SNC Laser Tool Setter User Manual

CONTENT

Before you begin

Disclaimers

Before publication, we made great efforts to verify the accuracy of this article, but to the extent permitted by law, all warranties, conditions, statements, and liabilities arising for any reason are excluded.

SilverCNC reserves the right to make changes to this article and the equipment and/software specified , as well as the specifications, without any obligation to provide notice of such changes.

Warranty

The standard warranty for all SilverCNC products is one year,

Unless you reach and sign a separate written agreement with SilverCNC, Otherwise, all devices and/or software should be sold according to the SilverCNC standard terms and conditions.

If the device encounters the following conditions, it is not covered by the warranty:：

- Negligence, improper operation or use
- Unauthorized modification or alteration of products
- If you purchase equipment from any other supplier, you should contact them to know about the warranty.

Device changes

SilverCNC reserves the right to change product specifications without prior notice.

Machine tool

CNC machine tools must always be operated by fully-trained personnel in accordance with the manufacturer's instructions

Interface maintenance

The laser tool setter system is a precision component that operates in harsh environments and is susceptible to interference from cutting fluids. The optical mirror components of the tool setter system need to be cleaned regularly .

Notice to machine manufacturer

It is the machine supplier's responsibility to ensure that the user is made aware of any hazards involved in operation, including those mentioned in SilverCNC product literature, and to ensure that adequate guards and safety interlocks are provided.

Under certain circumstances, the probe signal may falsely indicate beam not blocked. Do not rely

on probe signals to halt the movement of the machine.

Notice to machine installation

All SilverCNC equipment is designed to comply with the relevant EU and FCC regulatory requirements.

It is the responsibility of the equipment installer to ensure that the following guidelines are adhered to, in order for the product to function in accordance with these regulations:

- any interface MUST be installed in a position away from any potential sources of electrical noise (for example, power transformers, servo drives);
- all 0 V/ground connections should be connected to the machine “star point” (the “star point” is a single point return for all equipment ground and screen cables). This is very important and failure to adhere to this can cause a potential difference between grounds;
- all screens must be connected as outlined in the user instructions;
- cables must not be routed alongside high current sources (for example, motor power supply cables), or be near high-speed data lines;
- cable lengths should always be kept to a minimum.

Warning and Precautions

Warnings

Failure to follow the procedures described in this publication may result in exposure to harmful radiation. Maintenance work on the SNC system can only be carried out after the power has been switched off. Basic safety precautions must be strictly followed when using the SNC system to reduce the risk of fire, electric shock and personal injury. Include the following safety measures:

- Read all instructions for use before operating this product.
- This product may only be installed and used by trained professionals.
- Use eye protection to prevent mechanical injury and contamination of coolant and chips.
- Avoid breathing in coolant vapors from the machine
- Do not block the light hole, pneumatic supply of the transmitter, receiver or blowing system.
- Do not block the light hole, pneumatic supply of the transmitter, receiver or blowing system. by any reflective surfaces

Attention - Laser safety instructions

The laser used in the SNC Non-contact tool setter emits visible red light at a wavelength of 680nm and has an output power of less than 1mW.

According to the definitions of BSEN60825 - 1:2014(IEC60825- 1: 2014), SNC belongs to class 2 laser products.

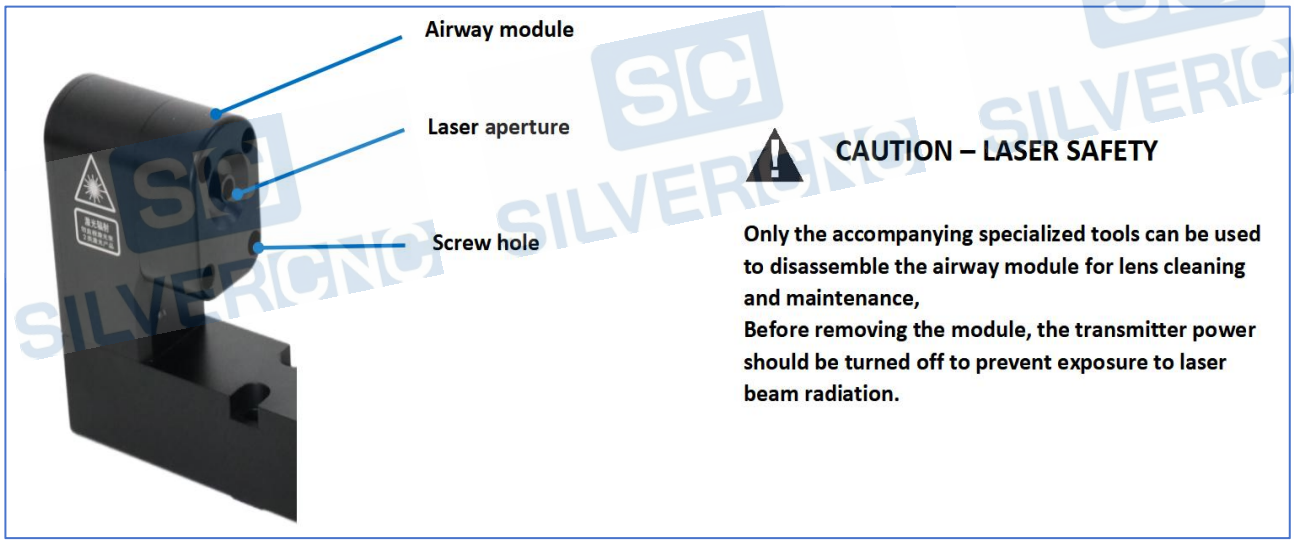
This product complies with 21 CFR 1040.10 and1040.11, except for deviations specified in Laser Notice No. 50 dated June 24. 2007. Standard BSEN60825-1:2014(IEC60825- 1: 2014) requires laser warning labels and instruction label.

There is a permanently attached warning label on one side of the launch module housing.

Laser safety and warning labels

Housing both sides contain labels

Laser hole position



SNC Non contact laser tool setter basic

This guide describes how to install, configure, maintain the SNC Non-Contact Tool Setter.

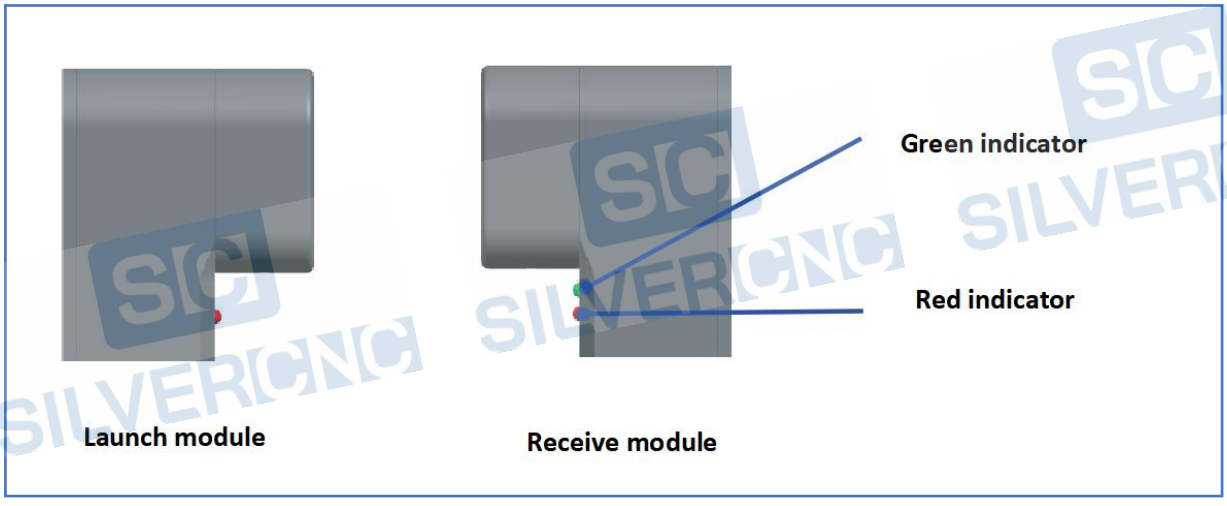
SNC (Laser Non-Contact Tool Setting System), which enables high speed/high-precision measurement of cutting tools on machining centers under normal operating conditions.

When the tool passes through the laser beam, the system detects that the beam is blocked. The output signal sent to the controller determines the presence of the tool and the position of the tool tip (broken tool detection).

Operating specifications

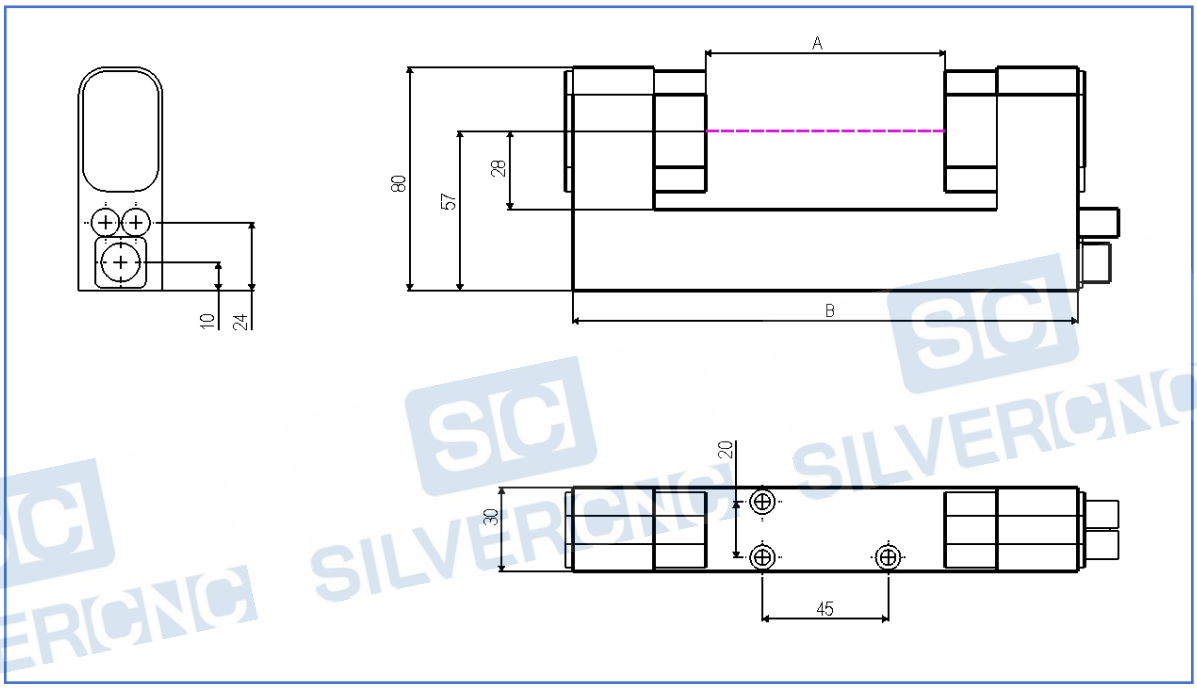
- SNC is a precision instrument and operate very carefully.
- Make sure all installations are secure.
- Keep electrical contacts clean.
- The system should be installed on the place so that not affected when operating the machine
- Install the system in a location that is not affected by chip buildup. Do not allow excessive waste to accumulate around the SNC.
- Cables, pneumatic tubes, protective tubes, etc. should be properly secured to avoid damage or load transfer to the SNC.
- Optimum measurement performance is achieved by continuously supplying pneumatic and power to the SNC.
- SNC is protected by a constant clean pneumatic flow. The optics should be checked periodically (approximately every 1 month) for contamination. Maintenance intervals can be extended or shortened according to actual conditions.

LED indicator light function for SNC



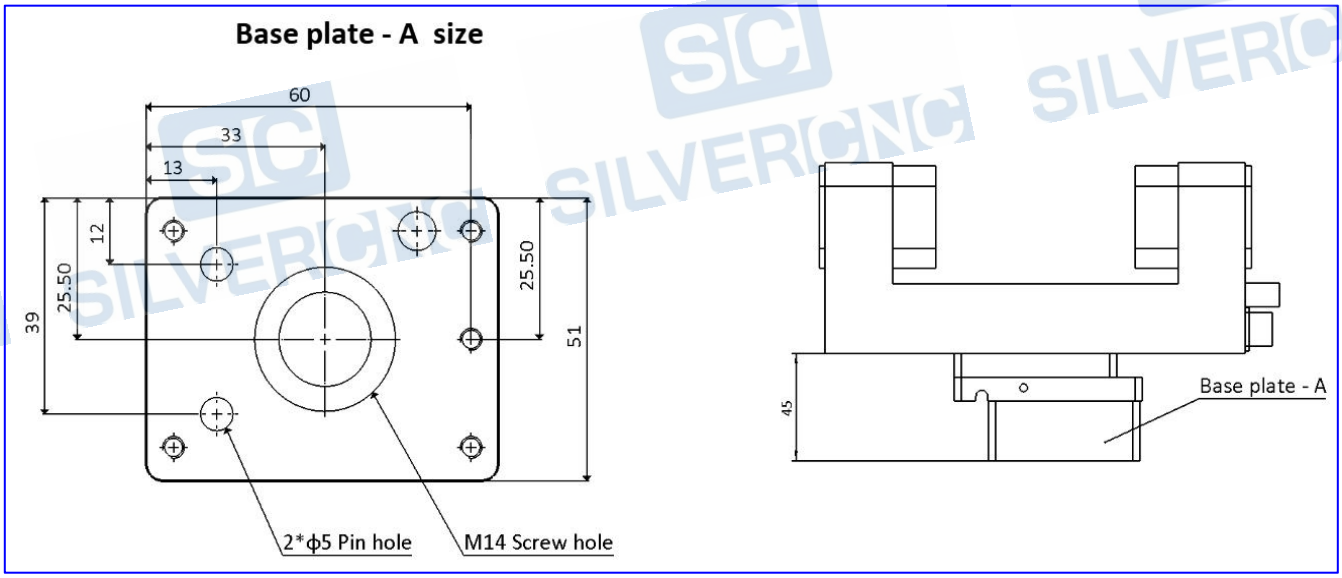
- When the tool setter powered on, red lights at both the laser emitting and receiving ends will light up
- Laser on, optical path on: the green light on at the receiving end.
- Obstruction of laser: Green light off

Feature size

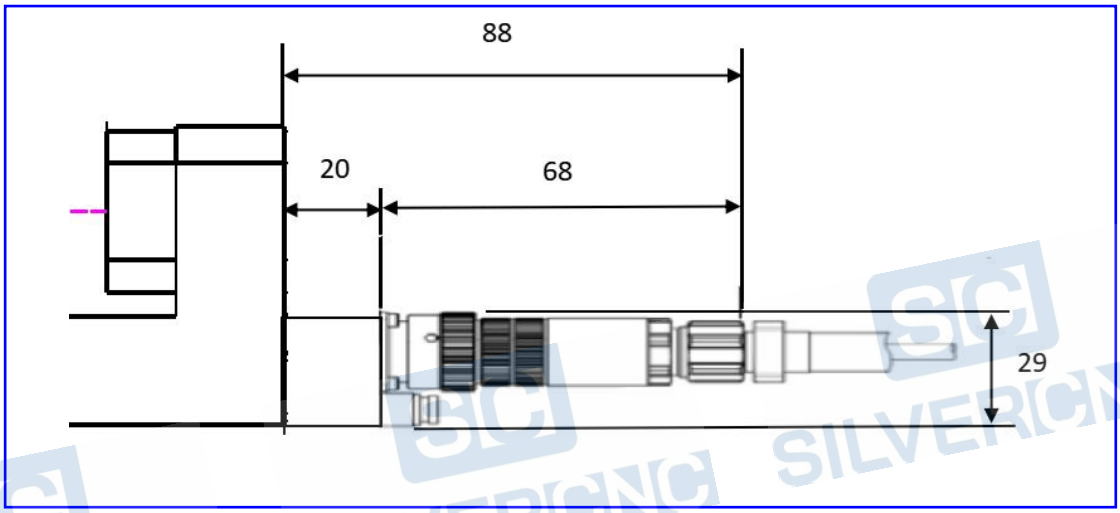


Models	A	B
SNC56	56	178
SNC86	86	208
SNC168	168	290

Mounting adjuster plate dimensions



Cable with connector dimensions



Specification

Laser type	Power <1mW, wavelength 680nm
Cable(to interface)	Hard-wired systems: cable on the end of the unit.
Sealing	IPX8
Best repeatability	±0.1 μm 2σ
Typical Repeatability	±1 μm (2σ)
Minimum tool or feature size	Ø0.1 mm or larger
Max tool or feature size	86 mm，
Minimum tool for breakage detection	Ø0.1 mm or larger
Power	100 mA @ 24 V
Output signal	No voltage solid state relay (SSR). Each relay may be normally open. Current (Max.) 50 mA, voltage (Max.) ±50 V
Storage temperature	~10 °C-50 °C
Operating temperature	5 °C-50 °C
Life	Tested to > 1 million on/off cycles
Pneumatic supply	4 mm Air pipe, 6.0 bar (87.02 psi) maximum 3 bar(43psi) min.
Cable	Ø6.0*8m (0.24 in) , two twisted pairs, two individual cores plus screen, each core 18 × 0.1 mm insulated

2.SNC Non contact laser tool setter basic

Mounting	M10 (3/8 in)
Application	High-precision, high-speed non-contact tool setting and tool breakage detection on all sizes of vertical and horizontal machining centres,multi-tasking machines and gantry machining centres
Laser beam alignment	The unit is supplied with an adjustable mounting plate on the underside

SNC minimum tool diameter

Note: The minimum tool diameters listed in this table are typical values and for reference only.

Unit（mm）

SNC models	Distance(mm)	Minimum tool diameter
SNC56	56	0.05
SNC86	86	0.06
SNC168	168	0.2

SNC System installation

Support required for complete installation

SNC	Ensure that the SNC system can meet your spacing distance requirement. If need a different ranges , please contact the supplier
Base plate	please choose the appropriate bracket
Air source	The device requires a clean and dry air source that must meet the requirements of 0.01um (ISO8573-1/1.3.1). If the standard cannot be met, choose a filter/regulator The blowing system requires a maximum air source of 5.0 bar. The air source of the blowing system must meet he requirements of 0.01μm (SO 8573-1/1.3.1). An electromagnetic valve is required to control the blowing system
Interface	Components require to use the interface.
Software	Need to use non-contact tool alignment software to run tool detection and measurement cycles
Accessories	Depending on the installation situation, it may be necessary to use protective pipes, joints, etc

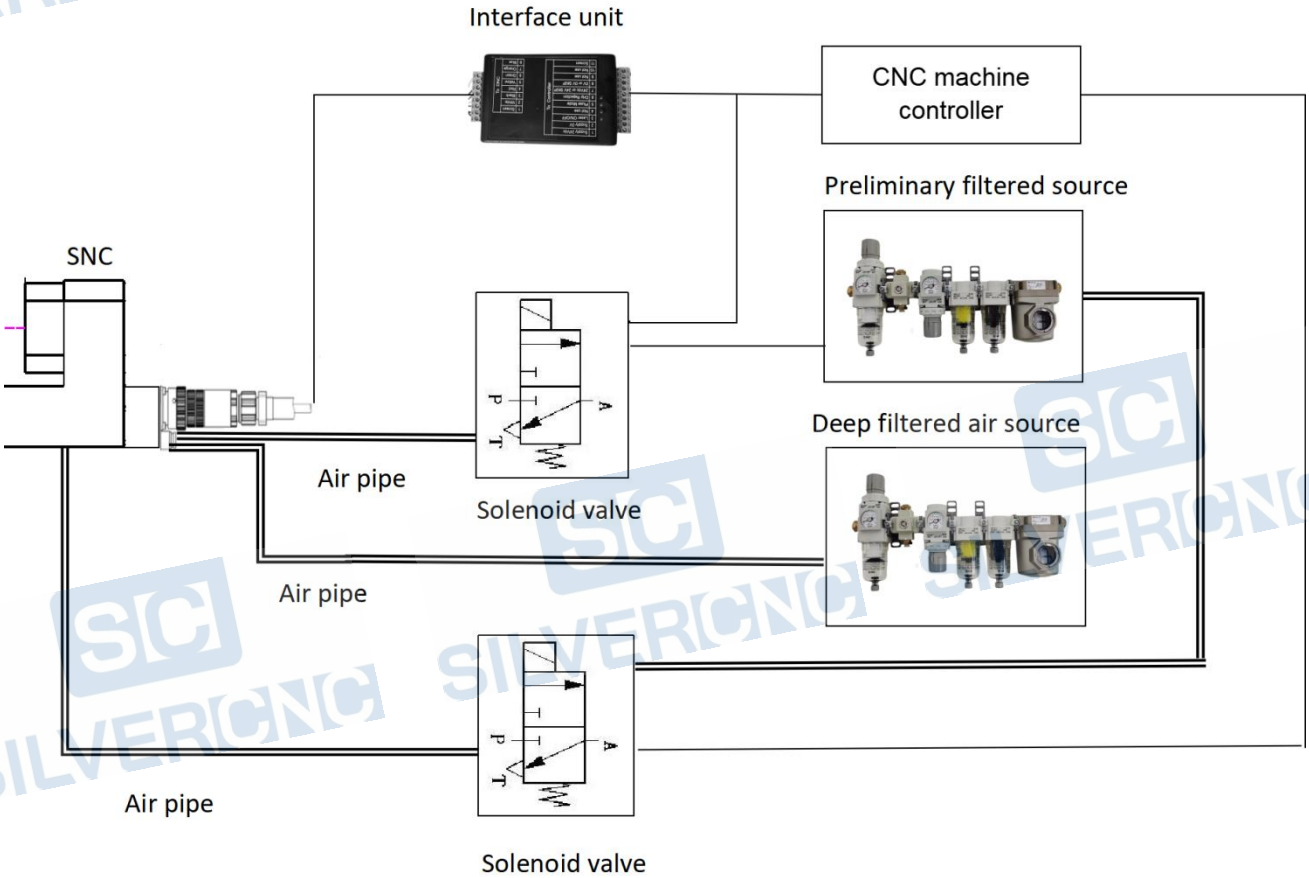
Installation steps

1. Install the air component (please refer to the "Installing Air Components" chapter for details). Do not turn on the air source or set the air pressure at this stage
2. Install system devices.
3. Install the interface.
4. Turn on the interface power.
5. Turn on the device's air source and set the air pressure
6. Straighten the beam.
7. Finally, calibrate the system according to the corresponding non-contact tool setting software programming guide
8. If there are any issues or if you want to learn more , please refer to the "Fault-finding" section.

Guidelines for best practice

- If possible, connect the air source to machine tool air filter/regulator device. Do not connect SNC to oil containing gas sources.
- Please protect the laser tool pipe in the machine tool to avoid contamination at both ends.
- Before connecting the air pipe to the inlet of the SNC device, turn on the air source for a while to blow out the debris inside the air pipe. When there is no more debris discharged, turn off the air source and connect it to the SNC.
- When installing the air pipe on the SNC, try to shorten the length of the air pipe as much as possible to reduce the pressure drop.
- If the air source temperature is 5 ° C higher than the ambient temperature and humid, please use air drying device.

Connection of circuit/gas circuit (schematic diagram)



Installing the air preparation pack

WARNING: Before starting to install components,make sure that the machine can perform the work safely

- Use the mounting bracket to secure the pneumatic conditioner vertically to a suitable surface. Must stay within 25.0 m of SNC
- Use a clean pneumatic supply compliant with BS ISO 8573-1: 2010 Pneumatic Quality Class 5.9.4, and connect it to the regulator inlet. Please use the gas that has been filtered for the first time directly from the filter of the machine tool.
- An additional pneumatic filter may be required if contamination of the compressed pneumatic supply is suspected (for example, if the pneumatic supply is coming directly from the shop, the machine tool filter is dirty, or if the pneumatic supply is downstream of an oil mist lubricator.
- After prepare air components, install the SNC system. Do not turn on the air source or set the air pressure until the SNC system and interface are installed and powered on.

Installing the SNC system

This section describes how to install the SNC system (integrated blowing module). Please refer to the diagram according to the actual situation

Warning: Before starting to install the SNC system, it is necessary to ensure that the machine tool can operate safely, When working in the control cabinet, please turned off the machine power.

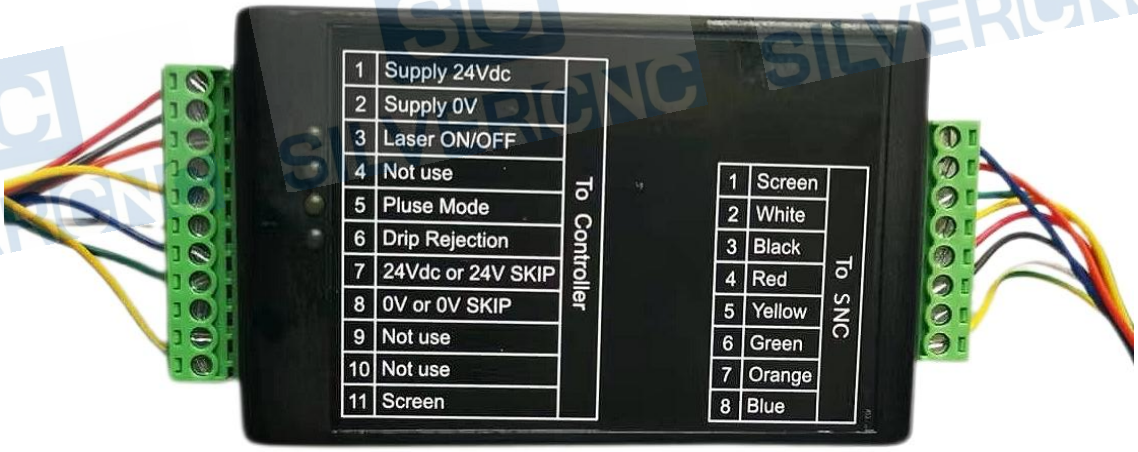
1. Install the system in a location where air can be freely discharged from the laser hole. Do not install the system in a location where a large amount of chips may accumulate.
2. Fix the adjustment base onto the machine tool workbench. Adjust the adjustment plate so that it is roughly parallel to the machine tool axis.
3. Use a dial gauge to adjust plate verticality to the machine tool spindle. Please adjust plate to within 0.5mm.
4. Lay protective tubes in the machine tool, check the length, and if necessary, cut the length of the protective tube.
5. Thread the cable and air duct into the protective tube, do not apply excessive pressure to the cable or air duct, otherwise it may damage the air circuit and circuit supply. If necessary, apply an appropriate amount of lubricant.
6. Connect the cable to the electrical cabinet of the machine tool, being careful not to place the cable next to the electrical noise source, such as the motor, power cable, etc.
7. Before connecting the air pipe, protect the free end of the air pipe to prevent debris from entering the air pipe.
8. Connect the air pipe to the air regulator and the blowing solenoid valve.
9. Open two solenoid valves, turn on the air source, and keep the three air pipes ventilated to remove debris.
10. Turn off the air source, connect the air pipe to the SNC body, and ensure that the load does not transfer to the SNC system during operation.
11. If necessary, wrap the protective tube over the air duct and cable.

Interface

WARNING: Before to install the interface, make sure that the machine is safety. Turn off the machine tool power when working in the control cabinet.

1. The signal interface should be installed in the CNC control cabinet, and should be as far away as possible from potential interference sources such as transformers and motor controllers.

2. The interface processes the SNC signal and converts to output. And then sent to the CNC machine controller to signal input.



SNC wiring detail

The SNC wire's colors and preset functions are explained below.

SNC system with two cables:

5m line: one end is aviation plug, the other end is terminal block, used to connect SNC house and signal interface.

1m line: One end is a wiring block, and the other end is a wiring terminal (with identification), used to connect the signal interface and the machine tool

Red: DC24V

Black: DCOV

Orange: turned on laser and connected to the output point controlled by the M code

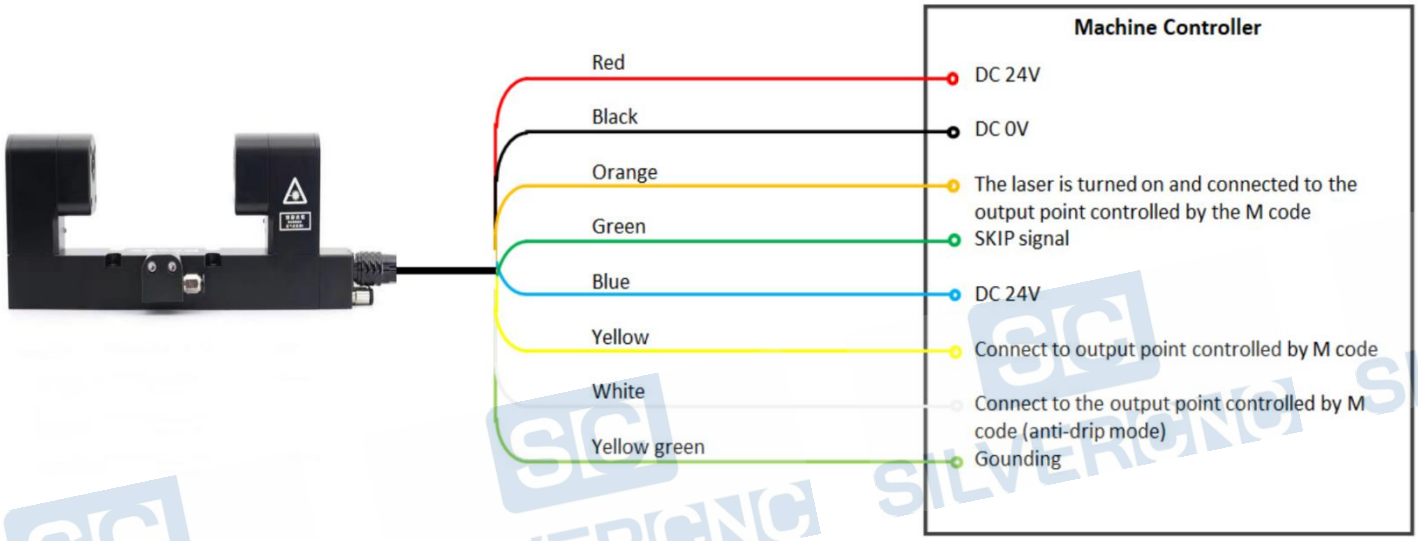
Green: SKIP signal

Blue: DC24VYellow

Yellow: Connect to output point controlled by M code

White: Connect to the output point controlled by M code (anti-drip mode)

Yellow-green: grounding



Note: If the FANUC system uses highspeed jump, the blue wire connected to the 5V terminal of the high-speed IO.

Wired the white wire means turn on the anti-drip mode.

Both the white and yellow wired means turn on the latch mode

After installing the interface, power on the interface.

After the interface is powered on, turn on the air source and set the voltage correctly

Power on

Warning： Before turning on the power, it is necessary to ensure that the machine tool can safely the operate. Before inserting or unplugging the interface, ensure that the interface is power-of.

- Make sure the interface and pneumatic supply are connected correctly.
- Power on the interface.
- Check and confirm that all the transmitter and receiver LED indicators is open

Setting the SNC system air pressure

Warning: Before setting the air pressure, it is necessary to ensure that the machine tool can safely the operation.

- Ensure that the interface is connected.
- Turn on the air source
- Adjust the air pressure, adjust the first stage filtration to 0.5Mpa, and adjust the second stage filtration to 0.3Mpa
- Pay attention to whether the SNC status indicator light is on and in a normal state.
- Pay attention to whether the laser hole channel protective blowing is turned on.
- Turn on the laser and blow air to check if it can be turned on normally.
- Note: If the air supply pressure changes during machine operate, it may be necessary to increase the SNC SYSTEM air pressure to allow for such pressure fluctuations.

Setting the SNC air blast pressure

Warning: Before setting the air pressure, it is necessary to ensure that the machine tool can safely the operation.

- Turn on the air source.
- Start the solenoid valve.
- Increase the air pressure until it is sufficient to remove chips and coolant dirt left during tool processing.
- The best effect achieved when the air pressure is 5.0 bar.
- For very small tools, the air pressure can be reduced to prevent damage to the tool.

Conversion table for different units of air pressure

Mpa	Bar	Psi
0.2	2	29
0.4	4	58
0.6	6	87
0.8	8	116
1	10	145

Aligning the SNC to the machine axis

Aligning the SNC system requires moving the system so that the laser beam is parallel to the machine axes. After straightening it can be adjusted so that the system is within the tolerances recommended in the "Alignment Tolerances" section

Use the Beam Alignment macro as described in the relevant "Non-Contact Tool Setting Software Programming Guide" to perform the alignment. The macro program shows the alignment of the system. You can then make adjustments to the SNC based on this information.

The transmitter and receiver of the SNC (integrated pneumatic blowing system) are set correctly before shipping. After installation, please follow the beam alignment macro program described in the "Non-contact Tool Setting Software Maintenance Guide" to perform alignment parameters.

Warning: Before setting the air pressure, it is necessary to ensure that the machine tool can safely the operate.

Straightening SNC

1. Run the beam alignment macro (see the Non-Contact Tool Setting Software Warranty Guide for more information).

2. If the alignment factory is out of the values described in the "Alignment Tolerances" chapter, make appropriate adjustments to the system. Please do the following.

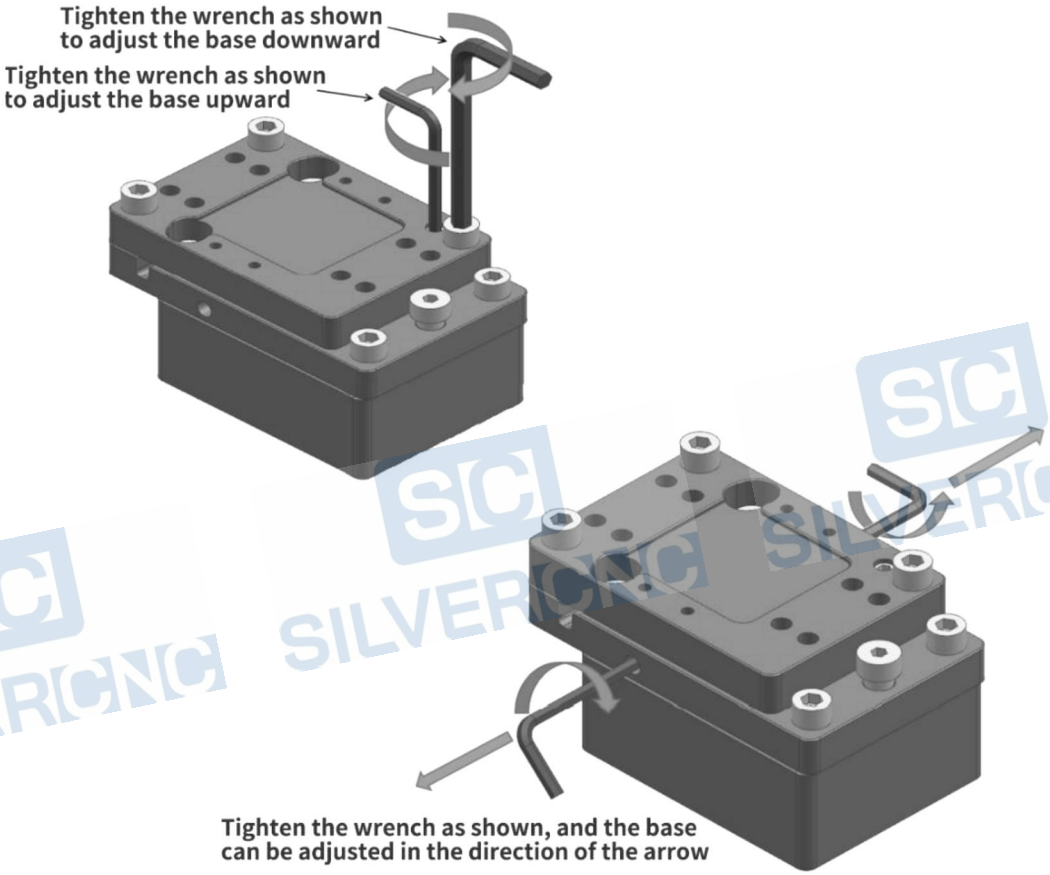
Align with X and Y axis

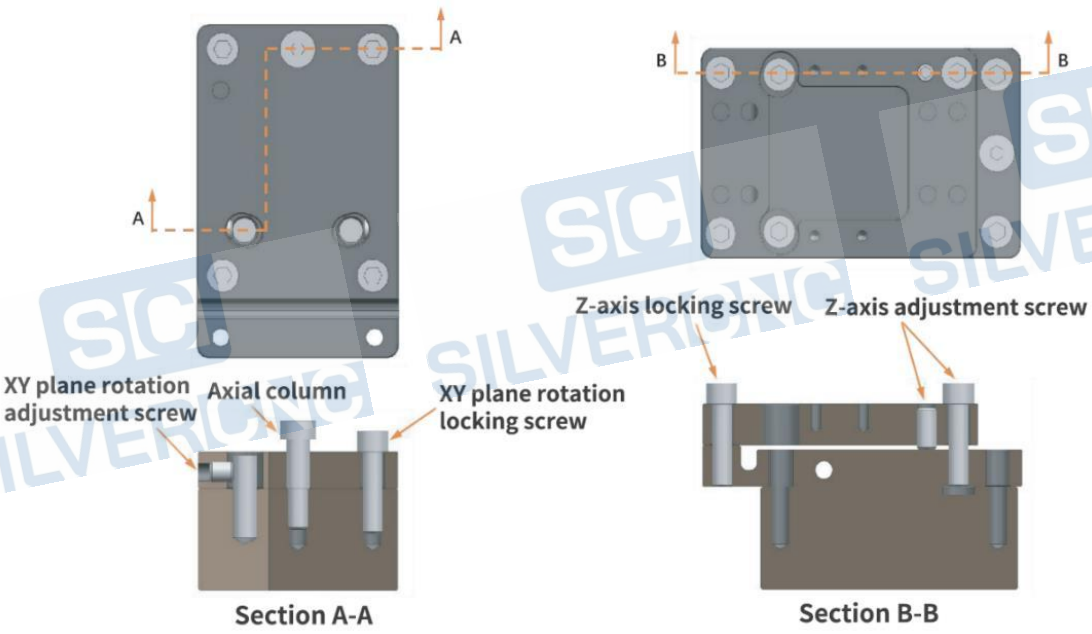
- Loosen the X-axis and Y-axis locking screws.
- Manually align the unit with the X and Y axis.
- Tighten the X and Y axis locking screws, taking care not to move the hardwired connections.

Align with Z axis

- Loosen the Z-axis locking screw.
- Adjust the Z-axis adjustment screw.
- Tighten the Z-axis locking screw carefully , taking care not to move the unit.

3. After system alignment is complete, run the beam alignment macro again。


Tighten the wrench as shown to adjust the base downward
Tighten the wrench as shown to adjust the base upward
Tighten the wrench as shown, and the base can be adjusted in the direction of the arrow


A
A
XY plane rotation adjustment screw
Axial column
XY plane rotation locking screw
Section A-A
B
B
Z-axis locking screw
Z-axis adjustment screw
Section B-B

Laser signal testing

1. Confirm the connection point of the SKIP signal. If connected to X122.13(SIEMENS controller), MEAS=1, and if connected to X132.13, MEAS=2.

2. Open the laser valve in MDA mode, turn on the laser, and then execute MEAS=1/MEAS=2 G91 G01 X100 F100. When the machine tool starts moving, touch the laser with your fingers or objects. If the machine tool stops moving, it indicates that the signal is normal.

More detail please check program manual to cycle code L9860

Alignment tolerances

The tolerances that can be set using the calibration table depend on the parallelism between the laser beam and the machine axes.

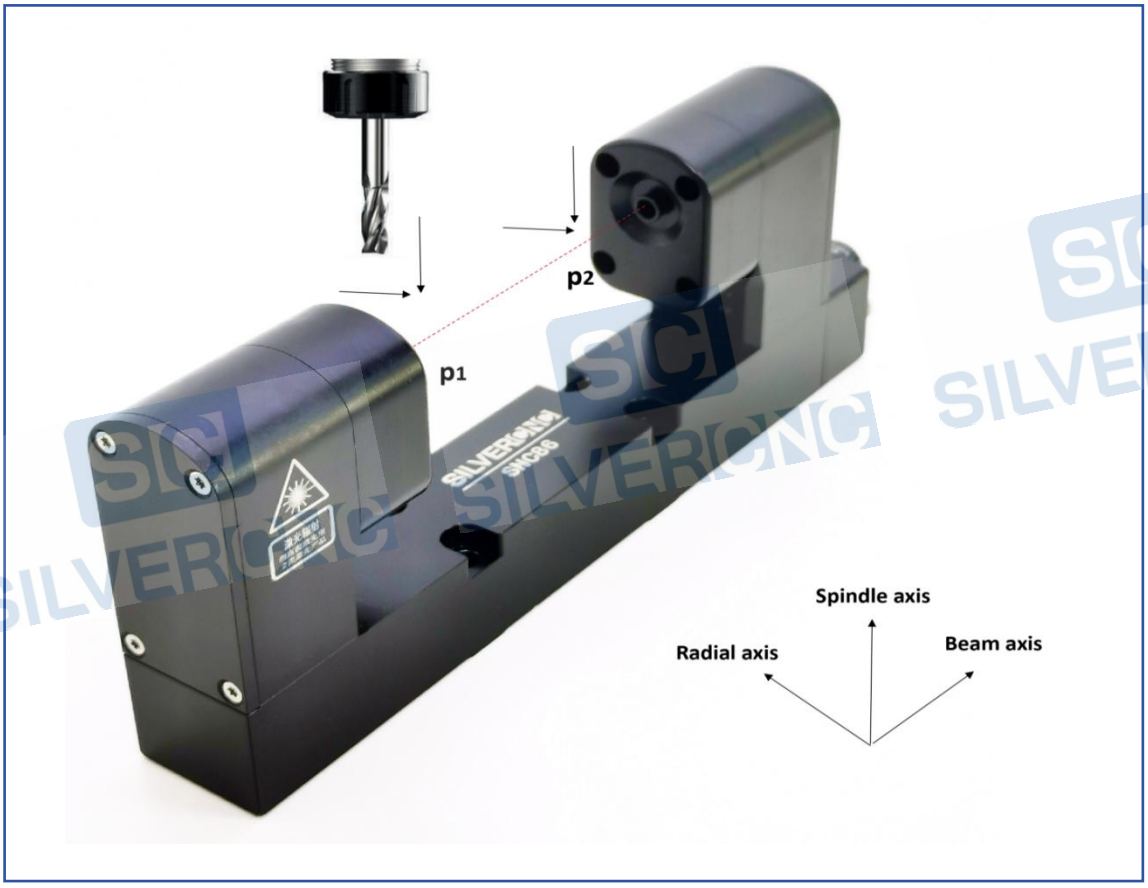
Tool setting application

The following straightening and finishing tools can be easily achieved on a 20 mm span tool.

Spindle (P2-P1)： ≤ 3um

Radial (P2-P1)： ≤ 10um

These values are sufficient for most tool setting applications.



Calibration the SNC

Why calibrate SNC ?

SNC laser tool setter is just one component of the measurement system which communicates with the machine tool. Each part of the system can introduce a constant difference between the position that the stylus touches and the position that is reported to the machine. If the not calibrated, this difference will appear as an inaccuracy in the measurement. Calibration of the SNC allows the SNC software to compensate for this difference.

During normal use, the difference between the touch position and the reported position does not change, but it is important that the SNC is calibrated in the following circumstances:

- when SNC system is to be used for the first time;
- when the enhanced trigger filter delay is changed;
- at regular intervals to compensate for mechanical changes of your machine tool.

More calibration detail please check SNC program manual: cycle code L9861

Tool setting

After completing the calibration, you can try to the tool measurement, SilverCNC SNC system have the following function:

- Tool length setting
- Tool radius/diameter setting
- Tool length and radius setting
- Tool edge inspection
- Tool Breakage Detection - Jump-in Inspection
- Solid tool breakage detection
- Tool radius and linear profile detection
- Arc Radius Measuring Cycle

More calibration detail please check SNC program manual cycle.

Fault-finding

Symptom	Cause	Action
SNC fails to turn on （red LED are not lit）	connection failure	Check for correct wiring
	The power supply voltage is wrong	Check the power supply voltage of the parameter interface.
	blown fuse	Check the connections for a short circuit.
	damaged cable	Replace the cable
No laser beam is exiting the transmitter	The Passive Seal is protecting the device	Check that the air supply to the SNC system is switched on
	Damaged air pipe	Check the air pipe for damage or kinks.
	Access panel could be blocked	Check that the SNC system pneumatic supply is switched on
Poor repeatability/ spurious readings	Coolant or chip on the tool.	Clean the tool with an air blast or high-speed spin. Optimise air pressure to the air blast. Check the air blast nozzle is not damaged or blocked. Replace if necessary.
	Feed rate is too high	Set the correct feed rate – 2.0 µm (78.74 µin) per revolution is the recommended value.
	Electrical interference	Ensure that the SNC cables are not routed alongside cables carrying high current. Ensure that the screen wire is connected to the NCi-6 interface unit.
	Thermal growth of the machine and the work piece.	Minimise temperature changes. Increase the frequency of calibration
	Excessive machine vibration	Eliminate vibration.

	SNC air pressure is set incorrectly.	Reset the air pressure
	Calibration and updating of the offset is not occurring	Check the software.
	Measuring speed is different from the calibration speed	Review the software program
	Measuring occurring during the machine acceleration and deceleration zones	Review the software program
	Poor machine repeatability due to worn slides, for example accident damage, loose encoders.	Perform a health check on the machine.
	Loose brackets.	Check and tighten the brackets as appropriate
	Poor tool change repeatability.	Check repeatability of the SNC without performing a tool change
	Poorly regulated power supply	Ensure that the power supply is correctly regulated.
	Coolant drips or mist.	Select anti-drip mode. If no M code is provided or the anti-drip mode is not available, remove the oil mist before starting the measurement
Air blast problems	Air blast nozzle makes a squealing noise	Air pressure is too low. Increase air pressure until noise stops. Do not exceed 0.6 MPa (87.02 psi) maximum.
	Jet of coolant from nozzle when air blast activated.	Check the nozzle is not damaged and is correctly fitted. Replace nozzle
	No air from air blast.	Check nozzle is fitted correctly and is not damaged. Check that the air supply is switched on.

Maintenance

SNC units are designed to be permanently attached to a variety of vertical and horizontal machining centers, compound machines, and various gantry machining centers Operates in hot metal chips and coolant environments with minimal maintenance. Only perform routine maintenance as described in this guide

If a product that falls within the warranty needs to be repair, overhauled or maintained, the product should be sent to the supplier for processing.

Before performing any maintenance operations, make sure that the machine can perform work and that the interface power is turned off

Check fluid level

Periodically check the fluid level in each filter cup. The liquid level must remain below the filter element.

Drain the liquid

Follow the steps below to empty the filter cup

1.Turn off the pneumatic supply. A large amount of liquid will drain from the filter cup.

2.Turn on the pneumatic supply and set the pressure as described in the chapter "Setting the SNC (Integrated Pneumatic Blow System) Pneumatic Pressure".

3.If the liquid level in the filter cup is still high, repeat steps 1 and 2 until the liquid level drops to a suitable level.

Cleaning SNC optics

The maintenance procedures described in this section should only be performed by professionals Cleaning of optics and maintenance should only be done by personnel trained in the use and use of laser products.

Clean SNC

Transmitter and receiver may need to be cleaned if the pneumatic supply to the SNC is contaminated.

Contamination will cause the system to be in a triggered state. If contamination is suspected, the cause should be found and the fault must be rectified before cleaning the SNC system. Replace the pneumatic tube if necessary.

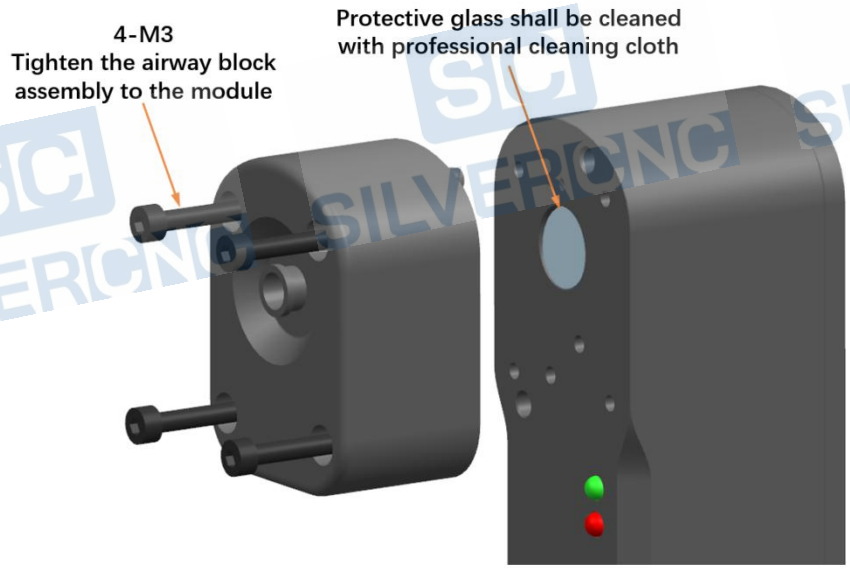
Clean the unit one at a time Remove the pneumatic way block and use the cleaning tool to clean the lens.

Equipment requirements

- 2.5mm hexagonal wrench
- Cleaning tools

Attention—Laser Safety Instructions

Remove the airway block of the SNC transmitter to clean the optics. Before removing the airway block, the transmitter should be powered off to prevent exposure to the laser beam.



SNC Pack list

类型	单位	数量	备注
测头	pcs	1	
接收器	pcs	1	
测针	pcs	1	Φ6*50
刀柄	pcs	1	BT30
电池	pcs	2	
安装支架	m	1	
附件	m	1	
安装手册	pcs	1	

For more products details, please visit our website at
www.silvercnc.com/contact