CLAIMS

1. A vertical measuring system comprising:

a surveying instrument which has a leveling module and a surveying instrument main body rotatably provided on said leveling module in a horizontal direction and is provided on a reference point,

a target device installed on a part to which said reference point is transferred and

a guiding terminal which has a display module and a first communication module and is used on a side of said target device,

wherein said target device has a target for emitting a target light toward said surveying instrument main body,

said surveying instrument main body comprises a sighting image photodetecting module for sighting a direction of a rotation axis of said surveying instrument main body and acquiring an image of said target,

a tilt sensor for detecting a tilt of said surveying instrument main body,

a second communication module for transmitting and receiving data to and from said guiding terminal and

an arithmetic control module,

wherein said arithmetic control module is configured to calculate a position of said rotation axis based on a locus of said target image obtained by rotating said surveying instrument main body and to transmit a positional information of said target image and a positional information of said rotation axis to said guiding terminal via said second

communication module,

and said guiding terminal is configured to display a position of said target and a position of a zenith on said display module based on the positional information of said target image and the positional information of said rotation axis received via said first communication module.

2. The vertical measuring system according to claim 1, wherein said surveying instrument main body further comprises said tilt sensor, and said arithmetic control module corrects the position of said rotation axis based on a detection result of said tilt sensor.

3. The vertical measuring system according to claim 1 or 2, wherein said target is a prism, said sighting image photodetecting module has a light source unit for emitting the target light onto an optical axis, and said surveying instrument main body is manually rotated.

4. The vertical measuring system according to claim 1 or 2, wherein said arithmetic control module performs a time division at a predetermined time, acquires said target image per said predetermined time and averages data of said target image acquired within said predetermined time, and said arithmetic control module is capable of changing a time length of said predetermined time.

5. The vertical measuring system according to claim 1 or 2, wherein said target is a prism, said surveying instrument

main body further comprises a distance measuring module, said distance measuring module emits a distance measuring light onto an optical axis, said target retro-reflects the distance measuring light and projects the distance measuring light as a reflected distance measuring light and the target light, said distance measuring module receives said reflected distance measuring light and measures a distance to said target, said surveying instrument main body is manually rotated, and said arithmetic control module is configured to display an actual deviation amount between said target and said optical axis as numeral values on said display module based on a deviation between said target image and said optical axis on an image and a distance measuring result.

6. The vertical measuring system according to claim 1 or 2, wherein said target is a light emitter for emitting the target light, and said surveying instrument main body is manually rotated.

7. The vertical measuring system according to claim 1 or 2, wherein said surveying instrument main body further comprises a distance measuring module, a sighting module, a horizontal angle detector, a vertical angle detector, a horizontal rotary driving module and a vertical rotary driving module, and said surveying instrument is configured as a total station.

8. The vertical measuring system according to claim 5, wherein said arithmetic control module performs a time

division at a predetermined time, obtains said target image and a distance measured value per said predetermined time and averages data of said target image and data of said distance measured value acquired within said predetermined time, and said arithmetic control module is capable of changing a time length of said predetermined time.

9. A method for tracing a reference point using the vertical measuring system according to any one of claims 1 to 8 comprising: a step of forming a through-hole on an upper floor in a structure above a reference point, a step of installing a surveying instrument on said reference point, a step of installing a target device in said through-hole, a step of directing a sighting optical axis of said surveying instrument to a vertical direction and rotating said surveying instrument, a step of photodetecting a target image from said target device on a photodetector by said surveying instrument, a step of calculating a zenith position based on a locus of said target image on said photodetector and a detection result of a tilt sensor of said surveying instrument and based on said reference point, a step of displaying said zenith position and said target image on a display module of a guiding terminal, a step of coinciding said zenith position with said target image, a step of marking a position of said target device on said upper floor in a state where said zenith position is coincided with said target image and a step of tracing said reference point on said upper floor based on said marking.