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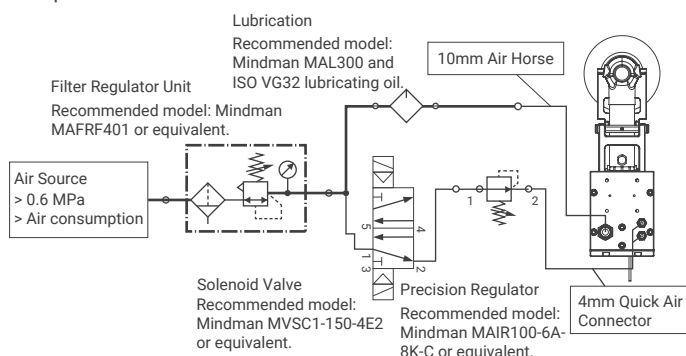
1. **Daily:** Check whether the grinding tool is damaged or wore, replace it immediately when it has invalid. Check air conditions and make sure the filter cup is not full of water, drain it in time. Check the lubricating oil drip rate is normal.

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.


Lubrication
Recommended model: Mindman MAL300 and ISO VG32 lubricating oil.

Filter Regulator Unit
Recommended model: Mindman MAFRF401 or equivalent.

10mm Air Horse

Air Source
> 0.6 MPa
> Air consumption

Solenoid Valve
Recommended model: Mindman MVSC1-150-4E2 or equivalent.

Precision Regulator
Recommended model: Mindman MAIR100-6A-8K-C or equivalent.

4mm Quick Air Connector

2. Check the CENTER POINT (*1) first; giving 0.2 MPa pressure to the compliant force connector while the spindle is turning off. Make sure the spindle is able to return to the CENTER POINT as shown as the illustration below. Please contact your supplier if it couldn't return to or is not on the CENTER POINT.
The PC900 has two 4mm quick connectors at the rear, each providing air pressure to enable the PC900's compliant mechanism to swing upwards or downwards. As shown in the diagram below, to minimize the compliant force, apply a low air pressure to the upward swing quick connector to counteract some of the mechanism's weight, thus reducing the output compliant force.


8mm
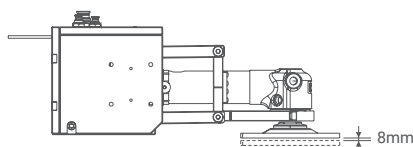
3. Turn the spindle on when it is on the CENTER POINT, and listen to its high-frequency sounds. If there are any other low-frequency sounds or noises, or if the spindle doesn't rotate or is not smooth, please contact your supplier.

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. Use a brand-new grinding wheel, keep the compliant mechanism fully pressed down, and then teach the robot path to ensure the grinding wheel just contacts the areas of the workpiece that need to be ground without interference (*4).

2. A grinding angle of approximately 30 degrees relative to the workpiece surface provides optimal grinding results and minimizes interference. The grinding path should move the contact point toward the center of the grinding wheel axis.

Workpiece

Surface
Max grinding height
Grinding wheel
Robot path
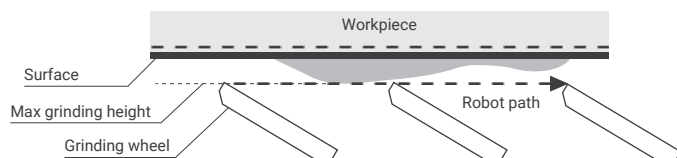
3. Add an offset (virtual depth of cut) along the path taught in the previous step. The purpose is to ensure that the compliant tool maintains contact with the workpiece. The offset should be greater than all dimensional errors, including the depth that needs to be ground, but should not exceed the limit of the compliant stroke.

Tolerance lower limit

Workpiece   Virtual robot path

Maximum grinding height

Minimun offset
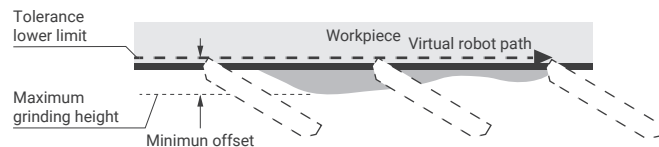
4. Adjust the robot path so that the grinding wheel stays roughly in a fixed position within the compliant stroke as it moves across the workpiece surface, preventing excessive swinging. This will help maintain a more stable cutting effect

Operation

1. Set the compliance force to a small value, such as 0.2 MPa, then start operating the robot path.

2. Increase the compliance force if the burrs were not completely removed. If some burrs remain, decrease the robot speed in the corresponding segments. If the cuts are too deep, reduce the compliance force or speed up the robot.

3. If the tool bounces on the workpiece, this is caused by too low of a compliance force. Increase the compliance force or decrease the robot speed to solve this issue.

4. If the spindle noticeably slows down or stops during the operation, this is due to a high material removal rate. Lowering the compliance force or robot speed will resolve this problem.

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. Tips and burrs could cause injuries, be cautious when working with them.

4. Tips and compliant tools could be damaged by collision. Always check the robot paths before setting it to automatic operation mode.

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. The noise from the deburring operation could damage your hearing, always wear ear protection during work.

8. Never make contact with the workpiece from the non-compliant module movement direction. Any contact in a direction other than the compliant direction, including the tip or the non-compliant side, will result in damage to the mechanism and is not covered under warranty.

Appendix

Compliant Stroke	(mm)	Unidirectional 8mm
Compliant Force	(N)	20~50
Compliant Pressure	(MPa)	0.2~0.5 (2~5bar)
Spindle Pressure	(MPa)	≥0.6(6bar)
Air Consumption	(LPM)	Compliance Force: Negligible
		Pneumatic Spindle: 1800
Lubricant	(drops/min)	1-2(only for spindle)
Pneumatic Spindle Speed	(rpm)	12,000
Collet Size	(mm)	5" Diameter Grinding Wheel, Sanding Disc
Ambient Temperature	(°C)	+5~35
Ambient Humidity	(%)	<95
Weight	(kg)	4

*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.