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OPERATION MANUAL
Model ISP-Z2510
Erect Image Profile Projector



1. Usage

ISP-Z2510 digital measuring projector is a precise and excellent effective measuring instrument integrating optic, mechanic and electricity. The instrument is suitable for measuring efficiently different shapes of workpieces with complicated profiles and surface, such as formed milling cutter, gear, thread cutter, cam, template, punched pieces, and various cutters and tools. It can also inspect the profile shape of the caporal. Therefore, it is widely used in inspecting room and workshop of the tobacco industry, mechanical manufacturing industries, instrument industries, and horologe industries.

2. Specification

2.1 Projective screen

- 2.1.1 Screen size(mm):Φ250
- 2.1.2 Screen rotary range:0~360°
- 2.1.3 Resolution:1', Rotating accuracy: 8'

2.2 Lens

(Size unit: mm)

Magnification	10X(standard)	20X(optional)
Object view	Φ 30	Φ 15
Working distance L	75m	69

2.3 Table And Dimensions:

(Size unit: mm)

X axis travel	100
Y axis travel	50
Metal table size	220×150
Glass table size	196×96
Resolution	0.001
Z axis travel	50

2.4 Illumination

- 2.4.1 The illumination of transmission and reflection are 12V、100W halogen lamp.

3. Working principle

The working principle of projector is shown in Fig.1. Put a work-piece on the table. The objective O forms and magnifies the image Y' of the work-piece Y on the projection screen P. User not only can measures Y' directly with a common glass scale, but also can compare with standard picture on the projection screen or directly can measure the workpiece Y to be measured by the digital display system equipped on the worktable. In Fig.1, S is transmission illumination source and K is the condenser.

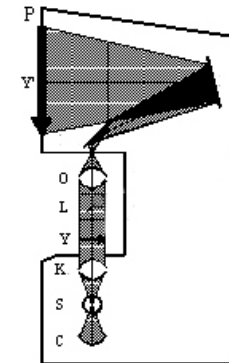


Fig.1 Working principle

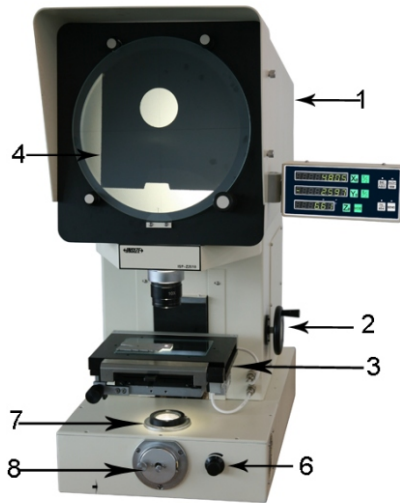
4. Construction and function

The structure of the instrument is shown in Fig.2. It is mainly consisted of projection case, shell and table and so on. The shell of the instrument is used to support the projection case and the worktable, and inside of the shell is also used to place the illuminating system, electronic controlling system, cool devices and digital display devices.

The optical system of the instrument including objective, mirror and projection screen. And the light source inside of the shell of the base is the transmission light source. There are two pieces of reflection mirrors, which are in the back and front of the projection case respectively. The objective and projection screen are clearly expressed in the Fig.2.

The instrument has digital display devices with corresponding operating buttons.

The worktable of the instrument can be moved in longitudinal direction (direction of left and right hands faced the instrument), transverse direction (back and front direction faced the instrument) and vertical focusing (up and down direction of the worktable). The longitudinal movement with grating transducer can measure the Cartesian coordinate with higher accuracy. The projection screen can be rotated in 360 degree directions. It can get the angle value by the rotation of the photo-electricity angle encoder driven by the fiction wheel. The cross-line on the projection screen is a reference point (line) for measuring length and angle.



- 1. Projection case
- 2. Handwheel
- 3. Worktable
- 4. projection screen
- 5. Objective
- 6. Adjusting knob for illuminating lamp
- 7. Condenser
- 8. Illuminating lamp socket

Fig. 2 The structure of the instrument

5. Method of operation

User should read the content of the chapter of instrument structure before operation so as to have a basic concept for the structure of the instrument.

The following information is the important content:

- (1) the description of the digital display part
- (2) Operating and measuring worktable
- (3) The function of the rotation of the projection screen
- (4) Adjusting of the illuminating lamp
- (5) The replacement of the objective

5.1 Operation of digital displaying part

The instrument adopts the external readout. The digital display part is used to display the measuring value of the workpiece. The display values include the length of the longitudinal and transverse movements of the worktable (3) and the rotation angle value of the projection screen.

5.2 Operation and measuring worktable

Rotating the up or down handwheel (2) with hands in clockwise or anti-clockwise direction, the worktable can be sharply imaged on the projection screen (4).

Rotating the handwheel of the longitudinal and transverse movements of the worktable, the moving value of the worktable can be displayed on the readout.

5.3 The function of the rotation of the projection screen

Rotating the handwheel in clockwise or anticlockwise direction, it is available to rotate the projection screen in 360 degree direction clockwise or anticlockwise. And the rotate angle can be displayed on the displayed on the readout so as to measure the angle of measured workpiece. worktable can be displayed on the readout.

5.4 Adjustment of illuminating lamp

The step is taken during the process of replacing the lamp and checking the instrument.

When adjusting the contour illumination lamp, loosen the locking screw on the lamp holder and adjust the lamp in the front, back, left and right to filament imagery on the center of projection screen clearly, then lock the locking screw on the lamp holder.

5.5 Replacement of objective

The 10X objective is the standard configuration. User can select objective with different magnification according to demand. Objective is connected with the projection case through threads rotation to realize replacements of different objectives.

6. Measuring method

Before measurement, check the correct positions of different parts on the instrument and clean the workpiece. Select the needed objective. Rotate the having selected objective (note: don't touch the surface of the glass lens of the objective) onto the objective socket of the projection case and then lock it. Select the illuminating method and turn on illumination switch, and then measurement can be done.

6.1 Comparing measurement with "standard drawing"

By comparing the standard drawing (transparent) with the image of the workpiece, its difference is the error of the workpiece. This is the most common method. Different parameters of the workpiece may be measured at a time rapidly and accurately. The operation can be carried out as follows:

- a. Choose the objective with proper magnification according to the size and form of the workpiece. Make a "standard drawing" according to the value that the parameter of the blueprint multiply the chosen magnification. Then put the "standard drawing" onto the projection screen and fix it with elastic pressers.
- b. Place the workpiece in the center area of the worktable (3) and rotate the up or down handwheel (2) in clockwise or anti-clockwise direction to raise or lower the worktable until a clear image is formed on the projection screen.
- c. Move the worktable and taro the projection screen (4), or move the standard drawing to let the image of the workpiece on the screen in coincident with the "standard drawing".

If there is any difference, the deviation can be measured directly with the glass ruler. The deviation can also be directly displayed on the readout by moving the worktable and the longitudinal and transverse reading devices of the worktable.

In addition, we can also give the maximum or minimum limit tolerance on the "standard drawing". Thus we can easily know whether the workpiece is qualified.

6.2 Measurement by using longitudinal and transverse reading devices of the worktable

Adjust the measured size of the workpiece to be parallel to X or Y direction of the worktable (3). Then move the worktable (3) to make the cross line on the projection screen (4) aim at one side of the workpiece. Now set X or Y to be zero. Again move the worktable (3) to bring the cross line aim at the other side of the workpiece. Now, the X or Y value is the actual value of the measured length.

6.3 Measuring with common glass scale

We can directly measure the size of the magnified image of the workpiece on the projection screen (4) by using the glass scale. Then the reading value divided by the magnification of the objective is the actual size of the workpiece. For example, if on the projection screen (4), the size of the workpiece directly measured by common scale is 80mm and the magnification of the selected objective is 10x, the measured size is $80/10=8(\text{mm})$

6.4 Measuring an angle by rotating the projection screen

Rotate the projection screen (4) to make the marking line aim at the line on the zero indicating panels. Now the cross-line on the projection screen is parallel to the X or Y coordinate of the worktable. Place the workpiece on the proper position of the center area of the worktable (3) and turn projection screen to make a line of the cross line coincident with one side of the workpiece. And make the angle of the readout be zero. Rotate the projection screen and move the worktable again to make the just selected cross line to be coincident with the other side of the workpiece. Now the angle value displayed on the readout is the actual angle of the workpiece.

7. Maintenance

The projector is a king of precision optical instrument. Attention should be paid to its maintenance so as to guarantee the precision and prolong its life of the instrument.

- (1) The instrument should be installed in a dry and clean room, the temperature of which should be at $20^{\circ}\text{C}\pm 5^{\circ}\text{C}$.

The relative humidity of the room should not exceed 60% so as to present the optical parts and reflecting mirror from molding and to keep the high duality of the image.

(2) The surfaces of optical park should be kept clean. They should not be touched with hands. If any dirt, oil fleck or dust is found on the surfaces, they should be removed with soft brushes, or they can be removed with clean linen or lens paper soaked in methyl benzyl or in a mixture of alcohol (30%) and ether (70%).

(3) The instrument should not be operated with a powerful force. All bare metal surfaces of the instrument and the accessories should be wiped clean and coated with protective grease after operation.

(4) Optical parts and moveable parts of the instrument have higher precision. They should not be dismantled optionally. If it is necessary, they should be sent to the specialize factories for repair.

8. Unpacking and installation

Take away the top cover and its four sides on the packing box. Take out the four feet placed in the bottom of the packing case. And then screw out the four hexagonal bolts fixed the base of the instrument shell. After this, transfer the instrument to the place where it is to be installed. Mount the four feet onto the bottom of the instrument and adjust them to make the install surface of the worktable in level state. Projection screen should not face the window and any strong light so as not to affect the contrast of the screen.

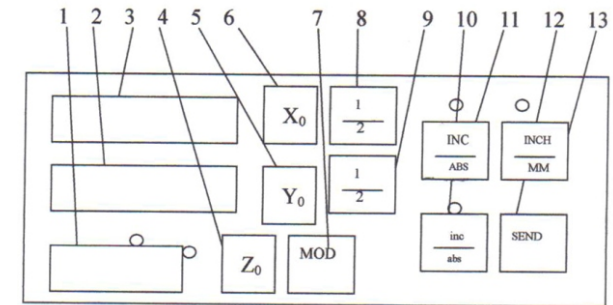
After the instrument has been placed properly, take away the protection paper carefully.

Wipe out the protection grease on the instrument with cloth socked in aviation gasoline.


After the grease is wiped opt, some lubricant oil should be applied.



Dismantle the connecting screwing for fixed the three layer worktable together and connecting board. The worktable can move in longitudinal and transverse directions. At lasts connect power and the instrument can be started to use.


9. Operation manual for Readout



- 1 .Display window for angle value
2. Display window for X coordinate
3. Display window for Y coordinate
4. Zero key of angle
5. Zero key of Y coordinate
6. Zero key of X coordinate
7. Conversion key for degree minute second/percentage
8. Half key for X coordinate
9. Half key for Y coordinate
10. INC/ABS conversion key for angle value
11. INC/ABS conversion key for X and Y coordinates
12. RS232 serial communication function key
13. Conversion key for Metric and Inch

 It is half key, which can divide coordinate value by two to determine the center point of the workpieces. Incremental or absolute coordinate key

 ABC coordinate: take zero as origin.
 INC coordinate: take absolute coordinate as origin point can zero at any time.

 Mode key: it can toggle between angle degree minute second and percentage key when pressing the key for 3 seconds. In general condition, the angle value will increase 90 degrees when pressing the key for the first time and the maximum angle value is 360 degrees.

The readout has RS 232 Serial port communication function. There are two ways for communication, the first way: the outer

equipment sends out data 0d (Hexadecimal) to the readout through RS232 part. The readout will send out the data through serial part when it received the signal. The second way: pressing the SEND key on the readout, the readout will send out the data to the external equipment through RS232 Serial port.

Output and Input of RS232 Serial port:

Baud rate: 9600

Pause bit: 1

Data bit: 8

Beginning bit:1

Parity bit: None

The data of serial output is ASCII, its format as follows:

RxxxxxxxxYxxxxxxxxZxxxxxxxxCR

Where: PXY is identifying character, X is sign and number, CR is Stopping sign

For example:

The data displayed on the readout is:

X 1235.347

Y—46.55 5

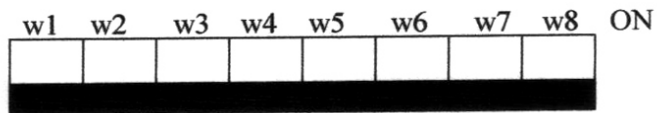
Z—120.80

The data sent in serial port is:

Px 1235347Y-46555Z-12080CR

The angle display parts of the readout can be rectified. Its range is ±59' and the rectifying value is input by the fuming switch on the circuit board.

The standard degree of rectifying data is 360. It is expressed by binary. It shows as follows:



From W1 to W6 is the rectifying data switch and W7 is positive/negative sign, OFF is positive and ON is negative. From W 1 to W6 is data bit, ON for data, and OFF is no data

For example:

The deviation is -20' and the rectifying value is +20 and input value is 00010100 when an encoder located in the 360 degree.

