



VersaFinish™
Axially Compliant Robotic Finishing Tool

(Model 9150-ACT-390-0-0-0)

Product Manual



Document #: 9610-50-1012

Foreword



CAUTION: This manual describes the function, application, and safety considerations of this product. This manual must be read and understood before any attempt is made to install or operate the product, otherwise damage to the product or unsafe conditions may occur.

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Glossary

Term	Definition
ACT	Axially Compliant Finishing Tool.
Adapter	Device for attaching the tool to robots or work surfaces.
Air Filter	Device for removing contamination from air supply lines. Typically refers to removal of particulates.
Air Lubricator	Device for adding controlled volumes of lubricating oil to the air supplying the air motor.
Bur	Cutting tool that is used to remove burrs from the workpiece.
Burr	Any unwanted, raised protrusion on the workpiece.
Chuck	Gripping device used to hold tools and media to the spindle.
Coalescing Filter	Device that removes liquid aerosols from the supply air lines.
Compliance	The ability of the spindle to passively move in response to protrusions on or deviations of the work piece.
Forward Sensor	The forward sensor is an inductive proximity switch which is ON when the spindle is in the fully forward position indicating there is no contact with the tool.
Gearhead	A gearbox responsible for reducing the spindle speed of the air motor.
Main Housing	The main cylindrical body of the unit which includes the mounting features.
Media	Term referring to tools and/or abrasives held by the tool during the completion of a manufacturing process.
Qty	Quantity
Rear Housing	Rear cover to the main housing. This body includes a connection port for the compliance air supply and feed-through seals for optional electrical sensors.
Regulator	Device used to set and control the supplied air pressure to lower acceptable levels.
Retract Sensor	The retract sensor is an optional inductive proximity switch which is ON when the spindle is in the fully back position indicating there is no further motion possible.
Solenoid Valve	Electrically controlled device for switching air supplies on and off.
Spindle	The rotating portion of the tool assembly.
Vane Motor	Air motor that drives the tool spindle.
VersaFinish	An ATI series of deburring tools that use a vane-type motor with an axially floating spindle. The deburring tool is for material finishing operations.

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1. Safety

The safety section describes general safety guidelines to be followed with this product, explanations of the notifications found in this manual, and safety precautions that apply to the product. Product specific notifications are imbedded within the sections of this manual (where they apply).

1.1 Explanation of Notifications

These notifications are used in all of ATI manuals and are not specific to this product. The user should heed all notifications from the robot manufacturer and/or the manufacturers of other components used in the installation.



DANGER: Notification of information or instructions that if not followed will result in death or serious injury. The notification provides information about the nature of the hazardous situation, the consequences of not avoiding the hazard, and the method for avoiding the situation.



WARNING: Notification of information or instructions that if not followed could result in death or serious injury. The notification provides information about the nature of the hazardous situation, the consequences of not avoiding the hazard, and the method for avoiding the situation.



CAUTION: Notification of information or instructions that if not followed could result in moderate injury or will cause damage to equipment. The notification provides information about the nature of the hazardous situation, the consequences of not avoiding the hazard, and the method for avoiding the situation.

NOTICE: Notification of specific information or instructions about maintaining, operating, installing, or setting up the product that if not followed could result in damage to equipment. The notification can emphasize, but is not limited to: specific grease types, best operating practices, and maintenance tips.

1.2 General Safety Guidelines

Prior to purchase, installation, and operation of the ATI product, the customer should first read and understand the operating procedures and information described in this manual. Follow installation instructions and pneumatic connections as described in this manual.

All pneumatic fittings, tubing, cables, and cable fittings must be capable of withstanding the repetitive motions of the application without failing. The routing of utility lines must minimize the possibility of stress/strain, kinking, rupture, etc. Failure of critical pneumatic lines to function properly may result in equipment damage.

1.3 Safety Precautions



CAUTION: Do not use spare parts other than original ATI spare parts. Use of spare parts not supplied by ATI can damage equipment and void the warranty. Always use original ATI spare parts.



CAUTION: Never be present near the deburring tool while it is started or in operation. Flying debris and rotating parts can cause injury. If it is necessary to approach the deburring tool while in motion, stand behind appropriate Plexiglas® or Lexan® windows. Provide a barrier to prohibit people from approaching the deburring tool while in operation must secure the installation.



CAUTION: Do not perform maintenance or repair on the VersFinish product unless the tool is safely supported or placed in the tool stand and air has been turned off. Injury or equipment damage can occur with tool not placed in a tool stand and air remaining on. Place the tool safely in the tool stand and turn off the air before performing maintenance or repair on the VersaFinish product.

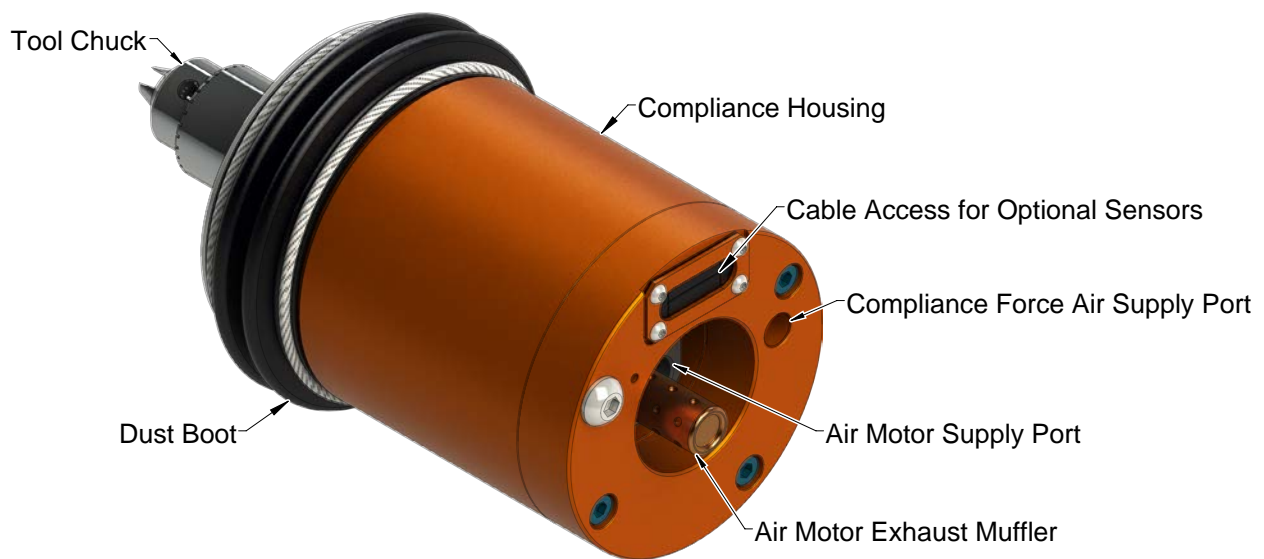
2. Product Overview

ATI's Axially-Compliant Finishing Tool, also known as VersaFinish, is a robust, low-speed, high-torque air tool with an axially floating spindle, suitable for a multitude of robotic and non-robotic material finishing operations on aluminum, plastic, steel, etc.

The rotating spindle is equipped with a 3/8" chuck for holding customer-supplied tools. These may include, but are not limited to, abrasive brushes, wire brushes, sanding disks, polishing points, and chamfering tools. While spinning at low speeds the customer's tool is pushed against the workpiece using an adjustable air supply to control the contact force. This constant pneumatic force allows the spindle to respond axially to changes in part profile. The force control system provides very high stiffness in the path direction and a low stiffness in the contact force direction.

Optional sensing devices are available to detect the position of the spindle and monitor its speed for process development. The floating head design reacts quickly to any variances in part position or robot path.

Figure 2.1—Product Overview



2.1 Features and Benefits of the VersaFinish Deburring Tool

- **Reliable vane motor**
A robust vane-type air motor with gear reduction and rugged components that provides a long service with exceptional power.
- **High-torque performance**
Vane motors increase their torque in response to loads that are introduced in finishing operations.
- **Floating axial compliance**
Remotely-adjusted air pressure controls and maintains the constant axial force on the floating spindle. The axially-compliant motion of the spindle allows the customer's tool to compensate for deviations in the part profile along the robot path, compensate for tool wear, and provide constant contact force with the workpiece.
- **Mounting options**
The VersaFinish is provided with a mounting pattern on the side of its housing. Adapter plates may easily be customized for robotic, bench, or fixture mounting.

- Simple Tool Holder

The VersaFinish is supplied with a simple key-actuated 3/8" chuck for holding common media. The spindle is threaded to allow replacement of the chuck with customer-supplied or custom-manufactured media holders. The VershFinish motor has an industry standard 3/8-24 right-hand spindle thread. The supplied drill chuck can be removed to attach any number of chucks, collets or custom tooling.

- Easy programming of the robot

The axial motion of the spindle allows fast and simple programming of the robot. This movement also compensates for changes in part tolerances, part misalignment, tool wear, and robot path variation.

- Optional Sensors

To assist in process development or monitoring, the VersaFinish may be ordered with optional sensors to detect the forward or retracted positions (2) options are available:

F = Forward Sensor (spindle pushed fully extended)

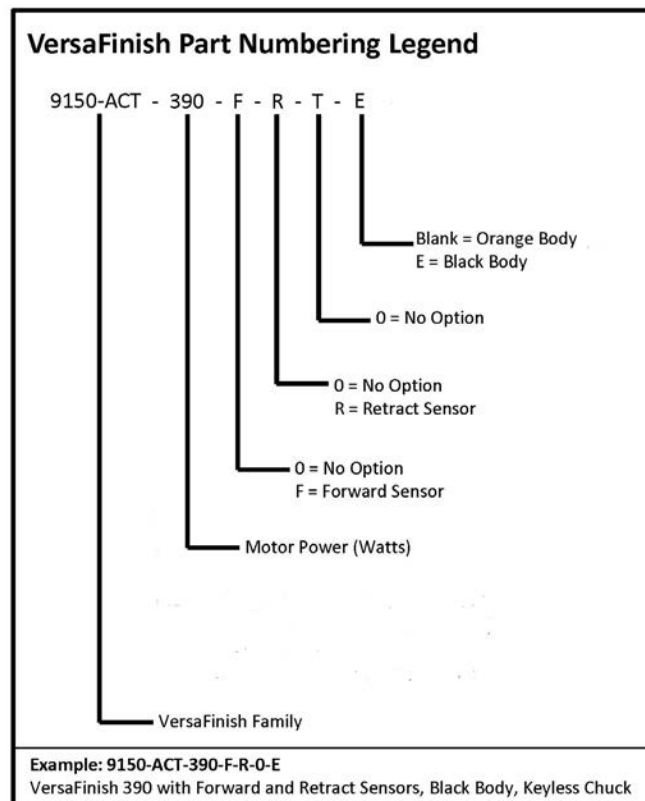
R = Retract Sensor (spindle pushed fully retracted)

- Dust boot

The tool is equipped with a simple boot between the moving motor mounting plate and the main housing. This boot is provided to minimize contamination of the guide and piston rods that allow free axial motion. This boot is not provided as a safety device. Under no circumstances should the user operate the unit without the boot. The user should never have their hands on or near the unit when in operation.

2.2 VersaFinish part numbering Legend

Figure 2.2—Part Numbering Legend



2.3 Technical Description

A technical overview of the product is provided in the following tables and graphs. For additional technical specifications, refer to [Section 8—Specifications](#).

2.3.1 Environmental Limitations

2.3.1.1 Operation

Table 2.1—Operation	
Installation position	Mounted to machining center by means various, customer-supplied tool holders/adapters.
Temperature range	5° C–35° C 41° F–95° F
Utilities	<p>The tool requires the following:</p> <ul style="list-style-type: none"> • Clean, dry, filtered, and lubricated air (refer to Section 4.2.2—Lubrication). • A coalescing filter and filter elements that are rated 5 micron or better. • The 960 W air motor consumes air at a rate of 19 CFM (9 l/s) at 6.2 bar (90 psi) • The axial force/compliance air must be supplied at 0.34 - 4.1 bar (5-60 psi) from a regulated source.

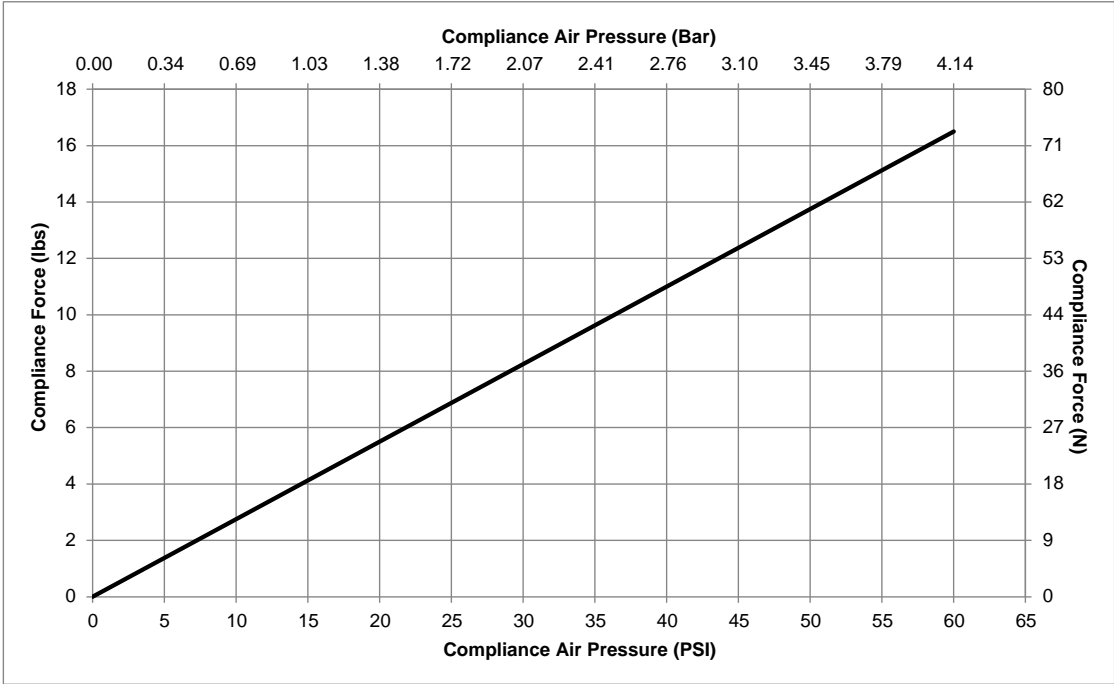
2.3.1.2 Storage

Table 2.2—Storage	
Temperature range	0° C–45° C 32° F–113° F
Conditions	<p>The tool should be stored in its crate and in a dry place.</p> <p>When not in use, keep the unit in its crate if possible. Consult Section 3.4—Storage and Preventive Maintenance During Storage of this manual.</p>

2.4 Compliance Unit Performance

The force created by the compliance mechanism varies linearly with air pressure as shown in *Figure 2.3*. The force characteristics shown are for horizontal, rigidly-mounted installations. This does not account for friction or the weight of the motor. Measurements may vary from one product to another and should only be treated as nominal. The effect of friction will vary based on the application, and a minimum compliance force is required to overcome the friction and allow the compliance mechanism to move properly. This minimum force is typically 2-4 lbf, but it may be higher or lower based on a variety of factors.

Figure 2.3—Horizontal Compliance Force Curves



Refer to *Figure 2.3* and factor in the weight of the attached tooling plus 2 lbs. for the weight of the motor. If the ACT is pointed upward, this weight will reduce the net compliance force, requiring a higher operating pressure to achieve the desired compliance force. If the ACT is pointed downward, it will increase the net compliance force, requiring a lower operating pressure to achieve the desired compliance force.

The air motor operating speed will change according to load applied to it developing the power required for the specific task being attempted. The idle speed of the motor will be its maximum as no load is applied. This will drop to a lower operating speed where it will develop the maximum torque. If the torque required exceeds the maximum available, the motor will stall.

Figure 2.4—Motor Torque Curves

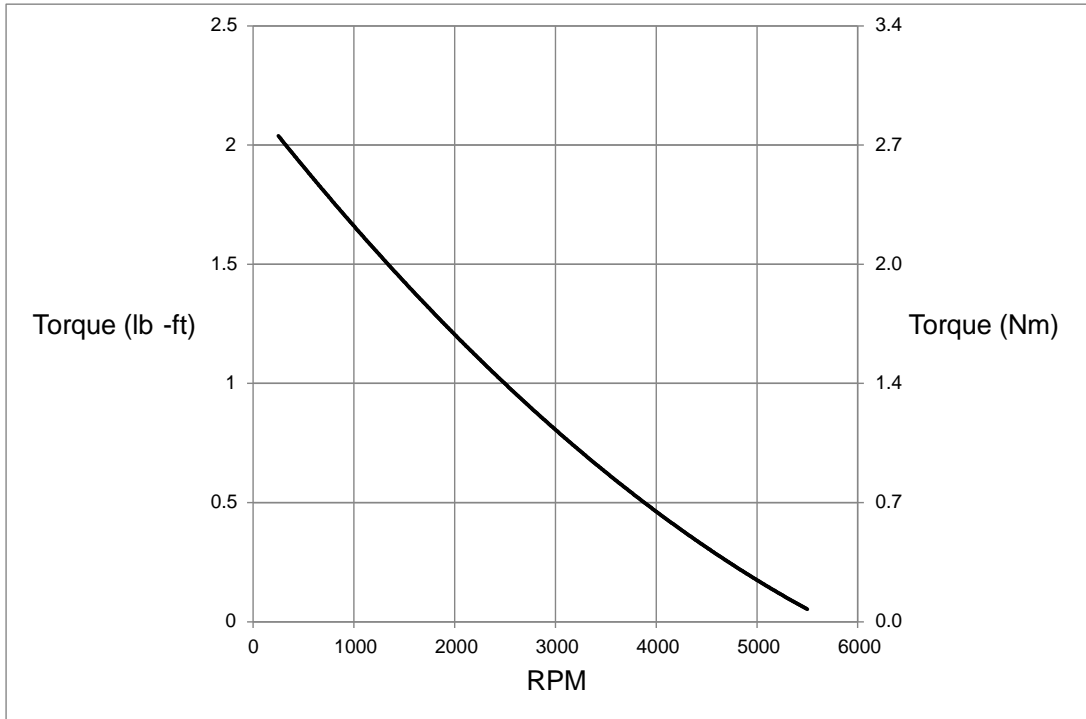
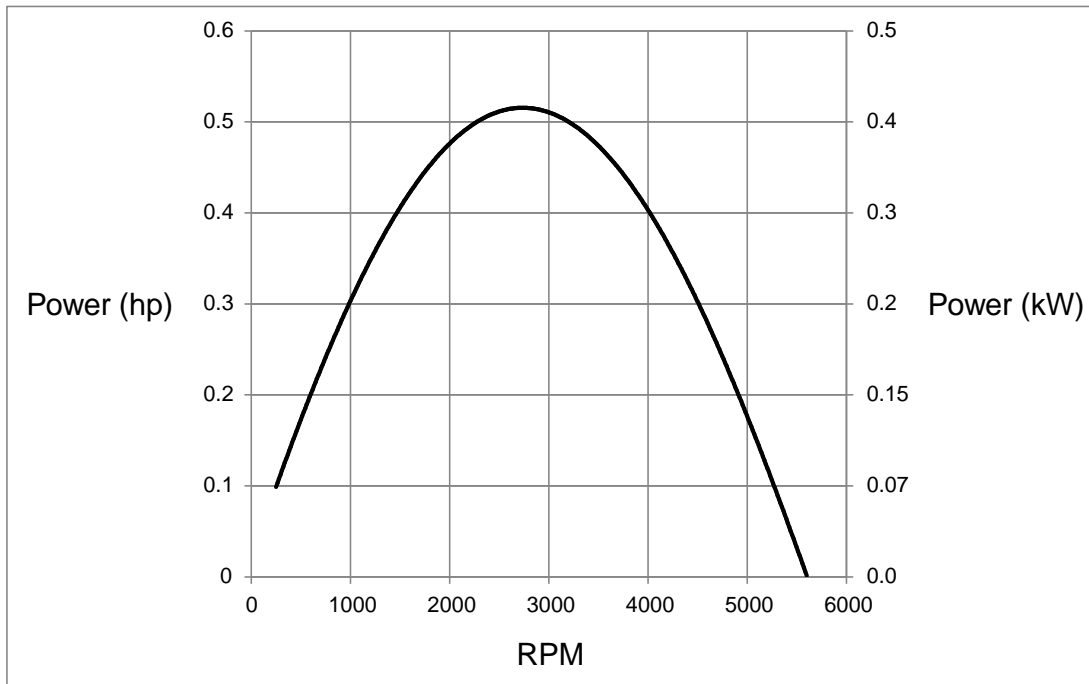


Figure 2.5—Motor Power Curves



3. Installation

The compliance housing incorporates a side mounting pattern which can be used directly or through the use of an optional bench mount adapter kit. See https://www.ati-ia.com/app_content/Documents/9630-50-ACT-390%20Series.auto.pdf.

The tool must be rigidly mounted prior to use. Under no circumstances should the unit be used for manual/hand operations. Once securely mounted, the unit should be supplied with clean, lubricated air filtered (5) micron or better. The use of a coalescing filter is recommended to remove trace moisture from the air supply. Air line fittings supplying the VersaFinish should be installed with care using a minimum of tape or liquid sealant. To prevent contaminant damage to the air motor, all air lines should be blown down to remove debris prior to connection of the VersaFinish.

3.1 Protection During Transportation

The VersaFinish tool arrives in packaging that secures and protects the tool during transportation. Always use this packaging when transporting the VersaFinish in order to minimize the risk of damage.

3.2 Inspection of Condition When Delivered

Upon receipt, the following should be checked:

- Delivery in accordance with freight documents
- Packaging is in good condition

If there is damage to any of the packaging, or if any of the goods have been exposed to abnormal handling, unpack those parts that may have been damaged for a closer inspection. Contact ATI for assistance.

3.3 Unpacking and Handling

The VersaFinish should always be placed inside the accompanying packaging, while transportation, storing, and handling.

3.4 Storage and Preventive Maintenance During Storage

For short-term storage, the tool should be stored in its accompanying packaging and in a dry place.

For long-term storage, the VersaFinish should be thoroughly cleaned of any burrs, dust, or debris. To protect the air motor, the user may wish to inject several drops of oil directly into the motor input followed by a short burst of supply air to insure the vanes and internal components are completely lubricated. The units should not be disassembled. Place the tool inside a sealed, plastic bag and place the bagged tool inside the crate.

3.5 Side Mounting Installation



CAUTION: Thread locker applied to fasteners must not be used more than once. Fasteners might become loose and cause equipment damage. Always apply new thread locker when reusing fasteners.



CAUTION: The length of the fasteners should not interfere with the compliant motion of the motor spindle. Refer to https://www.ati-ia.com/app_content/Documents/9630-50-ACT-390%20Series.auto.pdf for the maximum fastener length. Do not use fasteners that exceed the maximum length; otherwise, damage will occur.

The side mounting pattern of the ACT finishing tool consists of (2) dowel pin holes and a number of threaded holes as shown in *Figure 3.1*. If the ACT finishing tool is permanently mounted to a work surface, the robot carries the part to be finished to the finishing tool.

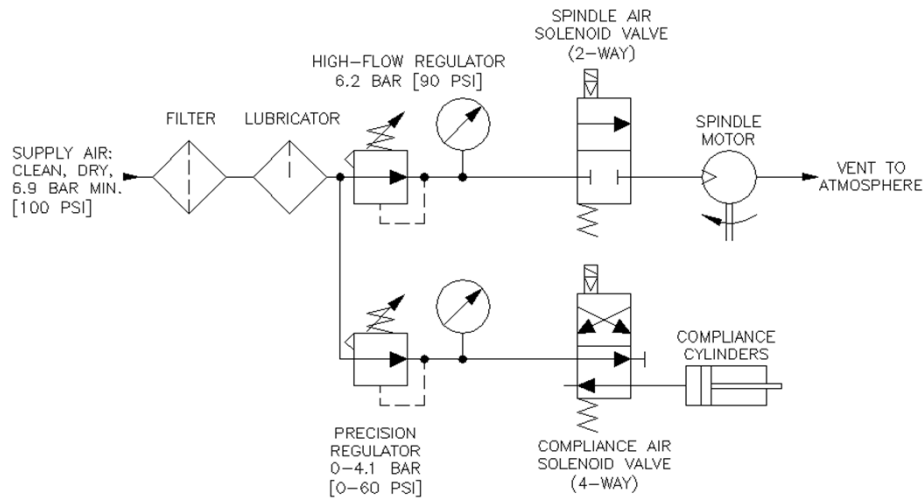
Figure 3.1—Side Mounting



3.6 Pneumatic Connections

Connect the VersaFinish tool as shown in [Figure 3.2](#).

Figure 3.2—Pneumatic Connections



WARNING: All pneumatic fittings and tubing must be capable of withstanding the repetitive motions of the application without failing. The routing of pneumatic lines must minimize the possibility of over stressing, pullout, or kinking the lines. Failure to do so can cause some critical pneumatic lines not to function properly and may result in damage to the equipment.

NOTICE: It is recommended that the customer use a coalescing filter and filter elements rated 5 micron or better to remove trace moisture. Water damage of the air motor or damage associated with debris in the air lines is not covered under warranty.

Conventional, customer-supplied, pneumatic components are used to control the air supply to the tool. ATI recommends that the user install a high-flow pneumatic pressure regulator and a high-flow valve to properly supply a stable air supply of 90 psi (6.2 bar) to the spindle motor (ATI Part # 9005-50-6174 or equivalent, see [Section 2.4—Compliance Unit Performance](#) for the maximum flow requirements.) While the spindle motor can be operated below 90 psi (6.2 bar), it will not develop full power or speed. A second, precision, self-relieving regulator (ATI Part # 9005-50-6164) will supply air for the compliance or centering force. Very little airflow is required for the compliance mechanism.

The compliance force is applied axially and is adjusted until the desired finishing result is achieved.



CAUTION: Pneumatic components used for the motor drive circuit must be capable of meeting the air consumption requirements (See [Section 8—Specifications](#)). Poor performance will result if the correct components are not used. Lubricators must be located as close to the unit as possible with performance rapidly deteriorating when the distance exceeds 15 feet (5 meters).

Table 3.1—Pneumatic Connections		
Function	Connection Type	Pressure
Motor Inlet	1/4 NPT	6.2 bar (90 psi)
Compliance (Axial) Force Inlet	1/8 NPT	0.34–4.1 bar (5–60 psi) (Maximum)
Exhaust	1/4 NPT	Not Applicable

The tool must be plumbed using flexible tubing. The inside diameter of the tubing should be as large as practical to minimize pressure drop to the spindle motor [3/8" (10 mm) minimum].

The air motor is quiet and vents air to the environment through the supplied high-flow muffler at the rear of the unit. The customer may choose to replace the muffler with tubing to carry exhaust away from the work area. Such tubing must have a minimum 1/2" (12.7 mm) inner diameter to minimize pressure drops and allow unrestricted axial motion respectively. To reduce the sound level in neighboring working areas, a customer-supplied barrier surrounding the installation may be installed (Plexiglas or Lexan is preferred).

The compliance force air supply pressure regulator should be adjusted between 0.34–4.1 bar (5-60 psi). When testing for the proper contact force, start with a very low pressure and increase slowly until the desired process result is achieved.

4. Operation

These operating instructions are intended to help system integrators program, start up, and complete a robotic cell containing a finishing tool. The system integrator should be familiar with the task of finishing in general, and should have extensive knowledge relating to robots and automation incorporating robots.

4.1 Safety Precautions



DANGER: Never use the VersaFinish for purposes other than automated processes. Never use the VersaFinish as a hand-held machine.



DANGER: Never use the VersaFinish in a manner to produce radial loads. If a failure occurs due to forces caused by improper use, hazardous situations for both personnel and equipment could be created. Avoid using the VersaFinish for countersinking or drilling. Rigid tools, such as milling machines, are required for such applications. The use of radial media (wheel brushes and sanding drums) in the unit is discouraged as this will lead to binding in the linear slides preventing axial motion.



WARNING: All personnel, who are involved in the operation of the VersaFinish product, should have a thorough understanding of the operating procedures. Failure to follow these procedures or neglecting safety precautions can create hazardous situations that may injure personnel or damage the deburring installation and the VersaFinish product.



WARNING: Never operate the ATI product without wearing hearing protection. High sound levels can occur during cutting. Failure to wear hearing protect can cause hearing impairment. Always use hearing protection while working in the proximity of the finishing tool.



WARNING: Never operate the ATI product without wearing eye protection. Flying debris can cause injury. Always use eye protection while working in the proximity of the finishing tool.



CAUTION: Do not use spare parts other than original ATI spare parts. Use of spare parts not supplied by ATI can damage equipment and void the warranty. Always use original ATI spare parts.



CAUTION: The compliance piston rods and (1) of the (2) floating guide rods that float in the front plate must not be restrained, for example: adding washers or additional thread locker. Rigid mounting of the rods attached to the front plate will prevent floating and result in binding of the unit's axial compliance. The compliance piston rods and the (1) guide rod float in the front plate to allow the motor assembly to achieve free compliant motion while resisting the motor's torque. Do not restrain the compliance piston rods and (1) of the (2) floating guide rods.

4.2 Normal Operation

The following sections describes the normal operating conditions for VersaFinish deburring tools.

4.2.1 Air Quality

The air supply should be clean, dry, filtered, and lubricated. A coalescing filter that has elements rated for 5 micron or better is required. The air must be supplied at 6.2 bar (90 psi).

Air quality affects tool performance more than almost any other factor. Particulate can block airflow or impede vane motion. If deburring tools do not receive the proper air pressure, the tool stalls.

4.2.2 Lubrication

Lubricate the air supply with 3-5 drops of an oil-fog lubrication mixture.

It is imperative that the lubricator be located within 5 m (15 feet) of the tool.

4.2.3 Media Selection

Use cup and encapsulated brushes that are under 3 inches in diameter.

Do not use media that requires radial loading. Do not use media rated to below the ACT-390 speed. Refer to *Section 8—Specifications*.

The ACT-390 deburring tool is designed to use radially loaded media under 3 inches in diameter due to its lower speed, and thus, sanding disks and cup brushes may be used. Plunge cuts for countersinking are acceptable as long as the bur angle is 90° or larger so that there is minimal radial load.

The VersaFinish air motor is equipped with an integral speed reduction gearbox. The life of this gearbox is reduced if the media extends a long distance from the tip of the spindle. Whenever possible, select media and mounting adapters for media that are short and position the work as close to the VersaFinish as possible.

Select media and media holders that position the work piece as close to the VersaFinish as possible.

The selection of such media is highly dependent upon the work piece material and geometry, and the amount of material to be removed. It is not practical to present all the possibilities in this document.

In most applications, no cooling or lubrication of the part or tool is necessary nor is it desirable. For some materials and situations, the addition of coolants or compressed air may aid the cutting process. Any application of coolant must be exercised with care to prevent fluids from entering the tool or its chuck.

When used with flexible abrasive media, the VersaFinish will perform best when the rotating media approaches the burr in a direction that will fold the burr back on itself. This will allow the media to remove material rapidly without excessive force and without the creation of a secondary bur. This will decrease the cycle time for the operation while extending the life of the tool and the consumable media. The VersaFinish spindle rotates clockwise when viewed from behind.

4.2.4 Deburring Tool Approach Path Should Be Slow and at an Angle

The deburring tool should approach the workpiece slowly and at an angle.

When beginning a deburring pass, try to minimize the initial impact on the work piece by slowly approaching the tool at an angle while maintaining a slightly parallel path with the surface.

If the tool quickly approaches perpendicularly to the workpiece, the result is gouging and premature wear of the tool bearings and results in premature failing of the unit. Additionally, collisions could result and create a hazardous situation for both personnel and equipment.

4.2.5 No Radial Loads

Do not apply radial loads, which are perpendicular to the axis of rotation.

4.2.6 Program the Robot to Incorporate 50% Compliance Travel of the Tool

Program the robot to have the tool's compliance at 50% travel when on the nominal path.

As the part's edge deviates from the perfect path, the cutting bit can use compliance to follow along high and low spots without losing contact or hitting the positive stop and gouging.

Do not "bottom out" the compliance and hit the positive stop.

Repeated impacts on the positive stop can damage the compliance mechanism or motor.

4.3 VersaFinish Working Environment

As described in previous sections, the VersaFinish should only be used in an automated cell/chamber.

The work cell must be secured by means of barriers to prohibit personnel from entering the cell. A lockable door should be included as a part of the barrier in order to facilitate access to the cell for authorized personnel only. The barrier could consist partly or fully of Plexiglas to facilitate observation of the manufacturing process.

During system or tool maintenance, make sure the VersaFinish and equipment are stopped before entering the cell. Never be present in the cell when the tool is running when installing and testing.

Be aware of rotating parts. Use eye-protection while working around the tool.

Be aware of high sound levels. While the VersaFinish air motor is not loud, the working action associated with many processes frequently is. Always use hearing protection while working in the neighborhood of the production cell.

4.4 Sensor Connections

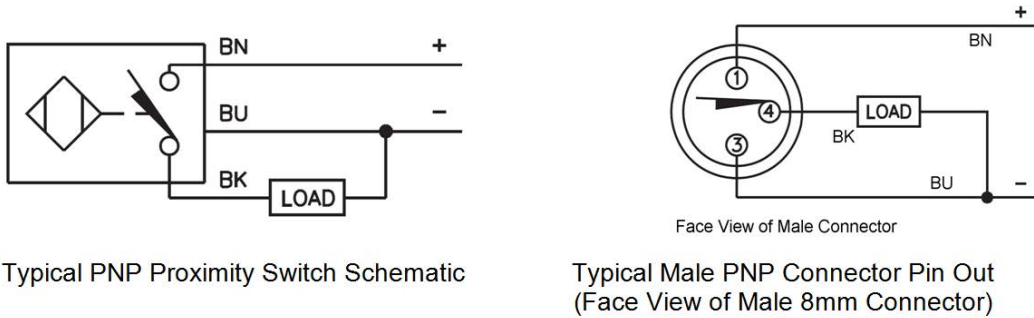
The VersaFinish tool can be equipped with up to (2) sensors to monitor spindle position and speed. These include the Forward and Retract sensors. Each sensor is a PNP (sourcing) type proximity switch using (2) wire electrical hook-up.

The Forward sensors are a standard 8 mm threaded body 3-pin type. Underterminated cables are connected to these sensors and exit the rear of the finishing tool. The Retract sensor is a flat proximity switch whose short cable is terminated with a male threaded 8 mm connector. This connection may be extended using any industry-standard 8 mm 3-pin cable. ATI part numbers for (2) such cables will be found in https://www.ati-ia.com/app_content/Documents/9630-50-ACT-390%20Series.auto.pdf.

The electrical connections for 3-pin proximity sensors are color-coded and adhere to industry-standards. The blue sensor wires are connected to 0V and the brown wires are connected to a positive voltage source between 10 and 30VDC. With the PNP sensors used on VersaFinish, the black wire is the output signal, which will go “high” when the switch closes (turns on). Thus, the sensor “sources” power to the load or monitoring circuit.

See [Section 6.2.5—Sensor Replacement](#) for more information on setting and using these sensors.

Figure 4.1—Sensor Schematics



Typical PNP Proximity Switch Schematic

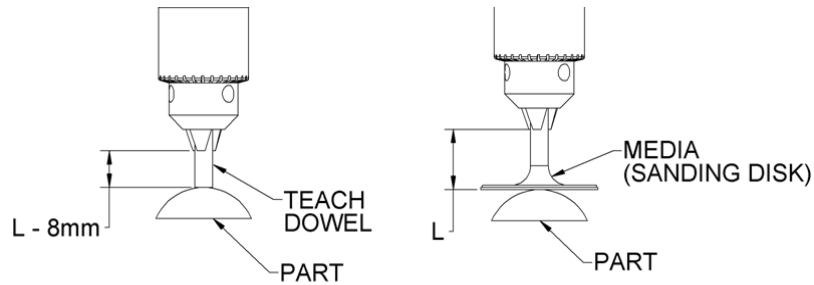
Typical Male PNP Connector Pin Out
(Face View of Male 8mm Connector)

4.5 Tool Position and Programming

The VersaFinish dimensions are provided in https://www.ati-ia.com/app_content/Documents/9630-50-ACT-390%20Series.auto.pdf. The VersaFinish provides axial compliance and performs best when spindle is displaced through approximately one-half of its allowable travel (approximately 8 mm). The tool spindle must never be running while programming a machining center. During teaching, the compliance air must be on and supplied near 1.4 bar (20 psi).

A simple programming method is to replace the desired media with a dowel pin which projects 8 mm less from the tool's chuck than the production robot media that will be used. The tip of this dowel can then be used to contact the part when teaching the robot path.

Figure 4.2—VersaFinish Dowel Teaching Tool



The short, teach dowel pin with the tool spindle fully extended (left in *Figure 4.2*) will simulate the position of the spindle deflected 8 mm when the actual media/tool is installed (right in *Figure 4.2*).

When running the program the first time, observe the path with the compliance air supply turned down to 1.4 bar (20 psi). Verify that at operational speed the media is deflected but contacts the work surface. Once the path has been confirmed, the compliance force of the media should be adjusted as described in *Section 3.6—Pneumatic Connections* in order to achieve the desired finish.

5. Maintenance

The air motor is supported by (2) guide rods attached to the front plate of the finishing tool. To prevent binding of the compliance, one of these guide rods is rigidly attached to the front plate. The second guide rod and the compliance piston rods are free to float in the front plate. This allows the motor assembly to achieve free compliant motion while resisting the motor's torque. Do not attempt to change the floating nature of the rods by adding washers or additional thread locker. These actions will prevent the rods from floating, which will result in binding of the tool's compliance.

5.1 Routine Operational Maintenance

The tool utilizes a vane-type air motor with integral speed reduction gearbox. When subjected to normal use, this robust unit will provide many hours of operation before service or repair is necessary. When subjected to high shock loading or periods of continuous service without interruption, the unit will require service or repair earlier. While simple in design, there are few user-serviceable parts in the assembly. The user is encouraged to return the unit to ATI for service.

For all service, it is recommended that the air supply (before the solenoid valves) be disconnected. Drain any trapped air pressure in the lines. It is suggested that the air supply be "locked out" to prevent accidental operation of the spindle. During maintenance operations, refer to https://www.ati-ia.com/app_content/Documents/9630-50-ACT-390%20Series.auto.pdf.

5.2 Media Replacement

Check media quality regularly to ensure it is not dull or worn. Using worn media causes a poor surface finish and increased wear on the bearings that results in premature tool failure.

When performing maintenance, always remember to tighten all the fasteners. When replacing media always secure it correctly and insure that the chuck is tightened.

The standard VersaFinish unit ships with a simple drill chuck to hold customer-supplied media. A standard chuck key is used to loosen and tighten the chuck. When tightening the chuck, insert and turn the key into each of the (3) holes around the chuck's perimeter.

When in doubt, the customer should refer to the manufacturer of the media to determine how to properly secure that media to the spindle.

5.3 Utilities

The air tubing and fittings to the unit should routinely be checked for their general condition and replaced as required. The lines must be flexible to allow free motion when the unit is mounted to a moving surface or robot. The air to the tool must be filtered and dry. The life of the filter elements is dependent on the quality of compressed air at the customer's facility.

5.4 Lubrication

Ensure the air motor is being lubricated. Refer to [Section 4.2.2—Lubrication](#).

6. Troubleshooting and Service Procedures

The following section provides troubleshooting information to help diagnose conditions with the product and service procedures to help resolve these conditions.

6.1 Troubleshooting

The following table is presented to assist in solving finishing problems.

Table 6.1—Troubleshooting		
Symptom	Cause	Resolution
Wear	Too heavy a cut	Decrease width of cut/make multiple passes
	Feed rate is too slow	Increase feed rate
Unequal compliance	Defective regulator	Replace defective regulator
Compliance slide sticking	Compliance slide contaminated	Clean the compliance slide with compressed air and alcohol.
Poor finish	Feed rate is too fast	Reduce feed rate
	Media is worn	Replace media
Secondary Burrs	Incorrect feed rate	Reduce feed rate
	Too heavy a cut	Decrease width of cut/make multiple passes
	Incorrect feed direction	Change path
Spindle stalls	Not enough or no drive air	Check drive air regulator for 90 psi (6.2 bar) and for leaks
	Media is not secure in collet	Properly tighten chuck
	Too much compliance force	Decrease width of cut/make multiple passes
	Compliance exceeded	Examine/correct path
Sticking spindle	Guide rods and pistons contaminated	Remove boot, clean and lubricate rods.

6.2 Service Procedures

The following service procedures provide instructions for component replacement, when the user chooses to service the unit in the field. For all service, the user should disconnect the air supply before the solenoid valves and vent trapped air pressure from the lines. This step prevents accidental operation of the spindle.



CAUTION: Thread locker applied to fasteners must not be used more than once. Fasteners might become loose and cause equipment damage. Always apply new thread locker when reusing fasteners.

6.2.1 Media Selection

ATI can provide some guidance in media selection, however, only experimentation will yield the results desired. Contact ATI's application engineers for assistance.

6.2.2 Flexible Boot Replacement

Parts required: Refer to https://www.ati-ia.com/app_content/Documents/9630-50-ACT-390%20Series.auto.pdf.

Tools required: a pick or small ball-end hex key

1. Discharge any pressure in the air lines to the tool's spindle and compliance connections.
2. Use a suitable pick or small ball-end hex key to lift and remove the garter spring securing the boot to the front plate of the unit. Install the new flexible boot by stretching over the body and the motor mount.
3. Similarly remove the garter spring securing the boot to the main housing.

Figure 6.1—Flexible Boot Replacement



4. Use the pick to lift the boot as necessary and slide it forward off the spindle end of the tool.
5. To refit the boot, slip the first garter spring up and over the boss of the main housing, temporarily leaving the garter spring on the main housing.
6. Slip the boot over the moving motor mount plate and onto the main housing.
7. Position the boot so its locking surfaces engage the grooved boss on both the moving plate and the main housing.
8. Install both (2) garter springs to secure the boot.
9. Safely resume normal operation.

6.2.3 Air Motor Muffler Replacement

The motor includes a muffler that vents air to the atmosphere. If the muffler becomes clogged the air motor will not function efficiently, and the muffler will need to be replaced. The following procedure must be performed:

Parts required: Refer to https://www.ati-ia.com/app_content/Documents/9630-50-ACT-390%20Series.auto.pdf

Tools required: 9/16 wrench

Supplies required: Loctite 569

1. Discharge pressure in the air lines to the tool's motor connections.
2. Using a 9/16 wrench, remove the muffler from the air motor.

Figure 6.2—Replacing the Muffler



3. Apply Loctite 569 to the threads of the new muffler.
4. Install the new muffler and tighten finger tight plus 1/2 turn using a 9/16 wrench.
5. Safely resume normal operation.

6.2.4 Air Motor Replacement

The motor includes a gearbox (gearhead) to lower the spindle speed. Maintenance of either the motor or the gearbox requires the motor be removed from the tool.

VersaFinish units with defective motors should be returned to ATI during the warranty period. For customer replacement the motor after the warranty period, the following procedure must be performed:

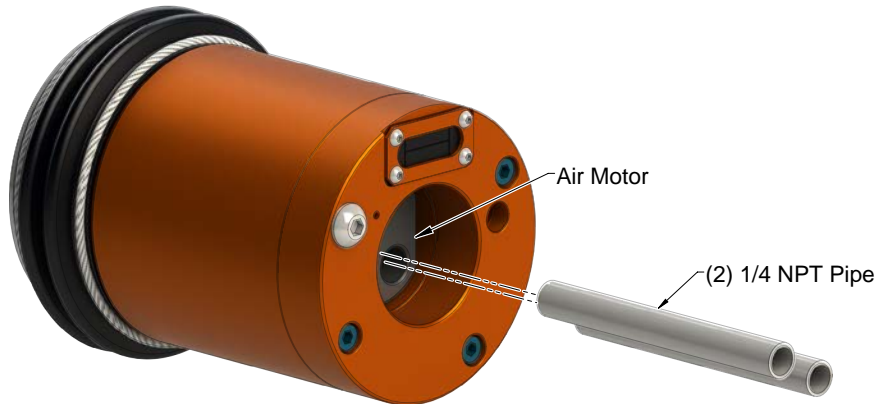
Parts required: Refer to https://www.ati-ia.com/app_content/Documents/9630-50-ACT-390%20Series.auto.pdf

Tools required: 2.5 mm hex key, 15 mm open-end wrench

Supplies required: ¼ NPT straight fittings or pipe

1. Discharge pressure in the air lines to the tool's spindle and compliance connections.
2. Disconnect the flexible tubing supplying the air motor and compliance.
3. Disconnect any air lines connected to the motor's exhaust port in place of the muffler.

Figure 6.3—1/4 NPT Pipe for Handles



4. Thread ¼ NPT straight fittings or pipe into the motor's supply and exhaust ports to use as handles during removal.

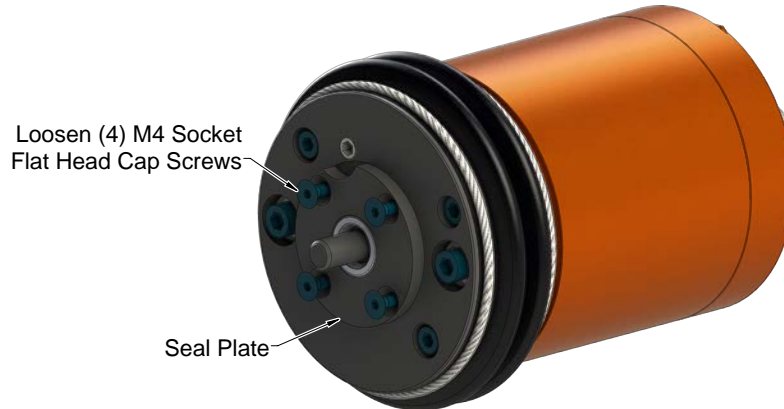
Figure 6.4—Removing the Chuck



5. Use the 15 mm open-end wrench to hold the spindle nut behind the chuck.

6. Insert the chuck key into the chuck. While holding the 15 mm wrench securely, unscrew the chuck counterclockwise using the chuck key as a lever.
7. Hold the spindle threads with fingers and remove the 15 mm nut previously held by the open end wrench.

Figure 6.5—Loosen the Seal Plate



8. Use a 2.5 mm hex key to loosen the (4) M4 socket flat head screws securing the seal plate to the motor mount at the front of the tool.

Figure 6.6—Replacing the Air Motor



9. At the rear of the unit, grasp the fittings/pipes installed previously in the rear of the air motor and use them to rotate the motor clockwise from the rear. This will unscrew the motor from the front plate of the tool (Note: The motor mount uses left-hand threads, rotate clockwise to remove).
10. Remove the fittings/pipes from the rear of the old air motor.
11. Install the fittings/pipes into the exhaust and supply ports at the rear of the new air motor.
12. Fit the seal plate to the moving motor mount plate tightening the flat-head screws until they bottom out.
13. Back the flat-head screws out one-half (1/2) turn.
14. Install the air motor into the compliance housing.
15. Thread the air motor into the motor mounting using the fittings/pipes installed previously in the rear of the air motor as a handle (Note: The motor mount uses left-hand threads, rotate counter-clockwise to install).

16. When the motor bottoms out against the seal plate, tighten the (4) M4 socket flat head screws on the seal plate to 14 in-lb (1.58 Nm). Refer to [Figure 6.5](#).
17. Apply a thin film of grease to the shoulder of the 15 mm nut that goes behind the chuck and thread the nut onto the spindle until it bottoms out using fingers.

Figure 6.7—Installing the Chuck



18. Thread the chuck onto the spindle until it bottoms out.
19. Insert the chuck key into the chuck and use it as a lever to tighten the chuck against the 15 mm nut held by the open end wrench.
20. Remove the fittings/pipes from the rear of the air motor.
21. Reinstall the air supply fittings and muffler.
22. Safely resume normal operation.

6.2.5 Sensor Replacement

The VersaFinish may be outfitted with up to (2) proximity sensors. These sensors may be monitored by the customer to determine the following information.

1. Option –F: The Forward Sensor. It is ON when the spindle is fully forward. Refer to [Section 6.2.5.1—Forward Sensor \(Option -F\)](#).
2. Option –R: The Retract Sensor. This sensor is ON when the spindle is fully Retracted. Refer to [Section 6.2.5.2—Retract Sensor \(Option -R\)](#).

These options can be added in the field by following the reassembly and adjustment in the following procedure:

6.2.5.1 Forward Sensor (Option -F)

The forward sensor is mounted inside the VersaFinish housing. When the spindle is fully forward the sensor will turn on. The spindle must be displaced 1 mm to the rear before the sensor will turn off. This may be utilized to insure that the media is in contact with the part to be deburred.

To remove, install, and adjust the sensor perform the following procedure:

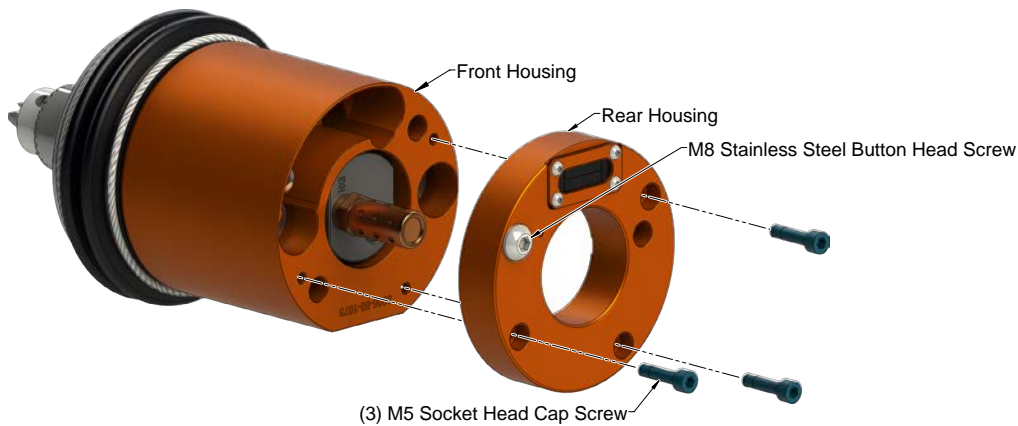
Parts required: Refer to https://www.ati-ia.com/app_content/Documents/9630-50-ACT-390%20Series.auto.pdf

Tools required: 2.5 mm, 4 mm, and 5 mm hex key, torque wrench

Supplies required: Loctite 222

1. Discharge pressure in the air lines to the tool's spindle and compliance connections.

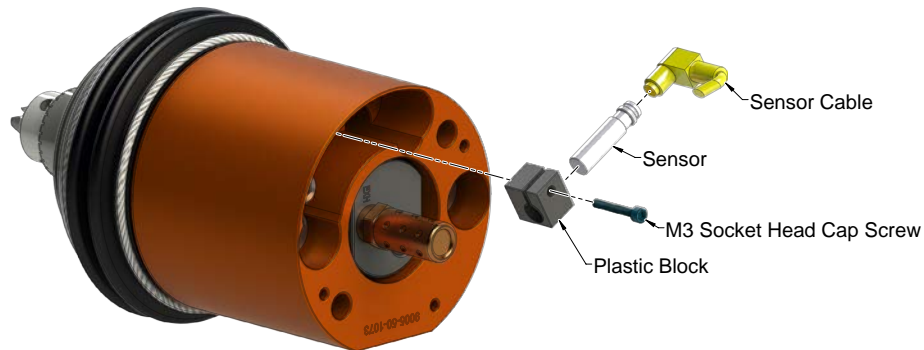
Figure 6.8—Removing the Rear Housing



2. Using a 4 mm hex key, remove the (3) M5 socket head cap screws holding the rear housing to the front housing.

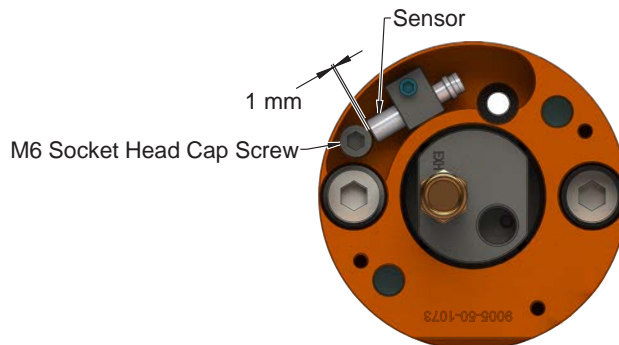
3. Remove the rear housing and observe the nickel plated cylindrical sensor mounted in the plastic block.

Figure 6.9—Replacing the Sensor



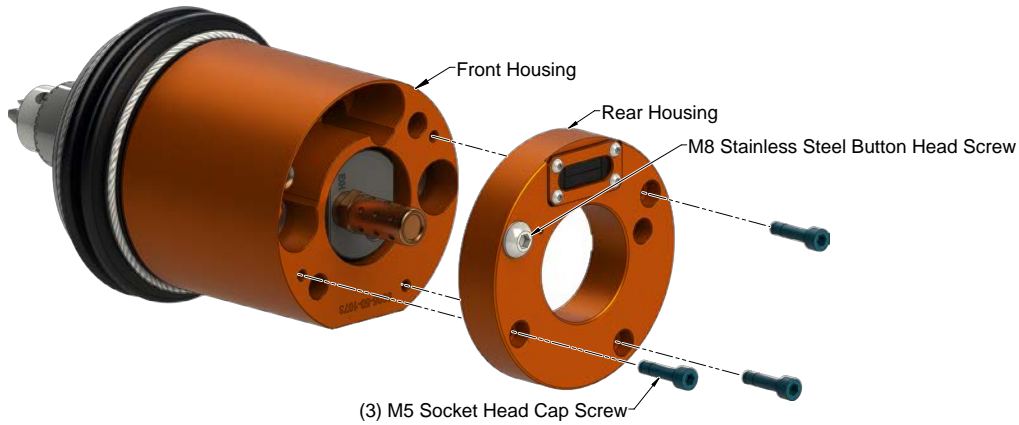
4. Replacing or adjusting the sensor:
 - If replacing the sensor, remove the M3 socket head cap screw (using a 2.5 mm hex key) that secures the plastic block to the housing. Disconnect the sensor cable from the sensor and remove the sensor. Continue to step 5.
 - If adjusting the sensor, loosen the M3 socket head cap screw (using a 2.5 mm hex key) that secures the plastic block. Continue to step 8.
5. Discard the sensor.
6. Install the new sensor into the plastic block and connect the sensor cable to the sensor.
7. Install the plastic block to the housing and push the sensor body fully forward.
8. Adjust the clearance between the face of the sensor and the head of the M6 socket head cap screw until the radial gap is 1 mm.

Figure 6.10—Adjusting the Sensor



9. Using a 2.5 mm hex key, tighten the M3 socket head cap screw securing the plastic block to contact plus a 1/4 turn.
10. Install the rear housing to the front housing.
 - a. Ensure the (2) o-ring seals are in place before securing.
 - b. Apply Loctite 222 to the (3) M5 socket cap screws that secure the rear housing.
 - c. Install the (3) M5 socket head cap screws that secure the rear housing to the front housing.
 - d. Using a 4 mm hex key, tighten the (3) M5 socket head cap screws to 20 in-lbs (2.26 Nm).

Figure 6.11—Installing the Rear Housing



11. Using a 5 mm hex key, remove the M8 stainless button head screw from the rear housing and reach through the opening with the 5 mm hex key to turn the target screw (M6 socket head cap screw). Refer to [Figure 6.8](#).
12. Push the motor mount all the way forward.
13. With the spindle pushed all the way forward, turn the target socket head cap screw counter clockwise until the sensor turns OFF.
14. Turn the target screw (M6 socket head cap screw) one complete turn clockwise using a 5 mm hex key.
15. Apply Loctite 222 to the M8 stainless steel button head screw.
16. Using a 5 mm hex key, install the M8 stainless steel button head screw. Tighten to 20 in-lbs (2.26 Nm).
17. Safely resume normal operation.

6.2.5.2 Retract Sensor (Option -R)

The retract sensor is mounted to the rear housing inside the tool. When the spindle is within 1.5 mm of being fully retracted the sensor will turn on. This may be utilized to indicate when excessive brush force is being applied (for example: the brush has been pushed back so far and so hard that the end of compliance travel has been reached).

To remove, and install the sensor perform the following procedure (there is no adjustment).

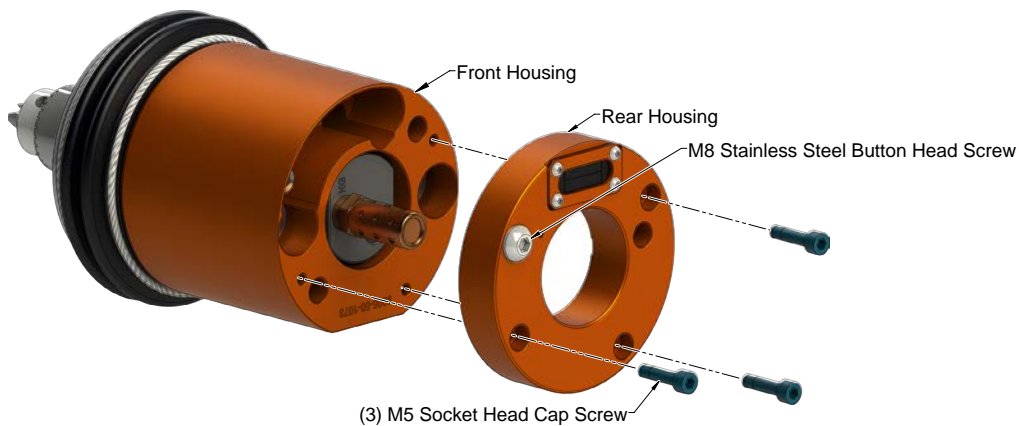
Parts required: Refer to https://www.ati-ia.com/app_content/Documents/9630-50-ACT-390%20Series.auto.pdf

Tools required: 2 mm and 4 mm hex key, torque wrench, feeler gauge

Supplies required: Loctite 222

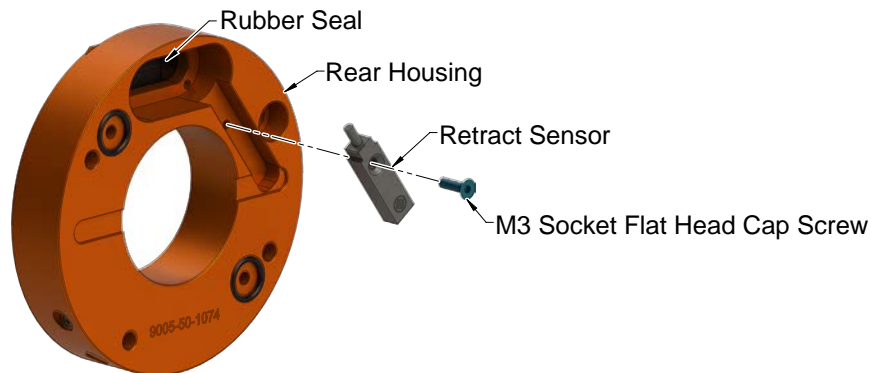
1. Discharge pressure in the air lines to the tool's spindle and compliance connections.

Figure 6.12—Removing the Rear Housing



2. Using a 4 mm hex key, remove the (3) M5 socket head cap screws holding the rear housing to the front housing.

Figure 6.13—Replacing the Retract Sensor



3. Using a 2 mm hex key, remove the M3 socket flat head cap screw that secure the retract sensor to the rear housing.
4. Slide the cable and sensor out through the rubber seal on the rear housing.
5. Slide the new cable and sensor through the rubber seal on the rear housing.
6. Apply Loctite 222 to the threads of the M3 socket flat head cap screw.
7. Install the new retract sensor to the inside of the rear housing using the M3 socket flat head cap screw.

8. Using a 2 mm hex key, tighten the M3 socket flat head cap screw to 60 in-oz (0.42 Nm).
9. Install the rear housing to the front housing.
 - a. Ensure the (2) o-ring seals are in place before securing.
 - b. Apply Loctite 222 to the (3) M5 socket cap screws that secure the rear housing.
 - c. Install the (3) M5 socket head cap screws that secure the rear housing to the front housing.
 - d. Using a 4 mm hex key, tighten the (3) M5 socket head cap screws to 20 in-lbs (2.26 Nm).
10. Safely resume normal operation.

7. Serviceable Parts

For repair and spare parts, please contact ATI. Refer to https://www.ati-ia.com/app_content/Documents/9630-50-ACT-390%20Series.auto.pdf for exploded drawings that show all the user replaceable components of the VersaFinish. Available accessories, tools, and optional replacement parts are listed in the following section: All other repairs must be performed by ATI.

7.1 Accessories, Tools, and Optional Replacement Parts

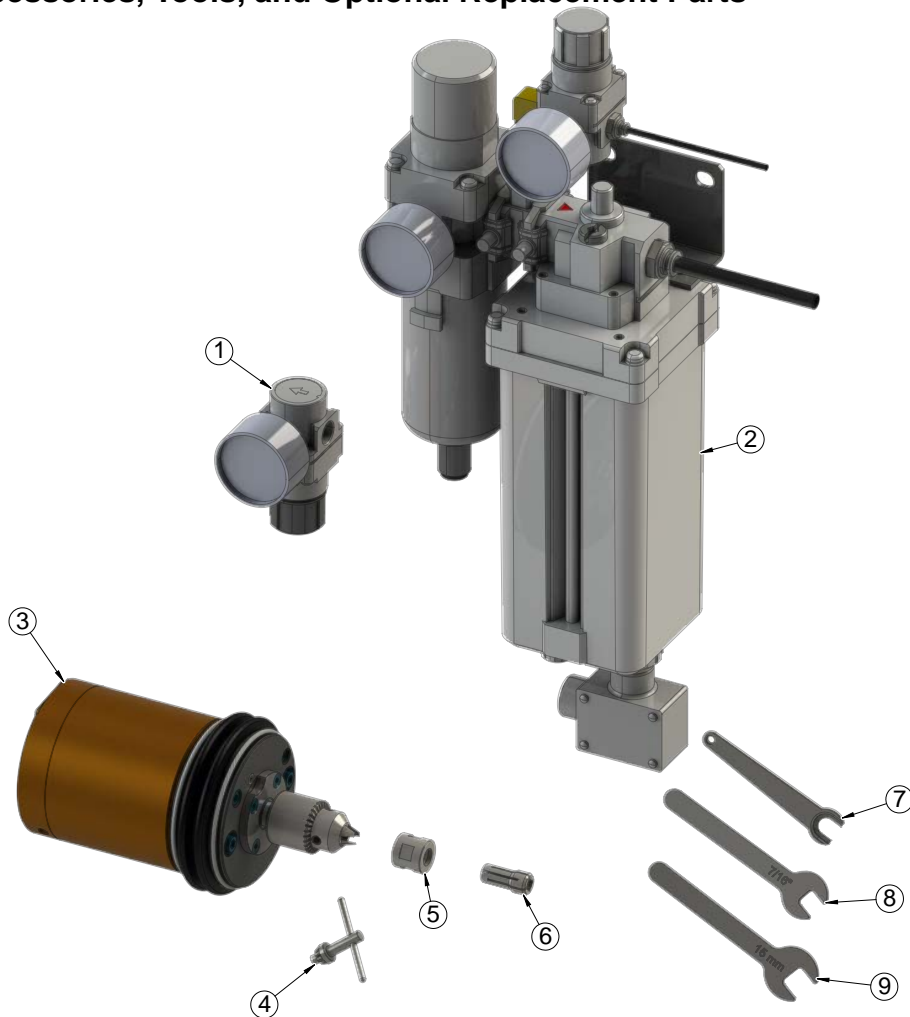


Table 7.1—Accessories, Tools, and Optional Replacement Parts

Item No.	Qty	Part Number	Description
1	1	9005-50-6164	Precision Regulator
2	1	9005-50-6174	High-Flow Filter/Regulator Assembly
3	1	9150-ACT-C-CBC200	Collet Nut (for DA200 Collet Models)
4	1	9150-ACT-C-84911163	1/4" DA200 Collet (for DA200 Collet Models)
5	1	9150-ACT-T-3169A26	VersaFinish Chuck Key, KG1 (for Keyed Chuck Models)
6	1	9150-ACT-T-841015mm	15 mm Open End Spanner (all Models)
7	1	9150-ACT-T-841075in	3/4" Open End Spanner (for DA200 Collet Models)
8	1	9150-ACT-T-841056in	9/16" Open End Spanner (for DA200 Collet Models)

8. Specifications

Table 8.1—Specifications for the ACT-390 Series	
Parameter	Rating
Motor	Air motor, vane type
Idle Speed	5,600 RPM
Working Speed (max. power)	2,600 RPM
Power	390 W (0.52 hp) at 2,600 RPM
Torque (max. power) (starting/stall)	1.4 Nm (1 lb-ft) 2.7 Nm (2 lb-ft)
Weight total (w/o adapter)	3.3 kg (7.25 lbs)
Compensation	15 mm max. axial, ± 7.5 mm recommended (0.59 in. max. axial, 0.30 in. recommended)
Compliance force	14–74 N, @ supply pressure of 0.34–4.1 bar (3.2–16.7 lbs, @ supply pressure of 5–60 psi)
Surface speed	Dependent on media geometry
Spindle Air pressure	6.2 bar (90 psi)
Air consumption (max.)	19 CFM (9 l/s)
Oil consumption	Approximately 3–4 drops of oil per minute (1 drop = 15 mm ³) by oil fog at max. air consumption
Chuck size	3/8" Standard (Specials Available)
Abrasive media	Customer-supplied
Special tools (supplied)	Open end spanner, 15 mm (Chuck & Collet Models) Jacobs chuck key, KG1 (Key Chuck Models) Open end spanner, 3/4" (Collet Models) Open end spanner, 9/16" (Collet Models)
Sound Pressure Level¹	Less than 75 dBA , No-Load at a distance of 1.5 meters (5 feet) from the tool.
Notes:	
<ol style="list-style-type: none"> 1. Because the working environment is unknown, it is impossible to predict the noise that will occur during an operation. The tool may also excite resonant frequencies on equipment to which it is mounted creating higher sound pressure levels than the unit by itself. 2. Each VersaFinish is tested for proper operation prior to shipment. 3. The following charts show measured forces relative to applied compliance air pressure. Measurements may vary from one product to another, and should only be treated as nominal. 	

9. Terms and Conditions of Sale

The following Terms and Conditions are a supplement to and include a portion of ATI's Standard Terms and Conditions, which are on file at ATI and available upon request.

ATI warrants the compliant tool product will be free from defects in design, materials and workmanship for a period of one (1) year from the date of shipment and only when used in compliance with manufacturer's specified normal operating conditions. This warranty does not extend to tool components subject to wear and tear under normal usage; including but not limited to those components requiring replacement at standard service intervals.

The warranty period for repairs made under a RMA shall be for the duration of the original warranty, or ninety (90) days from the date of repaired product shipment, whichever is longer. This warranty is void if the unit is not used in accordance with guidelines presented in this document. ATI will have no liability under this warranty unless: (a) ATI is given written notice of the claimed defect and a description thereof within thirty (30) days after Purchaser discovers the defect and in any event not later than the last day of the warranty period; and (b) the defective item is received by ATI not later ten (10) days after the last day of the warranty period. ATI's entire liability and Purchaser's sole remedy under this warranty is limited to repair or replacement, at ATI's election, of the defective part or item or, at ATI's election, refund of the price paid for the item. The foregoing warranty does not apply to any defect or failure resulting from improper installation, operation, maintenance or repair by anyone other than ATI.

ATI will in no event be liable for incidental, consequential or special damages of any kind, even if ATI has been advised of the possibility of such damages. ATI's aggregate liability will in no event exceed the amount paid by purchaser for the item which is the subject of claim or dispute. ATI will have no liability of any kind for failure of any equipment or other items not supplied by ATI.

No action against ATI, regardless of form, arising out of or in any way connected with products or services supplied hereunder may be brought more than one (1) year after the cause of action occurred.

No representation or agreement varying or extending the warranty and limitation of remedy provisions contained herein is authorized by ATI, and may not be relied upon as having been authorized by ATI, unless in writing and signed by an executive officer of ATI.

Unless otherwise agreed in writing by ATI, all designs, drawings, data, inventions, software and other technology made or developed by ATI in the course of providing products and services hereunder, and all rights therein under any patent, copyright or other law protecting intellectual property, shall be and remain ATI's property. The sale of products or services hereunder does not convey any express or implied license under any patent, copyright or other intellectual property right owned or controlled by ATI, whether relating to the products sold or any other matter, except for the license expressly granted below.

In the course of supplying products and services hereunder, ATI may provide or disclose to Purchaser confidential and proprietary information of ATI relating to the design, operation or other aspects of ATI's products. As between ATI and Purchaser, ownership of such information, including without limitation any computer software provided to Purchaser by ATI, shall remain in ATI and such information is licensed to Purchaser only for Purchaser's use in operating the products supplied by ATI hereunder in Purchaser's internal business operations.

Without ATI's prior written permission, Purchaser will not use such information for any other purpose or provide or otherwise make such information available to any third party. Purchaser agrees to take all reasonable precautions to prevent any unauthorized use or disclosure of such information.

Purchaser will not be liable hereunder with respect to disclosure or use of information which: (a) is in the public domain when received from ATI; (b) is thereafter published or otherwise enters the public domain through no fault of Purchaser; (c) is in Purchaser's possession prior to receipt from ATI; (d) is lawfully obtained by Purchaser from a third party entitled to disclose it; or (f) is required to be disclosed by judicial order or other governmental authority, provided that, with respect to such required disclosures, Purchaser gives ATI prior notice thereof and uses all legally available means to maintain the confidentiality of such information.

9.1 Motor Life and Service Interval Statement

The air motors that are used in ATI deburring/finishing tools are subject to wear and have a finite life. Motors that fail, during the warranty period, will be repaired or replaced by ATI as long as there is no evidence of abuse or neglect and that the normal operating practices outlined in this manual have been observed.

Components such as motor vanes, bearings, any gear reduction components, and collet nuts/chucks are considered consumable and are not covered by warranty. The customer should expect to service or replace these items at designated service intervals. For any part this is not detailed in this manual, contact ATI for part numbers and pricing.

Premature bearing failure can occur from exposing the deburring tool to coolants and water or impacts from collisions. Other failure modes that are outlined in the manual and relate to improper machining practices and deburring media selection.

9.1.1 Vane Motor Products

Vane type motors have a finite life and require regular service. At that time the customer should expect to replace the bearings and motor vanes. Any gear reduction components should also be inspected and replaced as necessary. Vane type motors perform best and longest when supplied with lubricated air. The service interval will be catastrophically shortened if the tool is ran without lubrication. The expected life of a properly lubricated vane motor in normal operation is entirely application dependent based on a multitude of factors. To maximize the life of a vane type motor products the customer should follow closely the normal operation guide in the product manual. The supplied air must be lubricated, and filtered to remove particulates and moisture. Premature bearing failure can occur from exposing the deburring tool to coolants and water or impacts from collisions. Other failure modes are outlined in the manual and relate to improper machining practices and deburring media selection.