

CMS系列

手动式三坐标测量机

Coordinate Measuring System

使用说明书



广东万濠精密仪器股份有限公司

Safety Precautions

Please read carefully the instruction book before operation otherwise it is likely to cause personal injury or damage of the machine!!

- 1. Please read carefully section 5.6 - safety precautions- of the instruction book and observe the regulations strictly while operating the machine.*
- 2. Please bear in mind the caution items in the instruction book so as to avoid accidents.*

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1. Application

CMS series automatic three-coordinate machine, a high precision measuring instrument integrated optics, mechanics, electronics and computing, is widely used in machinery, electronics, automobile and aerospace industry, etc. This instrument can fulfill measurement of point and position in spatial coordinate. It can be used for measuring dimension, shape and relative position of sophisticated components of tank, guide rail, cylinder and rack.

Advantages:

1. Strong universality: Ability to locate point and position in spatial coordinate and measure three-dimensional contour size and precision location of various components.
2. Accurate and reliable measurement
3. Convenient data processing and procedure control.

2. Specifications and parameters

Model		CMS-554M	CMS-564M	CMS-574M	CMS-584M	CMS-665M	CMS-685M	CMS-785M	CMS-6105M
Travel(mm)	X	500	500	500	500	600	600	700	600
	Y	500	600	700	800	600	800	800	1000
	Z	400	400	400	400	500	500	500	500
Operational method	Manual								
Structure	Moveable bridge structure								
Guide rail form	Air floatation guide rail								
Measurement deviation	Single axis MPEE1=(3.0+L/250) μm Space MPEE =(3.5+L/250) μm L: measurement length (mm)								
Digital measurement system	RENISHAW Linear scale measurement system								
Probe system	RENISHAW probe system								
Resolution	0.5 μm								
Maximum testing speed	300mm/s								

Outside dimension (bottom holder included) (mm)	1070	1070	1070	1070	1140	1140	1140	1140
	1000	1100	1200	1300	1120	1320	1320	1520
	2200	2200	2200	2200	2400	2400	2400	2400
Permissive workpiece weight (kg)	500kg	500kg	500kg	500kg	800kg	800kg	800kg	800kg
Dimension of packing case (mm)	X	1450	1450	1450	1450	1350	1450	1350
	Y	1320	1420	1520	1620	1550	1750	1750
	Z	2180	2180	2180	2280	2280	2280	2280
Net weight (kg)	700kg	760kg	820kg	880kg	896kg	1027kg	1050	1158kg
Power supply				220V±10%	50/60HZ			
Air supply pressure					≥0.5MPa			
Compressed air flow				120L/min(0.4 Mpa)				
Temperature				(20±2)°C	<1°C/h	<2°C/24h	<1°C/m	
Humidity					40%~70%			

3. Structure and working principle

3.1 Structure (Fig.1)

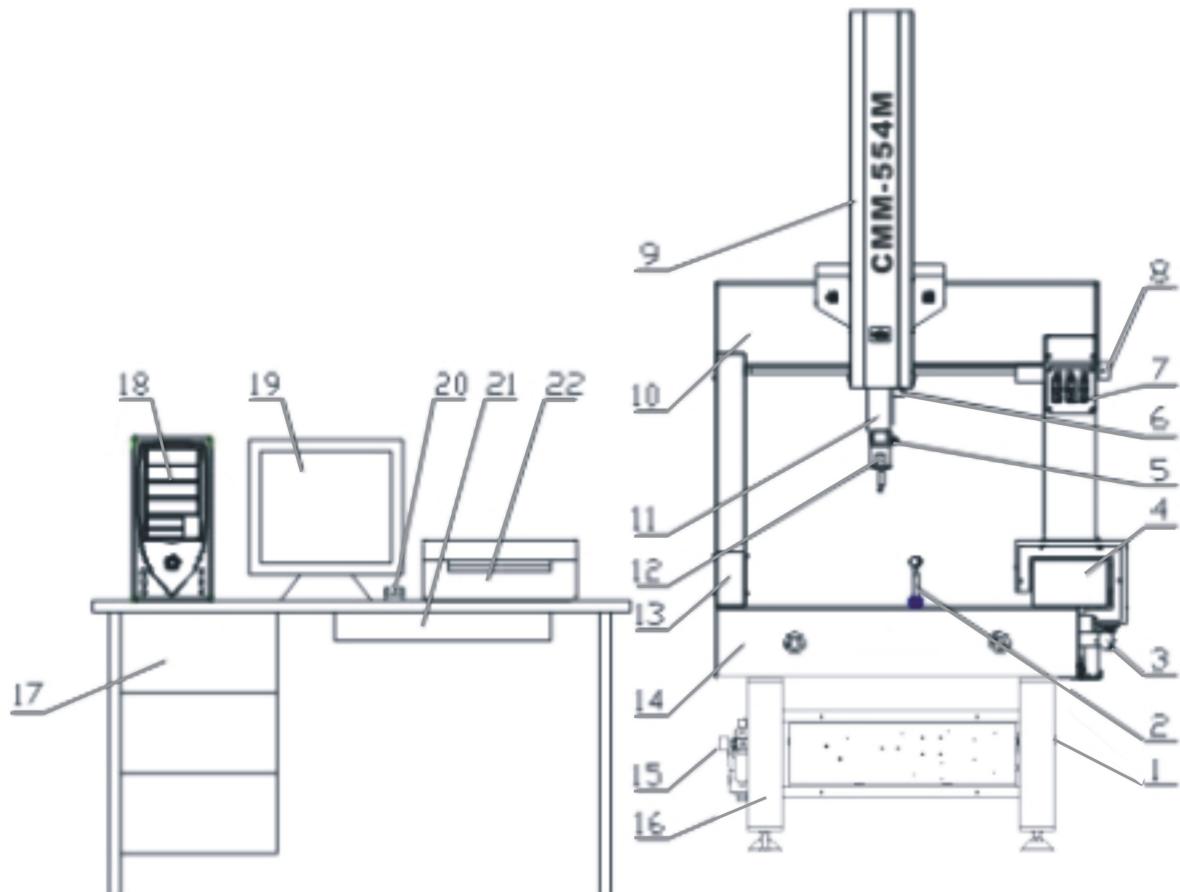


Fig.1 Overall structure of instrument

- | | | |
|----------------------------------|--|----------------------------------|
| 1. Power switch | 2. Standard sphere | 3. Y axis fine-tuning knob |
| 4. Y axis guide rail | 5. Clamp handle | 6. Z axis fine-tuning knob |
| 7. X,Y and Z axis locking switch | | 8. X axis fine-tuning knob |
| 9. X direction sliding assembly | | 10. X axis guide rail |
| 11. Z axis guide rail | 12. Trigger probe | 13. Y direction sliding assembly |
| 14. Worktable | 15. Air filtration assembly (side panel) | |
| 16. Bottom holder assembly | 17. Computer table | 18. IPC 19. Monitor |
| 20. Mouse | 21. Keyboard | 22. Printer |

3.2 working principle

Target workpiece is to be placed on the granite platform, where there are screw holes and fixtures which are used to fix the workpiece. Three axes linear scale are used as measuring datum. Trigger probe is mounted at the lower end of Z axis. Since all the three axes are guided by air flotation, the probe pedestal at the lower end of Z axis can be manipulated by hand swiftly and conveniently. Move the probe until it touches the target location on the workpiece and complete measurement.

When the probe is triggered, coordinate position of various testing points in the target workpiece will be read and spatial coordinate value of the testing points will be measured. Geometric dimension, shape and position of the target workpiece can be derived by the processing of software according to the spatial coordinate value of these points.

Abundant in measurement procedures, this coordinate machine can measure workpiece without pinpointing target workpiece with precision. Plain and easy to use is the user interface, and an inexperienced operator can master operating the machine quickly and easily.

Detailed operating please refer to software instruction book.

4. Use and operation of instrument

4.1 Preparations and examinations before use

Please follow below processes before use of this instrument:

- 1).Ensure the instrument has been installed according to chapter 9 in the instruction book.
- 2).Make certain that all the protective measures are in place
- 3).Start air supply system and set the air pressure at 0.4Mpa.



Caution! Air pressure adjustment has already been completed by manufacturer's technician in the procedure of installation and debugging of the instrument. It is unnecessary for the user to adjust air pressure any more. If the air pressure is arbitrarily adjusted in operation, great damage to the machine might cause!!

- 4). Put power plug into qualified power supply socket.

- 5). Turn on power switch
- 6). Turn on the computer and software
- 7). Install target workpiece
- 8). Install the standard sphere at the rear end of the worktable in order to save place for measuring.
- 9). Turn on the printer and connect it with the computer.

4.2 Specific use and operating

4.2.1 Movement of three axes

Movement of the three axes is fulfilled by moving the probe pedestal at the low end of Z axis. There are checking devices on both ends of the three axes. Move the probe slowly and carefully to avoid collision when it reaches the ends of the axes.

The instrument is equipped with a locking system which is controlled by three switches. The three switches are located in the upper part of the right pillar.

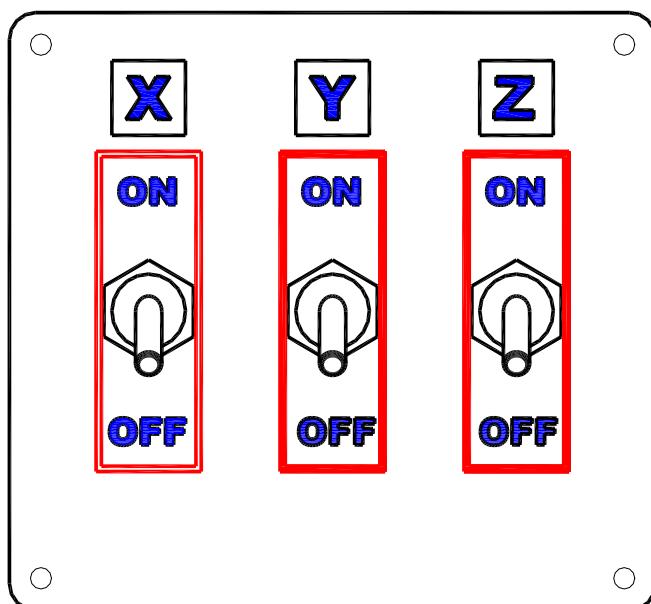


Fig.2 X,Y,Z locking switch

When the OFF switch is turned on, it is invalid to move the axis quickly.



Caution ! Do not attempt to move the axis quickly when the OFF switch is on ! !

The three axes can be fine-tuned. Fine-tuning handwheel is situated on one end of the axes. The switches in the upper of the right pillar can validate (ON switch) or invalidate (OFF switch) fine-tuning.

4.2.2 Workpiece installation

- 1). Remove any object that will hinder measuring from the worktable.
- 2). Ensure the target workpiece is within the measuring range of the instrument.
- 3). Put the workpiece within working range of the instrument and ensure the target area of the workpiece is within the reach of probe. If before mentioned premises are met, then put the workpiece close to the operator as much as possible. If the workpiece must be fixed, the workpiece should be placed in a suitable location on the worktable with insert nut available.



Caution! M10 screw hole on the worktable can be used to secure the workpiece. Do not excessively tighten the screw lest the nut will loosen.

- 4). Install the standard sphere within measuring range of the instrument. Ensure the location of the sphere can facilitate probe's measuring but not inconvenience measuring of the workpiece.

4.2.3 Probe installation

There is a built-in probe pedestal in the bottom of the Z axis. Please follow below steps to install the trigger probe:

- 1). Loosen the clamp handle on the right side of probe pedestal in the Z axis.(Item 5 in Fig.1)
- 2). Ensure the probe is available.
- 3). Rotate the probe and ensure red indicator shall face the front of the instrument.
- 4). Maintain the position of the probe and lock the clamp handle until the probe is securely fixed.
- 5). Plug the probe cable into the socket on the left side of the probe pedestal at the bottom of Z axis.

5. *Maintenance*

5.1 Daily maintenance

- 1). Use soft cloth dipped with ethyl alcohol or clean water to clean all the exposed surfaces of guide rail and countertop of the worktable.
- 2). Be careful not to scratch the countertop, guide rail surface.

3). Ensure air supply pressure is no less than 0.5Mpa.

5.2 Monthly maintenance

- 1). Scrutinize the instrument to see whether there is any loose or damaged components, if so, please contact the manufacturer timely.
- 2). Check the linear scale in X,Y and Z axis and clean the scales in accordance with requirement. (Refer to 5.5)
- 3). Check all the cables connected with the instrument and the IPC.
- 4). Check the air filtration system and change filter cartridge timely if necessary.
- 5). Check whether there is any air leakage or crack in the pipe.

5.3 Quarterly maintenance

- 1). Check the gradienter of the instrument and calibrate the deviation if there is any.
- 2). Check whether there is any dust, grease or water in the IPC, and any loosen cable or damaged insulation layer.



Caution! Examination or overhaul of IPC should be conducted by qualified technician .

5.4 Semiannual maintenance

Change filter cartridge of air filtration system.

5.5 Procedures to clean linear scale:

- 1). Move the sliding carriage to the other end.
- 2). Use silk dipped with little water and neutral detergent to clean softly the linear scale, **Do not use organic solvent!**
- 3). Move the sliding carriage to the opposite end and clean the rest area of the linear scale.
- 4). Scrutinize whether the linear scale is clean, if not, rework is necessary.

5.6 Safety precautions

Please read this section of the instruction book carefully before operating. If the operational regulations are not observed, it is likely to cause personal injury.

- 1). Observe strictly caution items in the instruction book to prevent accident from happening.
- 2). Do not adjust or loose fixing screws or nuts in the instrument at will.
- 3). Ensure all shields and cover boards are well installed and screwed.
- 4). Constantly pay attention to the target workpiece and other obstacles during operation.

- 5). Heavy workpiece shall be placed on the worktable via lifting equipment. Make sure worktable and guide rail surface are not scratched and damaged.
- 6). Do not measure over heavy or oversized workpiece.
- 7). Check whether there is any abnormal sound, if so, please contact the manufacturer immediately for repair. It is prohibited to operate the instrument under abnormal circumstances.
- 8). Slow down the speed when Z axis moves close to the end of its travel to avoid collision.
- 9). Forceful collision between probe and workpiece is prohibited.
- 10). When loosening the Z axis, hold the probe pedestal of the Z axis to avoid accidentally accidental falling.
- 11). Ensure power supply plug and socket have grounding terminal.
- 12). Ensure all the flexible protective sleeves covering the external cable joints are in good condition.
- 13). The power supply must be cut-off before repair. Ensure no one will turn on the power without the consent of serviceman. If a specific shield has to be uncovered, much more attention has to be paid to, and the shield shall be restored to its original position after repair.
- 14). Do not operate the instrument in an environment exposed to strong current and heavy noise, take welding machine big electrical machine, etc. for instance

6. Storage

The instrument shall be stored in a suitable place under proper conditions for a period of time with intact packing before installation.

- 1). Store on the firm ground of a room.
- 2). Humidity in the room shall be less than 80%.
- 3). Temperature in the room ranges from -40°C to 55°C

7. Unpacking and examination of instrument

7.1 Read careful the instruction book and packing list before unpacking.

Body of the instrument is mounted on the baseboard of the wooden case. All the other components including bottom holder, IPC and accessories are enclosed in an affiliated case.

Please check first whether the wooden case is damaged before unpacking. If so, please record it and contact relevant shipping forwarder.

7.2 Do not discard the packing materials, which might be used in the future, after unpacking.

Check first whether the objects in the case is intact. If there is anything damaged, please record and contact relevant department.

Please check the components according to the packing list. Do not uncover dust-proof shield covering the instrument and do not place the instrument outside the room before it is delivered to installation location.

8. Environmental requirement (please read this chapter before installation)

8.1 Working environment

8.1.1 Temperature (Verification condition)

Verification temperature: $20 \pm 1^\circ\text{C}$

Temperature variation: $<0.5^\circ\text{C}/\text{h}$

Instrument constant temperature: 48h

Temperature (Working condition)

Working temperature: $20 \pm 2^\circ\text{C}$

Temperature variation: $<1^\circ\text{C}/\text{h}$ $<2^\circ\text{C}/24\text{h}$ $<1^\circ\text{C}/\text{m}$

Workpiece constant temperature time: 4h (Depends on the size of workpiece, at least 4 hours)

8.1.2 Humidity

Relative humidity in the room shall be controlled within 40%~70%

8.1.3 Cleanliness

Measuring instrument is very sensitive to static electricity and dust, therefore dustproof and antistatic floor and wall shall be sufficiently taken into consideration.

8.1.4 Vibration requirement

Vibration frequency $\leq 10\text{Hz}$ Amplitude $\leq 0.5 \mu\text{m}$

$10\text{Hz} < \text{Vibration frequency} \leq 30\text{Hz}$ Amplitude $\leq 1 \mu\text{m}$

Vibration frequency $> 30\text{Hz}$ Amplitude $\leq 3 \mu\text{m}$

8.2 Installation environment

8.2.1 Size of instrument installation base

Model	CMS-554M	CMS-564M	CMS-574M	CMS-584M
L(mm)	1200	1200	1200	1200
W(mm)	1200	1300	1400	1500

8.2.2 Enough space should be preserved around instrument installation base for

installation, debugging, inspection and overhaul of the instrument. Reasonable location for operational system should also be allocated.

8.2.3 In order to be efficiently free from shock and quake, it is advisable to have shockproof ditch around the instrument installation base. Please refer to Fig.3 for structure and size of shockproof ditch.

8.2.4 The inner room is not allowed to be exposed to direct sunshine.

8.2.5 The instrument should be away from heat source and can not face directly the passageway.

8.2.6 Exhaled air from air-conditioning system is not allowed to blow directly to the instrument.

8.2.7 Height of the room housing the instrument should be above 3.5 meters

8.2.8 It is suggested an isolation room be set up outside the room for temporary storage and stock turnover of the target workpiece. The isolation room helps to keep temperature stable in the instrument chamber as well.

8.2.9 Please refer to chapter 2 “ Specification and parameters” for the dimension of the packing and weight of the instrument. Ensure all the doors and passageways are big enough for the passage of the instrument.

8.3 Matching environment

Qualified power supply and air supply are required for normal operation of the instrument.

8.3.1 Air source

8.3.1.1 Air source must be dry and clean. Compressed air to the measuring instrument must be first filtered through precision filter(filtration precision is less than $1\mu m$) to get rid of moister and oil mist. Make sure relative humidity of the compressed air shall be less than 15%.

8.3.1.2. Air supply flow should be no less than 120L/min

8.3.1.3 Air supply pressure should be larger than 0.5MPa. Air should be supplied to the instrument after filtration

8.3.2 Power supply

8.3.2.1 Voltage :AC 220V Voltage fluctuation should be within $\pm 10\%$ of rated voltage.

Frequency:50/60HZ

Rated power: 1KVA

8.3.2.2 Do not share power supply with other high-power electrical appliance such as air conditioner, duplicator and paper shredder, etc. If it is necessary to share the power supply, isolation transformer or high frequency noise filter should be used.

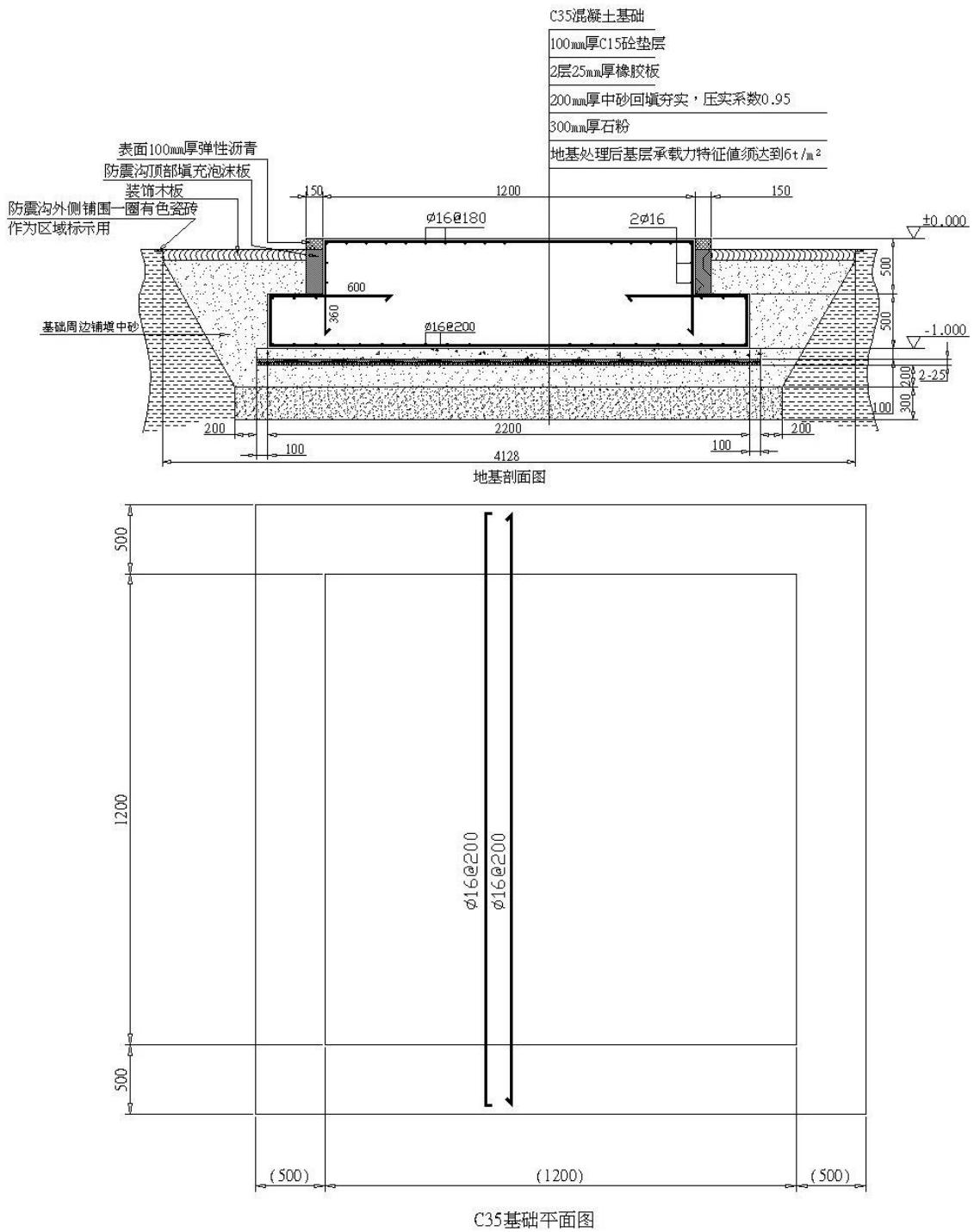


Fig.3 Instrument installation ground base (take CMS-554M for instance)
 8.3.2.3 Independent reliable grounding system (ground resistance shall be less than 4Ω) is indispensable.

8.3.2.4 It is advisable to use uninterruptible power supply for measuring instrument.

9. Installation and debugging of instrument

(please read chapter 8 “environment requirement” beforehand)

Instrument installation and debugging procedure:



Caution! Instrument installation and debugging should be done by manufacturer's technician.

- 1). Installation location requirements: Installation location shall have sound ground foundation with shockproof measures. In terms of foundation supporting capacity, weight of instrument and maximum workpiece should be taken into consideration. Working temperature shall be stable. The location shall be free of shock and vibration source, dust free and roomy enough for operation activity.
- 2). Locate bottom holder in a suitable place in the room and level it. All large instrument and components must be moved and handled by forklift or crane.
- 3). When joint footing and bolt of the worktable bottom base are assembled, locate the instrument body onto the bottom holder. While moving the instrument body, the fork of forklift should be under the instrument bottom base. Do not move the instrument body until it is equilibrated on the fork.



Caution! Sliding carriage and guide rail of the instrument can not be availed to move the instrument by any means. The sliding carriage can not be forced to move either so as not to scratch the carriage surface.

- 4). Dismantling of holder used in installation



Caution ! Avoid scratch of worktable surface and guide rail surface during the process of dismantling !!

- 5).Tighten X axis guide rail
- 6). Calibration and leveling of granite worktable
 - a) Avail the three joint footings in the worktable bottom to level the workbench. Put a gradienter on the workbench, adjust the footings until levelness in X and Y direction is within 0.06mm/m, then lock secure the locknut. (X and Y direction shall be adjusted repeatedly)
 - b) Adjust downward the two anti-roll bolts until they touch the supporting surface of the holder.
- 7). Installation of air filtration system

- a). Mount the air filter on the rear side of the bottom holder (mount vertically), connect the air supply (the air supply shall be shut at the time)
- b). Turn off all the locking switches on the right pillar of the instrument. Adjust pressure regulating valve of the air filtration system until the pressure is 0.4Mpa.



Caution! Adjustment of the pressure regulating valve of the air filtration system and relevant parameters shall be confirmed by manufacturer's technician. The user can not adjust it in use any more otherwise great damage will cause to the measuring instrument!!

- 8). Installation of trigger probe
 - a). Take the trigger probe out of the affiliated case, loosen the clamp handle on the right side of probe pedestal at the bottom of Z axis, mount the trigger probe and lock secure the handle.
 - b). Red indicator in the trigger probe shall face the front of the instrument.
 - c). Plug the probe cable into both the probe socket and the socket on the left side of probe pedestal.
- 9). Installation of IPC, monitor and printer.
 - a). Place them in appropriate location. Make sure good ventilation for IPC.
 - b). Put linear scale signal plug of X,Y and Z axis and probe signal plug on the exclusive socket of IPC. Then put on the plugs of other components.
 - c). Insert the encryption card of the software into the USB connector of IPC.
- 10). Connecting power supply with air supply
 - a). Power supply shall be 220VAC—50HZ with grounding power socket.
 - b). Turn on electromagnetic valve and connect air supply.
 - c). Turn on the computer and software.
- 11). Precision calibration
Manufacturer's technician will inspect and verify the measuring instrument under circumstances conforming to testing environment in accordance with three coordinate machine national calibration specification JJF1064-2000. When the inspection result meets acceptance criterion, the measuring instrument can be transferred to the user.

10. Warranty and after-sale service

The manufacture shall be responsible for warranty of the instrument within a period of one year ensuing the date when the instrument is debugged if the user operates the instrument in accordance with operational requirements, and the equipment failure is caused by manufacturing quality. If the equipment failure is caused by the user, the manufacturer shall be responsible for repair but the user will be charged a certain amount of cost.

11. List of matching components

Item	Description	Unit	QTY	Remark
I. Instrument body				
1	Instrument body	set	1	
2	Bottom holder	pc	1	
II. Probe system				
1	Probe pedestalMH20i	pc	1	Probe wire included
2	Probe TP20	pc	1	
3	Probe PS9R	pc	1	Φ 1 X 10mm
4	Probe PS8R	pc	1	Φ 2 X 10mm
5	Probe PS12R	pc	1	Φ 4 X 10mm
6	Extension rod SE4	pc	1	10mm
7	Extension rod SE5	pc	1	20mm
III. Probe calibration device				
1	Standard sphere assembly	pc	1	Φ 25
2	Teaching model	pc	1	
IV. Computer and measuring software				
1	IPC	set	1	
2	Monitor	set	1	17" LCD
3	Keyboard	pc	1	
4	Mouse	pc	1	
5	<M3D-M> software	set	1	
6	Color printer	pc	1	

Remark: Actual components are subject to the sales contract.

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