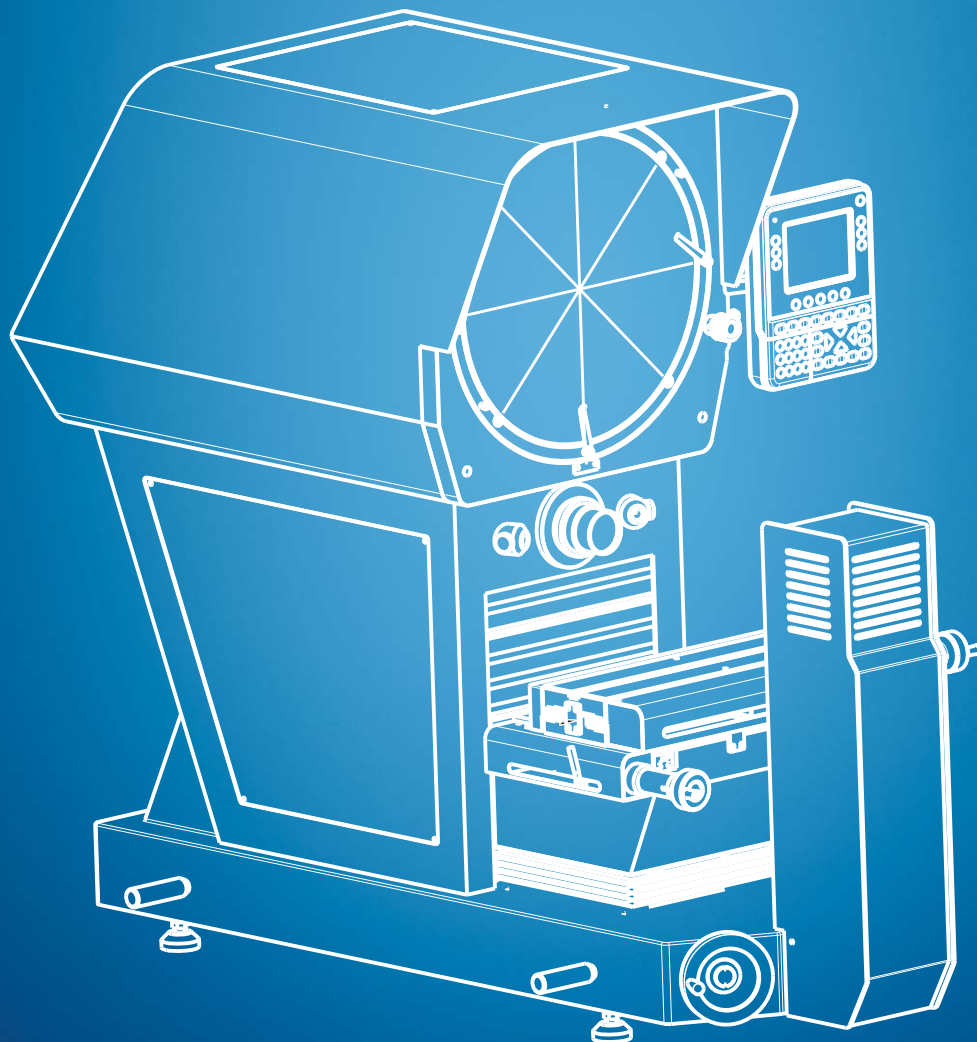


Digital Horizontal Profile Projector Operation Manual



Preface

This section describes the symbols (safety warning symbols) used in this manual.

- Disconnect all power sources when moving the instrument and do not hot plugging.
- The equipment should be placed in the original packaging, in accordance with the packaging and storage of the instructions placed, and the use of closed container handling.
- In storage, the packing material must be kept in a place where children can't touch, in order to avoid unsafe conditions.



※Indicates an imminently hazardous situation which, if not avoided, will result in serious injury or death.



※Alerts the user to a specific hazardous situation. The given example means " Caution" , risk of electric shock.

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1. Equipment Introduce

1.1 Application

PH series of Digital Horizontal Measuring Projector, is a light, machine, electricity, calculator integration of precision and efficient optical measuring instruments, it is widely used in machinery, instrumentation, electronics, light industry and other industries, institutions, research Therefore, the metrology department, laboratory and production workshop. The instrument can efficiently detect the contours of various shapes of complex work piece size and surface shape.

1.2 Technical Parameters

Name	Digital Horizontal Profile Projector
Model	PH400-3015
Code#	512-400
Table Size	455x126mm
Table Travel	300x150mm
Focus	120mm
Accuracy	$\leq 3+L/200(\mu\text{m})$
Resolution	0.0005mm
Load-Bearing	15Kg
Projector Screen	Diameter :412mm, Measuring Range $\geq \varnothing 400$ ("M" Line)
	Rotation Angle 0~360° ; Resolution: 1' or 0.01° , Accuracy 6'
Count	DP400 (510-340) Multi function color LED data processor
Illumination	Transparent Illumination : 3.2V/10W LED
	Reflected Illumination : 220V/130W Halogen Lamp
Operating Environment	20°C \pm 5°C , Humidity 40% - 70%RH
Power	AC110V/60Hz; 220V/50Hz,200W
Dimensions (L×W×H)	1099x1455x633mm
Packing Size(L×W×H)	1157x1355x653mm
Net/Gross Weight	350/300kg

1.3 Objective Lens

Objective Lens	5X(Option)	10X (Standard)	20X (Option)	50X (Option)	100X(Option)
Working Distance (mm)	93.7	80	67.7	48	35
View Distance	$\varnothing 80$	$\varnothing 40$	$\varnothing 20$	$\varnothing 8$	$\varnothing 4$

1.4 Illumination System

1.4.1 Transparent Illumination : 3.2V , 10W LED (Lighting focusing system)

1.4.2 Reflected Illumination : 220V/130W Halogen Lamp

1.4.3 Cooling Mode : Force-Air Cooling (Transparent use one fan and reflected use one fan)

2. Operating Principle

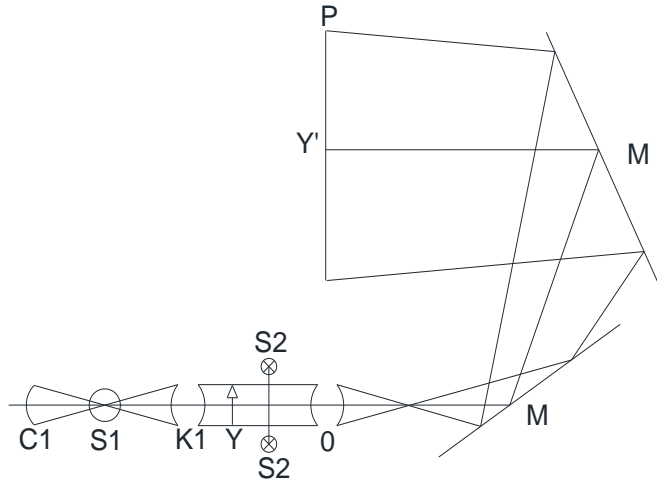


Fig1 Principle

The instrument working principle as shown in Fig 1, the measured work piece Y is arranged on the worktable, the transmitted or reflected light, it consists of 0 objective reality and amplified into Y 'through the mirror reflection on M projection screen P matte surface.

The projection screen is available on standard glass ruler of Y 'measurement, can use pre drawing good standard enlarge comparative measurement on it, the measured value by lens magnification is the work piece measurement. It can also coordinate measurement of work piece Y using digital measuring system on the table: you can use the projection screen rotation angle degree digital display system of the work piece measurement.

S1: Transparent Illumination ,

2-S2: Reflected Illumination, 220V/130W

K1: Transparent Collecting Lens ,

C1: Spherical Reflector (Depending on the nature of the workpiece, the two lighting can be used separately, can also be used simultaneously.)

3. Structure and Function

3.1 Structure

Mainly consists of four parts: the main body of the transmission illumination, the base of the instrument, the working table and the projection box. (as Fig 2)

3.1.1 The main transmission: including illumination, lighting spotlights, filter, cooling fan.

3.1.2 Instrument base: including vertical linear scale, lifting transmission system, reflected illumination, switching power supply, control circuit board and vertical guide rail base and guide rail

3.1.3 Table: including the upper, middle and lower stage, X to the friction drive mechanism, X to the grating ruler, Y to the friction drive mechanism.

3.1.4 Projection box: including the projection screen group, mirror, digital counter, objective lens, control panel, reflector, power supply and other transit board.

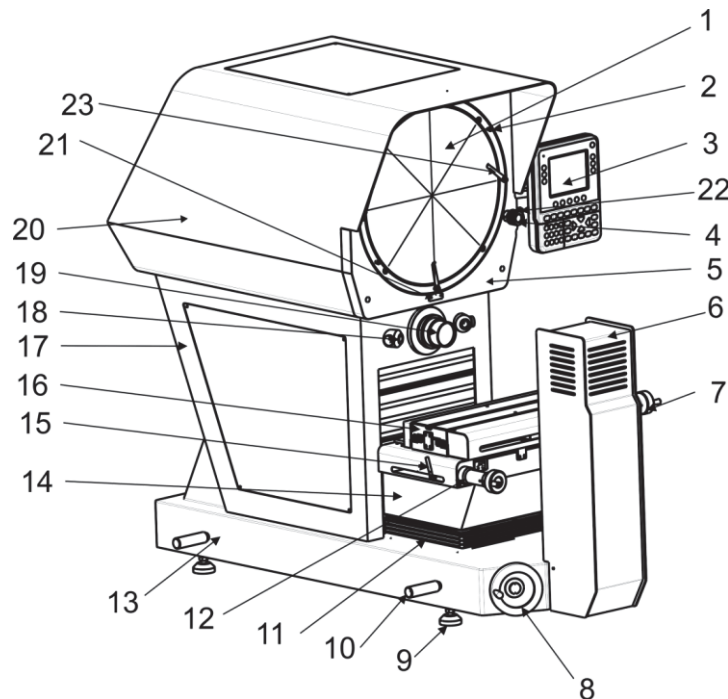


Fig 2 Structure

- | | | |
|-------------------------|-------------------------------|-----------------------------|
| 1. Projection Screen | 2. Screen Rapid Movement Knob | 3. DP-400 Counter |
| 4. Screen Rotating Knob | 5. Projector Frame | 6. Transparent Illumination |
| 7. X axis Knob | 8. Rising Knob | 9. Footing |
| 10. Carry Handle | 11. Dust Cover | 12. Y-axis |
| 13. Base | 14. Vertical Workbench | 15. Hinge |
| 16. Stage | 17. Down Body Shell | 18. Reflected Illumination |
| 19. Objective Lens | 20. Up Body Shell | 21. Zero Mark |
| 22. Lock Screw | 23. Elastic Clamp | |

3.2 Control Panel

3.2.1 Power Switch (as Fig 3)

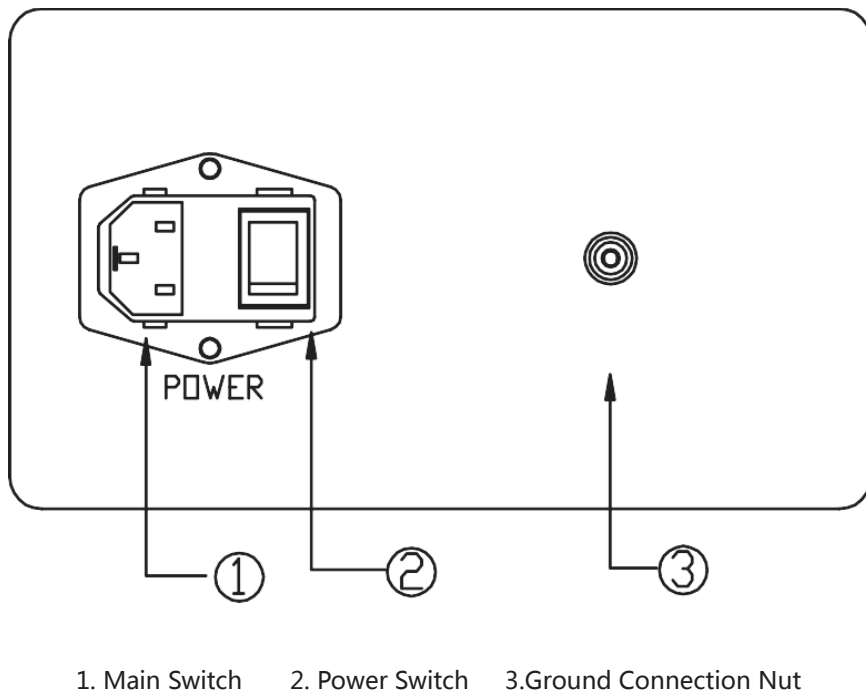


Fig 3 Power Switch Panel

3.2.2 Operation Panel (as Fig 4)

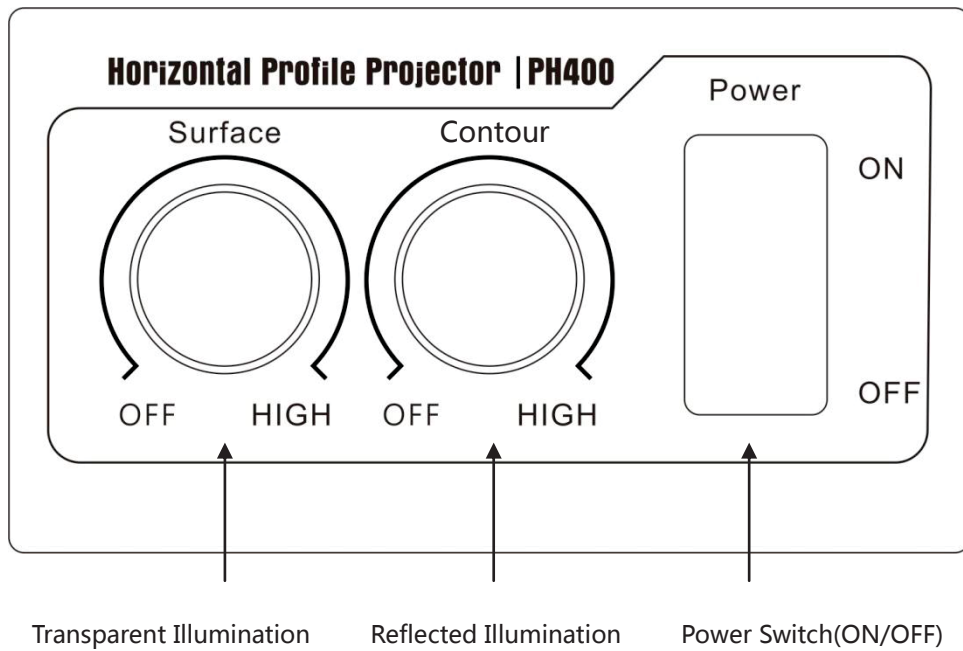


Fig 4

3.2.3 Signal Switch Panel (as Fig 5)

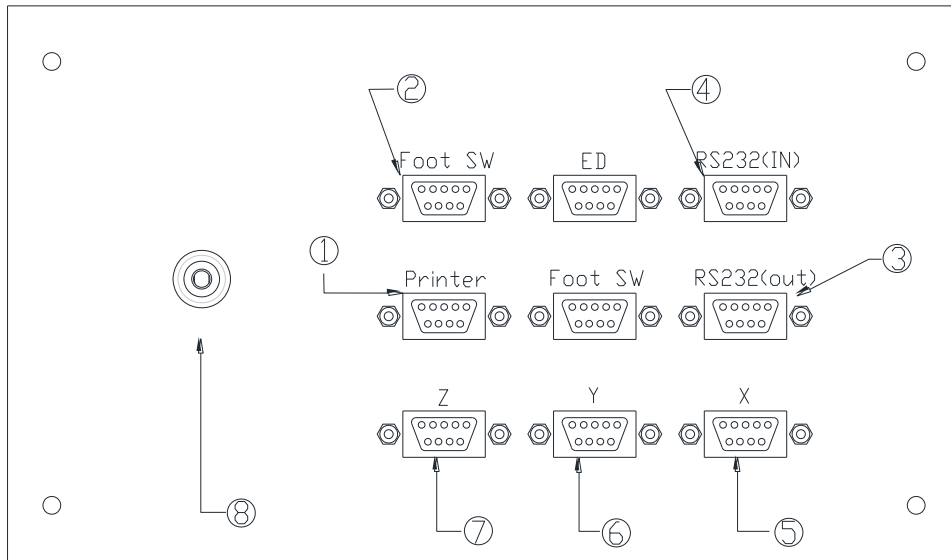


Fig 5 Signal Switch Panel

- | | | |
|-------------------------|------------------------|------------------------|
| 1. Counter Printer Port | 2. Foot Switch Port | 3. Counter RS232 Port |
| 4. Computer RS232 Port | 5. X Linear Scale Port | 6. Y Linear Scale Port |
| 7. Z Linear Scale Port | 8. Counter Power Port | |

4. Unpack and Installation

- Remove the instrument outer packing box and the inner box, take out the instrument manual and read the contents of this section first. (Fig 6) .
- Secure the four bolts on the instrument base and move the instrument to the workbench to be installed. As the instrument nearly 272Kg, therefore, the placement of the platform to have the appropriate carrying capacity and to stabilize.
- Install and adjust the four feet group, the basic work of the instrument table is in a horizontal state, you can use the level adjustment.
- Do not orient the instrument toward the window and strong light sources to reduce the sharpness of the image on the screen.
- The current use of wide voltage switching power supply can be the local supply voltage 220V \ 110V automatically adjust the voltage.
- Remove the two fixed table transport fixed plate, you can move the X, Y table. At this point, the instrument can work.

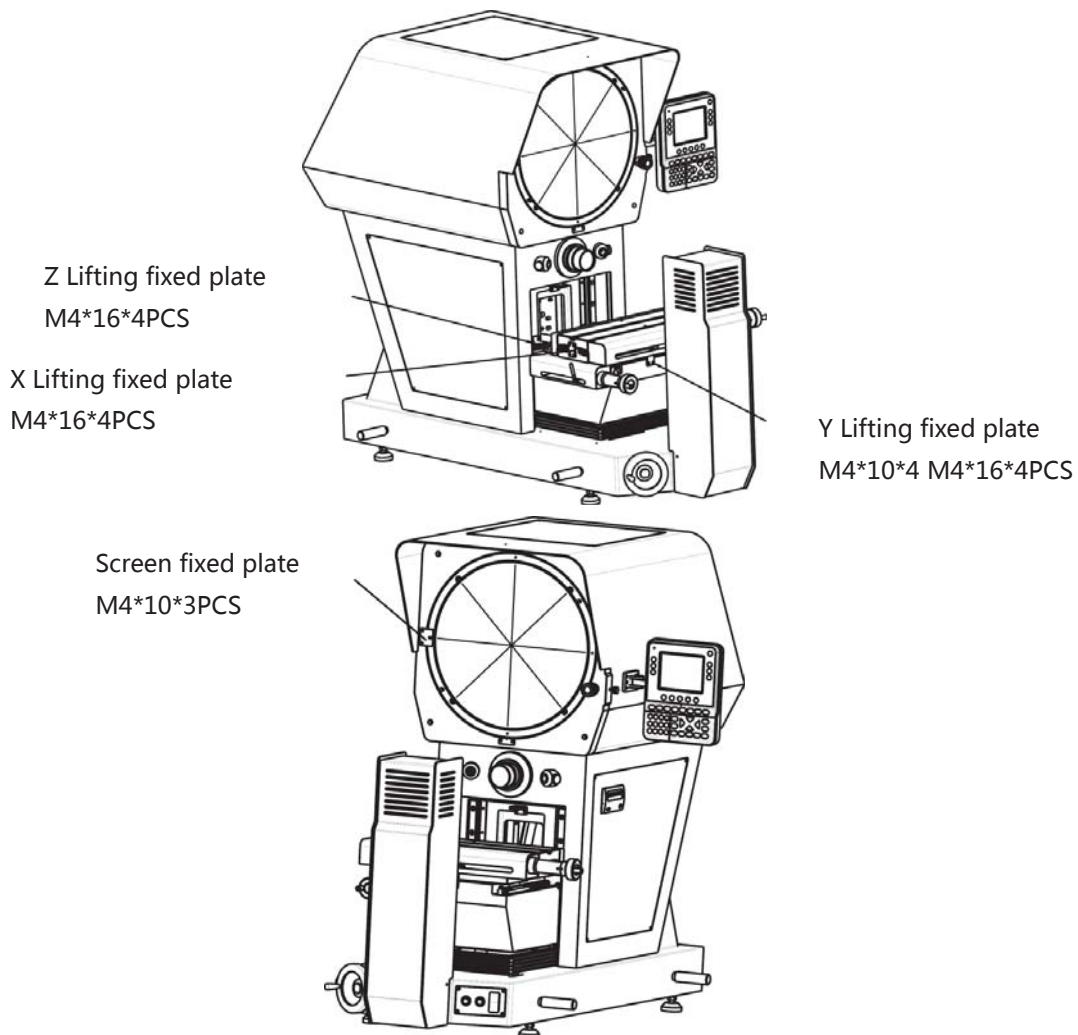


Fig 6 Unpack and Installation

5. Operation Method

Before using the instrument, please read the instrument manual, especially the < Structure and Function> section, so as to have a preliminary understanding of the instrument, it will help you to use the instrument correctly.

5.1 Replacement and Adjustment of Transparent Illumination Bulbs

This can only be done when the lamp is replaced or the instrument is checked regularly. Sometimes due to transport, handling and other reasons will make the original location of the lamp changes, then also need to re-adjust, this adjustment to restore the adjustment. Please note: this work must wait until the bulb cooling before proceeding, otherwise, due to the high temperature of the lamp, there is the risk of burns.

5.1.1 Restorative adjustment (see Fig 7)

5.1.1.1 Remove the objective lens, open the transmission light, if the filament does not like the center of the screen or filament like a very fuzzy.

5.1.1.2 Open the instrument to illuminate the rear cover of the main body, loosen the relevant screw to move the relevant parts, when the filament like a basic clear (but not very clear) and located in the screen center, fixed the relevant screws, fitted with objective lens, the instrument can be used.

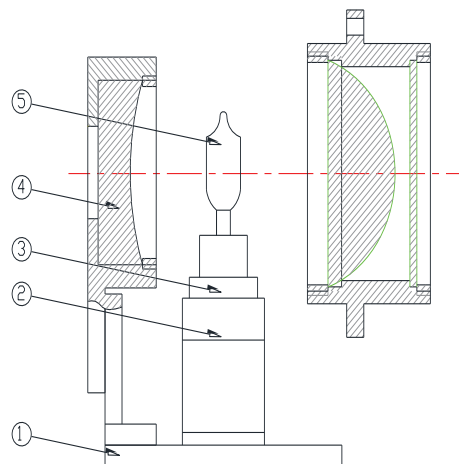


Fig 7 Illumination System

1. Lamp Holder 2. Adjust Lamp Holder 3. Lamp Holder 4. Reflector 5. LED Bulb

5.1.2 Replace the lamp (see Fig 7)

5.1.2.1 Open the back cover of the illumination.

5.1.2.2 After the lamp is cooled down, the broken lamp is replaced by hand.

5.1.2.3 Put on a new light bulb (with a soft cloth or paper pad with a light bulb)

5.2 Reflected Lighting Adjustment

Reflector light and transmissive illuminators which are illuminated with a semi-retro-mirror.

When lighting, the center of the light should be adjusted to half the center of the lens, and then use the locking screw can be fixed.

5.3 Objective Lens and Condenser Lens Replacement

5.3.1 Instrument only a common objective lens, the objective lens to be a single replacement.

5.3.2 The selection of the objective lens magnification depends on the measurement accuracy of the size of the workpiece to be measured. Generally speaking, the higher the multiple, the higher the precision of profile measurement and the precision of the coordinate measurement.

5.3.3 The machine could equip 5X、10X、20X、50X、100X objective lens , A common condenser, such as the need to enlarge the magnification, and the direct replacement of the objective lens.

5.4 The use of Work Table

5.4.1 When the total power of the instrument is turned on, the X and Z directions of the workbench are displayed on the counter. As the table moves in the vertical and horizontal directions, these indications are constantly changing.

5.4.2 X can be used for fast and slow transmission coordinate measurement. Y-axis friction drive is only for focusing. Z-axis drive that is the table movements, with the lift hand wheel drive, Z-axis transmission coordinate measurement.

5.4.3 With X, Z-axis measurement, when the workpiece is good focus, the general should be a few times back and forth movement, so that the table from the static state into the measurement state, is conducive to measurement.

5.4.4 With X, Z-axis measurement, the use of hand wheel drive, do not force too much.

5.4.5 The table is equipped with a rotating table for angular deflection, together with the center frame, can be used for forming measuring tools such as thread.

5.5 The use of Screen

5.5.1 The instrument power supply is turned on, the projection screen rotation angle values are also displayed on counter, can be set up through the counter display internal degrees, points and percent conversion. Eg: $3^{\circ}24'$ < -
-> 3.4° .

5.5.2 When the locking screw (Fig 2, 22 #) is released, the projection screen can be quickly rotated by the small handle (Fig.2, 2 #) on the projection screen frame or by using the fine-tuning hand wheel . Corner bottom measurement should be slow rotation.

5.5.3 Four flexible platens on the projection screen frame can be used to compress standard or glass workpieces for contour measurements. (Fig 2 , 23#)

5.5.4 When the projection screen white Short-term zero mark, the level of the line screen and the X-axis coordinates parallel stroke, parts of the measured edge image will adjust to it and can be made after the tangent X coordinate measurement. (Fig 2, 21#)

5.5.5 The projection screen has standard angle values of 30° , 60° , 90° , which can be used as a comparison for these special angles. At this point, the angle measurement system only need to measure the workpiece angle and the difference between the standard angle can be.

5.6 The use of RS232 Port

5.6.1 Figure 5 of the RS232 interface for counter and instruments, through the special software to achieve automatic measurement of counter and parts mapping function. Test reports and drawings can also be output with a printing device.

6. Measurement Method

Projector measurement methods are summarized into two categories: contour measurement and coordinate measurement.

6.1 Contour Measurement

6.1.1 The comparison is carried out with the standard magnification image.

This method is suitable for the detection of complex shape, large quantities of parts.

The step as follow :

6.1.1.1 According to the size of parts to determine the objective lens multiples, and then parts design drawings and magnification of the objective lens magnification of the same proportion of the standard scale, the choice of materials with less flexibility of transparent plastic film. Tolerances are also plotted on the diagram. Such as the detection of parts in size $\Phi 25\text{mm}$ or so, then make a 10: 1 enlarged view, use 10X objective lens for measurement. Standard arcs, angles, threads, tootheds, nets, etc. Enlarge images are also available as off-the-shelf.

6.1.1.2 The standard magnified figure with four elastic pressure plate on the projection screen. Focus and move the X table, lift the Z-axis bracket, so that part of the image and magnification register.

6.1.1.3 If the image and the image of the larger deviation in the tolerance zone, is qualified, or beyond the scope of the unqualified, the deviation value can be measured with Z, X coordinates.

6.1.2 Using the value of 0.5mm standard glass ruler (optional accessories) directly on the screen to measure the size of the work image (less than the value of the lattice can also be used Z, X coordinates measured), divided by the objective magnification that is the size of the workpiece.

6.2 Coordinate Measurement

6.2.1 Single Coordinate Measurement

6.2.1.1 The workpiece is placed on the working table or the vertical working table, and the objective lens with high magnification is used to adjust the focus.

6.2.1.2 The projection screen rotation zero alignment, namely short white screen frame of the zero mark.

6.2.1.3 To adjust the direction of the workpiece to be measured in parallel with the measuring axis, as shown in Figure 8, the BC edge is parallel to the X axis.

6.2.1.4 Projection screen rotation zero alignment, that is, the short white line on the screen alignment zero mark. Move or falling worktable, the measured length of an end surface such as the AB side of the vertical line on the screen alignment, X coordinates cleared.

6.2.1.5 Move the X axis, the other end such as CD edge aligned vertical lines, X axis value display the size of the AD.

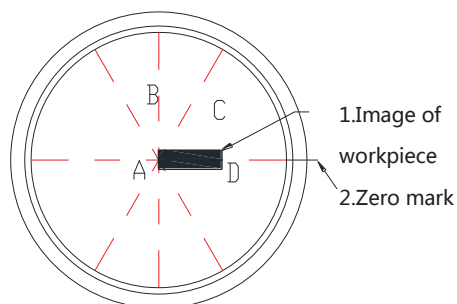


Fig 8 Single coordinate measurement

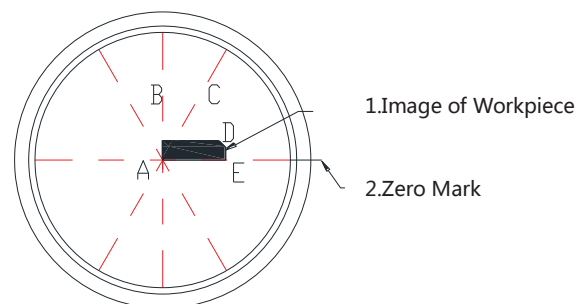


Fig 9 Double coordinate measurement

6.2.2 Double Coordinate Measurement

6.2.2.1 Projection screen rotation aligned with the zero mark line.

6.2.2.2 Place the workpiece on the table or vertical table, use a higher magnification of the objective lens and adjust the focus.

6.2.2.3 Adjust the direction of the workpiece were measured with the X axis and Z axis parallel, as shown in Figure 9 AE // X, AB // Z.

6.2.2.4 Move the X axis and lift the Z axis so that the point A on the workpiece image is aligned with the intersection of the engraved lines on the screen, and the X and Z numbers are cleared.

6.2.2.5 Move and lift the workbench again so that point C or D on the workpiece image is aligned with the intersection point. Then X display value that BC or AE measured value, Z display value is AB or DE measurement.

6.2.2.6 By using the coordinate rotation function (SKEW) in the counter, the work can be placed without any need of precise adjustment. Just move the lifting table and measure the length according to the requirements, which can save a lot of adjusting time and improve the measuring efficiency. See the specific operation of counter operation manual.

6.2.2.7 It can be connected with the counter by RS232 interface. It can also realize the automatic processing of two-coordinate measurement data and the mapping of part shape by using special measuring software (optional). The connected printing device can output the measured value and mapping chart, the measuring function and the measuring efficiency To further expand and improve the workpiece without precise adjustment can be placed.

6.2.3 Angle Coordinate Measurement

6.2.3.1 The workpiece is placed on the working table or the vertical working table, and the part size is selected as the objective magnification, and the focus is adjusted.

6.2.3.2 Adjust the measured angle vertex to the center of the cross of the projection screen (Fig 10)

6.2.3.3 Rotate the projection screen, with any one of the line alignment angle measured angle side, angle display value is cleared.

6.2.3.4 Rotate the screen again so that the line is aligned with the other side of the measured angle. At this time, the angle value is the measured angle.

6.2.3.5 A projection screen using line 30°、60°、90°..... (the accuracy is 1) measurement can make some special angles.

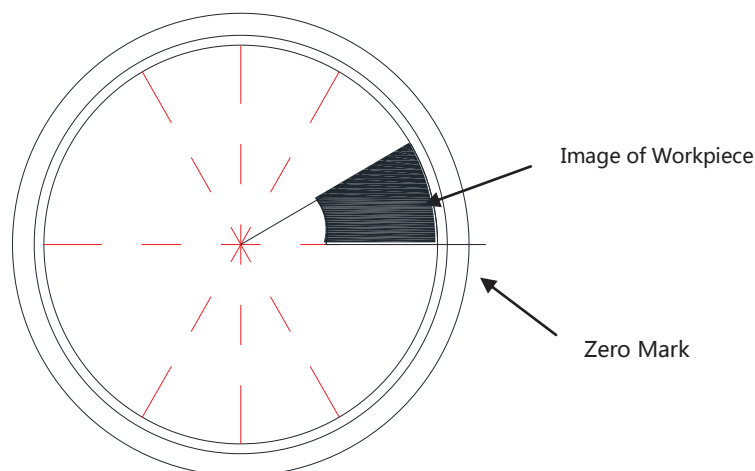


Fig 10 Measurement Angular

7. Maintenance

This chapter explains the daily maintenance that must be performed on the measuring projector PH-400 series, including cleaning and the replacement of consumable parts.

- **Temperature:** The PH-400 series measuring projector has been assembled and adjusted 20 °C in a temperature controlled room. To ensure the rated measuring accuracy, the temperature at the installation site must be maintained as close to 20°C as possible, with minimal fluctuation. In poor temperature conditions, the accuracy performance may not be satisfied. It is illegal to make any machine adjustments affecting the accuracy at ambient temperatures other than 20°C. After such adjustment, accuracy is no longer guaranteed at 20°C.
- **Humidity:** Humidity will not affect the measuring accuracy directly. However, high humidity may corrode machined surfaces and may adversely affect electronic parts. The environmental humidity should be maintained within a range of 55% to 60% RH.
- **Dust and dirt:** The PH-400 series measuring projector consists of high precision parts, including guide faces, linear scale units, and optical unit, that must be kept free of dust and dirt. Use and store the PH-400 series measuring projector in a place where it will not be subjected to dust and dirt.
- **Projection Lens:** Compared with ordinary hard glass, the optical glass of the projection lens used for the projector is soft and subject to scratches. In order to remove dust do not use a cloth to wipe the lens, but use a blower brush instead. To remove oil or fingerprints, dampen clean gauze with a mixture of high grade alcohol and ether in a ratio of 8 to 2, and wipe gently using a circular motion.
For lens storage, replace the lens cap and store it in its case. Also replace the lens cap when the projector is not in use, although the lens does not have to be removed from the projector.
- **A projection screen working surface grinding surface,** try to avoid touching the use. When used for a long time, the screen is dust, oil accumulation, influence of image clarity. At this time, the user can use a clean wet gauze dipped in a little neutral detergent the projection screen wipe gently, stains removed, then wipe clean wet gauze with a few times, to wipe the lotion. Gauze dipped in water can not be too much, so as not to drop to the bench and other metal surface rust, also can be covered with plastic film table. This work if users have difficulty, also can ask manufacturers do.
- **Instrument metal bare surface,** with a regular or regular use of aviation gasoline wipe clean, and then coated with anti rust grease to prevent rust.
- **Instrument cooling fan work is normal,** the normal use of the instrument, the lamp life is directly related to the user should always pay attention to this problem, and found that it is not normal should be timely notification to manufacturers overhaul.
- **Mirror (surface reflecting mirror)** Since the mirror used in the projector is silvered on its front face rather than on its back, unlike ordinary mirrors, it is highly subject to scratches. Ensure it is free from dust or oil. Should the mirror become stained, use the same cleaning procedure as for the projection lens. Greater precautions, however, are required for handling the mirror.
- **Instrument data measurement system counter,** the factory has made error compensation for the precision of the work table, compensation and other internal settings can not be changed by the user, otherwise, will affect the accuracy of the instrument and the normal use.
- **When the instrument is not closed at any time,:** when in use, transmission, reflection illumination, in addition to the outside, try not to open at the same time, these measures can save energy, is good for the good use of maintenance equipment and prolonging the service life of the bulb.

8. Instruments and Electrical Principle

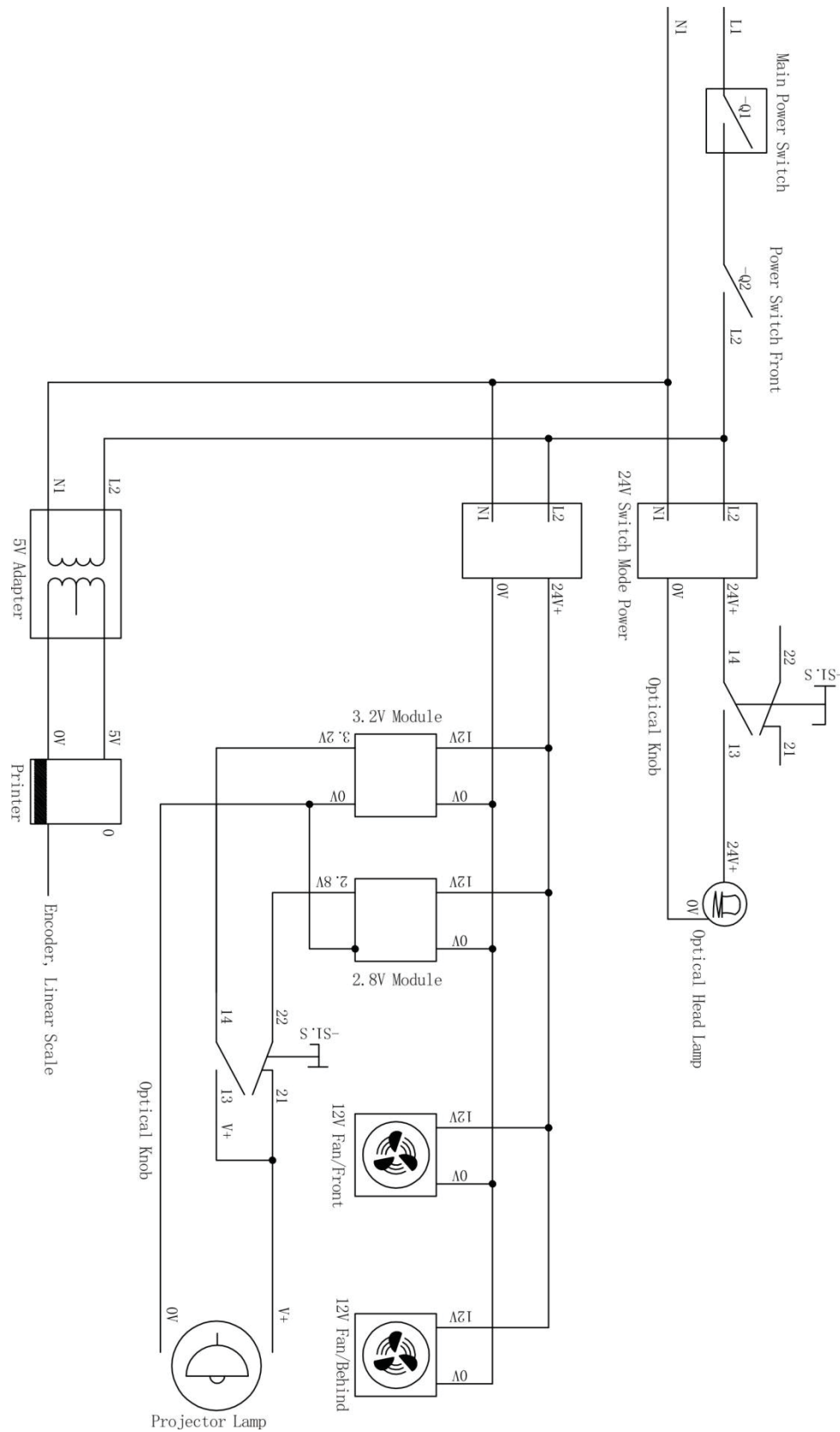


Fig 11 Electrical Principle



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