Compliant Deburring Tool for Robot

User's Quick Guide

BSA400

Website Youtube

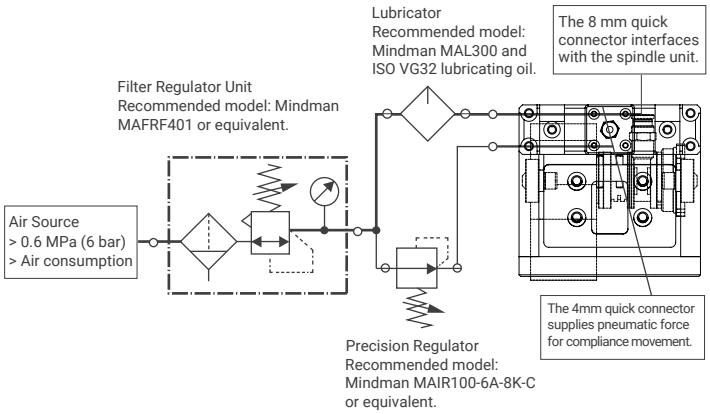
Maintenance

1. **Daily:** Check whether the grinding tool is damaged or wore, replace it immediately when it has invalid. Check air conditions and make sure the filter cup is not full of water, drain it in time. Check the lubricating oil drip rate is normal.

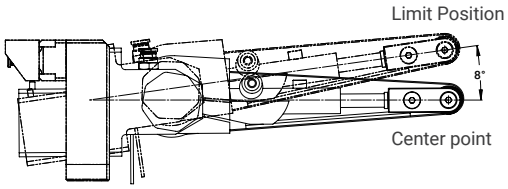
2. **Weekly:** Ensure the spindle operates smoothly without weird noises. Make sure compliant tool movements work smoothly, and the spindle is able to return to the CENTER POINT. Shake the spindle gently by hand at the CENTER POINT, and the mechanical gap should be less than 0.5mm. The spindle should be able to reach both forward and backward LIMIT POSITION. If any defect is discovered, please contact your supplier.

Before Use

1. Prepare a suitable air source as shown in the diagram below. The maximum flow rate of the air supply line must be greater than the air consumption of the tool.



2. Check the CENTER POINT (*1). While the spindle is at rest, apply 0.2 MPa (2 bar) of air pressure to the compliant force connector. Make sure the spindle returns to the CENTER POINT, as shown in the illustration below. If the spindle does not return or is not aligned with the CENTER POINT, please contact your supplier.



3. Turn the spindle on when it is on the CENTER POINT, and listen to its high-frequency sounds. If there are any other low-frequency sounds or noises, or if the spindle doesn't rotate or is not smooth, please contact your supplier.

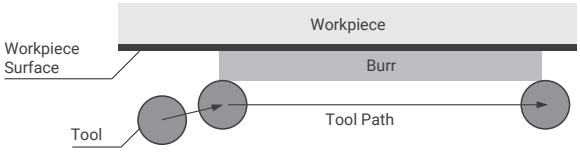
4. Install the compliant tool on the robot or a fixed position by screw holes and pin holes on the mounting plate (*2).

5. Set up TCP (Tool Center Point) of the compliant tool in the robot controller by using either the designed dimensions or the four-point calibration method (*3).

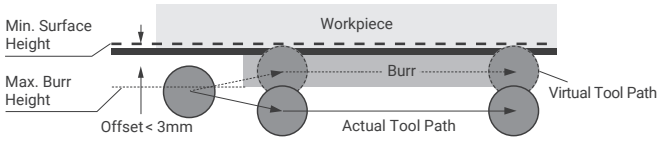
6. You have finished the pre-use preparation, now you can start teaching-in robot paths or run auto path generation.

Path Teaching Guidelines

1. Move the spindle back to the CENTER POINT, then guide the spindle to move over the workpiece (*4), and teach a path where the abrasive belt remains in consistent contact with the burrs or areas to be removed.



2. Apply an offset (virtual depth of cut) to the taught path from the previous step. The purpose of this offset is to prevent the tool from losing contact with the workpiece and to maintain a stable compliant force. The key to setting this offset is to visualize a virtual path of the tool starting from its CENTER POINT. The offset should be greater than the total tolerance to be absorbed, but less than 3 mm to avoid reaching the STROKE LIMIT of the compliant mechanism.



3. If the burr height is too high to maintain an offset of less than 3mm, it may be necessary to repeat the process along the corresponding path multiple times, each time gradually reducing the virtual cutting depth towards the final target.

4. If the robotic arm path is curved, more path points are required compared to a straight path. When the burr height is significant, reduce the robotic arm speed; conversely, increase the speed when the burr height is smaller. Before performing the final deburring operation, ensure that the robotic arm path is smooth and optimized.

Operation

1. Set the compliance force to a lower value, such as 0.2 MPa (2 bar), turn on the spindle's air pressure source, and execute the robot path.

2. If the burrs are not fully removed, increase the compliance force. If some burrs remain, reduce the robot speed along the areas where burrs are not completely removed. If the cut depth is too great, decrease the compliance force or increase the robot speed.

3. If the tool bounces on the workpiece, it indicates that the compliance force is too low. Increasing the compliance force or reducing the robot speed will resolve this issue.

4. If the spindle's rotational speed drops significantly or stops during the deburring operation, it indicates an excessive material removal rate. Lowering the compliance force or reducing the robot speed will address this issue.

Cautions

1. This product is exclusively designed for robot deburring work, DO NOT use it for other purposes.
2. For your safety, DO NOT approach the robot when it is in automatic operation mode.
3. The tool or burrs may cause injury. Exercise caution during operation.
4. Collisions may damage the tool or compliance module. Always verify the robot path before executing full automatic operation.

Cautions (continued)

5. Compliant tools could be damaged by severe bouncing of the tips on the workpiece. Always perform checks before setting it to automatic operation mode.
6. The air supplied to the precision regulator and compliant force should NOT be lubricated, otherwise, the compliant tools will be damaged.
7. To ensure proper operation of internal components, extend spindle lifespan, and maintain optimal performance, pneumatic spindles must be regularly lubricated with VG32 or R32 low-viscosity oil (recommended rate: 0.1 cc/2 min), in combination with the DS-Lubo ATML 100 Series (available as an optional item with the tool purchase order).
8. The noise from the deburring operation could damage your hearing, always wear ear protection during work.
9. The tool should engage the workpiece strictly along the compliant axis. Contact in any non-compliant direction, including axial or lateral contact outside the intended compliance path, may result in mechanical failure and is not covered under warranty.
10. To ensure optimal performance of grinding tools and spindles, operators must apply proper operating force and avoid excessive pressure or overloading. Improper use may lead to reduced spindle speed and shortened service life.

Appendix

Model		BSA400
Compliant Stroke	(mm)	15 mm
Compliant Force	(N)	36.5~91N
Power	(kW)	1.25
Compliant Pressure	(MPa)	0.2~0.5MPa (2~5MPa)
Spindle Pressure	(MPa)	≥0.6 (6 bar)
Air Consumption	(lpm)	Compliance Force: Negligible Pneumatic Spindle: 600
Lubricant	(drops/min)	1-2 (only for spindle)
Pneumatic Spindle Idle Speed	(rpm)	3,000
Applicable Sanding Belt Size	(mm)	25.4 mm × 914 mm (Diameter × Length)
Ambient Temperature	(°C)	+3~35
Ambient Humidity	(%)	<95
Weight	(kg)	14

*1. The CENTER POINT may not align exactly with the designed position. A tolerance or gap smaller than 0.5mm is normal.

*2. Please contact your supplier to obtain the 3D and 2D drawings of the compliant tool, or download them from our website.

*3. It is recommended to begin with the designed dimensions and then use the four-point calibration method to refine the TCP accuracy. When implementing the four-point calibration method, use a sharp dummy tip to indicate the desired TCP point.

*4. The robot can either hold the workpiece or the tool, depending on system integration requirements.

Outline Dimension Drawing