened and tough materials, super alloys, and fiber-reinforced plastics.	For deburring, beveling, chamfering. Long life.	For hardened and tough materials. Higher cutting capacity than standard cut.	For deburring of cast aluminum and thermo-plastics. No loading of the flutes.	For deburring of cast aluminum and thermo-plastics. Rounded burr tip.	For metal or plastics. Weld removal, rough finishing, surface working.

Part Number	RC-B-26408	RC-B-17203	RC-B-24061	RC-B-24063	RC-B-73003
Description	Cut FVK, 1/4" Burr Dia., 5/8" Burr Length, 1/4" Shank	Cylindrical Double cut, 1/8" Burr Dia., 9/16" Burr Length, 1/8" Shank	Flame Double cut, 1/8" Burr Dia., 1/4" Burr Length, 1/8" Shank	Cone Double Cut, 1/8" Burr Dia., 7/16" Burr Length, 1/8" Shank	Fiberglass Router, 1/8" Burr Dia., 1/2" Burr Length, 1/8" Shank
Application	For trimming and contour milling of all glass and fiber-reinforced plastic. High feed rates.	For hardened and tough materials, super alloys, and fiber-reinforced plastics.	For hardened and tough materials, super alloys, and fiber-reinforced plastics.	For hardened and tough materials, super alloys, and fiber-reinforced plastics.	For fiberglass and non-metallic materials.

* In stock. Additional off-the-shelf burrs available.

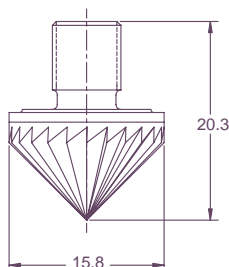
RC Pneumatic Accessories

Part Number	9150-FFR-90	9150-PPR-60
Description	Coalescing Filter/Regulator Assembly (for air motor)	Precision Regulator Assembly (for compliance)

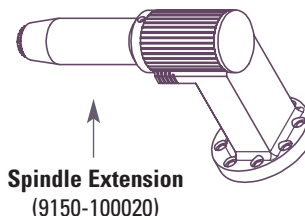
AC Burrs*

Part Number	4579-C2	4579-C5	4179-C5-F	4153-C5	4153-C5-F	43967	1010-C2
Description	Straight fluting, C2 micro-grain, 90° cone	Straight fluting, C5 micro-grain, coating added	4579-C5 burr with high lubricity micro-grain, 90° cone	Spiral fluting, triple segmentation, C5 coating added	4153-C5 burr with high lubricity breaker feature	Straight fluting, C2, 90° cone, Chip 80° cone	Straight fluting, 90° cone
Application	For hard metal, i.e. Steel.	For faster speed and longer life.	For hard metal, i.e. Steel.	For faster speed and longer life.	For reinforced plastics.	For soft metal in tight areas.	For soft metal, i.e. Aluminum.

* Specially designed burrs only available from ATI.



AC-90 Burr Dimensions
(except 1010-C2)



A spindle extension is available to increase the AC's reach by 52mm (2.05 inch) for hard-to-reach applications.

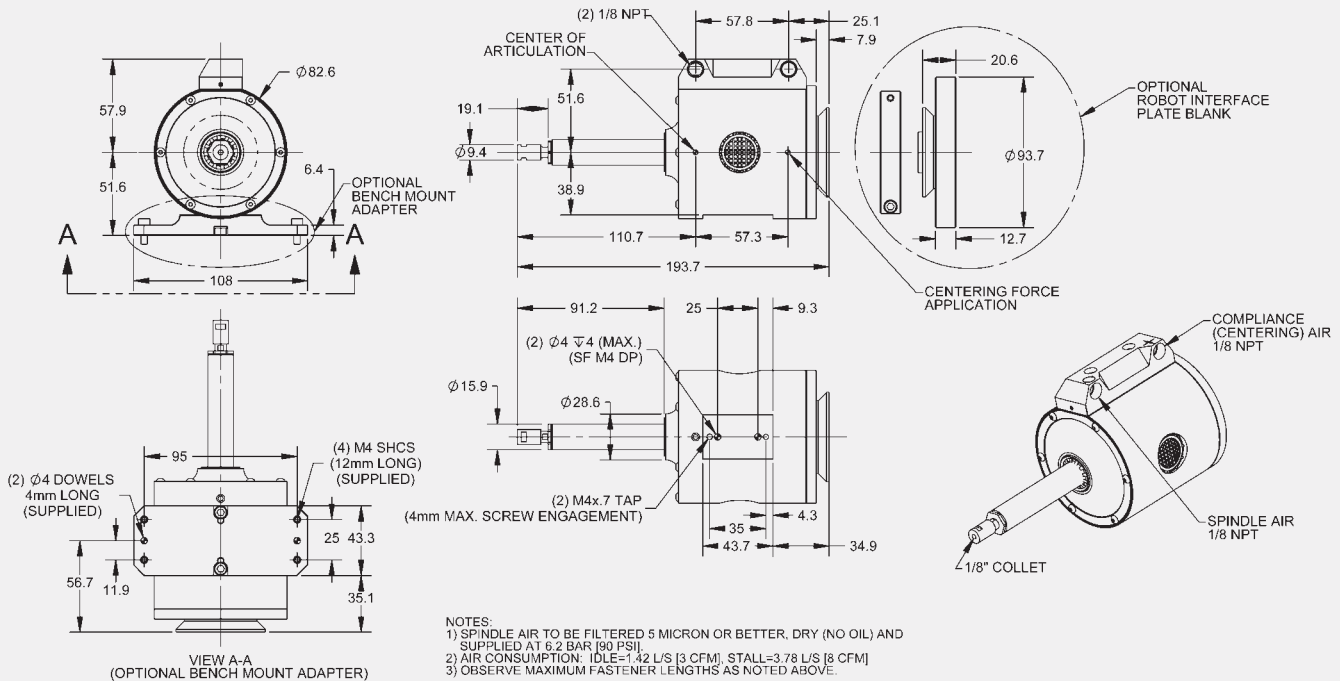
MODEL SPECIFICATIONS

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RC-150

9230-50-1032-01

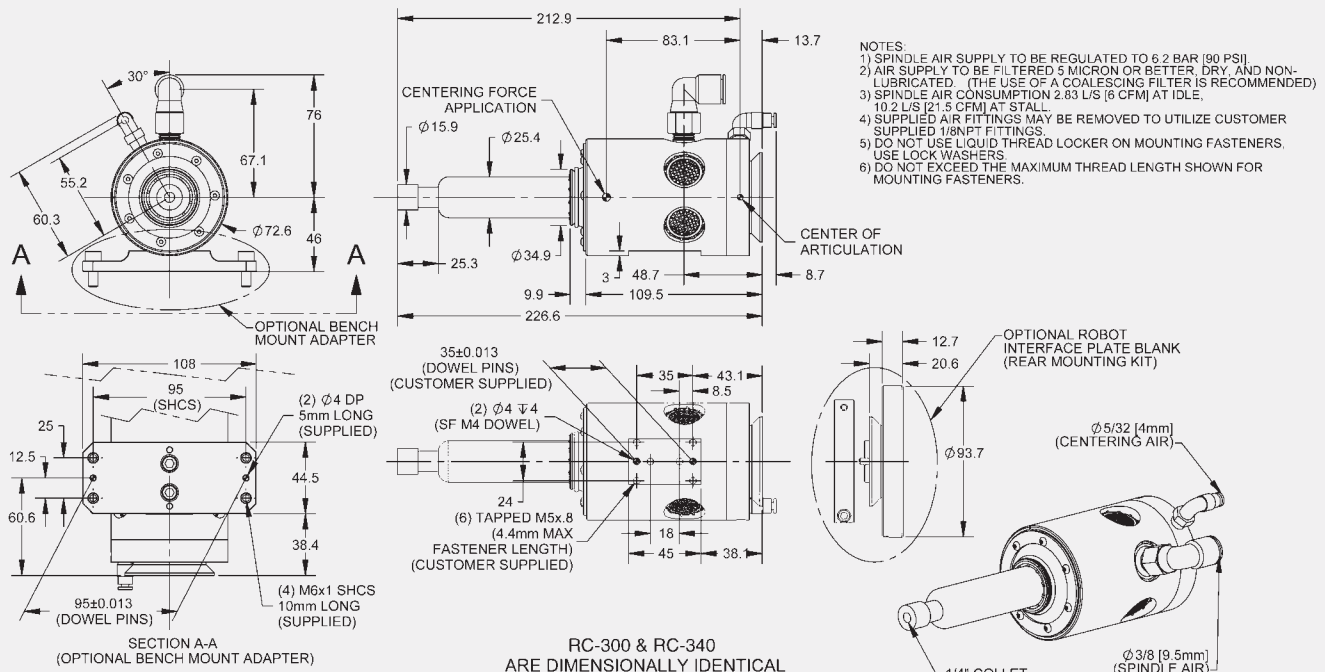


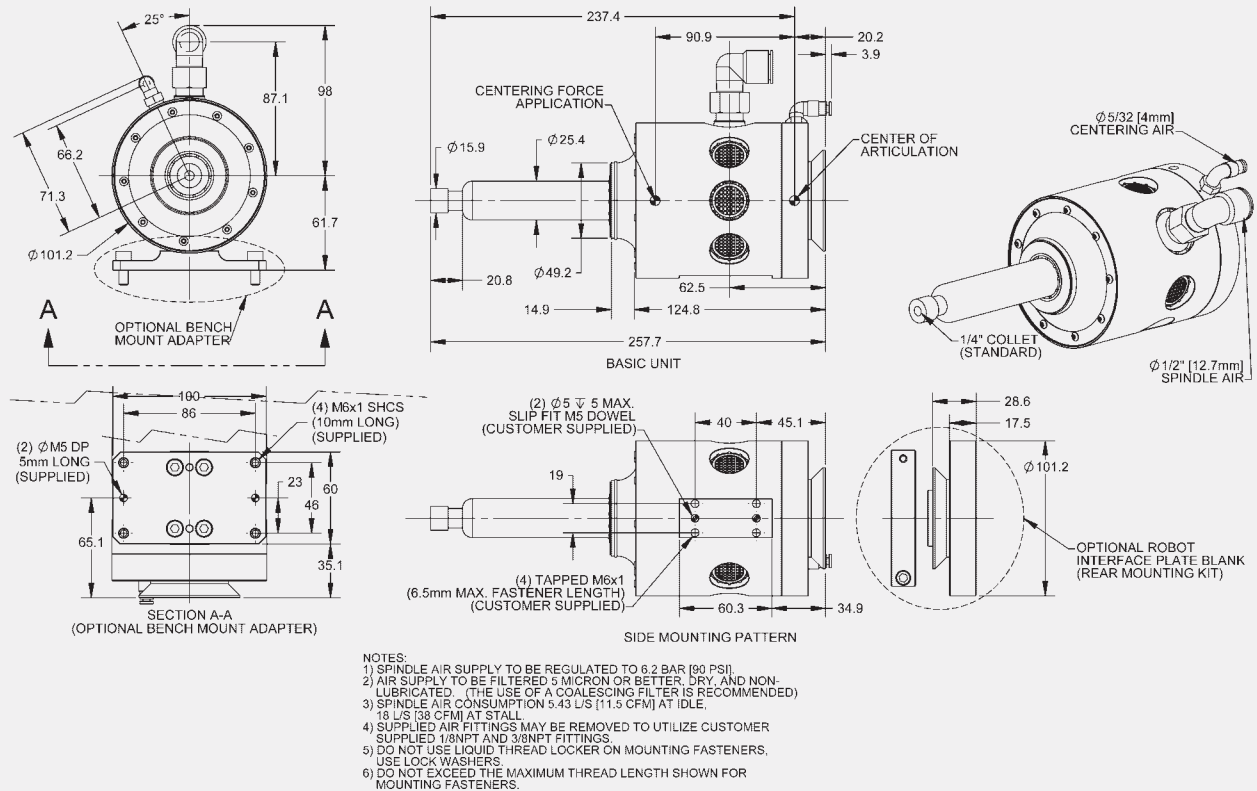
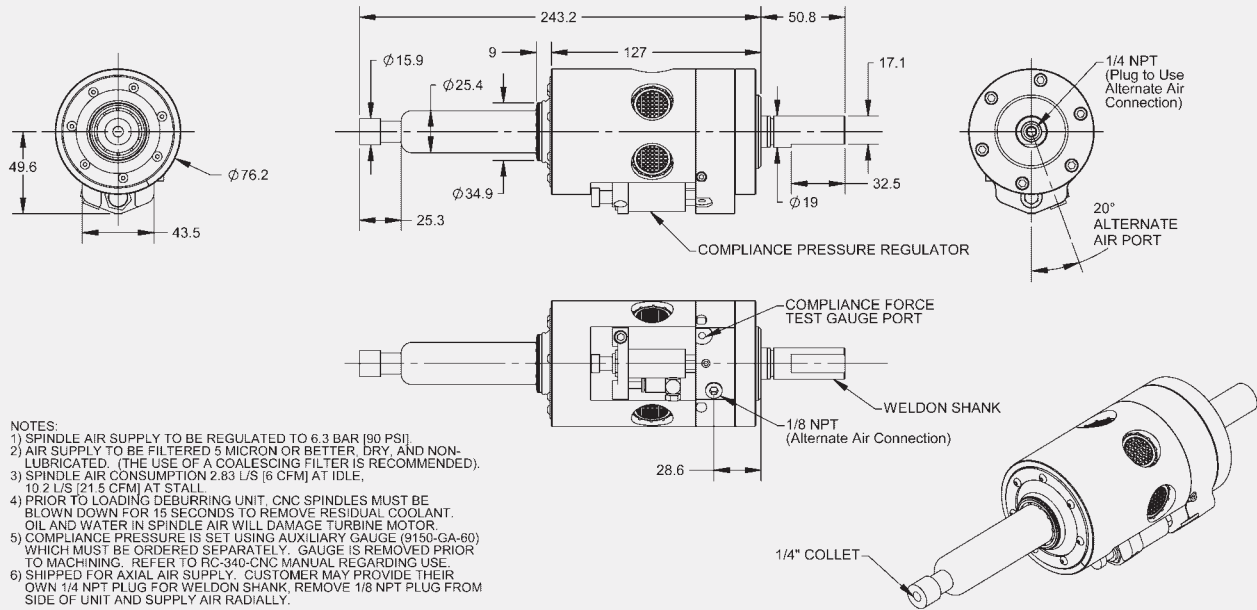
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RC-300/RC-340

9230-50-1033-01





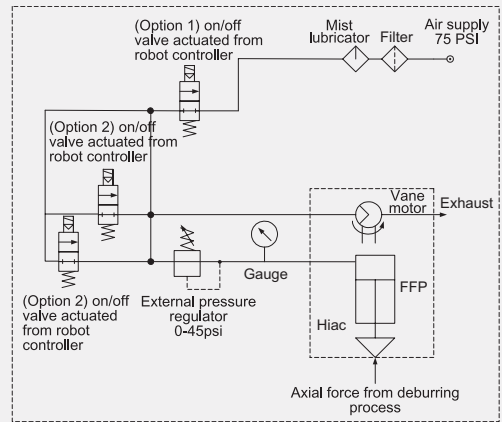
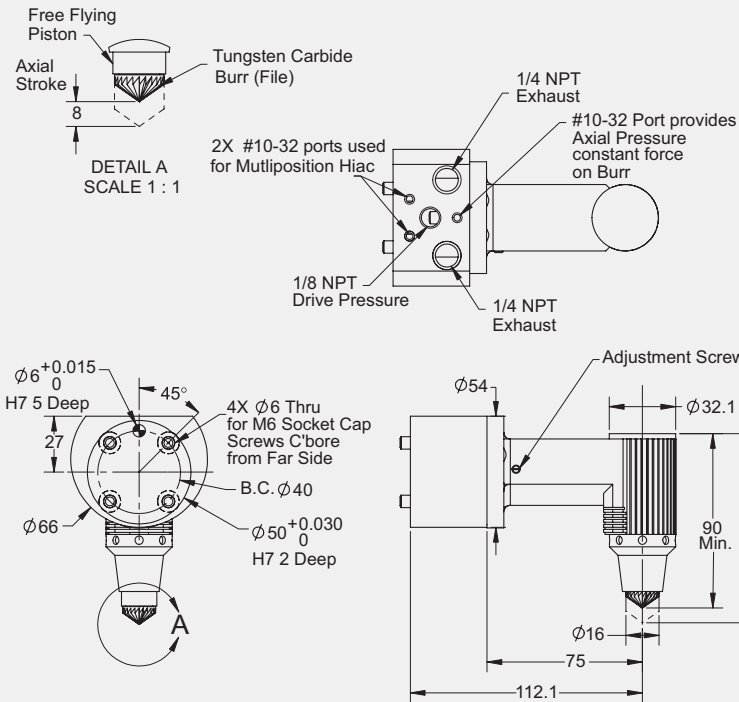
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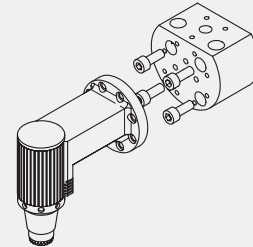
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AC-90

9230-50-1013-03



Pneumatic Diagram



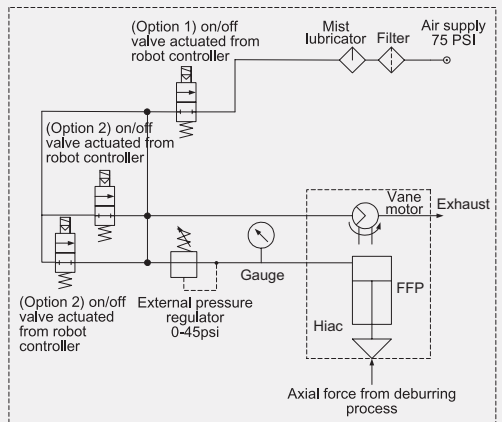
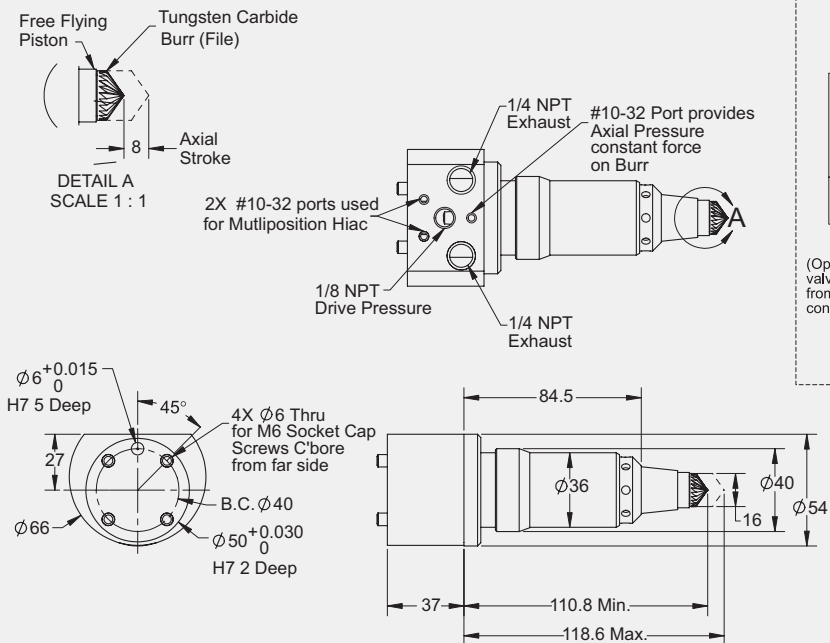
Adaptor plate sold separately

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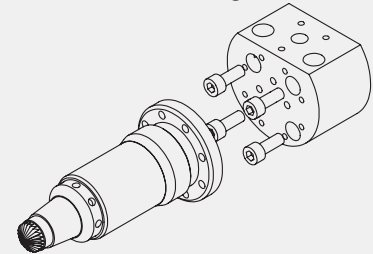
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AC-180

9230-50-1019-02



Pneumatic Diagram



Adaptor plate sold separately

ATI INDUSTRIAL AUTOMATION www.ati-ia.com AC-180-CNC 9230-50-1015-02

Normal and Low range adjustment screws. See note 2

DETAIL A SCALE 1 : 1

Air supply, 75psi (max. 90psi) filtered and oil mist lubricated.

CNC-Hiac Vane motor

Exhaust

Plug (Low Range) X

Optional Plug (Normal Range) X

Vent

Force adjustment

File

FFP

Axial force from deburring process

Spindle Air Supply Pneumatic Diagram

Notes:

- All dimension are in inches secondary dimensions in [] are in millimeters.
- Normal range is with both holes plugged with M2 screws and low range with only one of the ports plugged.

Drive pressure adjustment screw for spindle air

.640 [16.2] Flat

1/4 NPT Air Supply Port Plugged

Tungsten Carbide Burr (File)

Free Flying Piston

Ø 1.93 [Ø49]

1/8 NPT external axial pressure port plugged

2.913 [74]

1/4 NPT Spindle air supply port to be plugged when using external 1/4 NPT port

Ø 1.26 [Ø32]

Axial pressure adjustment screw used with spindle air

3.543 [90]

3.858 [98] Min. Max.

4.1 [104.1]

.623 [15.7]

.315 [8] Axial Stroke

Adaptor plate sold separately

ATI INDUSTRIAL AUTOMATION www.ati-ia.com AC-180-CNC 9230-50-1017-02

Normal and Low range adjustment screws. See note 2

DETAIL A SCALE 1 : 1

Air supply 75 PSI (max. 90psi) Filter

Mist lubricator

On/Off Valve Actuated by CNC Controller

CNC-Hiac Vane motor

Exhaust

Plug X

Plug X

Vent

Force adjustment

File

FFP

Axial force from deburring process

Side Air Supply Pneumatic Diagram

Notes:

- All dimension are in inches secondary dimensions in [] are in millimeters.
- Normal range is with both holes plugged with M2 screws and low range with only one of the ports plugged.

Drive pressure adjustment screw not used for external air

.640 [16.2] Flat

1/4 NPT Air Supply Port

Tungsten Carbide Burr (File)

Free Flying Piston

Ø 1.93 [Ø49]

1/8 NPT external axial pressure port

2.913 [74]

1/4 NPT Spindle air supply port to be plugged when using external 1/4 NPT port

Ø 1.26 [Ø32]

Axial pressure adjustment screw not used with external air. Must be closed.

3.543 [90]

3.858 [98] Min. Max.

4.1 [104.1]

.623 [15.7]

.315 [8] Axial Stroke

Adaptor plate sold separately

Other ATI Products

Robotic/Automatic Tool Changer

A high-precision rugged device that automatically changes tooling. Patented fail-safe locking mechanism uses No-Touch Locking™ technology, allowing plate separation when locking.

Robotic/Automatic Tool Changers for Heavy Automation

This series of modular tool changers are designed specifically for high-payload and high-moment applications. **Utility Modules** to pass air, fluid, and electrical signals are also available for use in non-tool changer applications. Useful for processes requiring repeated connection/ disconnection of utilities.

Robotic Collision Sensor

Designed to prevent damage to robotic end-effectors resulting from robot crashes. Features include: Automatic reset, high-repeatability, and large moment rotation.

Robotic Rotary Joint

A device that allows unlimited rotation of end-of-arm tooling without tangling or twisting robotic tooling utility lines. Utilizes advanced slip-ring technology to pass electrical and pneumatic signals from robot to tooling.

Multi-Axis Force / Torque Sensor

Measures the full six components of force and torque. High overload protection and high signal-to-noise ratio. Used in robotic and research applications.

Automated Assembly Alignment Device

An insertion device using Remote Center Compliance technology that helps assembly machines automatically align close-fitting parts, preventing jamming and galling.

Company Profile

ATI Industrial Automation is a world-leading developer of Automatic Tool Changers, Multi-Axis Force/Torque Sensing Systems, Compliance Devices, Robotic Collision Sensors, Robotic Deburring Tools, and Robotic Rotary Joints. Our products are found in thousands of successful applications around the world.

Since 1982, our engineers have been developing cost-effective, state-of-the-art products and solutions to improve manufacturing productivity.

Our Mission is to provide customers around the world with high-quality robotic peripheral devices, tooling and sensors that enhance customer profitability by increasing the effectiveness, flexibility, safety and productivity of their automation applications. We accomplish this through continuous improvement of existing products, product customization and new product innovation.

Our engineering-centric staff focuses on providing customer solutions to robotic, automation and sensing applications.

Our Quality Policy

ATI Industrial Automation strives to provide customer satisfaction through continual improvement of on-time delivery, quality and reliability, and a constant focus on innovation and profitability.



Engineered Products for Robotic Productivity

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