ATO



V1.6

DIGITAL DISPLAY INCLINOMETER

DMI815/825

TECHNICAL MANUAL

- Revision time:2024-08-07
- Product functions, parameters, appearance, etc. will be adjusted with technology upgrades, please contact the company's pre-sales business to confirm when buying.

Disclaimer

This product is developed exclusively for commercial applications and is prohibited from being used for illegal purposes, such as military activities, research related to nuclear, chemical, or biological weapons, or any other actions that violate laws and regulations. It is strictly forbidden to engage in activities related to goods embargoed by the United Nations, the European Union, or the OSCE, as well as any other activities prohibited by the Export Administration Regulations.

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GENERAL DESCRIPTION

DMI815/825 is a digital display inclinometer for angle control and measurement in various industrial fields. The core of this product is to adopt the micro-mechanical control principle and dual-core measurement unit. In the measurement process, the Y-axis can be used to compensate the X-axis, and then the interleaving and temperature compensation model algorithm can be used to give full play to the operational advantages of the micro-mechanical electronic principle. And the long-term stability and repeatability of the instrument measurement are ensured. ± 30 ° measurement, resolution of 0.001 °, accuracy of < 0.005 ° full range, fast response, stable data, easy installation and use, this product has data storage function, three measurement modes (angle, degree, minute and second, mm/m), powerful expansibility, convenient practical application, industrial reliability, high cost performance, It has certain competitive advantages in the international market!

FEATURES

★ Measured accuracy: < 0.005 ° ★ Angle resolution: 0.001 ° ★ Filter frequency optional
★ Measurement range: ± 30° ★ Absolute/relative measurement can be switched
★ With data storage function ★ Automatic angle interleaving compensation function
★ Fixed installation can be measured ★ Working temperature -10℃~ + 70℃
★ Angle/length double unit switching ★ Night vision four-color screen
★ Customers can calibrate the zero point by themselves ★ Alarm angle can be set
★ 3 measurement modes (angle, degree, minute and second, mm/m)

APPLICATION

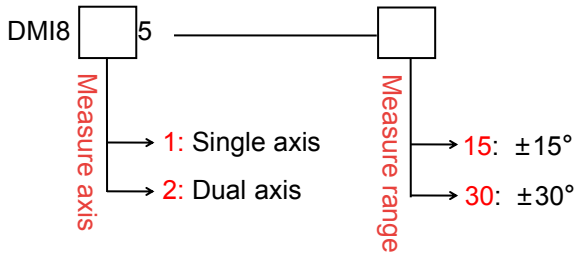
★ Building construction ★ Production fixture ★ Vehicle four-wheel detection
★ Mechanical installation ★ Pipeline installation ★ Industrial platform
★ PTZ angle detection ★ Turntable detection ★ Medical instrument ★ Road slope



SPECIFICATIONS

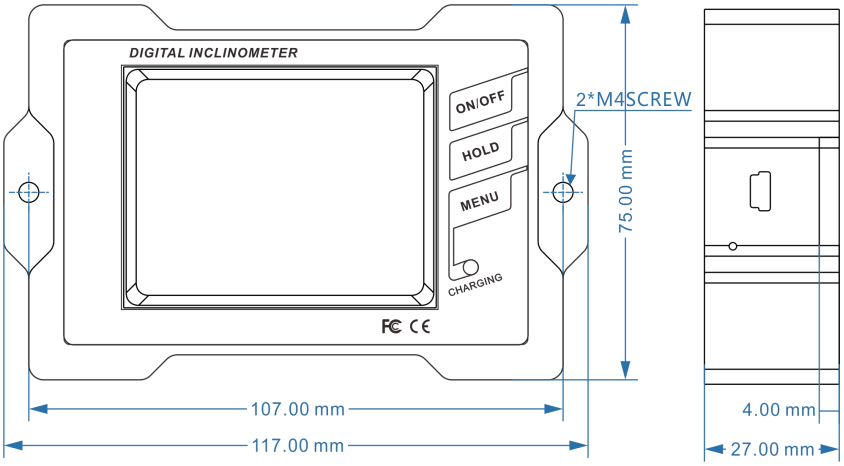
PARAMETER	DMI815		DMI825		Unit
Measure axis	Single axis	Single axis	Dual axis	Dual axis	Axis
Angle measurement range	±15°	±30°	±15°	±30°	°
Angle measurement accuracy (full range)	<0.005	<0.01	<0.005	<0.01	°
Angular measurement resolution	0.001	0.001	0.001	0.001	°
Millimeter/meter measuring range	267	577	267	577	mm/m
Millimeter/meter measurement accuracy	0.1	0.2	0.1	0.2	mm/m
Millimeter/meter measurement resolution	0.02	0.02	0.02	0.02	mm/m
Repeatability	0.003	0.003	0.003	0.003	°
3 measurement modes available	Three modes of angle, degree, minute, second and millimeter/meter can be set.				/
LCD screen	64-color true color luminous display				/
LCD viewable area size	L57.6*W43.2				mm
Operating temperature	-10℃ ~ +70℃				℃
Operating humidity	85				%RH
Power source	3.7 V rechargeable lithium battery				V
Ideal charging time	5				Hour
Continuous working time of battery	11				Hour
Data output signal	USB1.1 (Virtual Serial Device)				/
Equipped with upper computer software	VC application software				/
Connector	Standard USB connector, rechargeable function				/
Anti-vibration	10g @ 11ms, triaxial (half sine wave)				g
Impact resistance	10grms、10 ~ 100Hz				g
Waterproof grade	IP54				/
Material	Aluminum alloy anodizing				/
Size	L117*W75*H27mm				mm
Weight	300				g

ORDERING INFORMATION



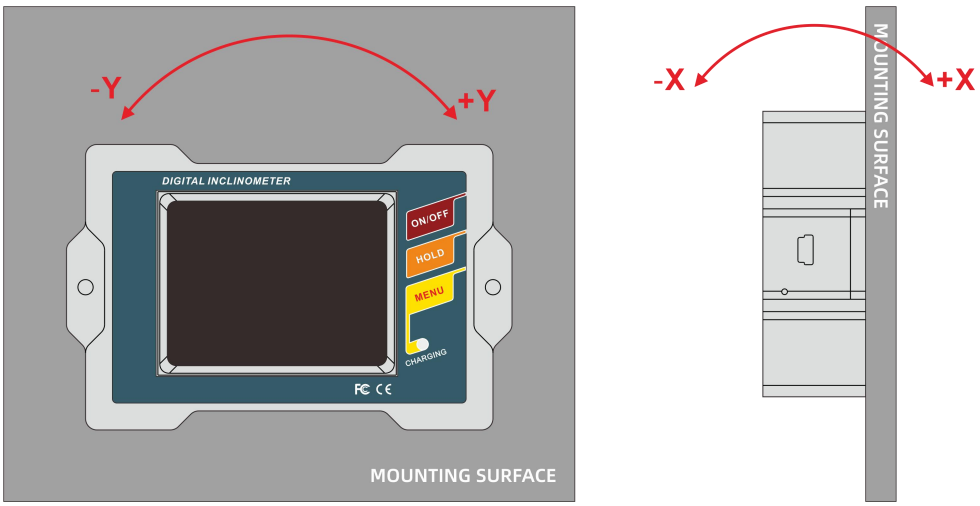
E.g: DMI815-15: means Singe axis /Measure range is ±15°.

PRODUCT DIMENSION DIAGRAM



Shell size: L117 * W75 * H27mm
Installation size: L107 * W75mm
Mounting screw: 2*M4 screws

MEASURE DIRECTION



PRODUCT FUNCTIONS



①Metal anti-wear structure
②Display area
③Fixed mounting hole
④USB jack
⑤Reset hole
⑥ON/OFF
⑦HOLD
⑧MENU
⑨CHARGING

Metal anti-wear structure: metal shell;

②Display area: 64-color true color luminous display screen;

③Fixed installation: it can be fixedly installed on the measured object;

④USB/charging hole: used for charging and USB 1.1 output data;

⑤Reset hole: If the product crashes during operation and the key cannot be operated, the needle-tip hard object can be inserted into the hole for reset;

⑥ON/OFF: Press the ON/OFF key for 2 seconds to turn on or off the machine;

⑦ HOLD: data lock key, which can lock the current data to facilitate customer records;

⑧MENU: menu key, press to hide the menu bar, and then press to display the menu bar;

⑨CHARGING: Charging indicator, when it is on, it means charging; when it is off, it means fully charged. (To ensure battery life, do not use while charging).

▶ FUNCTIONAL MENU INSTRUCTIONS

1．ON/OFF key: Press and hold for 3 seconds to hear "beep..." to turn on the device, Perform the same operation when shutting down;

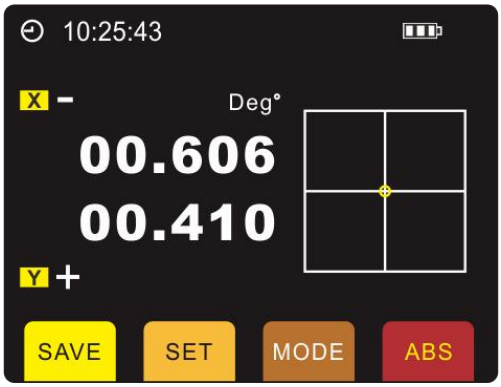
2． HOLD lock key: lock the angle data, press to lock the data,Press again to unlock, and an icon is displayed in the upper right corner of the display;

3． MENU menu key, press to hide the menu bar, and then press to display the menu bar;

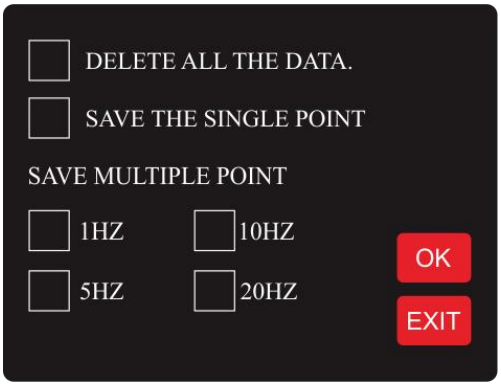
4． Press MENU and HOLD at the same time to enter the touch screen calibration;

4.1 Click OK to enter the touch screen calibration,and click EXIT to exit the touch screen calibration;

4.2 Enter the touch screen calibration, click the small red dots at the four corners of the screen in turn, click once and move once, and the small red dots move 4 points to automatically exit the calibration.



I. Click the SAVE button on the touch screen to enter the save option



A. The DELETE ALL DATA deletes the saved data;

B. The SAVE THE SINGLE POINT is saved for one time;

C. SAVE MULTIPLE POINT continuous multiple insurance (1Hz/5Hz/10Hz/20Hz is optional);

D. Click OK to save successfully;

E. EXIT Discard selection Keep the original option

SAVE DATA

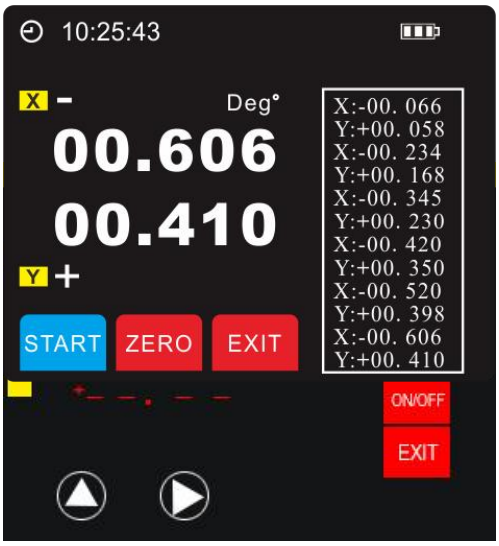
Click START to save relevant data, and the data will be saved in the SD card;

Select single save, and the data will be displayed in the right border of the interface. A single axis can display 6 groups of data at most, and a double axis can display 12 rows of data at most.

Select to save the data for several times, and the data will not be displayed and will be directly saved in the SD card. After the data acquisition is completed, click STOP to stop saving the data;

ABS/ZERO switch key;

EIXT: Exit the save function.



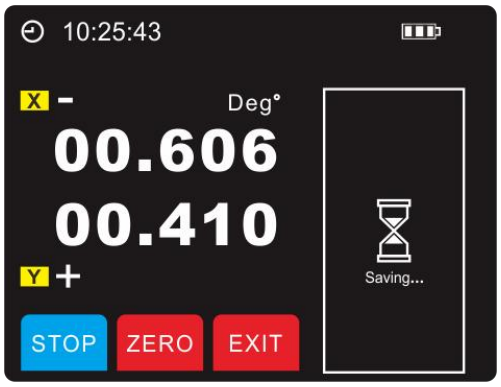
II. Six button options and functions for SET to enter the setting interface:

A. ALARM: Alarm angle settings

B. CALI.: calibration settings,

C. FILTER: filter frequency settings

D. DATE: date settings



E. FAC RESET settingsfactory reset

F. EXIT: Exit the setting interface

A. ALARM

1. Click ON/OFF to open the alarm angle setting, and the number will be displayed. After the setting is closed, it will be displayed as "_ _. _ _".

2.Click the data angle of the X or Y axis to select the angle setting of the corresponding axis.

3.Click ▲ to change the data and symbol of the corresponding bit.

▶: Change the corresponding direction key.

Angle symbol is +: alarm when it is greater than the corresponding angle

-: Alarm when the angle is less than the corresponding angle

±: alarm when the range is exceeded

For example, if X: + 03.00 is set, the alarm will be given when the X angle is + 3.3 ° and > 3 °.

Set Y: -04.00, alarm when Y angle is -4.6, < -4 °

Set Y: ± 05.00, alarm when Y angle is -6 and exceeds -5 ~ + 5 °

4. Click OK to save the setting angle, and the setting angle will take effect.

5.EXIT: Exit Set Angle Save

B. CALI Click OK to perform relevant actions according to the prompt

C. FILTER, The default FILTER is 20 HZ

Select 1HZ: output frequency after filtering

OK: Selection succeeded

EXIT: Exit Selection

D. DATE sets the date and time to be used for displaying and saving data

▶: Select the position of year, month, day, hour, minute and second of the time, which can be repeated.

▲: Increase the corresponding value

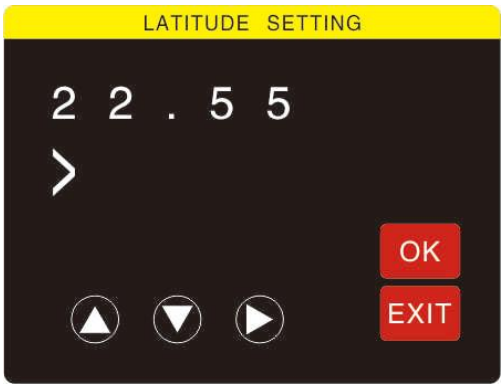
▼: Decrease the corresponding value

OK: Save settings

EXIT: exit the date setting interface without saving

E. FAC.RESET , RESET factory reset

The recovered parameters include alarm angle, filter frequency and calibration angle



F. LATITUDE Local Latitude Settings

Set the local latitude value. As the earth's gravity field varies from place to place, the customer only needs to set the local latitude, and the product will automatically calculate the local gravity field and correct the accuracy error.

As shown in the figure on the right, click the latitude setting.

1. Click the "▲" button to add the corresponding digit value 0-9
2. Click the "▼" button to decrease the corresponding digit value 0-9
3. Click the "▶" button to select the corresponding tens, units, tenths, percentiles and cycles to the right.

4.Click OK to save the latitude setting.

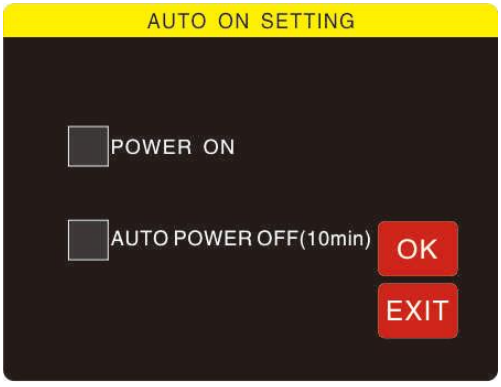
5.Click EXIT: Exit Settings

G. AUTO ON/OFF: Auto Shutdown Settings

As shown in the figure on the right, select "POWER ON" the product is in the power-on state; " If "AUTO POWER OFF (10min)" is selected and there is no operation for 10 minutes, the product will be shut down automatically (the product defaults to this setting).

OK: Save settings

EXIT: Exit without saving settings



III. Selection of Unit Mode

MODE changes DEG, DGS, mm/m cycle switching every time the displayed unit mode is pressed.

IV. ZERO/ABS absolute relative

Zero: Click to set the current angle to zero

ABS: Click to switch to absolute zero

▶ RION PRODUCT COMMUNICATION PROTOCOL

1. Data frame format: (8 data bits, 1 stop bit, no parity, default rate 115200)

Identifier (1byte)	Data length (1byte)	address code (1byte)	Command word (1byte)	Data field	Checksum (1byte)
68					

Data format: hexadecimal;
Identifier: fixed to 68;
Data length: the length from data length to checksum (including checksum);
Address code: the address of the acquisition module, the default is 00;
Command word: operation command keyword;
Data field: according to the different content and length of the command word changes accordingly;
Checksum: The sum of data length, address code, command word and data field does not consider carry;
For example: 68 04 00 04 08 (length 04 + address code 00 + command word 04 = 08).

2. command word analysis

Command word	Meaning/Example	illustrate
0X04	**Simultaneous reading of angle commands** E.g :***68 04 00 04 08***	Data field (0byte) No data field command
0X84	Sensor response reply E.g:***68 10 00 84 00 00 20 08 10 00 25 28 00 37 70 00 C0***	Data field (12byte) **AA AA BB BB CC CD DD DD EE EE FF FF** **AA AA BB BB**: 4 characters represent the X axis; **CC CC DD DD**: 4 characters represent the Y axis; **EE EE FF FF**: 4 characters represent temperature data; The angle format is the same as the X-axis or Y-axis analysis method: the angle in the left example is: X-axis +00.200°, Y-axis -00.252°; Temperature: 37.7°. (Angle analysis decimals are thousandths, ten-thousandths are discarded; temperature data analysis only keep one decimal.) 0A: Checksum, the hexadecimal sum of all data, excluding the prefix 68.
0X05	**Set relative/absolute zero point:**	Data field (1byte) 00: absolute zero

	The current angle can be set to zero for relative measurement, or absolute zero can be set so that no power failure occurs. E.g:***68 05 00 05 00 0A***	01: relative zero
0X85	Sensor response reply command E.g:***68 05 00 85 00 8A***	Data field (1byte) The number in the data field indicates the result of the sensor response 00: set successfully FF: Setting failed
0X32	**Read the data saved in the SD card:**E.g:***68 04 00 32 36***	Data field (0byte)
0XA2	Sensor response reply command E.g:***68 18 00 A2 AA AA AA AA AA AA AA BB BB BB BB CC CC CC CC DD DD DD DD CS***	Data field (19byte) The number in the data field indicates the result of the sensor response AA AA AA AA AA AA AA: Year, month, day, hour, minute, second BB BB BB BB: For details of the X-axis data, please refer to the X-axis analysis defined by the data format; CC CC CC CC: For details of the Y-axis data, see the analysis of the Y-axis defined in the data format; DD DD DD DD: reserved.

▶ RION INCLINOMETER DATA FORMAT DEFINITION

Baud rate： (usually is 115200，special one is 9600 , 8 data bits，1 stop bit，no verification)

Example：X axis：+02.010°　Y axis：-00.513°　Temperature：+50.50°

68 10 00 84 00 02 01 03 10 00 51 32 00 50 50 00 93

Prefix, fixed 68

Data length, fixed10

Sensor address ,default 00

Command word ,fixed 84

X axis angle :

The first byte is the sign bit, 00 indicate positive angle ,10 indicate negative angle .

The second byte is the integer bit of the angle, is compressed BCD code .

The third byte is the decimal place of the angle,is compressed BCD Code.

The fourth byte is the decimal place of the angle, which is the compressed BCD code.

Y axis angle ：
Format is same as X axis

Temperature data ：

The first byte is the sign bit, 00 indicate positive temperature ,10 indicate negative temperature .

The second byte is an integer bit of temperature, which is a compressed BCD code.

The third byte is the decimal place of the temperature, which is the compressed BCD code.

The fourth byte is reserved byte, fixed 00

The last byte is the sum of all the previous data. If there is a carry, the lower data is taken.

▶ PRODUCT MAINTENANCE

B. The digital display inclinometer uses a 3.7V rechargeable lithium battery. In order to improve the service life of the battery, please charge it when the battery is not completely exhausted.
C. If you turn on the power switch and there is no digital display, please charge it in time.
D. This instrument has strong reliability and can be used in a vibrating environment, but please do not drop the instrument from a high altitude, it will cause permanent damage.
E. If you find that the instrument is damaged, please don't disassemble it by yourself. Please call our company as soon as possible to conduct professional inspection and repair. If you disassemble it yourself, the manufacturer will refuse to repair it.

▶ WARNING NOTICE

1. This product has high-precision sensors and information processing circuits. It is strictly forbidden to drop, bump, or disassemble by yourself, otherwise you will be responsible for the consequences.
2. Don't press multiple buttons at the same time, it will easily affect the service life of the product.
3. This product should be placed in a safe place that is not easy for children to touch.