Laser Interferometer Measurement System SJ6000

Calibration of Guide Rail

Portable case and tripod

Structure of the case

【Prism Modules】

| Linearity	Angle	Straightness	Squareness	Flatness	Rotation
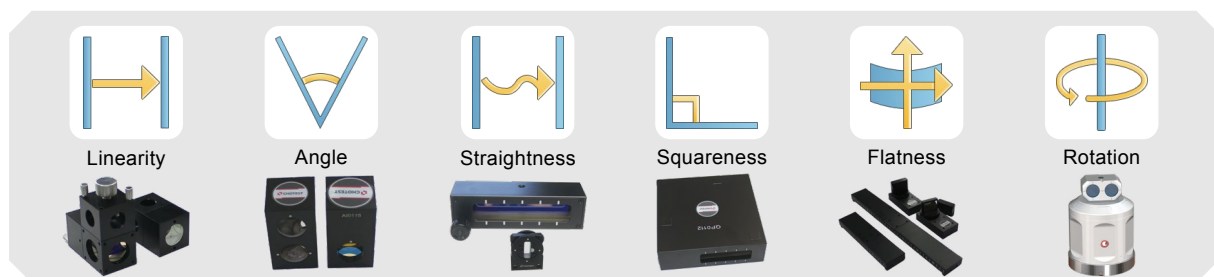
Laser interferometer is recognized as a high precision, high sensitive measuring method by applying light wavelength as criterion, and is widely used in high-end manufacturing domain.

Laser interferometer SJ6000 insists of high-frequency Helium-Neon laser generator from an USA supplier, high-precision environmental compensation modules, high-precision laser interference signal processing system, high-performance computer control system. By applying with thermal frequency stabilization technology of laser dual-longitudinal mode and geometric parameters interference optical path design, SJ6000 can output long-term stable and high-precision(0.05ppm) laser quickly(about 6 minutes) which has powerful anti-interference performance. With different prism modules, it can measure linearity, angle, straightness, Flatness and perpendicularity, besizes it can also analyze dynamic characteristics.
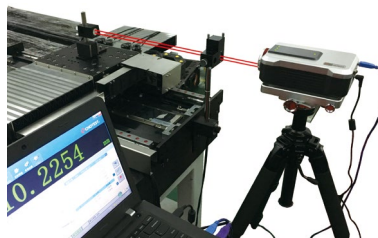
○ Functions ○

1. Calibrate motion accuracy of guide rail quickly and accurately.
2. Measure and analyze many kinds of dynamic parameters, such as displacement, velocity, acceleration and amplitude frequency.
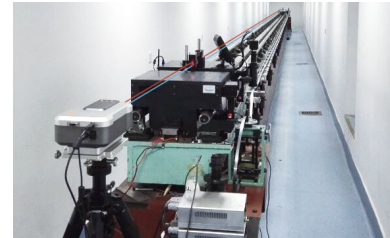3. Built-in variety of general standards of machine tools.
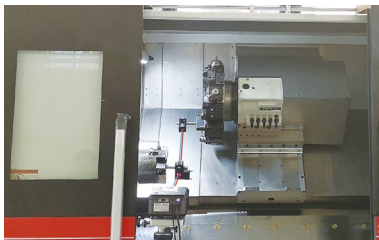
[Application]
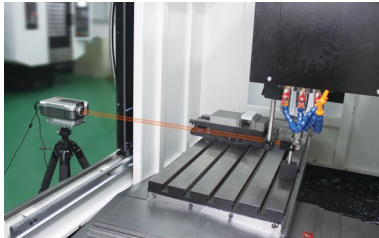
Linear meas. of machine tool
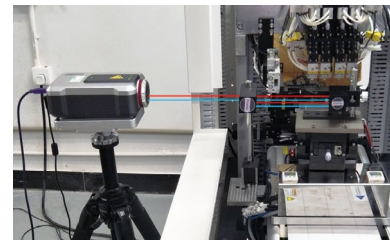
Linear meas. of stage module

Lab length reference

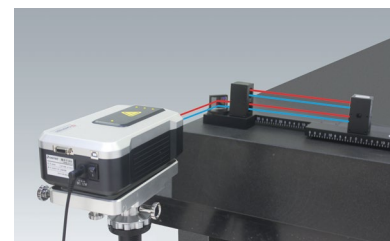Linear meas. of machine tool

Angle meas. of stage module
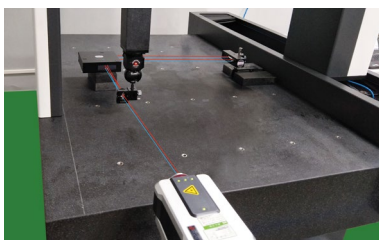
Angle meas. of DC motor
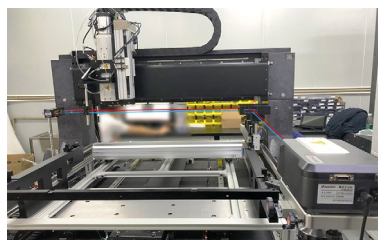
Parallelism meas. of two guide rails
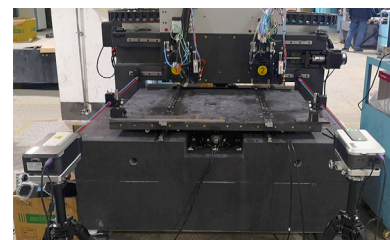
Straightness meas. of equipment

Flatness meas. of Granite table

Perpendicularity meas. of CMM

Perpendicularity meas. of equipment

Twin guide rails meas. of equipment

[Software]

Meas. Module

Tools

Value window

Installation guide

Signal:
Display connection status and signal strength.

Info:
Display the current meas.item, sampling method and device status.

Environment compensation:
Display ambient and object`s temp., manual environment compensation is also available.

[Dynamic Measurement Application]

○ Time based ○

Motion performance evaluation

* Control parameter test and setting of motion controller PID
* Stability test and evaluation after high-speed motion
* Small steps test of high-performance motion controller

Vibration monitoring

* Scanning application:
  Applied for the situation when positioning accuracy is not important but constant speed is critical for high quality imaging.
* Machine tool applications:
  Applied for the situation when slow and smooth contour movement of cutting tool is critical for high quality machning.

Vibration frequency analysis

* Vibration frequency analysis of the measured object
* FFT fast Fourier transform analysis

○ Distance based ○

In distance-based dynamic measurement, laser interferometer SJ6000 "flies" along the axis, that means SJ6000 samples data at designated points without stopping.

○ Pulse Trigger Mode ○

Pulse trigger CT70 is compatible with glass scales, encoders and controllers. Equipped with Pulse trigger CT70, laser interferometer SJ6000 can sample data in pulse trigger mode. Even if the axis does not stop, laser interferometer SJ6000 could sample data at designated points or continuously sample data.

Pulse trigger CT70

Technical Parameters

System parameters:

1. Measuring method: single frequency
2. Laser frequency accuracy: 0.05ppm
3. Dynamic capture rate: 50kHz
4. Warm-up time: about 6 min
5. Operating temperature: (0~40)℃
6. Environment temperature: (0~40)℃, humidity: 0~95%
7. Storage temperature: -20℃~70℃

Environmental sensors:

1. Atmospheric temperature sensor : ±0.1℃(0~40)℃, resolution: 0.01℃
2. Material temperature sensor: ±0.1℃(0~40)℃, resolution: 0.01℃
3. Atmospheric humidity sensor: ±5% (0~95%)
4. Atmospheric pressure sensor: ±0.1kPa (65~115)kPa

Linearity measurement:

1. Measuring range: (0~80)m
2. Measuring accuracy: 0.5ppm (0~40)℃
3. Measuring resolution: 1nm
4. Maximum measuring speed: 4m/s

Angle measurement:

1. Axial range: (0~15)m
2. Measuring range: ±10°
3. Measuring accuracy: ±(0.02%R+0.1+0.024M)″ (R is indicating value, unit: ″; M is measured length in m)
4. Measuring resolution: 0.1″

Flatness measurement:

1. Axial range: (0~15) m
2. Flatness measuring range: ±1.5 mm
3. Measuring accuracy: ±(0.2%R+0.02M) μm (R is indicating value in μm; M is measured length in meters)
4. Substrate size: 180mm adjustable, 360mm adjustable
5. Measuring resolution: 0.1μm

Straightness measurement:

Item	Axis range	Measuring range	Accuracy	Resolution
Short straightness	(0.1~4)m	±3.0mm	±(0.5+0.25%R+0.15M)μm	0.01μm
Long straightness	(1~20)m	±3.0mm	±(5.0+2.5%R+0.015M)μm	0.1μm

Note: R is indicating value in μm; M is measured length in meters

Squareness measurement:

Item	Axis range	Measuring range	Accuracy	Resolution
Short distance	(0.1~3)m	±3.0M mm/m	±(2.5+0.25%R+0.8M)μm/m	0.01μm
Long distance	(1~15)m	±3.0M mm/m	±(2.5+2.5%R+0.08M)μm/m	0.1μm

Note: R is indicating value in μm; M is measured length in meters

Rotary axis measurement:

1. Measuring range of angle: 0-360°
5. Power supply: Li-battery
2. Max axis rotation speed: 10rpm
6. Communication type: Bluetooth
5. Power supply: Li-battery
6. Communication type: Bluetooth
7. Weight: 1.9kg
8. Size: Φ112*H148mm

Precision TurnTable WR50
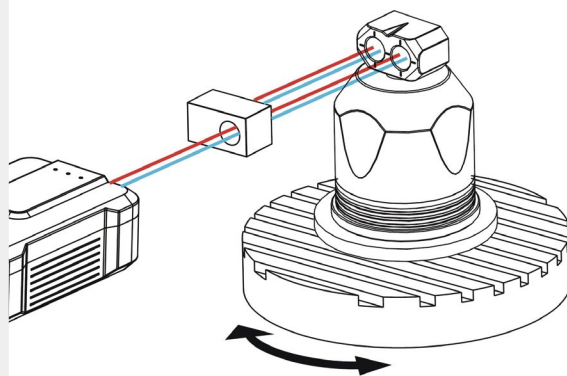
Measurement Diagram

[Measurement Principle]

Equipped with Precision turntable WR50 and Angle prism, Laser interferometer SJ6000 is capable to calibrate rotary axis 0~360°. Precision turntable WR50 is intalled to the rotary axis as angle master.

○ **Parameters** ○

Model No.: WR50

Measuring range: (0~360)°

Accuracy: ±1″

Resolution: 0.1″
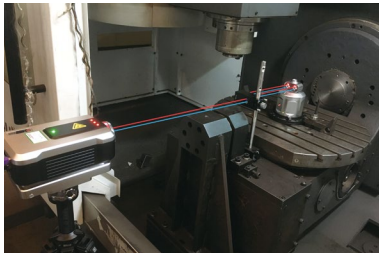
Max axis rotation speed: 10rpm

Max tracking speed: 2rpm
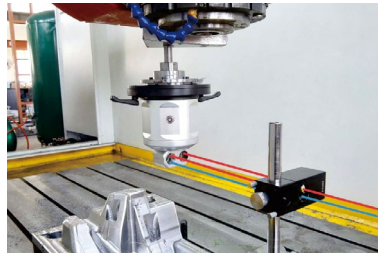
Weight: 1.9kg

Size: Φ112*H148mm

Communication type: Bluetooth

Power supply: Li-battery
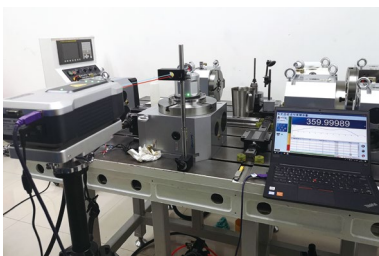
[Application]

Rotary axis measurement of CNC

Electric spindle measurement of CNC

Swing axis measurement of CNC
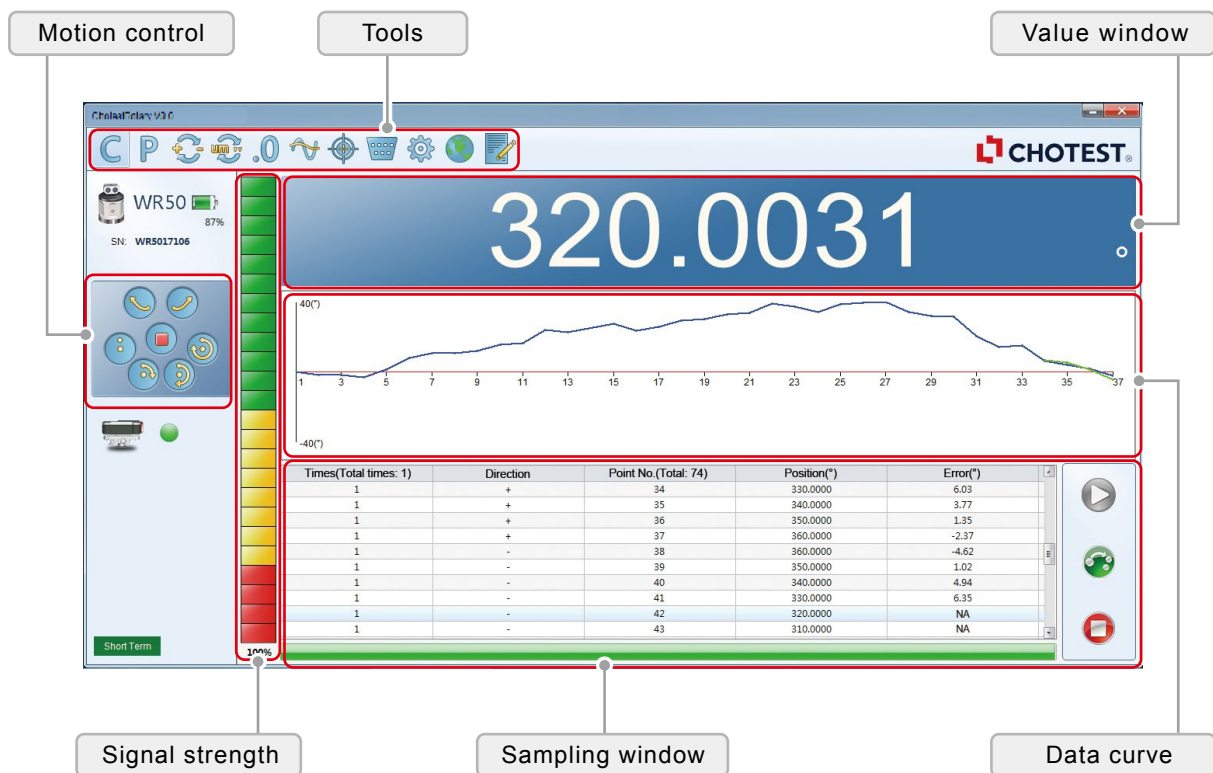

Angle measurement of CNC index plate

Angle measurement of turntable

Angle measurement of CNC turntable

[Software]

Motion control   Tools   Value window

Signal strength   Sampling window   Data curve

[Eccentric Axis Measurement]

Equipped with angle prism, precision turntable WR50, dedicated jig and dedicated software, SJ6000 is capable to calibrate eccentric axis rotation accuracy.

Eccentric axis meas. kit:

1.Magnet, 3pcs

2.90° Jig

3.Dedicated software
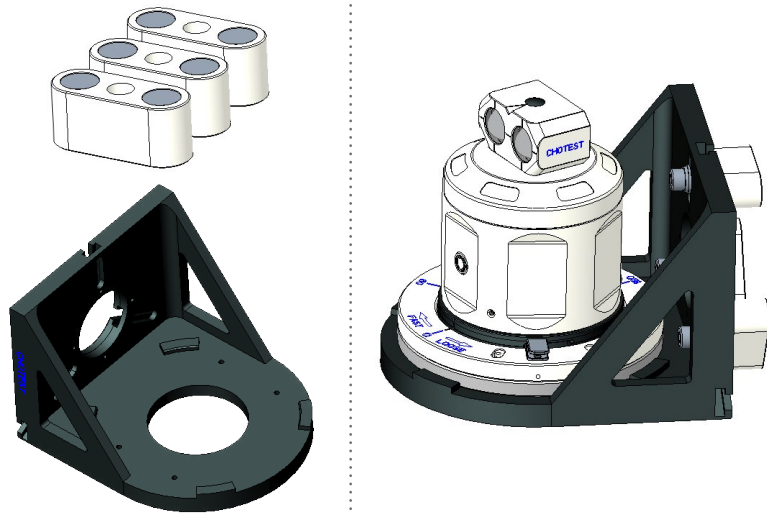
Measurement Principle

The measurement principle is to use the synchronous movement of the object table and the main spindle, as shown in the figure below. It is important to make sure that angle prism should be always aligned with WR50.

Measurement Principle

Center Offset

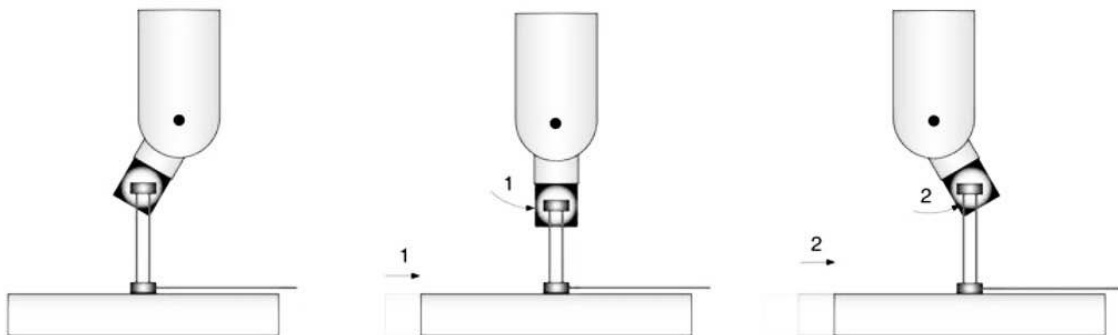| Rotary axis: | 0 | ° | Linear axis: | 0 | mm |
Rotary axis:	60	°	Linear axis:	121	mm
Rotary axis:	120	°	Linear axis:	158	mm
Rotate to:	120	°			

Rotary axis offset: 124.005 mm   Calculat

OK   Can

Generate program of CNC

Controller: Siemens

Program No.: 0023

Rotary Axis: B

Linear Axis: Y

Pause Time: 3 s

Moving Time: 4 s

Overrun: 2 mm

☐ Exclude rotary axis

Generate   Save

```
;0023
G90 G64
G71
G93
G01 F12.0 Y-0.000 B0.000
M00
G01 F60.0 Y-4.108 B-2.000
G04 F3.0
G01 F60.0 Y-0.000 B0.000
G04 F3.0
G01 F45.0 Y6.944 B3.333
G01 F45.0 Y13.991 B6.667
G01 F45.0 Y21.115 B10.000
G04 F3.0
G01 F45.0 Y28.292 B13.333
G01 F45.0 Y35.500 B16.667
G01 F45.0 Y42.712 B20.000
G04 F3.0
G01 F45.0 Y49.905 B23.333
G01 F45.0 Y57.054 B26.667
G01 F45.0 Y64.135 B30.000
G04 F3.0
G01 F45.0 Y71.125 B33.333
G01 F45.0 Y77.999 B36.667
G01 F45.0 Y84.735 B40.000
G04 F3.0
G01 F45.0 Y91.309 B43.333
G01 F45.0 Y97.699 B46.667
G01 F45.0 Y103.883 B50.000
G04 F3.0
G01 F45.0 Y109.842 B53.333
```

Software Setting

[Application]

Eccentric axis measurement

Wireless Ballbar MT21

Fast Diagnosis Tool for Machine

MT21 Wireless Ballbar is a simple, fast, economical and efficient solution to diagnose performance of machine tools, and helps to improve the machining quality of machine tools.

【Features】

Simple, Fast

The measurement software with guided operation can generate the machine running program automatically. With simple setting, the round track test on three orthogonal planes can be completed in 10~15 minutes.

Powerful Function

Comprehensive diagnosis report provides a full and professional assessment of machine performance. Taking 360 degree measurement at the XY plane as an example, it can analyze: backlash X, backlash Y, reverse jump X, reverse jump Y, lateral gap X, lateral gap Y, period error X, period error Y, servo Mismatch, perpendicularity, straightness X, straightness Y, proportional mismatch, scale error X, scale error Y, thread pitch X, thread pitch Y, feed rate, center offset X, center offset Y, position tolerance, the best fitting radius, roundness.

Wireless

Data is transferred to the laptop computer via Bluetooth in real time.

【 Software 】

MT21 software with guided operation can implement the round track test on three orthogonal planes quickly and simply. After measurement, software calculates the overall measurement values (roundness, roundness deviation) of the positional accuracy automatically, then generates the analysis report with the graphic format according to GB17421-4, ISO230-4. MT21 achieves the real spatial diagnosis for machine tools.
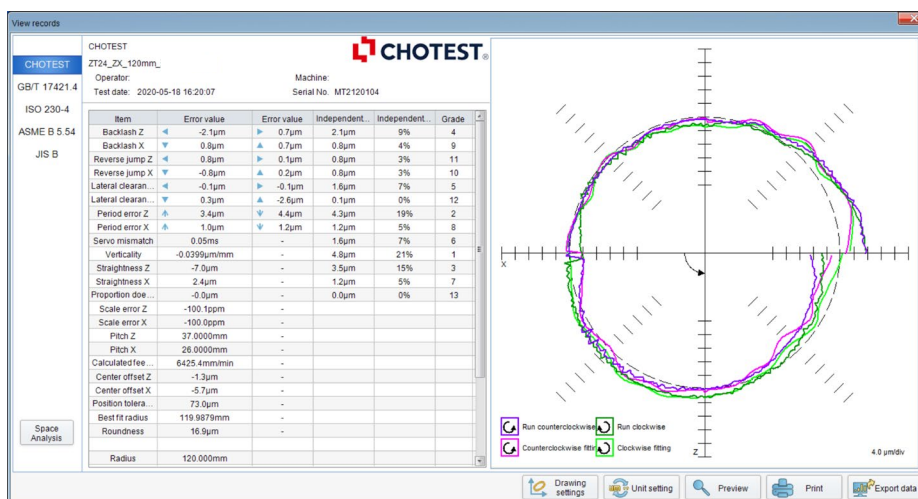

Error Analysis Report

○ Parameters ○

Communication: Bluetooth(Typical 10m)	
Power supply: Li-battery	
Resolution: 0.1μm	
Measuring accuracy: ±(0.7+0.3%L)μm	
Measuring range: ±1.0mm	
Sensor range: ±2.0mm	
Sample rate: 1000Hz	
Working Temperature: (0~40)℃	
Size: 150mm×26mm×21mm	

○ Configuratioin ○

1. MT21 Wireless Ballbar	1pc
2. Master gauge	1pc
3. Offset setting ball	1pc
4. Centric holder	1pc
5. Tool cup	1pc
6. Extension bar 50, 100, 150mm	1pc of each
7. Software	
8. Portable suitcase	
9. User Manual, Product certificate and Warranty	

【 Application 】
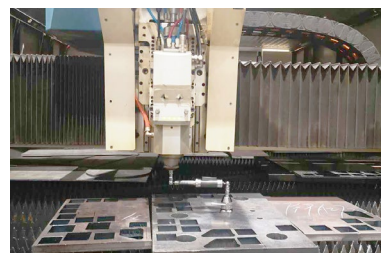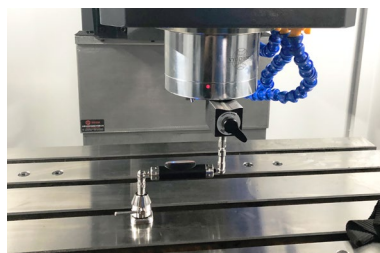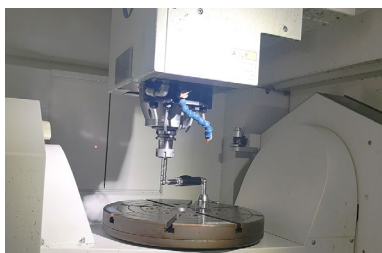
Roundness inspection of machine tool

Machine Tool Probes PO Series

○ Precision, Reliable ○

PO40M   PO60   PO40   PO40L   PL20

PO series contains 3-point trigger unit inside the probe, which is the most stable structure. When the stylus is moved radially or axially by external force, the trigger unit is triggered. Then the circuit inside of probe sends a triggering signal to the receiver, and the receiver transmits it to the machine tool, consequently the present coordinates of each axis of the machine tool are recorded automatically. Finally measurement results are calculated according to the coordinate records of related points.

【Features】

*High repeatability: One-way repeatability <1μm

*Long standby time: As long as 6 months

*Omnidirectional energy-absorbing design: 360° omnidirectional energy-absorbing design, which helps to cushion the spindle in impact when an operating accident occurs

*Waterproof design: IP68 for probe and receiver

*Intelligent LED indicators: Show current working status of the probe
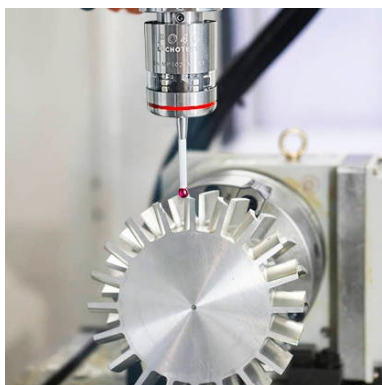
[Parameters]

1. Technical parameters of the probe:

1) Storage temperature: (-25-70)℃

2) Working temperature: (5~55)℃

Model No.	PO40	PO60	PO40L	PL20
Size	Φ40mm* L50mm	Φ63mm* L76mm	Φ40mm* L52mm	Φ25mm* L41mm
Weight(Without Holder)	260g	880g	280g	65g
Transmission Type	360° IR	360° IR	360° IR	Cable
Transmission Distance	5m	6m	5m	No limit
Starting Mode	Code M	Code M, Revolve	Code M	/
Rotational Speed	Max 1000rev/min	Max 1000rev/min	Max 1000rev/min	Max 1000rev/min
Power Supply	1/2AA 3.6V battery*2	AA1.5V/3.6V battery*2	1/2AA 3.6V battery*2	/
Triggering Direction	±X/±Y/-Z	±X/±Y/-Z	±X/±Y/-Z	±X/±Y/-Z
Repeatability of One-way triggering 2δ(*1)	1μm	2μm	1μm	0.5μm
Max overrun(*2)	XY:12.5mm +Z:6mm	XY:21mm +Z:11mm	XY:12mm +Z:6mm	XY:12.5mm +Z:6mm
XY Trigger Force(*3)	0.5 N~0.9N	0.5 N~1.6N Adjustable	0.3 N~1.6N Adjustable	0.5 N~1N Adjustable
Z Trigger Force	5.8N	3.5N~14N Adjustable	4N~10N Adjustable	5.9N
Application	Small and medium-sized 3-axis, 5-axis machining center	Large gantry machine tool, horizontal machining center	CNC lathe or turning-milling composite machining center	Small engraving and milling machine tool

Note: .

*1: Test with a 50mm straight stylus under speed 480mm/min

*2: Test with a 50mm straight stylus

*3: Test with a 50mm straight stylus under speed 480mm/min

2. Technical parameters of the receiver:

1) Transmission type: IR, 360°

2) Working range: Max 8m

3) Weight: 926g

4) Input voltage: 12V~ 30V

5) Input current: <100mA, receiving <40mA

6) Cable to machine controller: dedicated 13PIN shielded cable, 8 meters or 15 meters

7) Storage temperature: (-25-70)C, working temperature: (5~55)C

COMI Receiver