

# **Smart W-LAC H920-P500**

## User's Manual

SURUGA SEIKI CO., LTD.



## Contents

Before using the product, confirm that the following parts are included.

### Product configuration

#### ■ Model: H920-P500

- (1) Sensor head H920-P500M 1 pc
  - +LD connector XW4B-06C1-H1 1 pc
- (2) Signal processor HSP-3810 1 pc
  - + DC Power In (terminal block) XW4B-02C1-H1 1 pc
  - + Analog connector XW4B-07B1-H1 3 pcs
  - + I/O connector IN XW4B-10B1-H1 1 pc
  - + I/O connector OUT XW4B-05B1-H1 1 pc
- (3) Sensor head cable H900-CABLE1 1 pc

## Using the Product Safely

Before use, be sure to read the following Safety Cautions.  indicates prohibition.



Be sure to observe the Safety Cautions indicated here. Otherwise, injury or damage may result.

### - Cautions on Safety and Usage

- The product should be installed and operated by someone familiar with laser device safety.
- In a noisy environment, use a power strip with a noise filter.
- Be sure to ground the controller. If not grounded, electric shock may result.

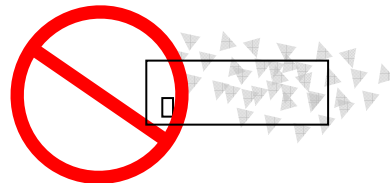
### - Wiring

- When connecting or removing cables, turn off the power sources for the main unit and the equipment connected to the main unit. If the power source remains on, the main unit may be damaged.
- When connecting external equipment control cables, check the external equipment polarity. If the polarity is incorrect, the external equipment may be damaged.

### - Operating Environment

The product must not be installed in locations with the following characteristics.

- Dust
- Significant temperature changes
- Vibration
- Tilts causing instability
- Exposure to corrosive or inflammable gases





## Caution

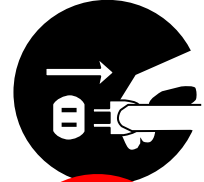
### - Handling and Storage

When placing the product in long-term storage, remove the 24 V power source connector.

This will provide protection from accidents such as fire or electric shock.

### - Power Source

Prepare a 24 V DC power source.



### - Disassembly and Modification

Do not disassemble, modify, or unsuitably repair the measuring head or controller chassis.

Contact Suruga Seiki Optical System Division sales personnel in the case of any malfunctions.

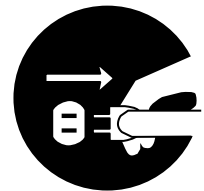


### - Repair Requests

In the following situations, immediately cease use and request repair via Suruga Seiki Optical System Division sales personnel.

Continued use may lead to fire, electric shock, or injury.

- Abnormal noise, abnormal smell, or smoke
- Damage to cables
- Product exposed to water or to ingress of foreign objects
- Product dropped or product cabinet damaged



For inquiries, see page 68.



## Safety Cautions for the Laser

This is a warning for anyone handling the laser or exposed to potential danger nearby. Be sure to follow the directions here.

**Caution: Control, adjustment, or execution using methods not listed in this manual may result in hazardous laser irradiation.**

- Never look directly or through optical methods at the laser light. If the laser makes direct contact with eyes, it may cause serious damage. Damage may result not only from the direct laser light but also from its reflected light.
- Be sure to apply the safety/preventative measures required of the users of Class 3R laser products by the laws and regulations of countries and regions where this product is used.
- In order to avoid radiation exposure due to careless reflection from laser irradiation target objects or their surroundings, install a protective enclosure around the laser irradiation range, using materials with adequate reflectivity, durability, and heat resistance.
- When the enclosure includes a door, we recommend the construction of an interlock system functioning to cut off laser irradiation when the door is opened.
- Do not leave the laser in the irradiating state.
- Only those expert in laser devices should be permitted to handle the laser. Never permit those without experience or training to assemble, operate, or repair the laser equipment.
- Securely position and fix a DUT mirror so as to prevent unintended mirror reflection or diffuse reflection.
- Do not allow the laser beam to strike reflective objects. Scattered laser light from the reflective surface is as harmful as the laser beam itself. Dangerous reflective objects may include rings, watchbands, metal pens or pencils, etc.
- Assemble the head so that the laser beam is not at eye level.
- Terminate the laser beam light path with an adequate non-reflective beam stopper.
- When laser radiation is expected, be sure to wear laser protective glasses of optical density 3+ (@650 to 665 nm).
- Do not perform operation or maintenance not listed in this manual. Radiation exposure due to laser light or electric shock may result.

## Laser Warning Labels

The content of the warning labels on this product and their locations on the product are indicated below.

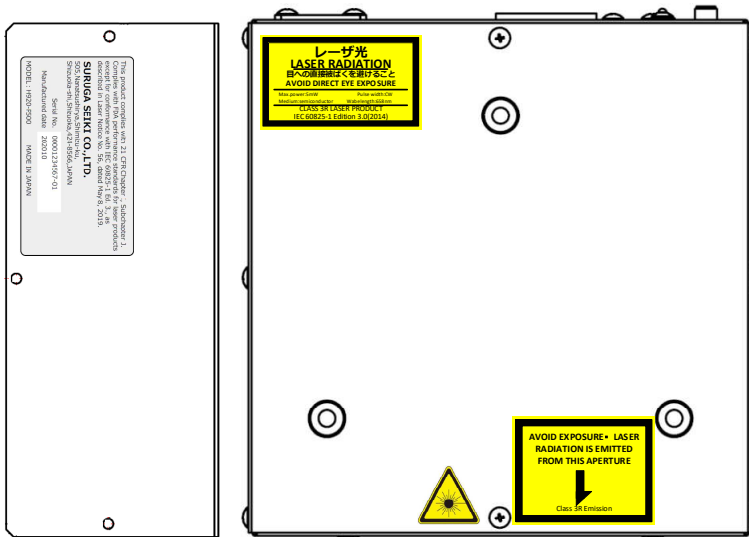


This product complies with 21 CFR Chapter I, Subchapter J. Complies with FDA performance standards for laser products except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

**SURUGA SEIKI CO.,LTD.**  
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Shizuoka-shi,Shizuoka,424-8566,JAPAN

Serial No. 00001234567-01  
Manufactured date 202010

MODEL : H920-P500              MADE IN JAPAN



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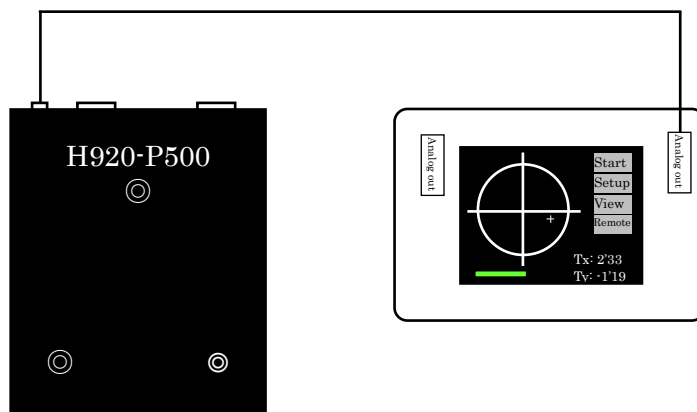


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## . System configuration

### 1.1 H920-P500 system configuration diagram (H920-P500 系统构成图)

The system configuration is composed of the sensor head, one signal processor (tilt), and the sensor head cable. (系统包括 Sensor Head 和一个 Signal Processor(Tilt)以及电线(Sensor Head Cable))



When installing user interface devices such as a processor or user PC, be careful to avoid laser exposure during normal operation and maintenance.  
(当配置处理器和用户 PC 的用户界面部分时, 请注意不要在暴露在激光下的情况下进行操作和维护)

### 1.2 H920-P500 product configuration (产品构成)

The part names and models used in the above configuration are shown here. (上述构成部件的型号说明)

1	Sensor Head	H920-P500M	1 pc
2	Signal Processor	HSP-3810	1 pc
3	Sensor Head Cable	H900-Cable1	1 pc

## 2. Part Names and Functions

### 2.1.1 H920-P500 sensor head (appearance)

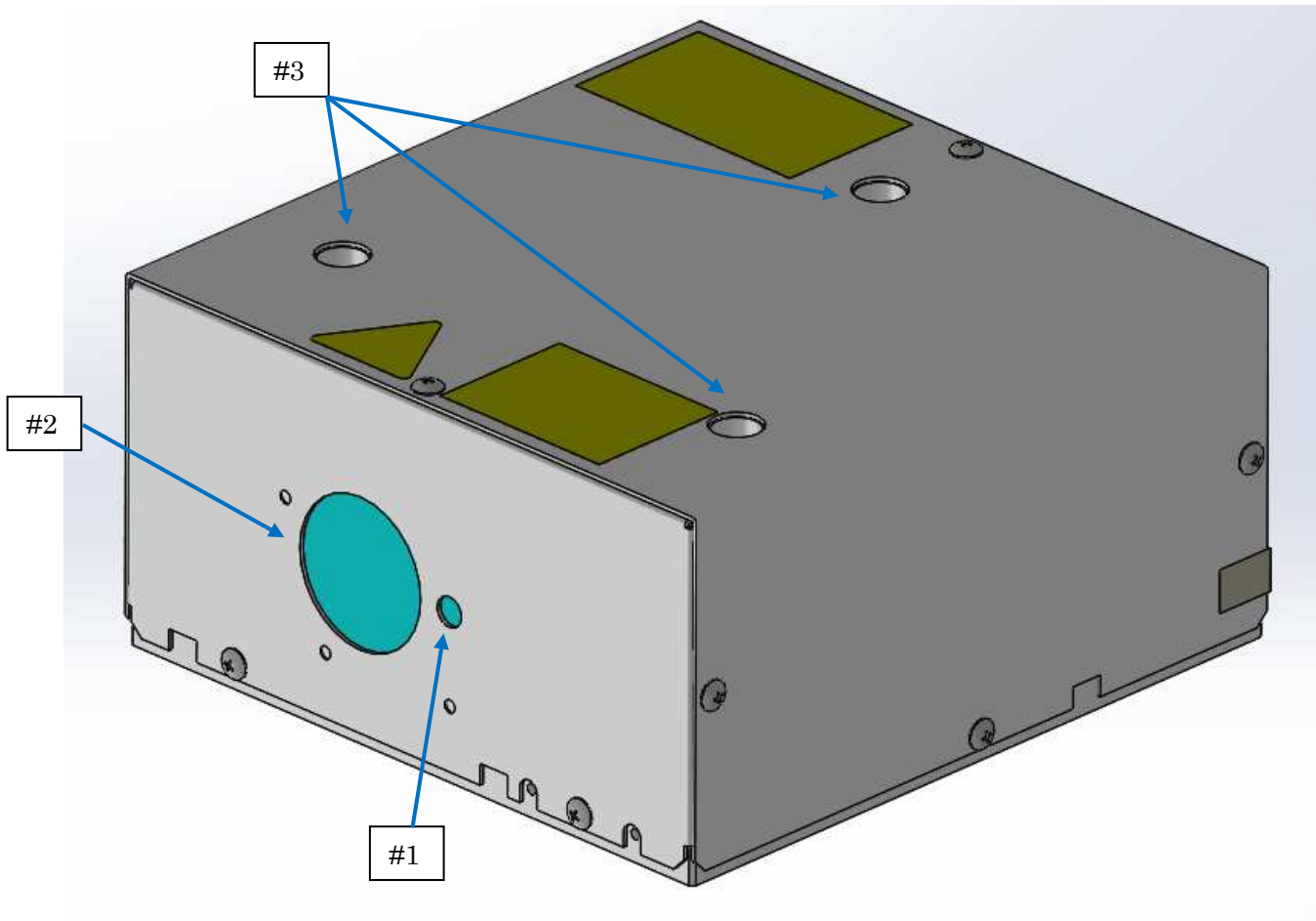
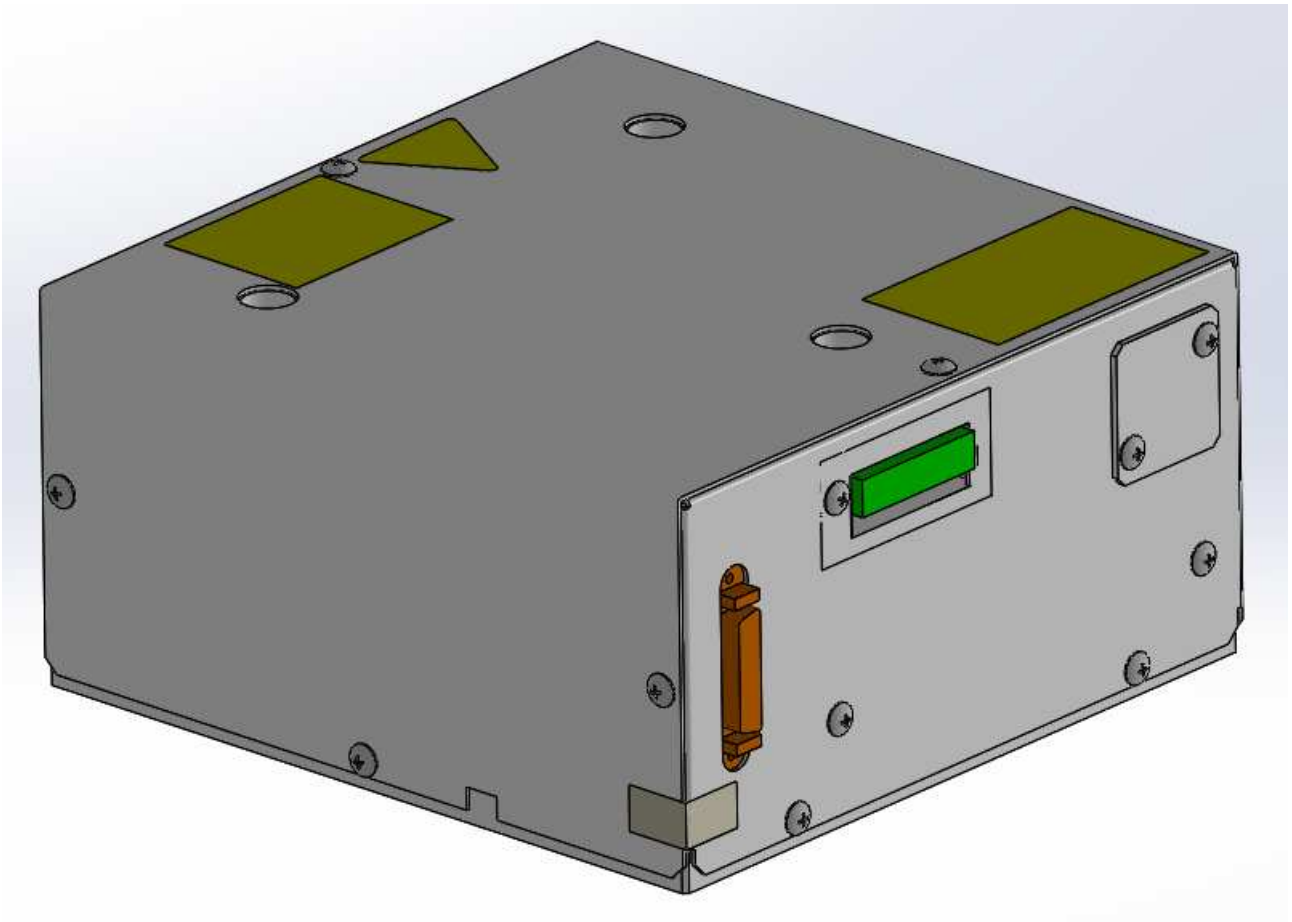


Fig. 2-1-1. External appearance (front side)

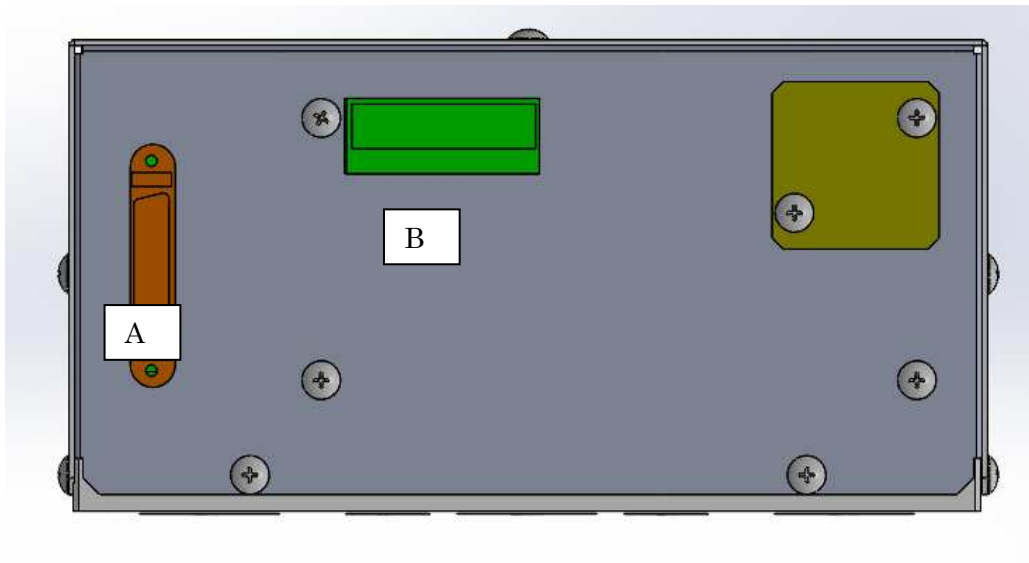
No.	Name	Detailed description
#1	Tilt measurement beam emission aperture	This is the tilt measurement beam emission aperture. Caution: Do not look into it or touch it with bare hands.
#2	Tilt measurement beam entrance aperture	This is the tilt measurement beam entrance aperture. Caution: Do not touch it with bare hands.
#3	Sensor head fixing hole	The sensor head fixing hole uses three included cap bolts (M5 x 12). Tightening torque 460 cN · m
#4	Laser seal	Emission position display

**Caution:** Before connecting or removing cables, be sure to turn the controller power source off.



**Fig. 2-1-2. External appearance (rear panel surface)**

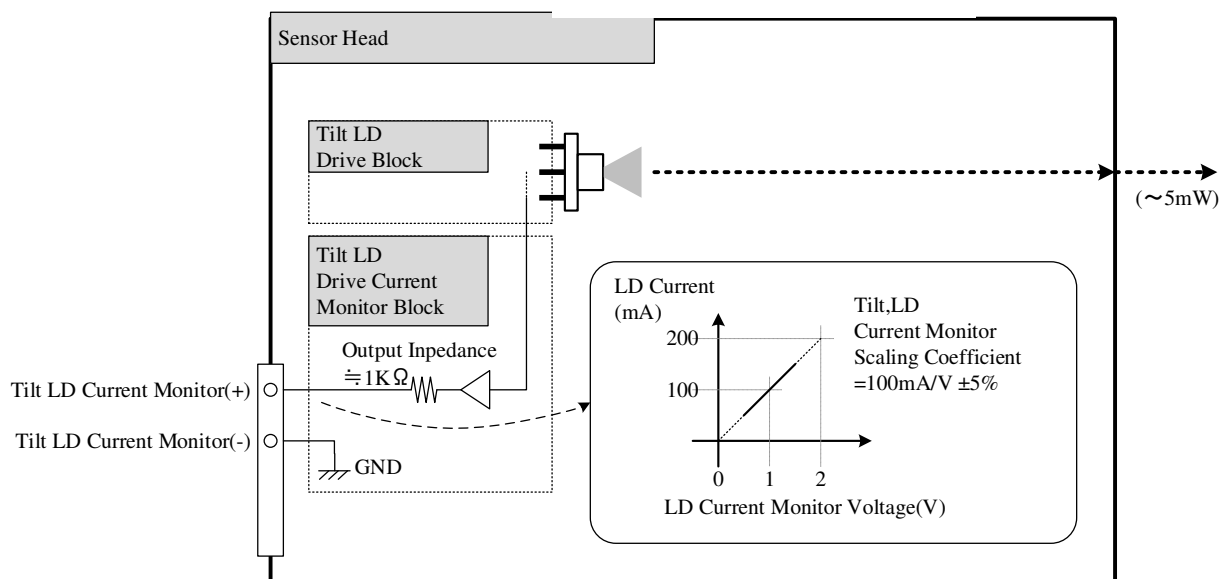
2.1.2 H920-P500 sensor head (rear panel surface) (传感器头 (后面板))



**Fig. 2-1-3. External appearance (rear panel)**

A	I/F Connector	Connects to the processor with liquid crystal monitor.								
B	LD connector	<table border="1"> <thead> <tr> <th>Signal</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>Interlock+</td> <td rowspan="2">Interlock for laser safety</td> </tr> <tr> <td>Interlock-</td> </tr> <tr> <td>Tilt LD Monitor+</td> <td rowspan="2">Tilt-LD current monitor</td> </tr> <tr> <td>Tilt LD Monitor-</td> </tr> </tbody> </table>	Signal	Function	Interlock+	Interlock for laser safety	Interlock-	Tilt LD Monitor+	Tilt-LD current monitor	Tilt LD Monitor-
		Signal	Function							
Interlock+	Interlock for laser safety									
Interlock-										
Tilt LD Monitor+	Tilt-LD current monitor									
Tilt LD Monitor-										
		Applicable connectors: XW4B-06C1-H1 (made by Omron)								

<<Tilt LD Monitor diagram>>



## 2.2 Implemented laser information

**An overview of the laser system parameters is below. Confirm the regulations concerning classes governed by the Center for Devices and Radiological Health (CDRH), a department of the Food and Drug Administration (FDA).**

(1) Main laser beam  
Medium Semiconductor laser  
Optical Power :           5 mW max.  
                                  30 mW max.  
Wavelength :           658nm  
Duration :                CW  
Beam divergence: Parallel beams  
Beam Diameter :        1.0mm  
Embedded Laser :       HL6501MG (OCLARO)

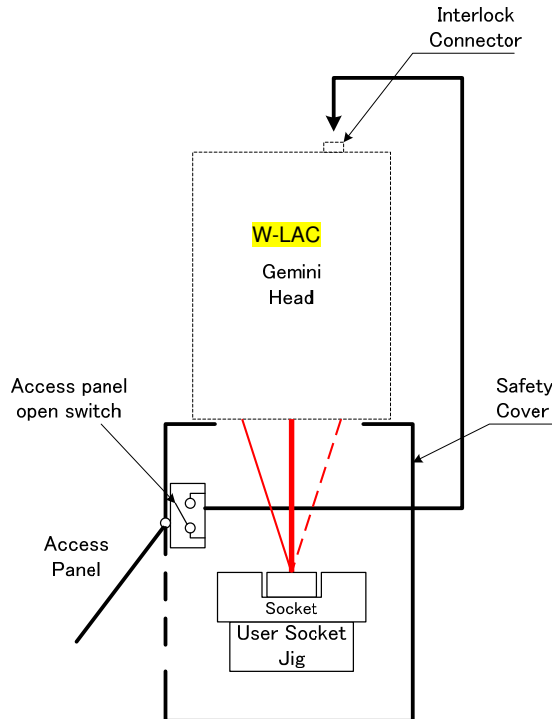
-

### 2.2.1 Example of laser interlock system configuration

When using this product, in order to prevent radiation exposure due to reflections from the mirror or surrounding objects, construct an interlock system along with a protective enclosure around the laser irradiation range. Below is an example of the laser interlock system configuration.

To stop the laser radiation electrically, the interlock connector is used as in the figure below. Two terminals are assigned for interlock control and laser irradiation is enabled by connecting them, so that it will be stopped electrically upon disconnection.

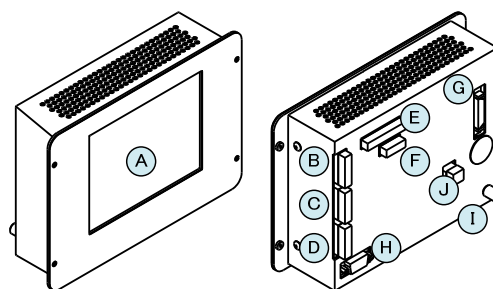
Therefore, by connecting the access door opening switch to these terminals, interlock control is enabled.



**Fig. 2-2-2. Laser interlock**

2.3 H920-P500 processor (part names and functions)

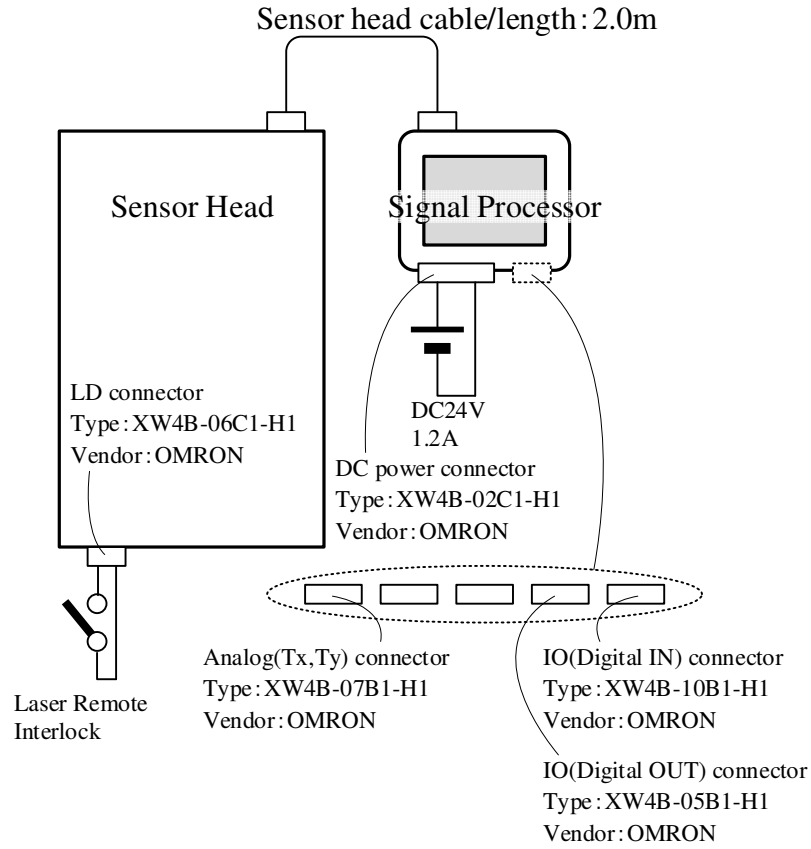
**Fig. 2-3-1. Processor external appearance**



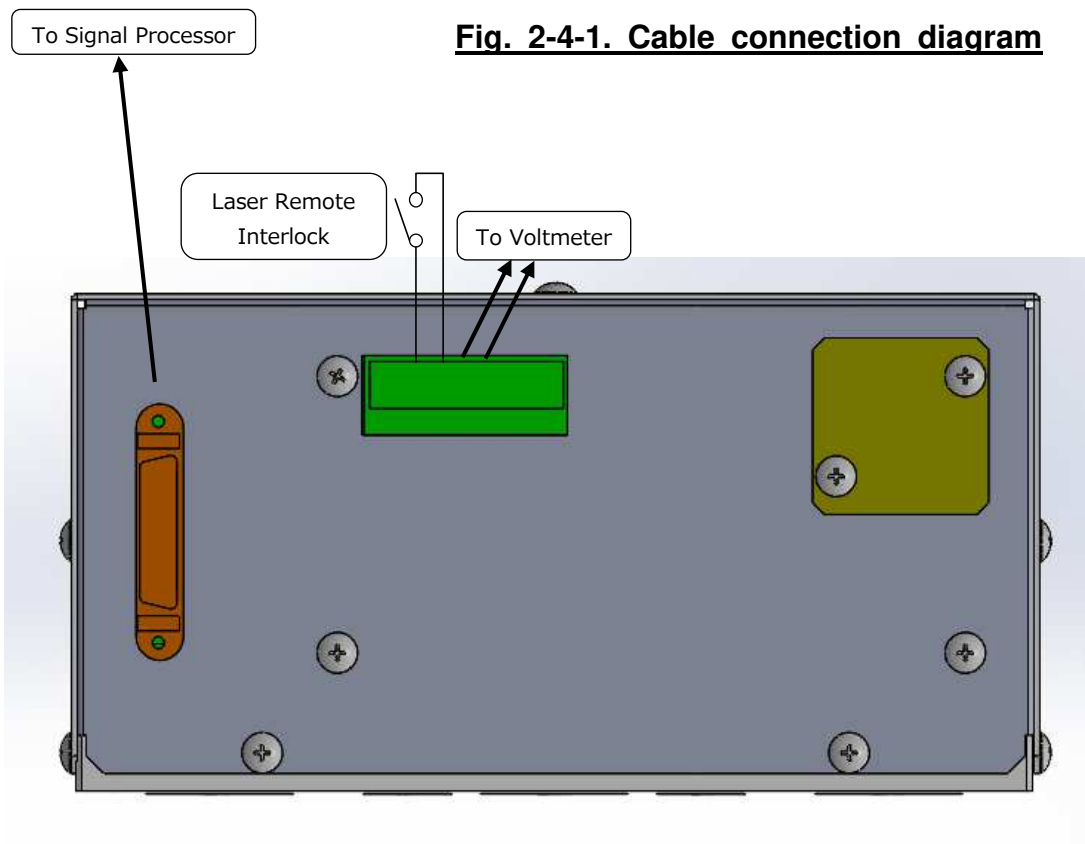
Symbol	Name	Details																																																		
A	LCD Display (with touch panel)	Used for operation and display via touch panel display.																																																		
B	Analog output (Tilt)	The output is analog. <table border="1"> <thead> <tr> <th>Signal</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>Analog ch1+</td> <td>Measurement Result Signal output*</td> </tr> <tr> <td>Analog ch1-</td> <td>- Analog output +/-10V</td> </tr> <tr> <td>Analog ch2+</td> <td>- Output impedance : 50Ω</td> </tr> <tr> <td>Analog ch2-</td> <td>- Offset : +/-5mV or less</td> </tr> <tr> <td></td> <td>- Gain : +/-0.05%</td> </tr> <tr> <td>C</td> <td>Reserved</td> <td></td> </tr> <tr> <td>D</td> <td>Reserved</td> <td></td> </tr> <tr> <td></td> <td>AGND</td> <td>Analog GND</td> </tr> <tr> <td></td> <td>HSOUT</td> <td>High Speed output (5VTTL Level) *Measurement error status digital output *L=Analog valid / H=Analog invalid</td> </tr> <tr> <td></td> <td>DGND</td> <td>Digital GND</td> </tr> </tbody> </table> <p>*Analog signal recommendation: Differential signaling</p>	Signal	Function	Analog ch1+	Measurement Result Signal output*	Analog ch1-	- Analog output +/-10V	Analog ch2+	- Output impedance : 50Ω	Analog ch2-	- Offset : +/-5mV or less		- Gain : +/-0.05%	C	Reserved		D	Reserved			AGND	Analog GND		HSOUT	High Speed output (5VTTL Level) *Measurement error status digital output *L=Analog valid / H=Analog invalid		DGND	Digital GND																							
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2.4 H920-P500 cable connection diagram



**Fig. 2-4-1. Cable connection diagram**

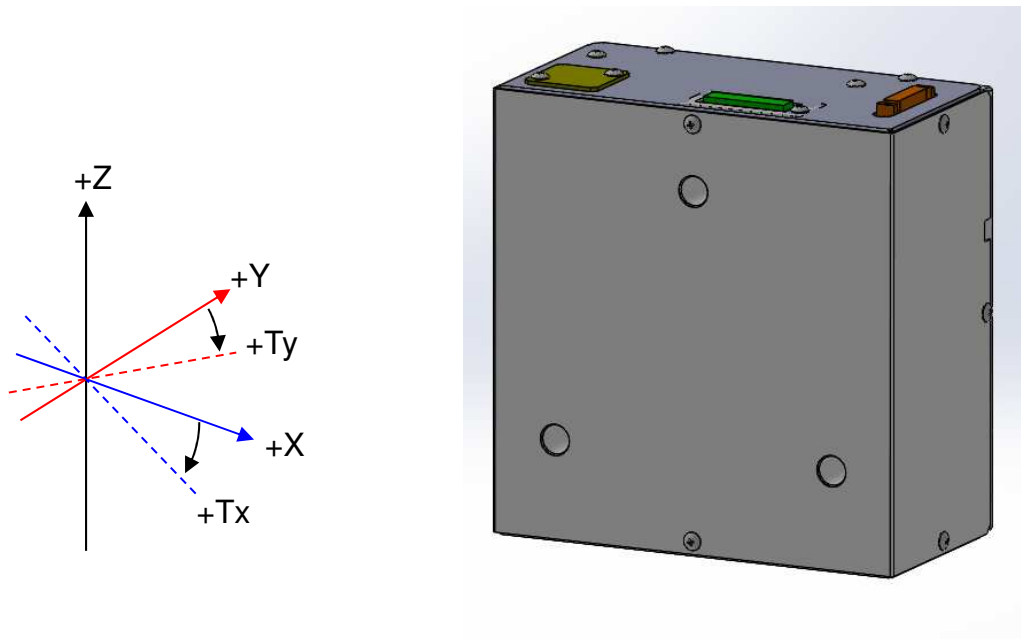


**Fig. 2-4-2. Back panel diagram**

## 2.5 System performance

## &lt;&lt;Measurement performance (H920-P500)&gt;&gt;

Function	Item	Performance
Tilt	Range	+/- 5 deg
	Resolution	1 sec
	Repeatability	20 sec (*1)
	Linearity	+/- 0.25%F.S. (= +/- 90 sec)
	Sampling rate	200 kHz

**Fig. 2-5 Definition of axis direction**

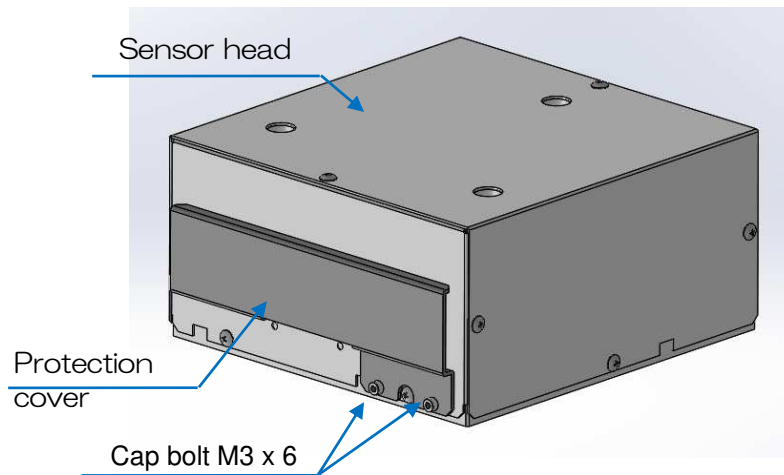
## &lt;&lt;Product specifications (H920-P500)&gt;&gt;

Part	Function	Performance	
Sensor head	Light source	Red semiconductor laser	
	Wavelength	Tilt	655 +/- 10 nm
	Maximum output	Tilt	5 mW or below (Class 3R)
	Emission beam diameter	Tilt	φ1.0 mm *Collimated beam diameter
	Precision guarantee WD		70 +/- 2 mm
	Power source		- (Supplied from Signal Processor)
	Dimensions		W165 x H170 x D85 mm Excluding protrusions
	Weight		2.0 kg
Processor	Signal output	Analog output +/-10 V (Connector Terminal blocks) Output impedance: 50Ω offset +/-5mV or less	
	Signal bandwidth	40KHz *3dB cutoff frequency	
	Communication port	RS-232C (D-SUB 9-pin)	
	Parallel I/O	Non-isolated I/O: Input 9 terminals/output 4 terminals	
	Power source	24 VDC +/-10%, 1.2 A	
	Dimensions	W202 x H141 x D50.5 mm Excluding protrusions	
	Weight	1.0 kg	
Common	Operating environment	23 +/-3°C/20 to 80% RH 23 +/-1°C/20 to 80% RH *Recommended environment	
	Storage environment	10 to 40°C/20 to 80% RH	

## 2.6 Product installation method

### 2.6.1 Remove the protection cover.

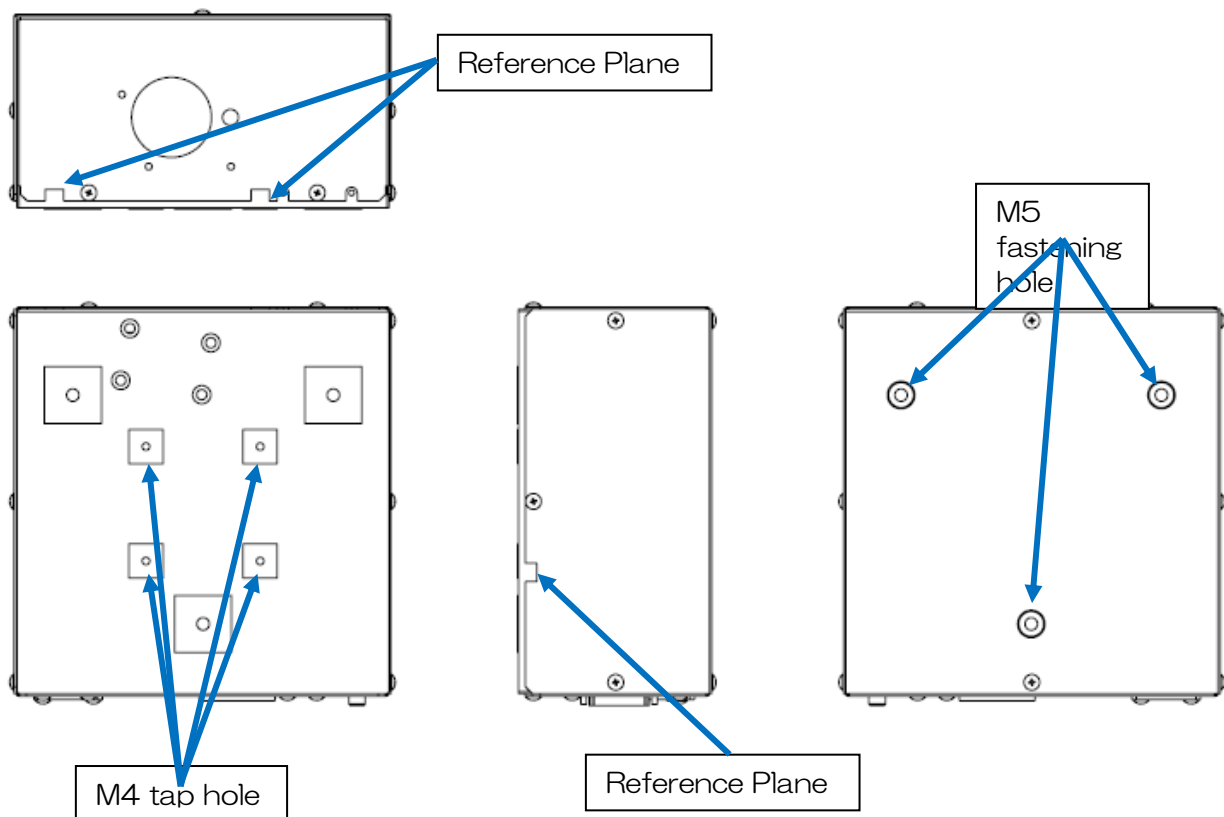
Remove the two cap bolts (M3 x 6) fixing the sensor head, and then remove the protection cover.



**Fig. 2-6 Sensor head status as of delivery**

### 2.6.2 Sensor head installation method

- (1) Apply the reference plane on the base and perform positioning in the XYZ directions
- (2) Using the three included cap bolts (M5 x 12) or M4 screws in the 3- $\phi$ 5.5 holes, mount to a fixing base, etc.

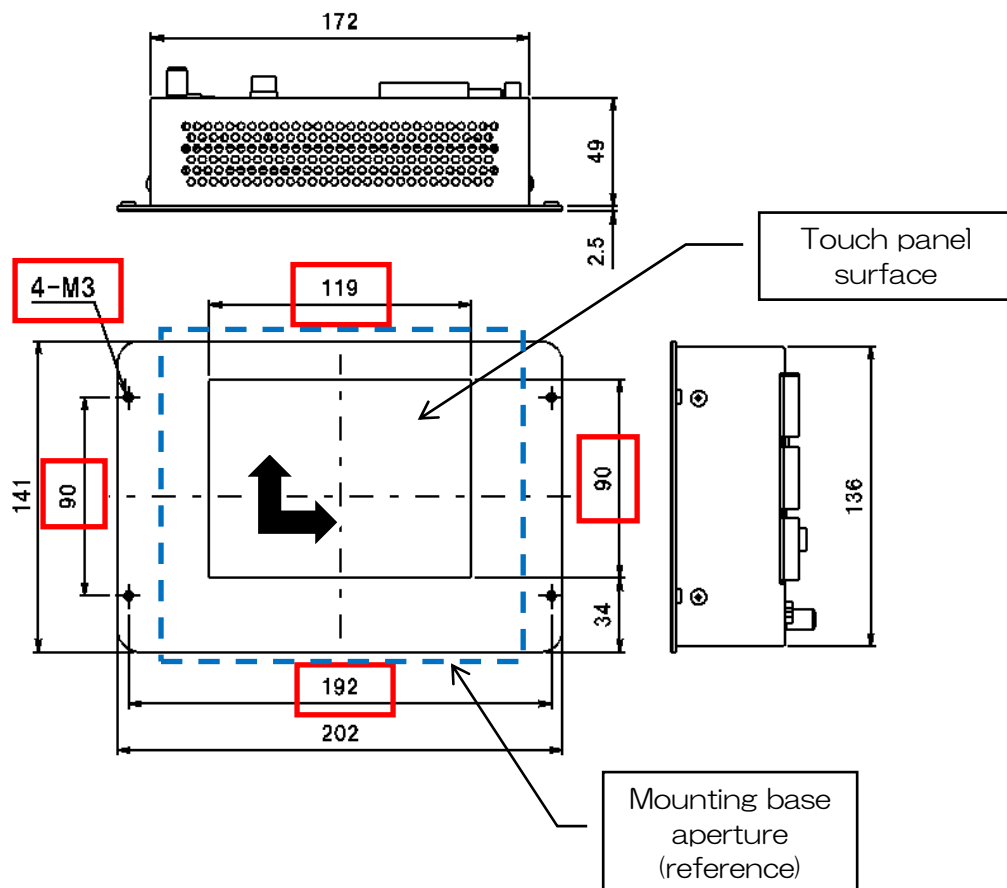


**Fig. 2-7 Sensor head reference plane**

## 2.6.2 Processor installation method (example)

- (1) Install an aperture on the fixing base, etc., in contact with the touch panel surface.  
(reference : Aperture size 143×179)
- (2) Fix to the fixing base, etc. for installation with four M3 screws.  
(Screws are to be prepared by the customer.)

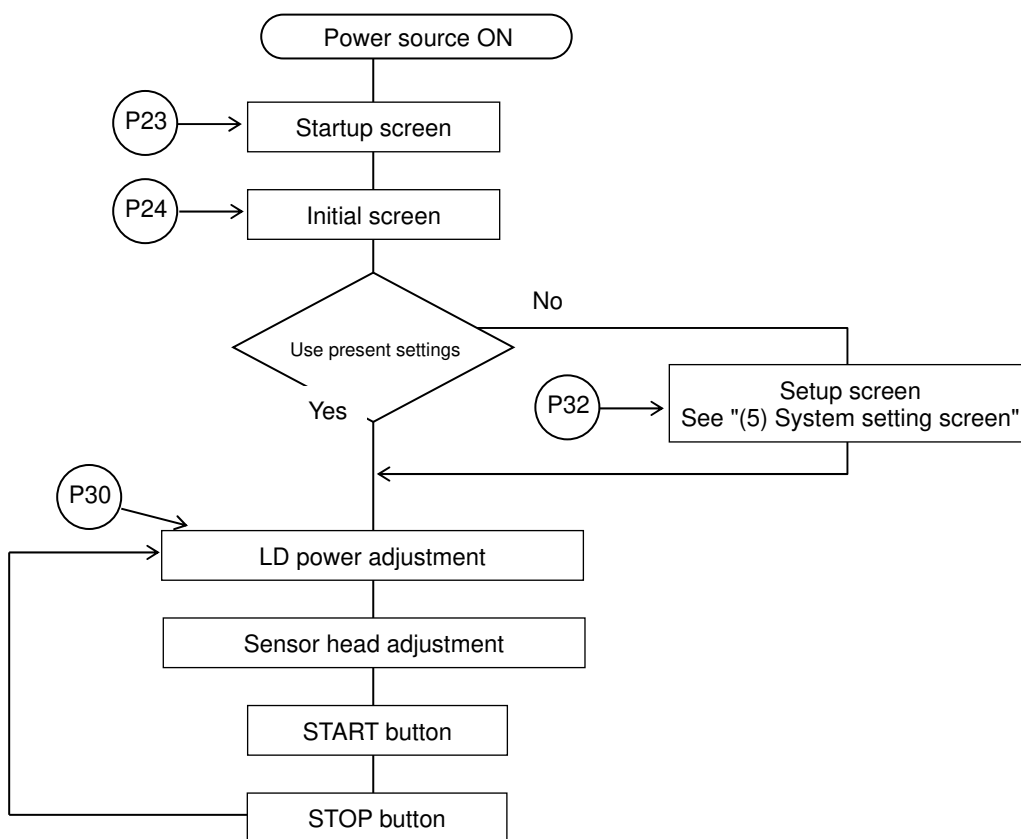
\*Fix the processor for use within a range in which the included sensor head cable can be used to connect the sensor head and the processor.



**Fig. 2-8 Processor installation method (example)**

### 3. Measurement Procedure

#### 3.1 Setting and measurement process

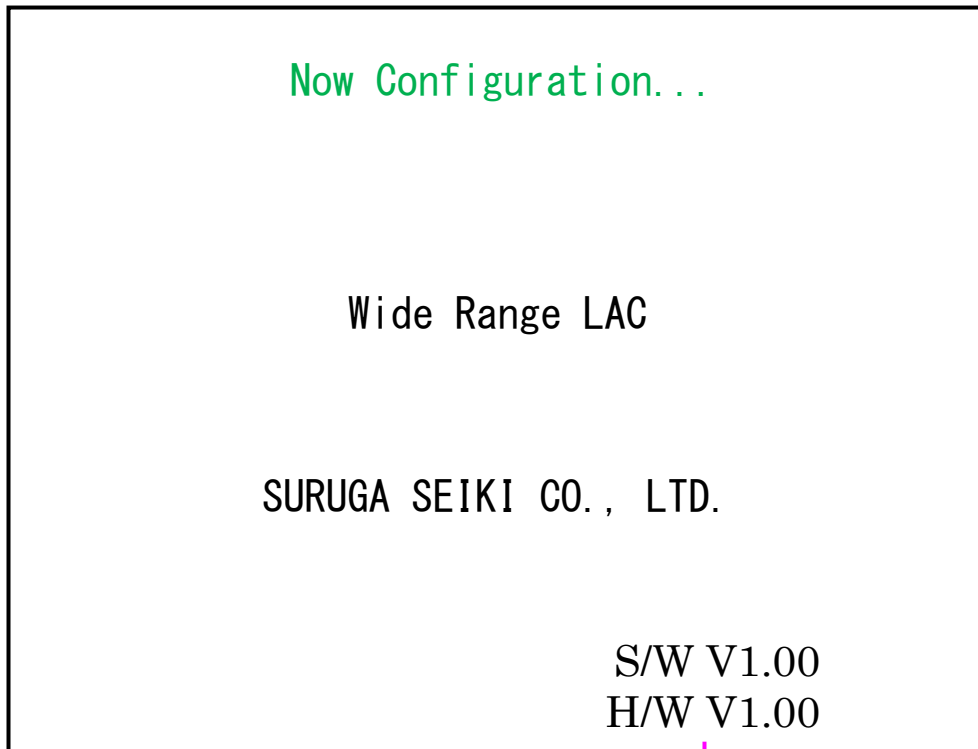


\*External control is possible via I/O interface or communication commands.

(See p.40)

3.2 Basic operation  
3.2.1 Startup screen

When the processing unit power source is turned on, the following screens launch.



(1) Version display

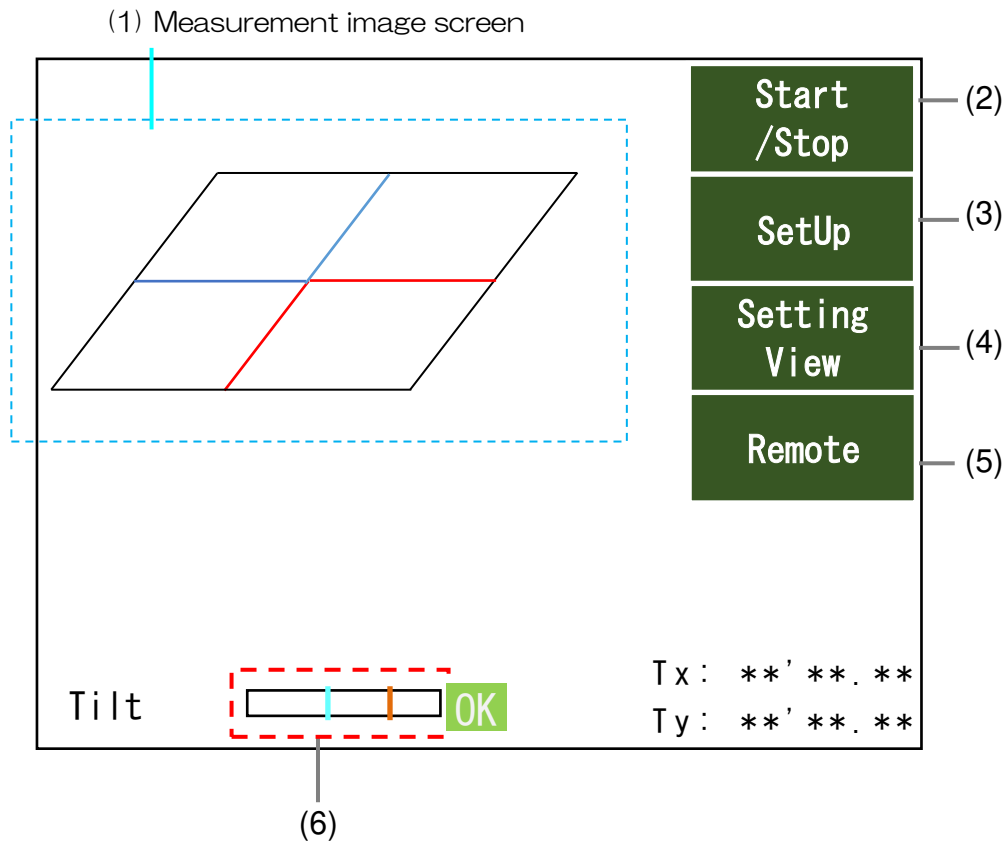
\*(1) Version display will be displayed a few seconds after startup.

Line 1: Software version

Line 2: Hardware version

### 3.2.2 Initial screen (after power source on)

When configuration completes normally, the following screens will be displayed.



(1) This area displays the measurement image.

(2) START/STOP buttons

See p.25

(3) Setup button

Used when changing the measurement conditions setting

See p.28

(4) Setting/View buttons

Used when confirming parameters within password-protected system settings.

See p.32

(5) Remote button (Remote 按钮)

Used when using I/O or commands for operation.

See p.39

(6) Light reception amount bar button

This is a shortcut button for the LDPW adjustment screen AutoSet button.

See p.30

\*This button is only enabled during measurement stop.



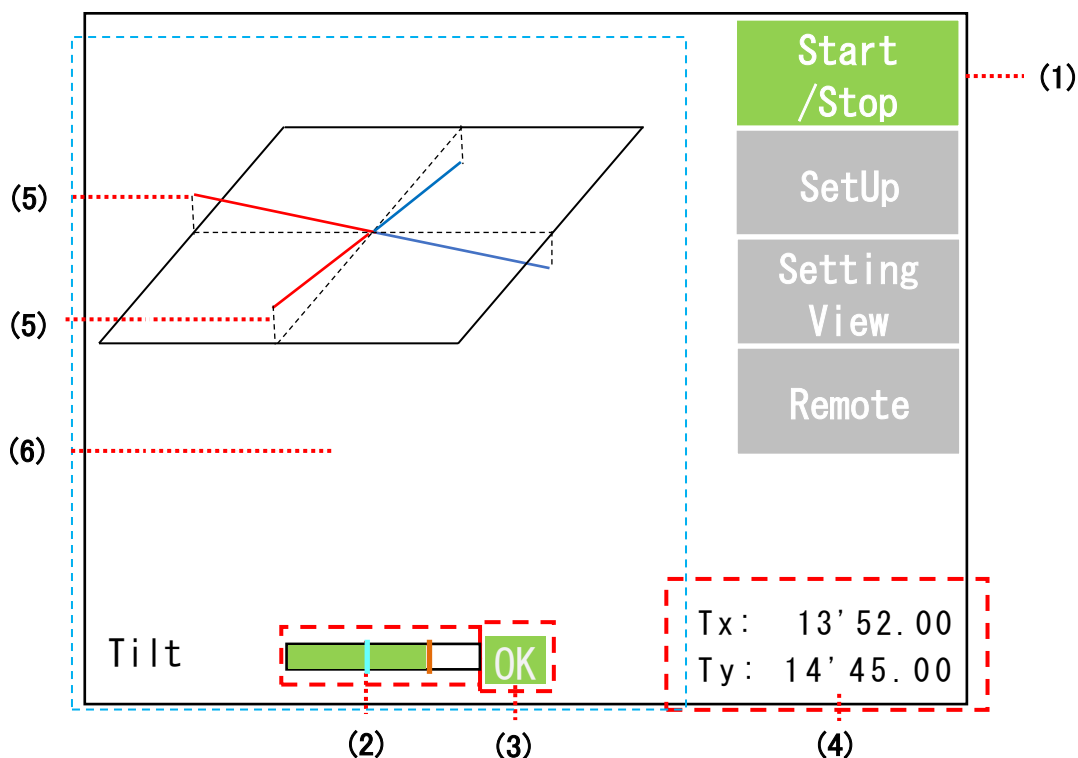
## 3.2.3 Measurement screen (测量画面)

During measurement, the START/STOP buttons brighten. The other buttons are displayed in gray.

(测量中[Start/Stop]按钮变亮, 其他按钮均为灰色)

All buttons darken during measurement stop. (测量停止时所有按钮均变暗)

## A. Measurement state 1 ((1): Initial screen) (测量状态 (初始画面))



(1) START/STOP buttons (Start/Stop 按钮) Start or stop measurement. (测量开始/停止)

(2) Light reception amount bar (接受光强条) PSD light reception amount is displayed. (显示 PSD 接受光强)

Green: Light reception amount is within appropriate range (绿色: 接收光强在正常范围内)

Red: Light reception amount is outside appropriate range (红色: 接收光强超出正常范围)

(3) Judgment result Judgment result is displayed as OK or NG.

(判定结果 判定结果显示 OK 或 NG)

In the case of an error, ER is displayed. (发生异常时显示 ER) See p.27

(4) Measurement value Measurement values are displayed. (测量值 显示测量值)

(5) Tilt The tilt amount is displayed linearly with the origin at the center, on the X-axis for Tx and the Y-axis for Ty.

(倾斜相对中心原点的倾斜量 Tx 显示在 X 轴上, Ty 显示在 Y 轴上以直线显示)

Tilt is shown with a red line in the + direction and a blue line in the - direction. (+ 方向倾斜式红线, 负方向倾斜式蓝线)

(7) Measurement screen display During measurement, touch the center of the screen to switch screen display in the order of (1) → (2) → (3) → (1).

(如果在测量过程中触摸屏幕中心附近, 屏幕显示将为①→②→③→① 并切换)

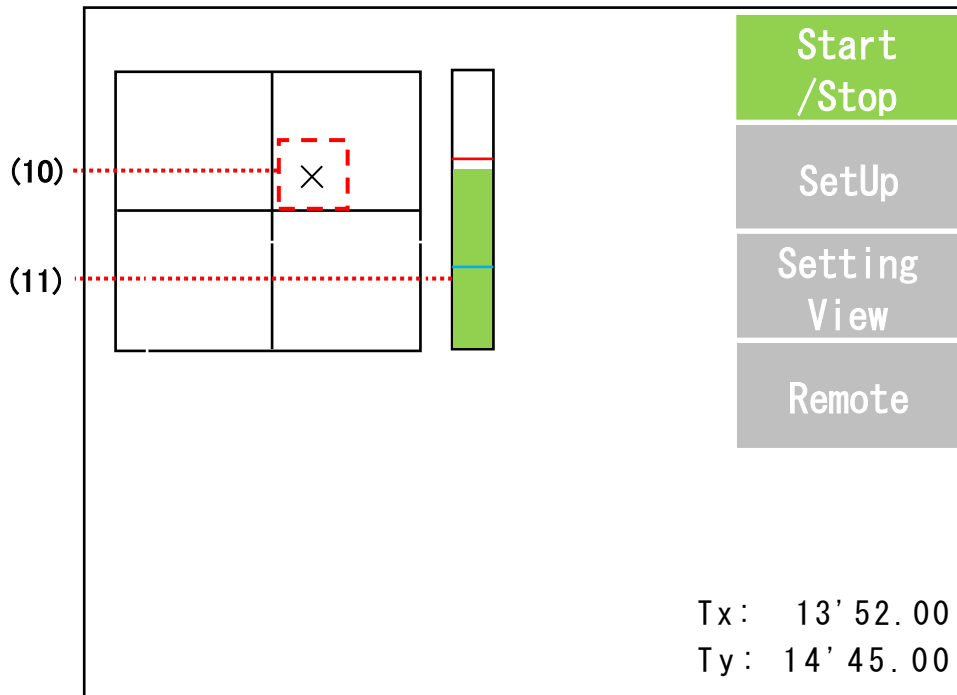
(1): Initial screen (初始屏幕显示)

(2): Tilt individual display (个别显示)

See p.26

(3): Measurement value zoom in display (放大显示测量值)  
See p.26

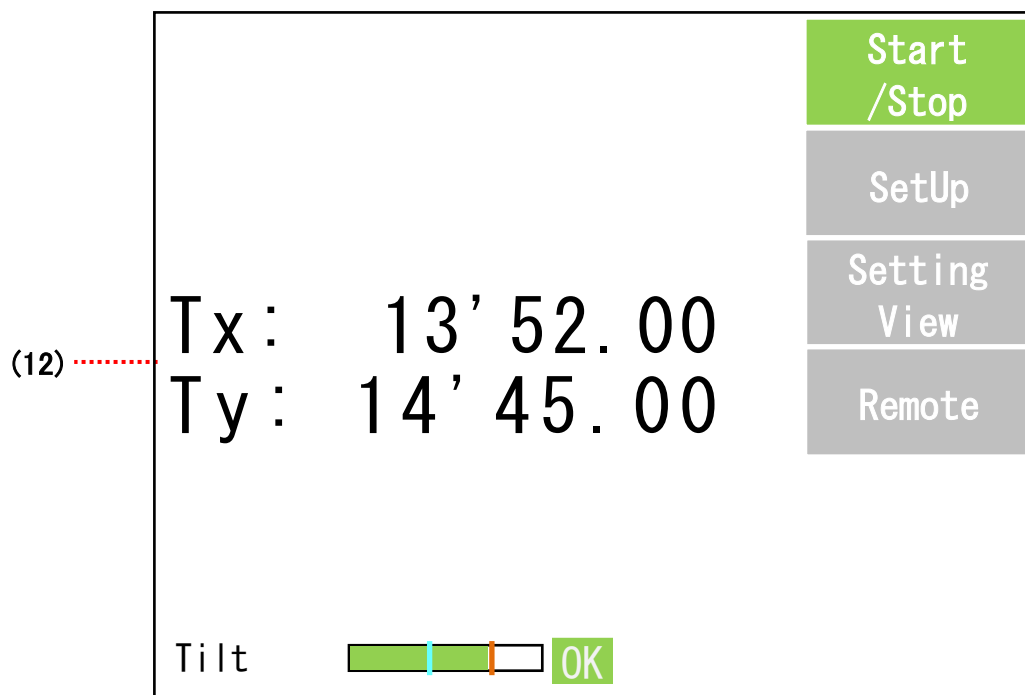
A. Measurement state 2 ((2) Tilt individual screen) (测量状态 2)



(10) Pointer The tilt axis pointer is displayed as a black X. (点 Tilt 轴上的点显示为黑色的 x)

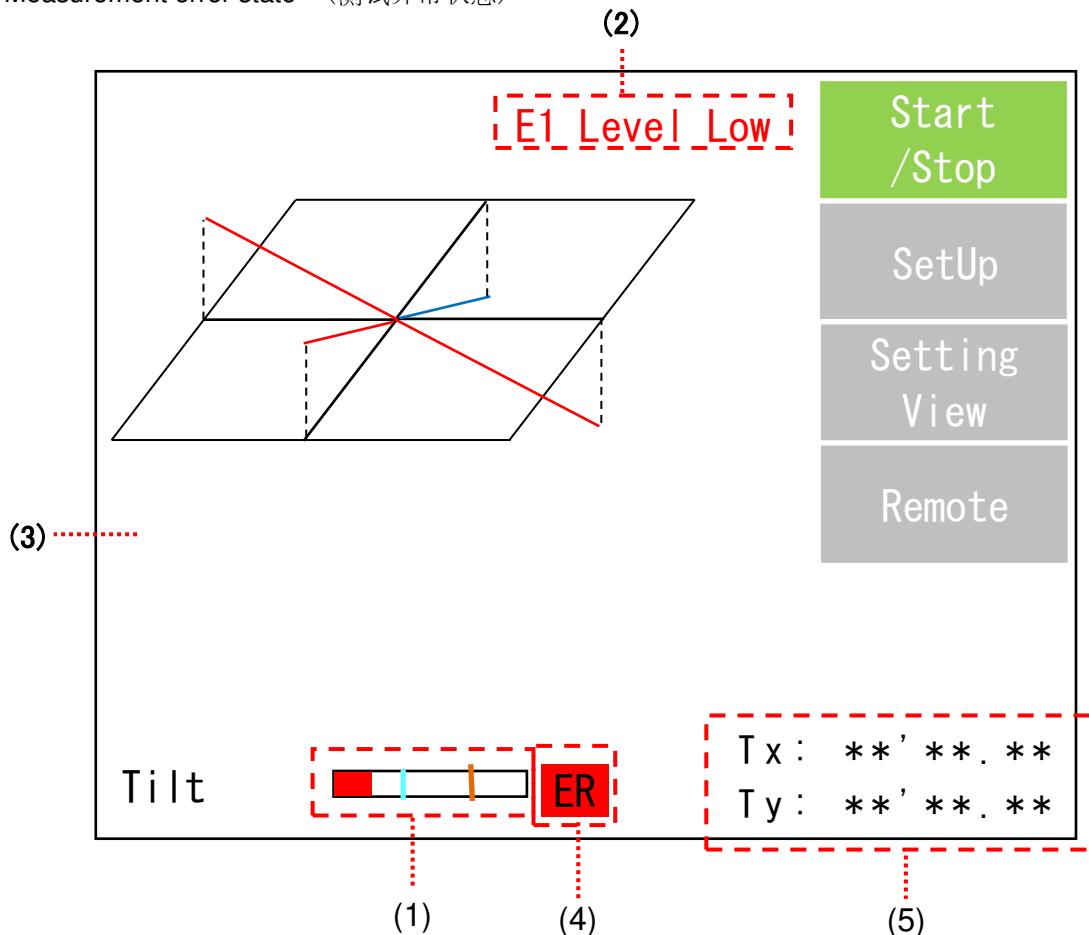
(11) Light reception amount bar PSD light reception amount is displayed. (接收光强 显示 PSD 接收光强)

A. Measurement state 3 ((3) Measurement value zoom in display) (测量状态 3 (放大显示测量值③))



(12) Measurement value Measurement values are displayed with a zoom. (测量值 放大显示测量值)

## B. Measurement error state (测试异常状态)



(1) PSD light reception amount is displayed as a bar graph. (PSD 接受光强显示为条形图)

Green: Light reception amount is within appropriate range (绿色: 接收光强在正常范围内)

Red: Light reception amount is outside appropriate range (红色: 接收光强超出正常范围)

(2) Error message (错误信息)

(See p.63)

Of the errors generated by the tilt sensor, the most critical ones are displayed.

(Tilt 传感器发生的错误是最严重的, 将严重显示)

The following message is displayed according to the error status, with those at the top considered most critical.

(根据错误异常情况会显示如下信息, 严重程度等同上述传感器错误)

E1 Level Low: Light reception amount level is below the lower limit value. (接收光强的值低于下限值)

E2 Level Over: Light reception amount level is above the upper limit value. (接受光强的值高于上限值)

E3 Area Out: Measurement value is beyond the measurement range. (测量值超出测量范围)

E9 PW Set Error: During automatic adjustment, LDPW did not reach the target light reception amount during the regulated time.

(自动调整 LDPW 时, 指定时间内接收光量未达到目标值。)

(3) Judgment results (判定结果)

When an error message is displayed, the judgment value is displayed as ER.

(若有错误信息弹出则判定结果显示为 ER)

(4) Measurement results (测量结果)

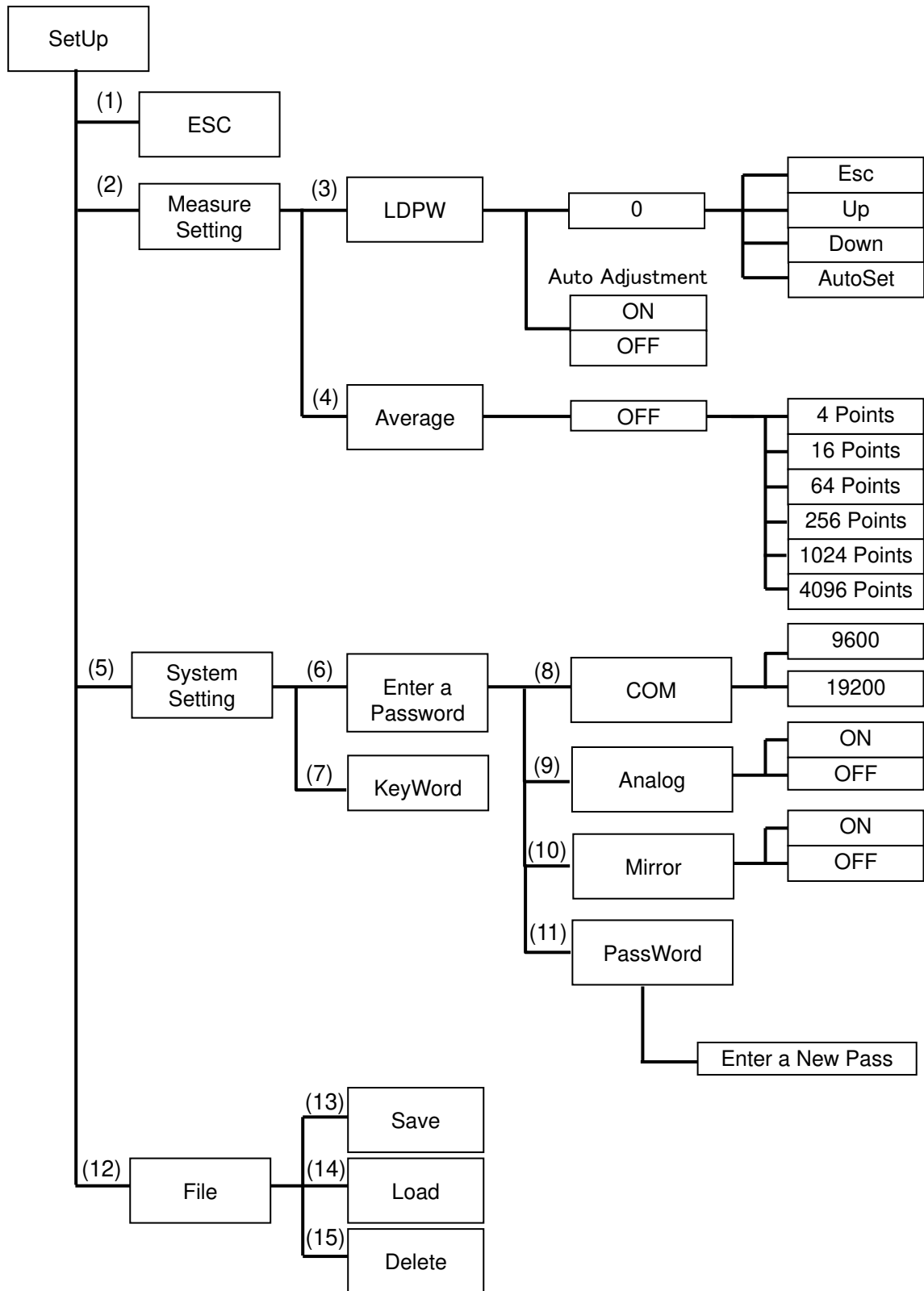
When an error message is displayed, the measurement value is displayed as \*\*\* \*\*\*. (若有错误信

息弹出则测量结果显示为\*\*\*.\*\*\*)

### 3.3. SetUp menu

#### 3.3.1 Menu configuration (菜单栏构成)

The settings menu configuration is shown in the figure below. (设置菜单的构成如下图所示)

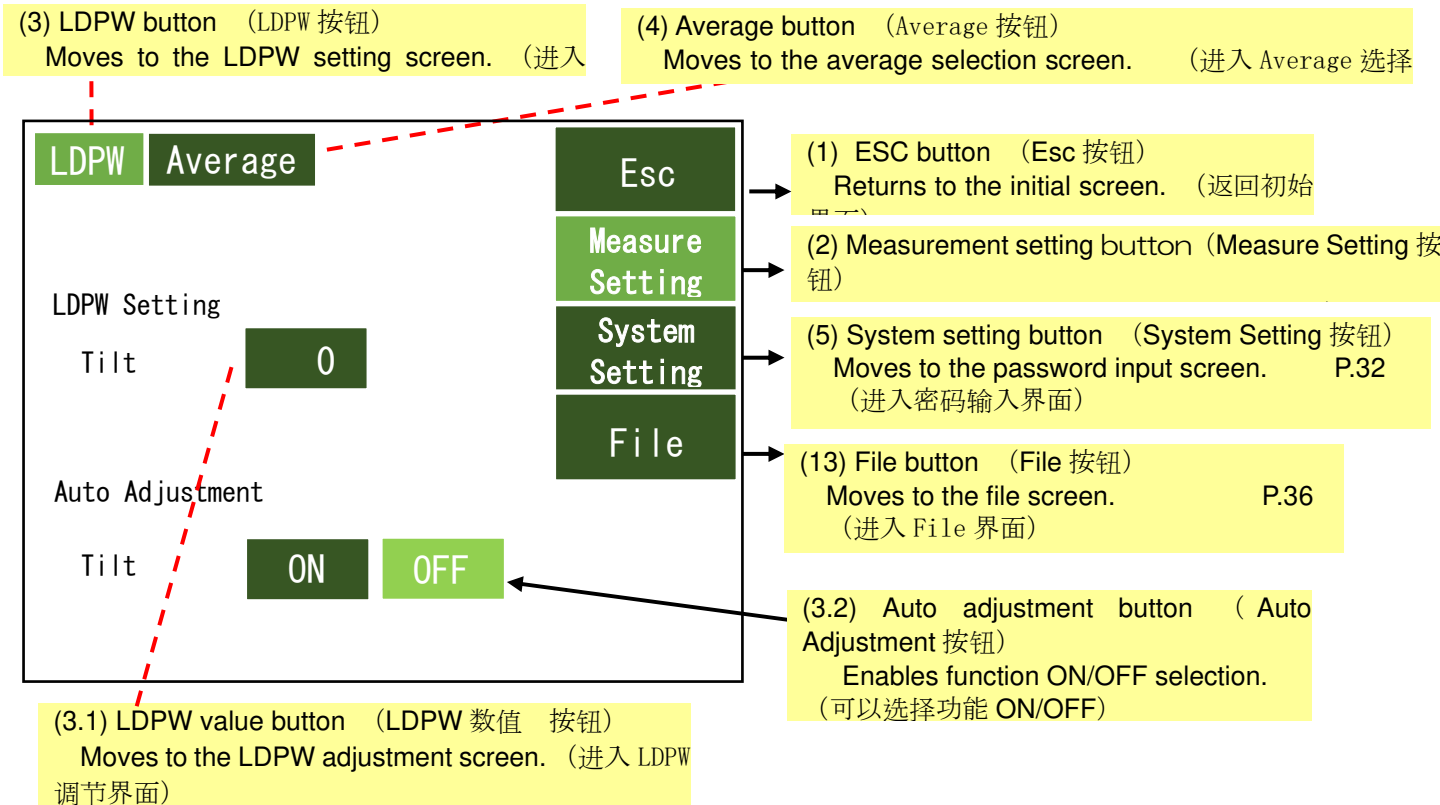


## &lt;&lt;Menu configuration table&gt;&gt;

No.	Name of button	Description	Page
(1)	Esc	Shifts to the initial screen. (返回初始界面)	P.30
(2)	Measure Setting	Shifts to the measurement parameter setting screen. (移至测量参数设置界面。)	P.30
(3)	LDPW	Adjusts LD light amount. (调节LD光强度)	P.30
(4)	Average	Sets measurement value averaging count. (设置测量值的平均计数)	P.31
(5)	System Setting	Performs system setting. (设置系统)	P.32
(6)	Enter a Password	Inputs password. (输入密码) *Used when changing password-protected setting items. (用于更改密码保护的设置项目。) The initial user password is 1111. (初始用户密码「1111」)	P.32
(7)	KeyWord	Used in the case of forgotten passwords. (忘记密码时使用)	P.32
(8)	Com	Sets serial communication speed. (设置串行通信速度)	P.34
(9)	Analog	Sets analog output polarity. (设置模拟输出的极性)	P.34
(10)	Mirror	Sets measurement value mirroring display. (设置反向显示测量值。)	P.35
(11)	PassWord	Used when changing passwords. (用于更改密码)	P.33
(12)	File	Selects parameter file operation. (选择参数文件操作)	P.36
(13)	Save	Saves measurement parameter files. (保存测量参数文件)	P.36
(14)	Load	Reads measurement parameter files. (读取测量参数文件)	P.36
(15)	Delete	Deletes measurement parameter files. (删除测量参数文件)	P.36

3.3.2 Screen configuration (屏幕构成)

(3) LDPW setting screen \*Screen accessed by the setup button. (LDPW 设置界面, 按下 SetUp 键后的界面)

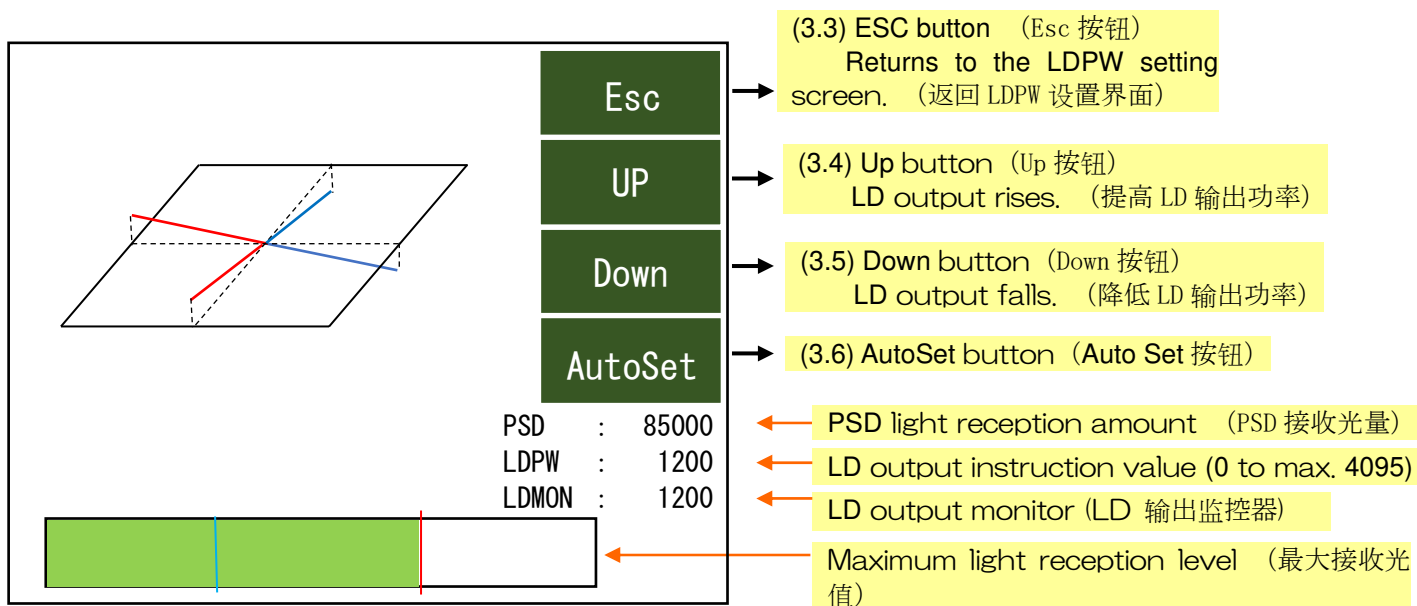


\*1 When auto adjustment is set to ON, LDPW automatic adjustment takes place at measurement start. (Auto Adjustment 设置为 ON 时, 测量开始时 LDPW 将自动调整)

(3.1) LDPW adjustment screen (LDPW 调节界面)

Enables manual adjustment of laser power for optimum light reception amount values. (手动调整激光功率, 以使接收的光量达到最佳值。)

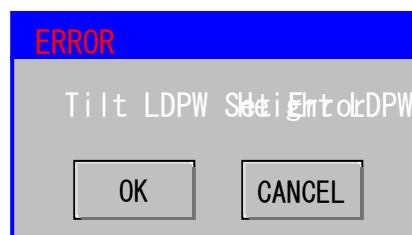
The level bar turns red when the light reception amount is below the error level or above the maximum light reception amount. (当接收到的光量低于错误水平值或超过最大接收光量值时, 水平条变为红色。)



Item	Content	Remarks
PSD	Displays the PSD_SUM value. (显示 PSD_SUM 值)	
LDPW	Displays the LD power output instruction value. (显示 LD Power 输出值)	
LDMON	Displays the LD power monitor value. (显示 LD Power 监视值)	

\*While the light reception amount is measurable when the level bar is green, it should be set around the light reception amount optimum level line as the optimum value. (see figure above) (接受光量的水平条呈绿色则可接收，将最优值设置在最合适的接收光量线附近)

\*Press the AutoSet button for automatic adjustment of the laser power light reception amount to the light reception amount optimum level line. When automatic adjustment is not possible, an error message will be displayed. (当按下“自动设置”按钮时，将自动调整激光功率，以使接收到的光线水平处于最佳接收到的光线水平线上。如果无法执行自动调整，将显示错误信息。)

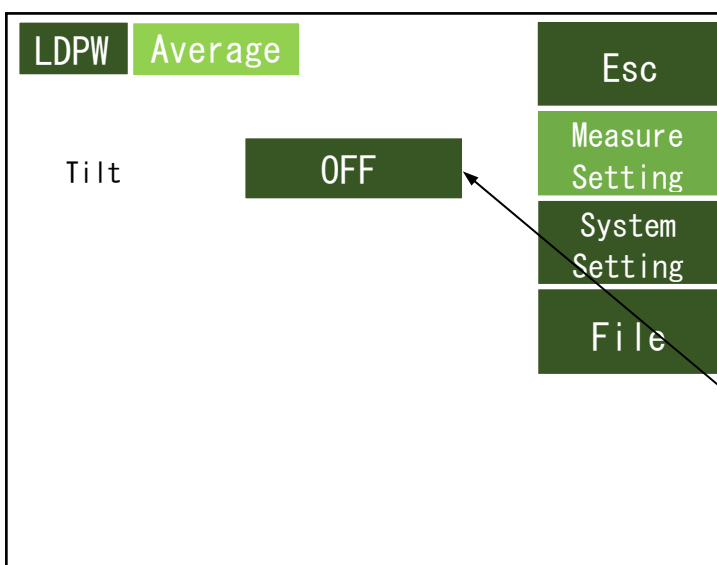


\*When the W4 or W5 error message is displayed, the white background will be displayed as yellow. (当出现 W4、W5 的错误信息时，白色背景将变成黄色)

(See p.63)

(4) Average screen (Average 界面)

Averages the measurement values at designated intervals. (按指定次数平均测量值)



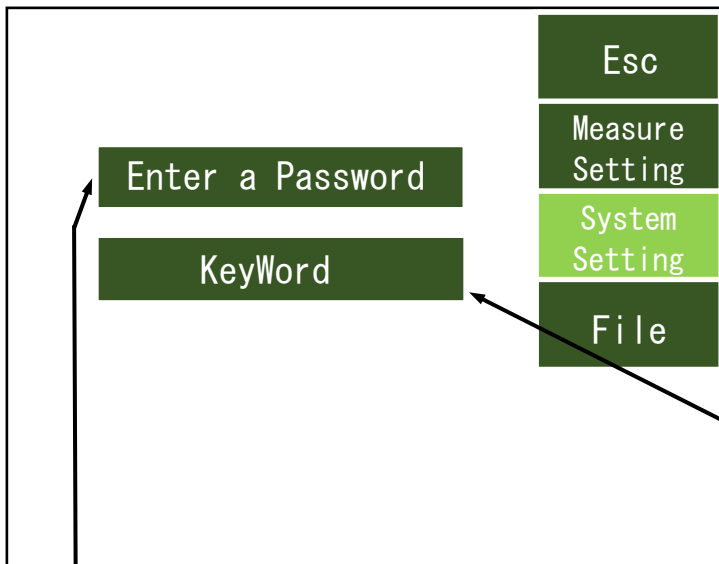
(4.1) Averaging selection button\*1  
(平均化选择按钮)  
Selects the number of processes for averaging. (选择平均化处理次数)

\*1 OFF is selected for the averaging selection button default. (OFF 是平均选择按钮的默认设置。)  
Press the averaging selection button to change the number of processes for averaging as below.  
(按下平均选择按钮时，如下所示，平均处理数将发生变化。  
OFF → 4 points → 16 points → 64 points  
→ 256 points → 1024 points → 4096 points → OFF

(5) System setting screen (System Setting 界面)

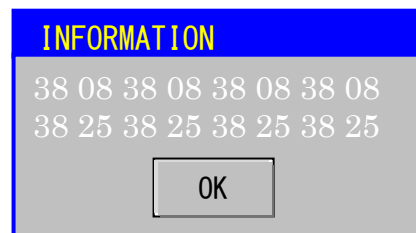
This screen is used to proceed to the password-protected parameter change screen for administrators' use.

(该界面是为进入到修改受密码保护的参数的界面，供管理员使用)



(7) Keyword button/ (KeyWord 按钮)  
 \*Press when the password has been forgotten. Send the displayed code to Suruga Seiki to receive the set password.  
 (忘记设置的密码时点此按钮。将显示的号码发给骏河精机，本司将回复所设定的密码)

(6) Password button (Password 按钮)  
 Moves to the password input screen.



Password input screen (输入密码界面)

1111								
A	B	C	D	E	F	BS	CL	ESC
G	H	I	J	K	L	7	8	9
M	N	O	P	Q	R	4	5	6
S	T	U	V	W	X	1	2	3
Y	Z	_	.	-	+	0	ENT	

- Characters which can be input: Letters and numbers, symbols (underbar, dot, minus, plus)

(可以用于设定的文字符号：英文数字，符号（下划线，点，减号(-)，加号(+))

- Character string length for input: 8 characters

(可输入的字符串：8位)

ESC: Cancels input and returns to the **save** screen. (ESC：取消输入返回 **Save** 界面)

CL: Deletes input. (CL:清除输入内容)



BS: Deletes input from the right. (BS : 从右端起删除)

ENT: Confirms input content. (ENT : 确定输入内容)

※ The initial password is 1111. If the initial password is not changed with the password setting screen, password-protected screen operation will not be possible. (初始密码时「1111」。若不通过密码设置界面更改初始密码, 则无法操作受密码保护的界面)

※ The initial password (1111) cannot be used again after the password is changed. (初始密码一经更改将无法再使用)

#### (5.1) Password-protected screen (受密码保护的界面)

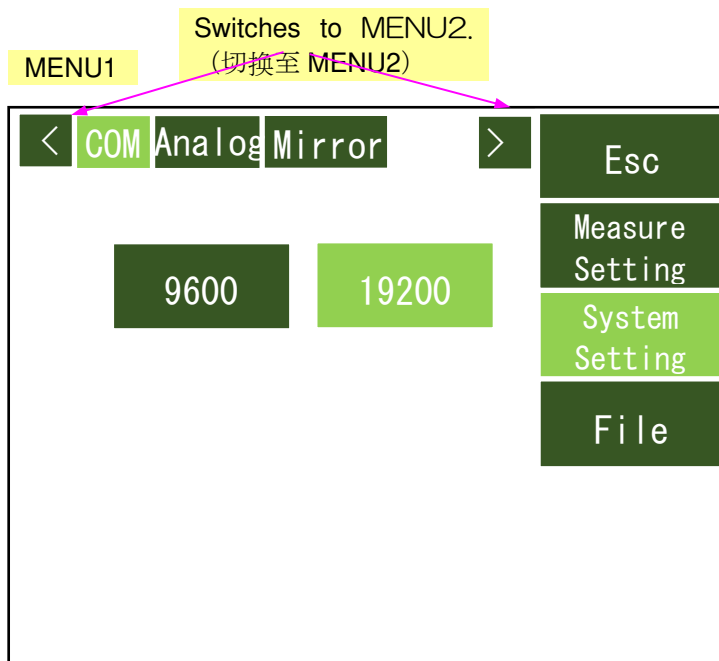
This screen is used to change password-protected parameters. (更改受密码保护的参数的界面)

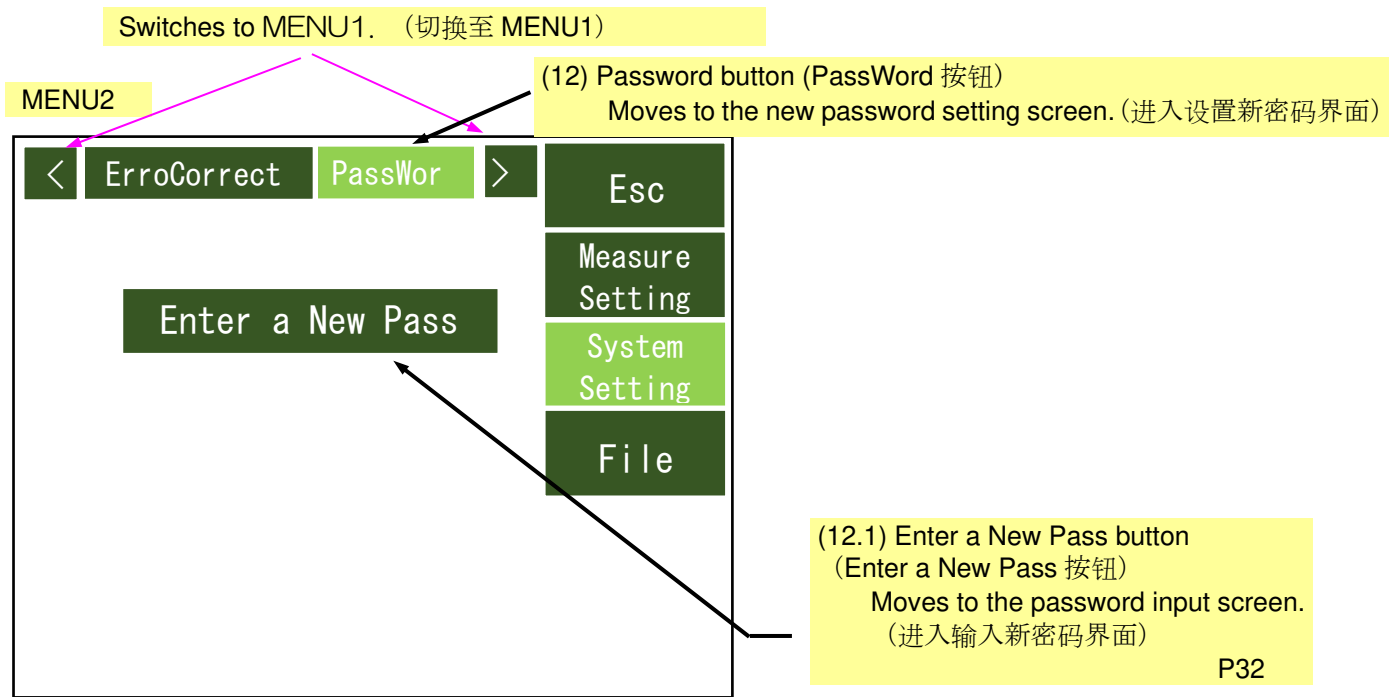
##### (a) When transitioning with the initial password (1111) (初始密码「1111」过渡)

Press the < or > buttons to display MENU2, and select the password button.

(按「<」或「>」按钮在 MENU2 上显示「PassWord」, 选择此按钮)

Press the "Enter a New Pass" button, set the new password, and press ESC to leave the measurement screen temporarily. (按「Enter a New Pass」按钮, 设置了新密码后按「Esc」退出)





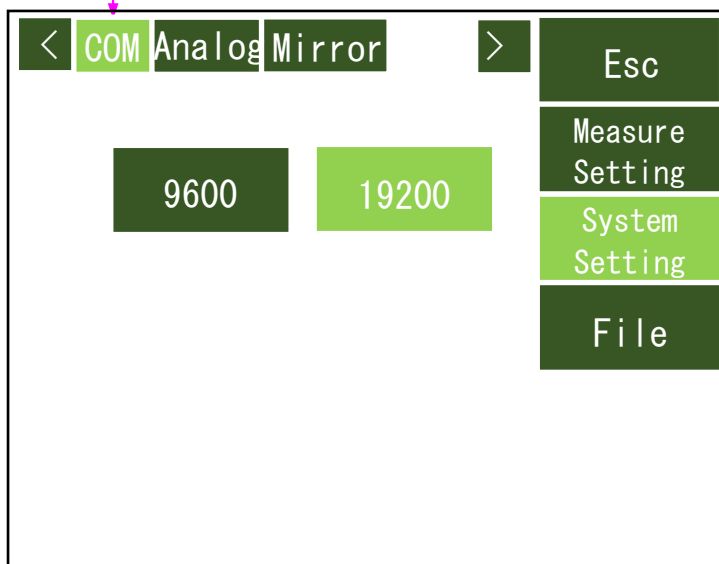
\*If the initial password is not changed, parameters cannot be changed.

(不更改初始密码的话将无法更改参数)

(b) When transitioning after setting the password (设置完 PassWord 密码后的过渡)

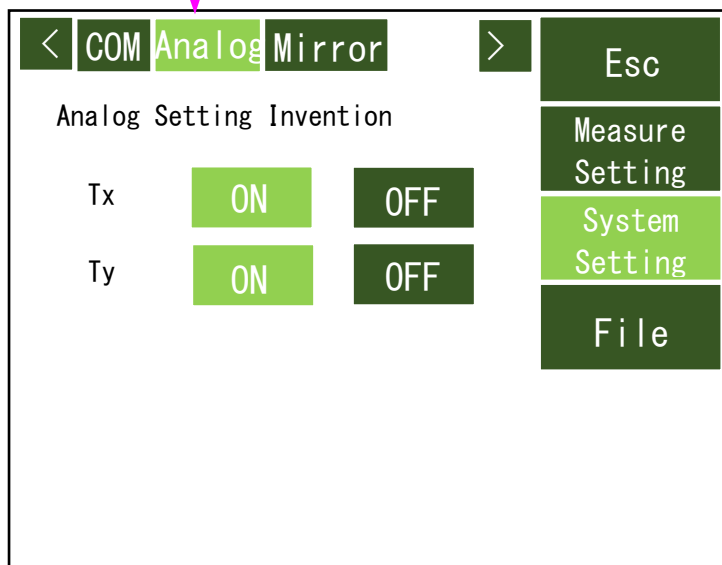
(8) COM button (COM 按钮)

Select baud rates of 9600 or 19200. (可以选择通信速度 9600 和 19200)



**(9) Analog polarity setting button (模拟极性设置按钮)**

This screen sets whether or not the analog output polarity is reverted. (设置是否反转模拟输出的极性的界面)

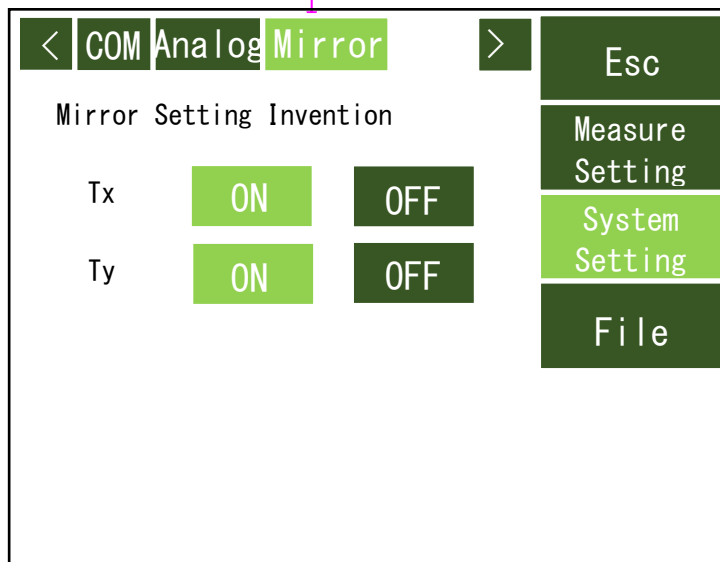


\*For analog output, see p. 43.

(有关模拟输出，请参阅第 43 页。)

**(10) Mirror button (Mirror 按钮)**

This screen sets whether or not the screen display is flipped. (设置屏幕显示是否翻转的界面)



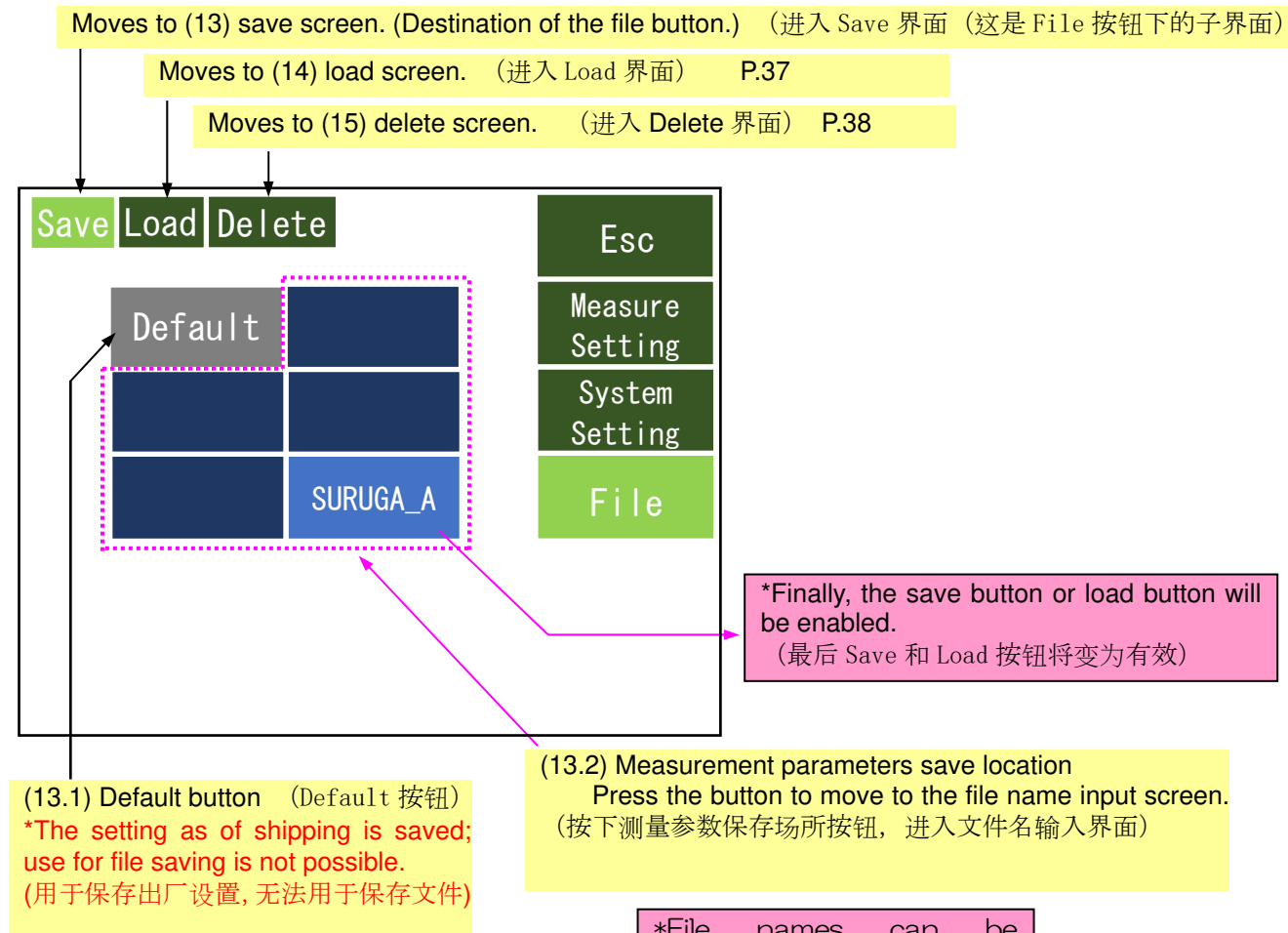
(13) Save screen \*Screen accessed by (12) File button. (Save 界面这是 File 按钮下的子界面)

Saves the present measurement parameters to a file. (Max. 5 items) (以文件形式保存现在的测量参数)

Press an arbitrary button to open the file name input screen. (按任意按钮将打开输入文件名称的界面)

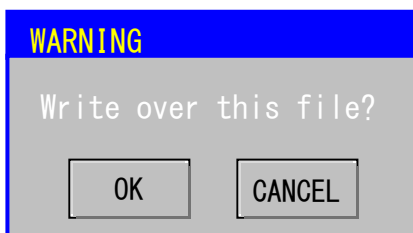
Input the file name and press the ENT key to save the present measurement parameters to a file.

(输入文件名, 按[ENT]键保存现在的测量参数)



\*When saving, the following confirmation message will be displayed. (覆盖保存时将弹出如下信息框)

To save, press the OK button. (确认进行覆盖保存的话按 OK 按钮)



(13)-1 File name input screen (文件名输入界面)

SURUGA_G								
A	B	C	D	E	F	BS	CL	ESC
G	H	I	J	K	L	7	8	9
M	N	O	P	Q	R	4	5	6
S	T	U	V	W	X	1	2	3
Y	Z	_	.	-	+	0	ENT	

- Characters which can be input: Letters and numbers, symbols (underbar, dot, minus, plus) (可以用于设定的文字符号: 英文数字, 符号(下划线, 点, 减号(-), 加号(+))

- Character string length for input: 8 characters (可输入的字符串: 8位)

ESC: Cancels input and returns to the save screen. (ESC: 取消输入返回 Save 界面)

CL: Deletes input. CL:清除输入内容)

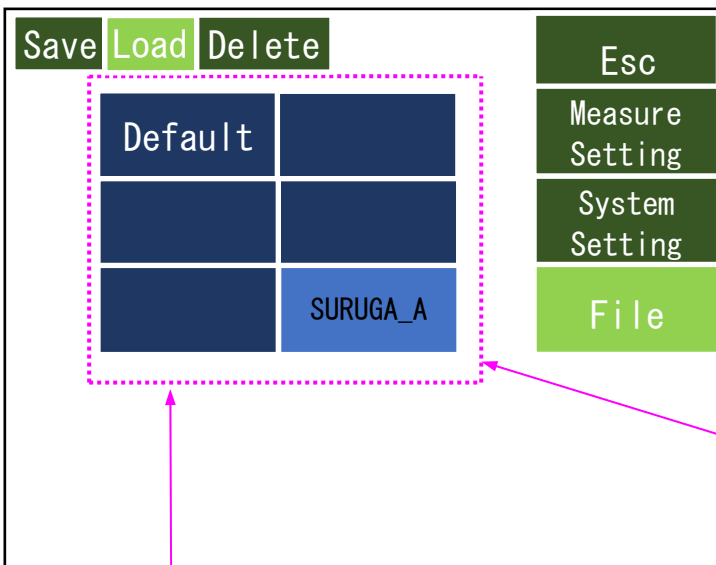
BS: Deletes input from the right. (BS: 从右端起删除)

ENT: Confirms input content. (ENT: 确定输入内容)

(14) Load screen (Load 界面)

Reads measurement parameter files saved in advance. (读取预先保存的测量参数文件)

※ At initial startup, "Default" is selected. (首次启动时处于「Default」)

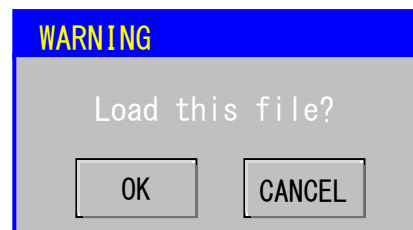


(14.1) Measurement parameters save location  
 Press the button to brighten, enabling the saved measurement parameters.  
 (按下测量参数保存地方的按钮此处变亮, 保存的参数将变有效)

\*Finally, the save button or load button will be enabled. (最后 Save 和 Load 按钮将变有效)

\*The following confirmation message will be displayed. To load, press the OK button.

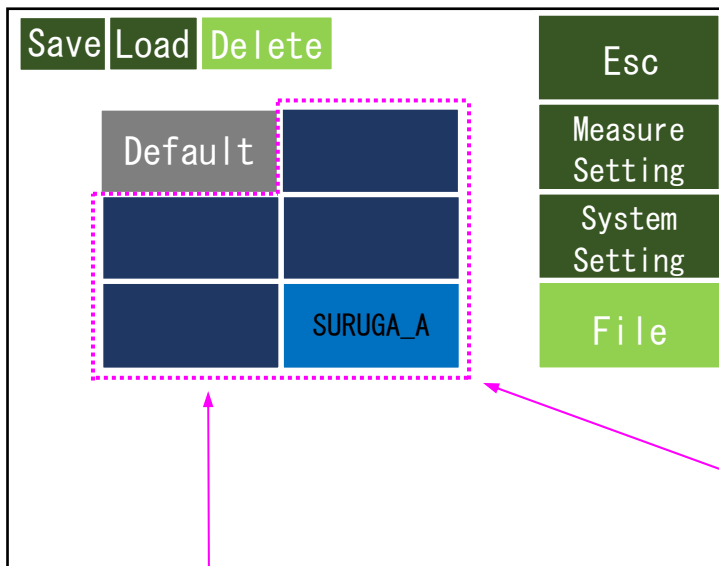
(弹出如下信息框, 确认 Load 的话, 按下 OK 按钮)



## (16) Delete screen (删除界面)

Deletes measurement parameter files. (删除测量参数文件)

※ Default files are not deleted. (Default 文件无法删除)

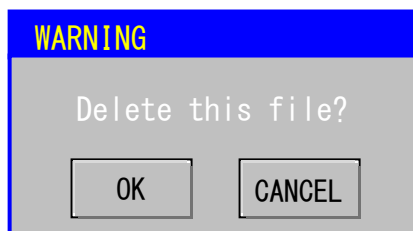


(16.1) Measurement parameters save location  
Press the button to elicit the delete confirmation message.  
(测量参数保存场所按下按钮将弹出确认删除的信息)

\*Finally, the save button or load button will be enabled.  
(最后 Save 和 Load 按钮将变有效)

\*The following confirmation message will be displayed. To delete, press the OK button.

(弹出如下信息框，确认删除的话，按下 OK 按钮)

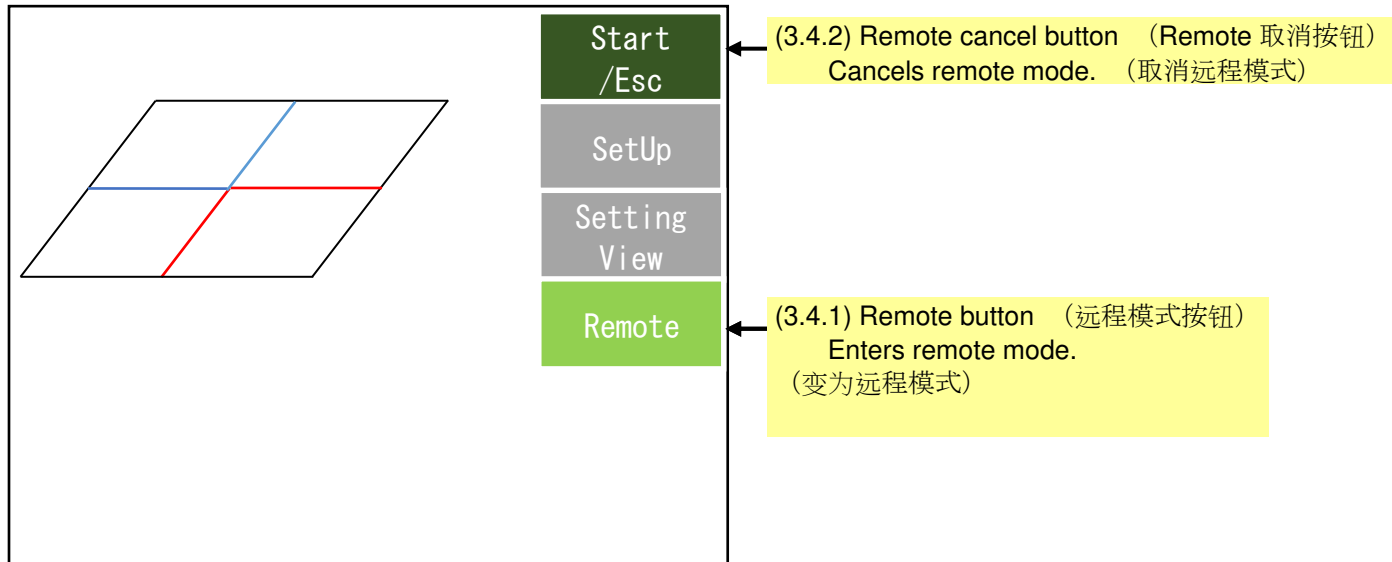


### 3.4 Other (其他)

#### 3.4.1 Setting remote mode (远程连接的设置)

Press the measurement screen remote button to switch to remote status and enable I/O or communication command input. With partial exceptions, touch panel screen input will be disabled.

Because remote mode is remembered, the unit will launch in remote mode as of the next power source on. (按下测量画面的 Remote 按钮, 进入远程连接状态, I/O 输入和通讯指令的输入有效, 触摸屏上一部分输入界面无效。另外, 因为远程连接会被记忆, 下一次开启电源时将自动启动远程连接模式)

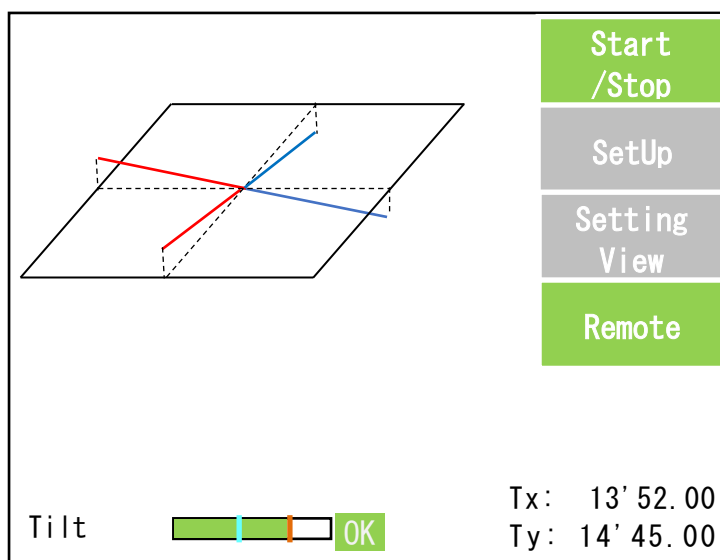


\*Measurement screen display switching is also possible in remote mode. (在远程模式下也可切换测量屏幕显示)

#### 3.4.2 Canceling remote mode (取消的远程模式)

In measurement stop status, hold down the Start/Esc buttons for at least 4 seconds. (在测量停止状态, 长按[Start/Esc]按钮 4 秒以上)

During measurement in remote mode, hold down the Start/Stop buttons for at least 4 seconds to stop measurement. (远程模式下测量中时长按[Start/Stop]按钮 4 秒以上可以停止测试)



\*During measurement in remote mode, measurement will be canceled when a remote cancel command is sent. (远程模式下测量中发出取消远程模式的命令时测试将自动停止)

## 4. Connecting External Devices (外部设备的连接)

### 4.1 I/O interface (H920-P500) (I/O 介面)

The following control I/O is available for removable terminals.

(有些端子有可能脱落, 请参照下表的输入/输出控制)

For wiring, see the interface circuit diagram on p. 42.

(接线请参照 P42 页介面回路图)

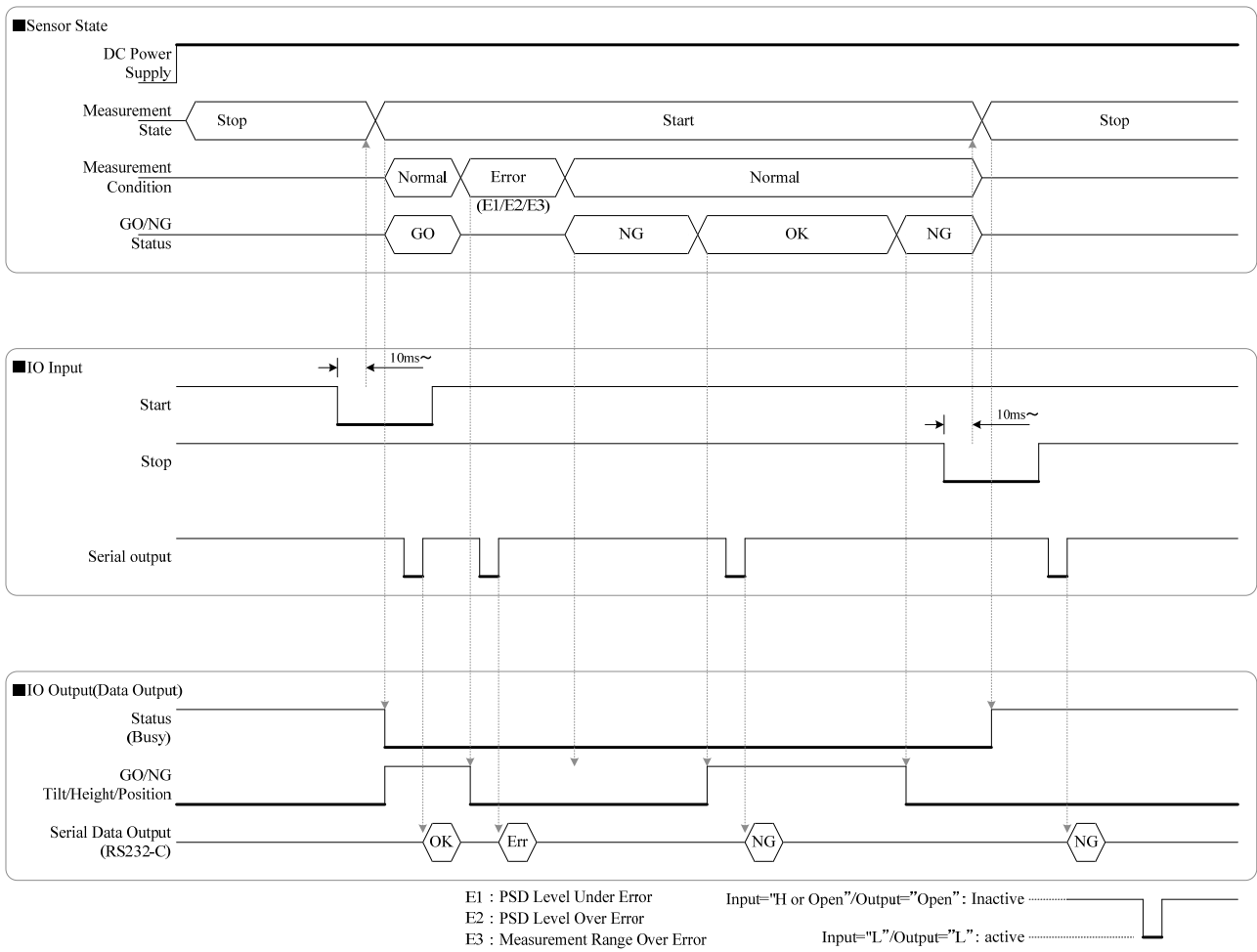
Type	Pin No	Signal Name	Description	Measurment Start State	Measurment Stop State	
IO Input	1	IN1	Start (Tilt/Height/Position)	Measurement stop → Transition to measurement state (测量停止=>测量状态过渡中)	—	Enable
	2	IN2	Stop (Tilt/Height/Position)	Measuring → Transition to measurement stop state (测量中=>测试停止状态过渡中)	Enable	—
	3	IN3	Serial_Output (Data Request)	Measurement results as of this signal input are output as serial data (输入该信号时的测量结果为串行数据输出)	Enable	Enable
	4	IN4	—	—	—	—
	5	IN5	—	—	—	—
	6	IN6	—	—	—	—
	7	IN7	—	—	—	—
	8	IN8	—	—	—	—
	9	HSIN	Not assign	—	—	—
	10	DGND	Digital GND	—	—	—
IO Output	1	OUT1	Status (Busy)	"L" = Busy (during measurement state) (测量中状态) "Open" = Ready (measurement stop state) (测量停止状态)	Busy State Output	Ready State Output
	2	OUT2	GO/NG_Tilt	"L" = Tilt judgment NG/E1/E2/E3 "Open" = Tilt judgment OK *Synchronized with measurement screen judgment display content (与测量屏幕上的判断同步显示)	Enable	Enable
	3	OUT3	—	—	—	—
	4	OUT4	—	—	—	—
	5	DGND	Digital GND	—	—	—

\*Input signal can be executed only in remote mode (输入信号只能在远程模式下执行)

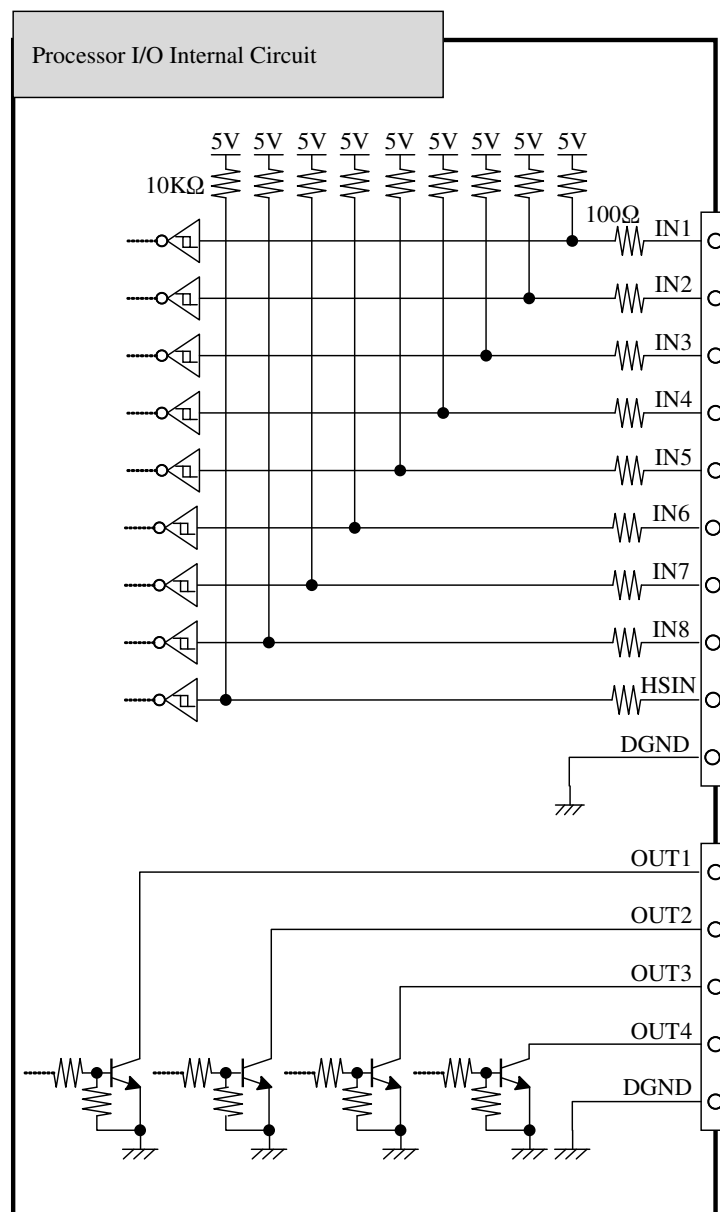
\*GO/NG signals during measurement stop output NG state (测量停止期间的 GO / NG 信号输出 NG 状态)



• Control I/O operation timing chart (H920-P500) (控制输入/输出操作时序图)



• I/O interface circuit (H920-P500) (IO 介面回路图)



\*To turn IN1 to HSIN input ON, short-circuit the input terminals and GND terminal with a no voltage contact such as a switch, etc. (请使IN1~HSIN在输入ON状态, 各输入端子和GND端子的通过开关非电压触电短路)

\*Connect OUT1 to 4 output to a current load of 30 V or less and 50 mA or less. Residual voltage is 0.3 V or less.

(将OUT1-4的输出处连接30V以下, 50mA以下的电流负载, 残留电压在0.3V以下。)

\*IN1 to HSIN: 5 V TTL level; OUT1 to 4: open collector (开集器)

## 4.2 Analog output (模拟量输出)

### 4.2.1 Analog interface (模拟接口)

The following analog output and high-speed output are available for removable terminals.

(对于有可能脱落的端子，下表为模拟输出和告诉输出)

For wiring, see the interface circuit diagram on p. 42.

(接线请参照 P42 介面回路图)

Signal name	Signal content	Description
DGND	Digital GND (GND 信号)	GND for HSOUT (HSOUT 用 GND)
HSOUT	Measurement state high-speed output (测量状态的高速输出)	Measurement state high-speed digital output (5 V TTL level) (测量状态的高速输出 (5VTTLLevel)) L = Analog output enabled / H = Analog output disabled (L=模拟输出有效 / H=模拟输出无效)
AGND	Analog GND (模拟 GND)	GND for analog output (模拟输出用 GND)
Analog ch1+	Analog output for ch1+ (Tx axis) (ch1+(Tx 轴)模拟量输出)	Measurement results analog output (测量结果模拟量输出) • Analog output voltage +/-10 V (模拟量输出电压: +/-10V) • Output impedance: 50 Ω (输出阻抗: 50Ω) • Offset voltage: +/-5 mV (电压偏差: +/-5mV) *Analog signal recommended handling method: Differential signal (建议模拟信号处理方式: 差分信号)
Analog ch1-	Analog output for ch1- (Tx axis) (ch1-(Tx 轴)模拟量输出)	
Analog ch2+	Analog output for ch2+ (Ty axis) (ch2+(Ty 轴)模拟量输出)	
Analog ch2-	Analog output for ch2- (Ty axis) (ch2-(Ty 轴)模拟量输出)	

Analog voltage proportional to the measurement value can be output from the analog terminals (ch1, ch2).

The processor tilt analog output ch1 and ch2 are respectively equivalent to the Tx and Ty measurement values. (可以从模拟端子 (ch1, ch2) 输出与测量值成比例的模拟电压。

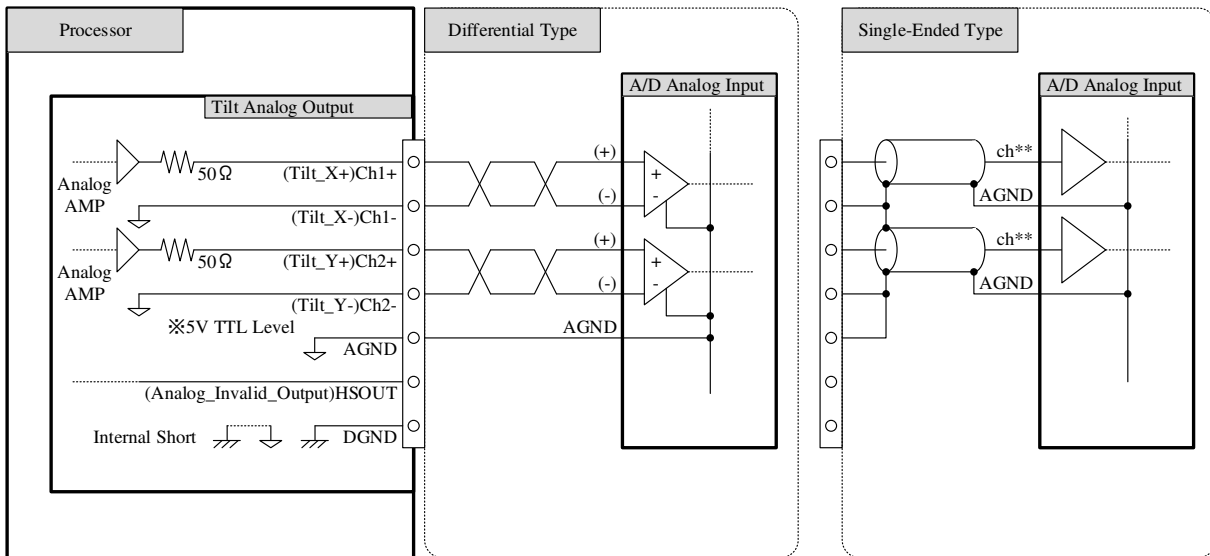
处理器的 Tilt 模拟输出 ch1 和 ch2 分别对应于 Tx 和 Ty 的测量值。)

Analog output takes place only during measurement ([Start]), and is retained during measurement stop ([Stop]).

(模拟输出仅在测量期间 ([开始]) 输出, 在测量停止期间 ([Stop]) 保持。)

<Recommended analog signal wiring>

(建议模拟信号接线)



## 4.2.2 Relations between measurement values and output voltage (测量值与输出电压的关系)

All Analog Sign Inv. settings OFF (default) shown.

See p. 35 to change these settings.

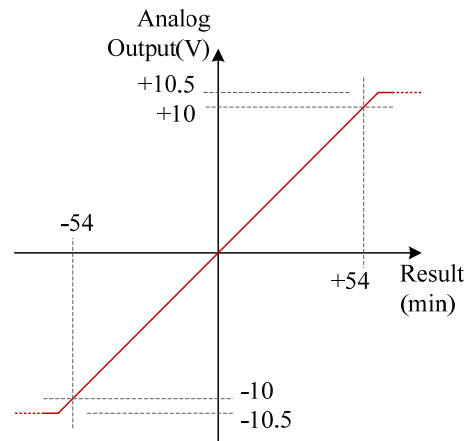
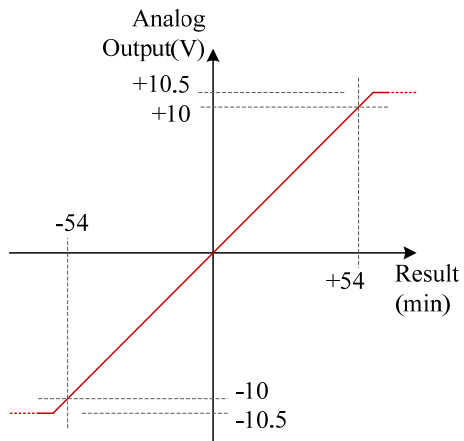
(Analog Sign Inv.设置全部为 OFF (默认) 时表示)

有关更改此设置, 请参阅第 35 页。

## 4.2.2 Tilt processor (Analog Sign Inv. settings OFF) (Tilt 处理器)

(1) Tx (Ch1)

(2) Ty (Ch2)



## 4.3 Serial interface (串行接口)

## 4-3-1 Specifications (仕様)

Conforms to EIA and RS-232C (EIA and RS-232C 合规)

Communication format (通信方式) : Start-stop synchronization type (异步类型)

Transmission code (传输码) : ASCII format

Data bit length (数据位长) : 8bit

Stop bit length (停止位长) : 1bit

Parity check (奇偶校验) : None (无)

Baud rate (波特率) : 9600, 19200 bit/sec selected

Flow control (流量控制) : None (无)

Connector pin number (连接器针脚编号)

Pin number	Signal name	Remark
1	NC	—
2	RXD	Receiving data (收到的数据)
3	TXD	Sending data (发出的数据)
4	DTR	Normally ON (始终 ON)
5	GND	—
6	NC	—
7	RTS	Normally ON (始终 ON)
8	NC	—
9	NC	—

\*\*Use a D-sub 9-pin (female-female) cross cable for connection with the computer.

(使用 DSub 9 针 (母对母) 交叉电缆连接到个人计算机。)

## 4.3.2 Control command list (控制命令表)

Remote control of readout of measurement results and setting content as well as changing of setting content is possible by sending control commands from the host device. (通过从主机发送控制命令, 可远程控制读取测量结果和设置内容, 并更改设置内容。)

\*Operates only in remote status, with some commands excepted. (除了一部份命令, 其余只能在远程状态下执行)

To switch to remote status, send a remote request command. (切换远程状态请发出远程请求命令)

To cancel remote status, hold down the ESC button or send a remote cancel command.)

(取消远程状态可长按 Esc 键发出取消远程连接命令)

#	Command name	Content of Command	Description
(1)	File reading (读取文件)	R000	Reads saved settings files. (读取已保存的设置文件)
(2)	File information readout (读取文件信息)	R001	Reads saved file information. (读取以保存文件里的信息)
(3)	Setting value readout (读取设定值)	R002	Reads present settings. (读取现在的设定值)
(4)	Moving average point count readout (读取移动平均点)	R005	Reads the sampling point count for the moving average process. (读取移动平均处理的采样点数)
(5)	Analog polarity reversion setting readout (读取 Analog 极性反转设置)	R006	Reads the analog output polarity reversion setting. (读取 Analog 极性反转设置)
(6)	Measurement value readout (读取测量值)	R009	Reads measurement results. (读取测量结果)
(7)	LD monitor readout (读取 LD 显示屏)	R010	Reads the LD monitor. (读取 LD 显示屏)
(8)	File saving (保存文件)	W000	Saves present settings. (保存现在的设定)
(9)	File information setting (设置文件信息)	W001	Rewrites saved file information. (覆盖替换已保存的文件的的信息)
(10)	Setting value setting (设置设定值)	W002	Individually rewrites parameter settings. (分别重新设定参数)
(11)	Setting value batch setting (设定值批量设定)	W003	Rewrites all parameter settings. (全部重新设定参数)
(12)	Moving average point count setting (移动平均点数设置)	W005	Sets the sampling point count for the moving average process. (设置移动平均处理的采样点数)
(13)	Analog polarity reversion setting (Analog 极性反转设置)	W006	Sets the analog output polarity reversion. (Analog 输出极性反转设置)
(14)	Measurement stop (停止测量)	S000	Stops measurement. (停止测量)
(15)	Measurement start (开始测量)	S001	Starts measurement. (开始测量)
(16)	Remote cancel (取消远程连接)	S002	Cancels remote mode. (取消远程连接)
(17)	Remote request (请求远程连接)	S003	Switches to remote mode. (切换至远程连接)
(18)	LD output automatic adjustment (自动调节 LD 输出功率)	S005	Adjusts LD output to suitable values. (适当调整 LD 输出功率)

## 4.3.3 Control command format (控制命令格式)

## (1) File reading (R000) (读取文件)

Command (命令)	R000
Command name (命令名)	File reading (读取文件)
Overview	<p>Reads setting information from files. (读取文件信息)</p> <p>When the designated file name exists, reads setting information from the relevant file. When the designated file name does not exist, an error is returned. (当指定的文件名存在时, 读取该文件的信息, 当指定的文件名不存在时, 弹出错误信息)</p>

Transmission format (传输格式)	R000,[1]						
Sending parameters (传输参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	File name (文件名)	Max. 8	-	-	0	Designates file name to be read. (命名保存的文件名) Up to 40 characters can be used. (可用于命名的字符为如下 40 个) Uppercase letters A to Z, (大写字母「A~Z」) Numbers 0 to 9, (数字「0~9」) Symbols $\_$ , $\cdot$ , $-$ , and $+$ (符号「 $\_$ 」「 $\cdot$ 」「 $-$ 」「 $+$ 」)

Reception format (接收格式)	R000						
Receiving parameters (接收参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	-	-	-	-	-	



## (2) File information readout (R001) (读取文件信息)

Command (命令)	R001
Command name (命令名)	File name readout (读取文件信息)
Overview	Reads file name. (读取文件信息)

Transmission format (传输格式)	R001						
Sending parameters (传输参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal	Remarks (备注)
	[1]	-	-	-	-	-	-

Reception format (接收格式)	R001,[1],[2],[3],[4],[5],[6],[7]						
Receiving parameters (接收参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal	Remarks (备注)
	[1]	File number read at startup (启动时读取文件编号)	1	1	6	0	Indicates the file numbers read at startup. (启动时读取文件编号) The last file number read after processor startup is applied. (处理器在启动后应用最后读取到的文件编号)
	[2]	Saved file name 1 保存文件名 1	8	-	-	0	Output the file name saved for file 1. (输出保存在文件 1 中的文件名。) Because File 1 is the basic setting, its name is fixed. (文件 1 具有固定名称, 因为它是基本设置。) "DEFAULT"
	[3]	Saved file name 2 保存文件名 2	8	-	-	0	Output the file name saved for file 2. (输出保存在文件 2 中的文件名。)
	[4]	Saved file name 3 保存文件名 3	8	-	-	0	Output the file name saved for file 3. (输出保存在文件 3 中的文件名。)
	[5]	Saved file name 4	8	-	-	0	Output the file name saved for file 4. (输出保存在文件 4 中的文件名。)
	[6]	Saved file name 5 保存文件名 5	8	-	-	0	Output the file name saved for file 5. (输出保存在文件 5 中的文件名。)
	[7]	Saved file name 6 保存文件名 6	8	-	-	0	Output the file name saved for file 6. (输出保存在文件 6 中的文件名。)

## (3) Setting value readout (R002) (读取设定值)

Command (命令)	R002
Command name (命令名)	Setting value readout (读取设定值)
Overview	Reads parameters related to measurement. (读取测量的设置参数)

Transmission format (传输格式)	R002.[1]						
Sending parameters (传输参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	Sensor type (传感器类别)	-	-	-		Designates the target sensor type. (指定目标传感器的类别) 0 : Tilt

Reception format (接收格式)	R002.[1].[2].[3]						
Receiving parameters (接收参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	LD output (LD 输出)	4	0	4095	0	Reads the LD output. (读取 LD 输出功率)
	[2]	Automatic dimming (自动调光)	1	-	-	0	Reads automatic dimming settings at measurement start. (读取开始测量时自动调节光设定) 0: Automatic dimming OFF (自动调节 OFF) 1: Automatic dimming ON (自动调节 ON)
	[3]	Mirror reversion (镜头反转)	1	-	-	0	Reads mirror reversion settings. (读取镜头反转设定) 0: Tx/Ty axes mirror reversion OFF (TxTy 轴镜头反转 OFF) 1: Tx axis mirror reversion ON (Tx 轴镜头反转 ON) 2: Ty axis mirror reversion ON (Ty 轴镜头反转 ON) 3: Tx/Ty axes mirror reversion ON (TxTy 轴镜头反转 ON)
Sensor type: Tilt (传感器类别 : Tilt)							

## (4) Moving average point count readout (R005) (读取移动平均点数)

Command (命令)	R005
Command name (命令名)	Moving average point count readout (读取移动平均点数)
Overview	Reads moving average point count for each sensor type. (读取各种传感器的移动平均点数)

Transmission format (传输格式)	R005						
Sending parameters (传输参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal	Remarks (备注)
	[1]	-	-	-	-	-	-

Reception format (接收格式)	R005.[1]						
Receiving parameters (接收参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal	Remarks (备注)
	[1]	Tilt_Moving average point count (Tilt 平均移动点数)	1	-	-	0	Reads the tilt moving average sampling count. (读取 Tilt 的移动平均采样数。) 0: No moving average process (无平均移动) 1: 4-point moving average (4 点平均移动) 2: 16-point moving average (16 点平均移动) 3: 64-point moving average (64 点平均移动) 4: 256-point moving average (256 点平均移动) 5: 1024-point moving average (1024 点平均移动) 6: 4096-point moving average (4096 点平均移动)

## (5) Analog polarity reversion setting readout (R006) (读取 Analog 极性反转设定)

Command (命令)	R006
Command name (命令名)	Analog polarity reversion setting readout (读取 Analog 极性反转设定)
Overview	Reads the analog output polarity reversion setting. (读取 Analog 输出的极性反转设定)

Transmission format (输出格式)	R006						
Sending parameters (输出参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	-	-	-	-	-	-

Reception format (接收格式)	R006,[1],[2]						
Receiving parameters (接收参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal	Remarks
	[1]	Analog polarity reversion setting_Tx axis (Analog 极性反转设定 Tx 轴)	1	-	-	0	Reads the Tx axis analog polarity reversion setting. (读取 Tx 轴的 Analog 极性反转设定) 0: Not reverted (0: 无反转) 1: Reverted (1: 有反转)
	[2]	Analog polarity reversion setting_Ty axis (Analog 极性反转设定 Ty 轴)	1	-	-	0	Reads the Ty axis analog polarity reversion setting. (读取 Ty 轴的 Analog 极性反转设定) Status content same as [1] (状态内容同[1])

## (6) Measurement value readout (R009) (读取测量值)

Command (命令)	R009
Command name (命令名)	Measurement value readout (读取测量值)
Overview	Reads present measurement results. (读取现在的测量结果)

Transmission format (传输格式)	R009						
Sending parameters (传输参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	-	-	-	-	-	-

Reception format (接收格式)	R009.[1].[2].[3].0.0.0.0						
Receiving parameters (接收参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	Tilt_Judgment result (Tilt 判断结果)	1	-	-	0	Reads tilt judgment results. Output differs depending on judgment range settings. (读取对 Tilt 的判断结果, 根据设置的判断范围不同输出的结果不同) <Judgment range: Unset> (判断范围: 未设定) Error generated: E (发生错误: E) Error not generated: * (未发生错误: *)  <Judgment range: Setting> (判断范围: 有设置) Error generated: E (发生错误: E) Within judgment range: O (判断范围内: 0) Outside judgment range: N (判断范围外: N)
	[2]	Tilt_Present value Tx (Tilt_现在值 Tx)	6	-18000	18000	0	Reads Tx axis measurement values. (读取 Tx 轴的测量结果)
	[3]	Tilt_Present value Ty (Tilt_现在值 Ty)	6	-18000	18000	0	Reads Ty axis measurement values. (读取 Ty 轴的测量结果)

## (7) LD monitor readout (R010) (LD 显示器读出)

Command (命令)	R010
Command name (命令名)	LD monitor readout (LD 显示器读出)
Overview	Reads the LD monitor value. (读出 LD 显示器的值)

Transmission format (传输格式)	R010						
Sending parameters (传输参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]		-	-	-	-	

Reception format (接收格式)	R010,[1]						
Receiving parameters (接收参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	Tilt_LD monitor	4	0	4095	0	Reads the tilt LD monitor value. (读出 LD 显示器的值)

## (8) File saving (W000) (保存文件)

Command (命令)	W000
Command name (命令名)	File saving (保存文件)
Overview	<p>Saves present setting information in files. (现在的设置信息保存成文件)</p> <p>When the designated file name has already been saved, it is overwritten. (指定的文件名已存在时, 覆盖)</p> <p>If the file name does not exist and there is an unsaved file area, a file will be created with the newly designated file name. (如果文件名不存在, 并且有未保存的文件区域, 则将使用新指定的文件名来创建它。)</p> <p>If the file name does not exist and there is no unsaved file area, an error will be returned. (如果文件名不存在, 并且没有未保存的文件区域, 则返回错误。)</p> <p>Up to 5 files can be saved. (最多可保存 5 份文件)</p>

Transmission format (传输格式)	W000,[1]						
Sending parameters (传输参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	File name (文件名)	Max. 8	-	-	0	Designates file name to be saved. (命名保存的文件名) Up to 40 characters can be used. (可用于命名的字符为如下 40 个) Uppercase letters A to Z, (大写字母「A~Z」) Numbers 0 to 9, (数字「0~9」) Symbols _ , . , - , and + (符号「_」「.」「-」「+」)

Reception format (接收格式)	W000						
Receiving parameters (接收参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	-	-	-	-	-	

## (9) File information setting (W001) (设定文件信息)

Command (命令)	W001
Command name (命令名)	File information setting (设定文件信息)
Overview	Sets file information. (设定文件信息)

Transmission format (传输格式)	W001,[1],[2]						
Sending parameters (传输格式)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks
	[1]	Setting change items (设定更改项目)	1	-	-	0	Designates settings to be changed. (指定更改设定) a: File number read at startup (a: 启动时读取的文件号) b: Saved file 2 (b: 保存文件 2) c: Saved file 3 (c: 保存文件 3) d: Saved file 4 (d: 保存文件 4) e: Saved file 5 (e: 保存文件 5) f: Saved file 6 (f: 保存文件 6)
	[2]	Setting items (设定项目) *When "a" is designated for [1] Setting change items (在 [1] 设定更改项目中指定「a」时)	1	1	6	0	Indicates the file numbers read at startup. The files with the numbers designated here will be read at the next startup. (指示启动时读取的文件号。 下次启动时将读取此处指定编号的文件)
	[2]	Setting items (设定项目) *When other than "a" is designated for [1] Setting change items (在 [1] 设定更改项目中指定「a」以外时)	Max. 8	-	-	0	Changes the names of files designated in [1]. (更改 [1] 指定的文件名) Up to 40 characters can be used. (可使用以下 40 个字符命名) Uppercase letters A to Z, (大写字母「A~Z」) Numbers 0 to 9, (数字「0~9」) Symbols _ . , - , and + (符号「_」「.」「,」「-」「+」)

Reception format (接收格式)	W001						
Receiving parameters (接收参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	-	-	-	-	-	-

## (10) Setting value setting (W002) (设定设定值)

Command (命令)	W002
Command name (命令名)	Setting value setting (设定设定值)
Overview	Sets parameters related to measurement. (设定测量相关参数)

Transmission format (传输格式)	W002.[1].[2].[3]						
Sending parameters (传输参数) Common part (共同点)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	Sensor type (传感器类型)	1	-	-	0	Designates the target sensor type. (指定目标传感器类型。) 0: Tilt
Sending parameters (传输参数) Sensor type: Tilt (传感器类型: Tilt)	[2]	Identification (识别)	1	-	-	0	Designates parameters to be changed. (指定要更改的参数) a: Designates LD output. (a: 指定 LD 输出功率) b: Designates automatic dimming. (b: 指定自动调光) c: Designates mirror display. (c: 指定镜头头显示)
	[3]	LD output (LD 输出) *When "a" is designated for [1] ([1] 中指定了 a 时)	-	0	4095	0	Sets the LD output. (设定 LD 输出功率)
		Automatic dimming setting (设定自动调光) *When "b" is designated for [1] ([1] 中指定了 b 时)	-	-	-	0	Sets automatic dimming. (设置自动调光) 0: Automatic dimming OFF (0: 自动调光 OFF) 1: Automatic dimming ON (1: 自动调光 ON)
[3]	Mirror reversion (镜头反转) *When "c" is designated for [1] ([1] 中指定了 c 时)	-	-	-	0	Sets mirror reversion. (设置镜头反转) 0: Tx/Ty axes mirror reversion OFF (0: Tx/Ty 的镜头反转 OFF) 1: Tx axis mirror reversion ON (1: Tx 的镜头反转 ON) 2: Ty axis mirror reversion ON (2: Ty 的镜头反转 ON) 3: Tx/Ty axes mirror reversion ON (3: Tx/Ty 的镜头反转 ON)	

Reception format (接收格式)	W002						
Receiving parameters (接收参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal	Remarks (备注)
	[1]	-	-	-	-	0	-



## (11) Setting value batch setting (W003) (设定值批量设定)

Command (命令)	W003
Command name (命令名)	Setting value batch setting (设定值批量设定)
Overview	Sets parameters related to measurement as a batch. (相关测量参数批量设定)

Transmission format (传输格式)	W003.[1].[2].[3].[4]						
Sending parameters (传输参数) Common part (共同)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	Sensor type (传感器类别)	-	-	-		Designates the target sensor type. (指定目标传感器类别) 0 : Tilt
Sending parameters Sensor type: Tilt	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[2]	LD output (LD 输出)	-	0	4095	0	Sets the tilt LD output. (读取 Tilt 的 LD 输出功率)
	[3]	Automatic dimming (自动调光)	-	-	-	0	Sets automatic dimming settings. (读取自动调光设定) 0: Automatic dimming OFF (0 : 自动调光 OFF) 1: Automatic dimming ON (1 : 自动调光 ON)
	[4]	Mirror reversion (镜头反转)	-	-	-	0	Sets mirror reversion settings. (读取镜头反转设定) 0: Tx/Ty axes mirror reversion OFF (0 : TxTy 轴镜头反转 OFF) 1: Tx axis mirror reversion ON (1 : Tx 轴镜头反转 ON) 2: Ty axis mirror reversion ON (2 : Ty 轴镜头反转 ON) 3: Tx/Ty axes mirror reversion ON ((3 : TxTy 轴镜头反转 ON)

Reception format	W003						
Receiving parameters	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	-	-	-	-		-

## (12) Moving average point count setting (W005) (设定平均移动点数)

Command (命令)	W005
Command name (命令名)	Moving average point count setting (设定平均移动点数)
Overview	Sets moving average point count for each sensor type. (设定各传感器的平均移动点数)

Transmission format (传输格式)	W005,[1],[2]						
Sending parameters (传输参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	Sensor type (传感器类别)	-	-	-	0	Designates the target sensor type. (指定目标传感器类别) 0 : Tilt
	[2]	Moving average point count (平均移动点数)	1	-	-	0	Sets moving average point count. (指定平均移动点数) 0: No moving average process (0 : 无平均移动) 1: 4-point moving average (1 : 平均移动 4 点) 2: 16-point moving average (2 : 平均移动 16 点) 3: 64-point moving average (3 : 平均移动 64 点) 4: 256-point moving average (4 : 平均移动 256 点) 5: 1024-point moving average (5 : 平均移动 1024 点) 6: 4096-point moving average (6 : 平均移动 4096 点)

Reception format	W005						
Receiving parameters	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal	Remarks
	[1]	-	1	-	-	-	-

## (13) Analog polarity reversion setting (W006) (设定 Analog 极性反转)

Command (命令)	W006
Command name (命令名)	Analog polarity reversion setting (设定 Analog 极性反转)
Overview	Sets the analog output polarity reversion status. (设定 Analog 输出的极性反转状态)

Transmission format (传输格式)	W006.[1].[2]						
Sending parameters (传输参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	Axis (轴)	1	-	-	0	Designates the target axis. (指定目标轴) 0: Tx axis (0: Tx 轴) 1: Ty axis (1: Ty 轴)
	[2]	Analog polarity reversion setting (设定 Analog 极性反转)	1	-	-	0	Designates the analog polarity reversion setting. (指定设置 Analog 极性反转) 0: Not reverted (0: 无反转) 1: Reverted (1: 有反转)

Reception format (接收格式)	W006						
Receiving parameters (接收参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	-	-	-	-	-	-

## (14) Measurement stop (S000) (停止测量)

Command (命令)	S000
Command name (命令名)	Measurement stop (停止测量)
Overview	Stops measurement. (停止测量)  When executed during measurement stop, an error is returned. (若已经停止测量, 执行该命令将弹出错误信息)

Transmission format (传输格式)	S000						
Sending parameters (传输参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	-	-	-	-	-	

Reception format (接收格式)	S000						
Receiving parameters (接收参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	-	-	-	-	-	

## (15) Measurement start (S001) (开始测量)

Command (命令)	S001
Command name (命令名)	Measurement start (开始测量)
Overview	Starts measurement. (测量开始)  When executed during measurement, an error is returned. (若处于测量中, 执行该命令将弹出错误信息)

Transmission format (传输格式)	S001						
Sending parameters (传输参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	-	-	-	-	-	

Reception format (接收格式)	S001						
Receiving parameters (接收参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	-	-	-	-	-	

## (16) Remote cancel (S002) (取消远程连接)

Command (命令)	S002
Command name (命令名)	Remote cancel (取消远程连接)
Overview	Cancels remote status. (取消远程连接)  When executed during remote cancel, an error is returned. (若已经是非远程连接状态, 将弹出错误信息)

Transmission format (传输格式)	S002						
Sending parameters (传输参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	-	-	-	-	-	

Reception format (接收格式)	S002						
Receiving parameters (接收参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	-	-	-	-	-	

## (17) Remote request (S003) (请求远程连接)

Command (命令)	S003
Command name (命令名)	Remote request (请求远程连接)
Overview	Switches to remote status. (切换至远程连接状态) When executed during remote status, an error is returned. (已处于远程连接状态时, 弹出错误的信息)

Transmission format	S003						
Sending parameters	3	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	-	-	-	-	-	

Reception format	S003						
Receiving parameters	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	-	-	-	-	-	

## (18) LD output automatic adjustment (S005) (LD 输出功率自动调节)

Command (命令)	S005
Command name (命令名)	LD output automatic adjustment (LD 输出功率自动调节)
Overview	Adjusts LD automatic dimming so that the PSD light reception amount matches the light reception amount target value. (LD 自动变调节光量, 以使 PSD 的接收光量达到目标值。 This command is enabled only during measurement. (该命令仅在测量中有效)

Transmission format (传输格式)	S005, [1]						
Sending parameters (传输参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]	Sensor type (传感器种类)	1	-	-	-	Designates the target sensor type. (指定目标传感器类型) 0 : Tilt

Reception format (接收格式)	S005						
Receiving parameters (接收参数)	No	Name	No. of characters	Lower limit value	Upper limit value	Digits after decimal (小数位数)	Remarks (备注)
	[1]		-	-	-	-	

## &lt;Measurement value&gt; (测量值)

Response data measurement values differ by processor type.

The various processor display formats are shown below.

(测得的响应数据取决于处理器类型。

每个处理器的显示格式如下所示。)

## o Tilt processor (倾斜处理器)

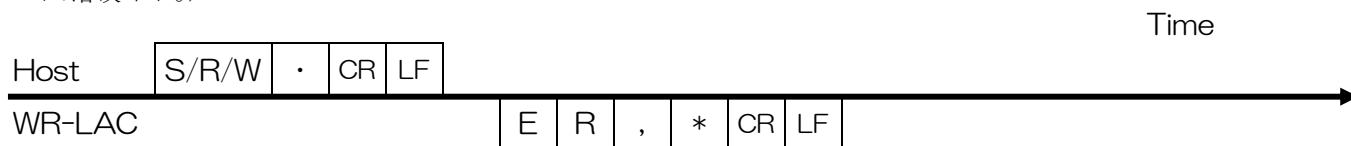
The format differs from the measurement values displayed onscreen. (与屏幕显示的测量值格式不同)

Units are seconds, with 1 sign digit and 5 integer digits. (单位为秒, 一个符号位, 五个整数位)

Display example: -12345 (sec)

#### 4.4 Communication errors (关于通信错误)

When a command cannot be received or executed normally, the device will return an error command in the format below. (如果无法正常接收命令或无法执行该命令, 则本机将以以下格式返回错误命令。)



#### Error command content (错误命令内容)

#	Error name	Error content
1	Communication error (通信错误)	<ul style="list-style-type: none"> <li>Number of received characters from "S" to LF is 7 or more (从"S"到LF的接收字符数为7个及以上)</li> <li>Number of received characters from "R" to LF is 16 or more (从"R"到LF的接收字符数为16个及以上)</li> <li>Number of received characters from "W" to LF is 100 or more (从"W"到LF的接收字符数为100个及以上)</li> <li>Overrun or framing error (溢出或成帧错误)</li> </ul>
2	Setting data error (设置数据错误)	<ul style="list-style-type: none"> <li>A value outside the setting range has been set. (设定参数超出规定范围)</li> </ul>
3	Format error (格式错误)	<ul style="list-style-type: none"> <li>Identification characters other than "S," "R," "W," etc. have been set. (设置了除"S", "R", "W"等标识字符以外的字符)</li> <li>Regulated command number of commas does not match (规定命令中逗号的数量不一致)</li> </ul>
4	Execution error (执行错误)	<ul style="list-style-type: none"> <li>Process execution failure (执行处理失败) (zero set process luminous point abnormality, etc.) (调零处理中光斑异常)</li> </ul>
5	Condition error (状态错误)	<ul style="list-style-type: none"> <li>Command outside regulated status received (在规定状态以外的状态下收到命令)</li> </ul>
6	Timeout error (超时错误)	<ul style="list-style-type: none"> <li>LF cannot be received within 1 second of receiving the first command character (收到命令第一个字符后1秒钟内无法接收到LF)</li> </ul>
7	File number in excess error (文件数量过载错误)	<ul style="list-style-type: none"> <li>The maximum number of new files to be saved has been exceeded. (超过可保存文件的最大数量。)</li> </ul>
8	No output data error (无输出数据错误)	<ul style="list-style-type: none"> <li>Result output command received with no measurement results. (接收到没有测量结果的结果输出命令。)</li> </ul>
9	No file name error (无文件名错误)	<ul style="list-style-type: none"> <li>No file name at file saving or readout (保存或加载文件时没有文件名)</li> </ul>
10	File name mismatch error (文件名不匹配错误)	<ul style="list-style-type: none"> <li>No matching file name at file readout (读取文件时没有匹配的文件名)</li> </ul>
2**	Setting data error (设定数据错误) (** : Item number 01 to 19) (* * : 项目编号 01~19)	<ul style="list-style-type: none"> <li>Among the setting value batch setting command items, a value outside the setting range has been set For item numbers, see the Setting value batch setting command modes content (设置值批量设定时, 有几处的设置参数超出规定范围 关于项目编号, 请参阅设定值批处理设定命令的各种模式的内容。)</li> </ul>

#### 4.5 Remote control (远程控制)

Readout of judgment results and setting content as well as changing of setting content is possible by sending communication commands from the host device.  
(可以通过从主机设备发送通信命令, 读取判断结果和设置内容并更改设置内容。)

(Operates only in remote status upon pressing the remote button on the main screen.)

To cancel remote status, hold down the ESC button for at least 4 seconds or send a remote cancel command.) (当按下主屏幕上的“远程”按钮时, 只有远程状态起作用。)

要取消远程状态, 长按 Esc 键 (4 秒钟以上) 或发送取消远程连接命令。)

## 5. Other (其他)

### 5.1 Error display list (错误显示表)

Codes are displayed for errors or warnings generated during measurement or setting.

The main error and warning content is as shown here. Confirm the content and take suitable measures.

(在测量或设置过程中发生错误或警告时会显示代码。显示主要错误和警告内容。请检查内容并采取相应措施。)

Status	Code	Message	Content
Error (错误)	E1	Level Low	Light reception amount decrease error (接收光强过低错误)
	E2	Level Over	Light reception amount excess error (接收光强过高错误)
	E3	Area Out	Outside luminous point area error (光斑在测量范围外错误)
	E5	Input Error	Outside input value range error (输入值在规定范围外)
	E9	PW Set Error	LD power automatic adjustment error (LD 功率自动调节错误)
Warning (警告)	W2	Level Over	Light reception amount excess (接收光强过高)
	W4	Level Over	Light reception amount end saturation (接收光边缘饱和)
	W5	LD HiOutput	LD high output status (LD 高输出状态)

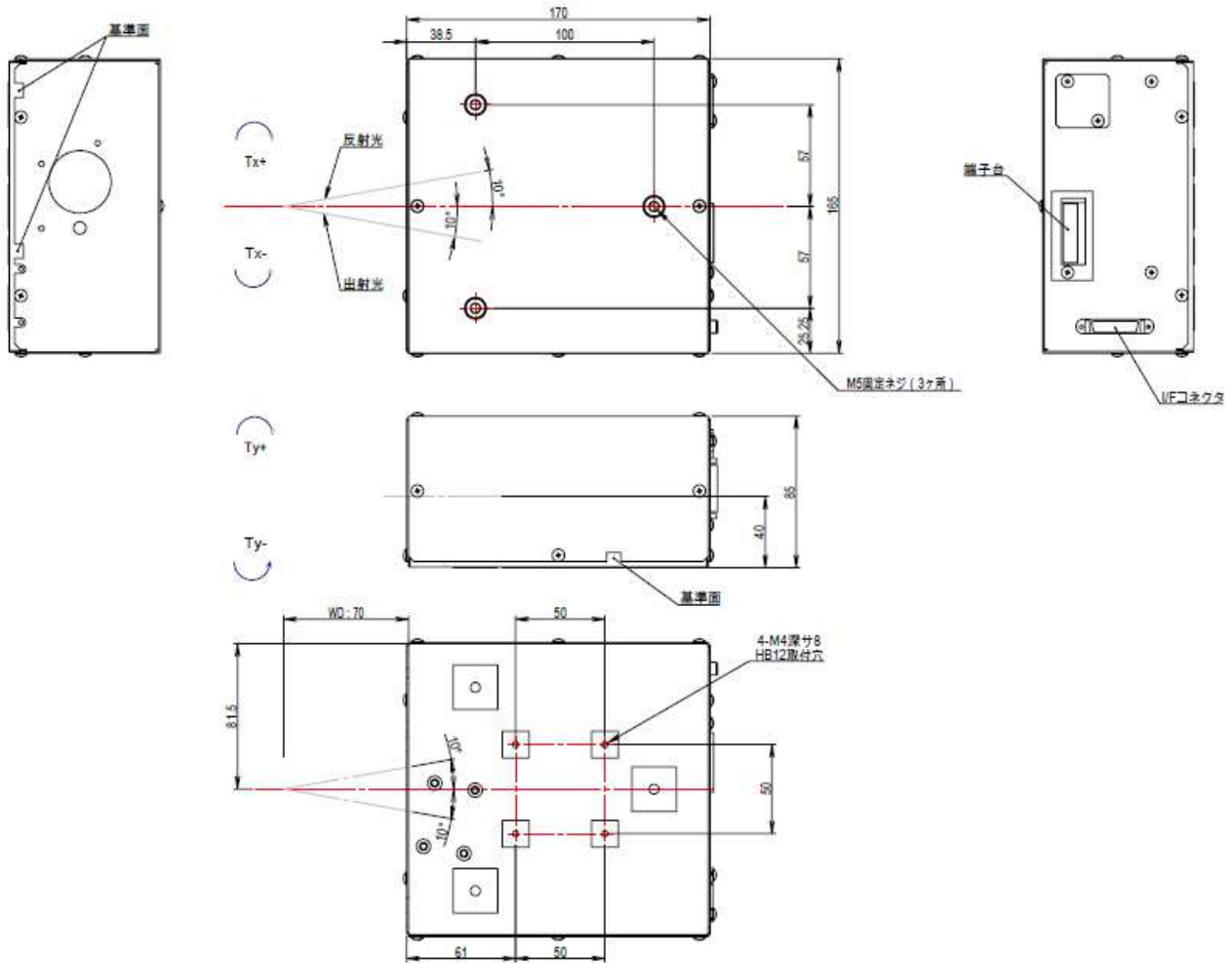
## 5.2 Troubleshooting (故障排除)

Phenomenon	Cause	Countermeasure	Reference page
Power source does not turn on (未通电)	Power source connector is disconnected (电源插头被拔)	Insert a 24 V power source connector (插入 24V 电源插座)	-
	Power source cable is disconnected (电源线断线)	Replace the power source cable (更换电源线)	-
Luminous point pointer is not displayed on monitor (显示屏上未出现光点指针)	Connection cable is disconnected (接线被拔出)	Correctly connect the cable with the processor power source OFF (切断处理器电源后, 正确接线)	P.9, 17
	Distance to measurement target object is too long (测量物体距离太远)	Keep the distance to the measurement target object within 92 ±0.1 mm (请将测量物体置于距离在 92±0.1mm 以内)	-
	Object measured has displacement exceeding the measurement range (测量物体的位移过大超出测量范围)	Measure the displacement within the measurement range. 在测量位移范围内测量。 <Measurement range> (测量范围) · Tilt: -5.0 deg to +5.0 deg	-
	Laser output is low (激光输出太弱)	Adjust laser output with settings menu LPDW (在设置菜单 LDPW 中调节激光输出)	P. 30
	Laser service life (激光的寿命)	If laser output fluctuates significantly or does not increase even with LPDW setting, contact Suruga Seiki. (激光输出波动很大, 如果即使使用 LDPW 设置, 输出也没有增加, 请与我们联系。)	-
Measurement results are unstable (测量结果不稳定)	Measurement target object reflectivity is low (被测量物体的反射率过低)	The WA-LAC measurement target is the specular reflector. (WA-LAC 测量的对象是镜面对象)	-
	Laser output is low (激光输出太弱)	Adjust laser output with settings menu LPDW (在设置菜单 LDPW 中调节激光输出)	P. 30
	Vibration is present (有振动)	Confirm that reflectivity and laser output are adequate and remove any causes of vibration. (确保适当的反射率和激光输出并去除振动因素)	-
	Ambient diffuse light is present (外界光漫反射)	Remove ambient diffuse light around the head (排除传感器头周围的外界光反射)	-
No response to I/O input (I/O 输入无反应)	IN1 to 3 and GND are incorrectly connected (IN1-3 和 GND 接线不正确)	Connect IN1 to 3 and GND correctly (正确连接 IN1-3 和 GND 的接线)	P. 42
	Processor is not in remote status (处理器未处于远程状态)	Press the remote button on the main menu to shift to remote status (主菜单栏中按下 Remote 按钮切换至远程状态)	P. 39
I/O output is not taking place (无 I/O 输出)	OUT1, 2 and output common are incorrectly connected (OUT1、2 和输出公共端没有正确连接)	Connect OUT1, 2 and output common correctly (正确连接 OUT1、2 和输出公共端)	P.16,17
No response to commands (不响应命令)	Serial cable is not connected (没有连接串行电缆)	Connect serial cable correctly (正确连接串行电缆)	P. 17
	Straight cable is in use (使用的是直电缆)	Use a cross cable (使用交叉电缆)	-
	Baud rate mismatch (波特率不匹配)	Match the communication speed (请同步通信速度)	P. 34
	Processor is not in remote status (处理器未处于远程状态)	Press the remote button on the main menu to shift to remote status (主菜单栏中按下 Remote 按钮切换至远程状态)	P. 39



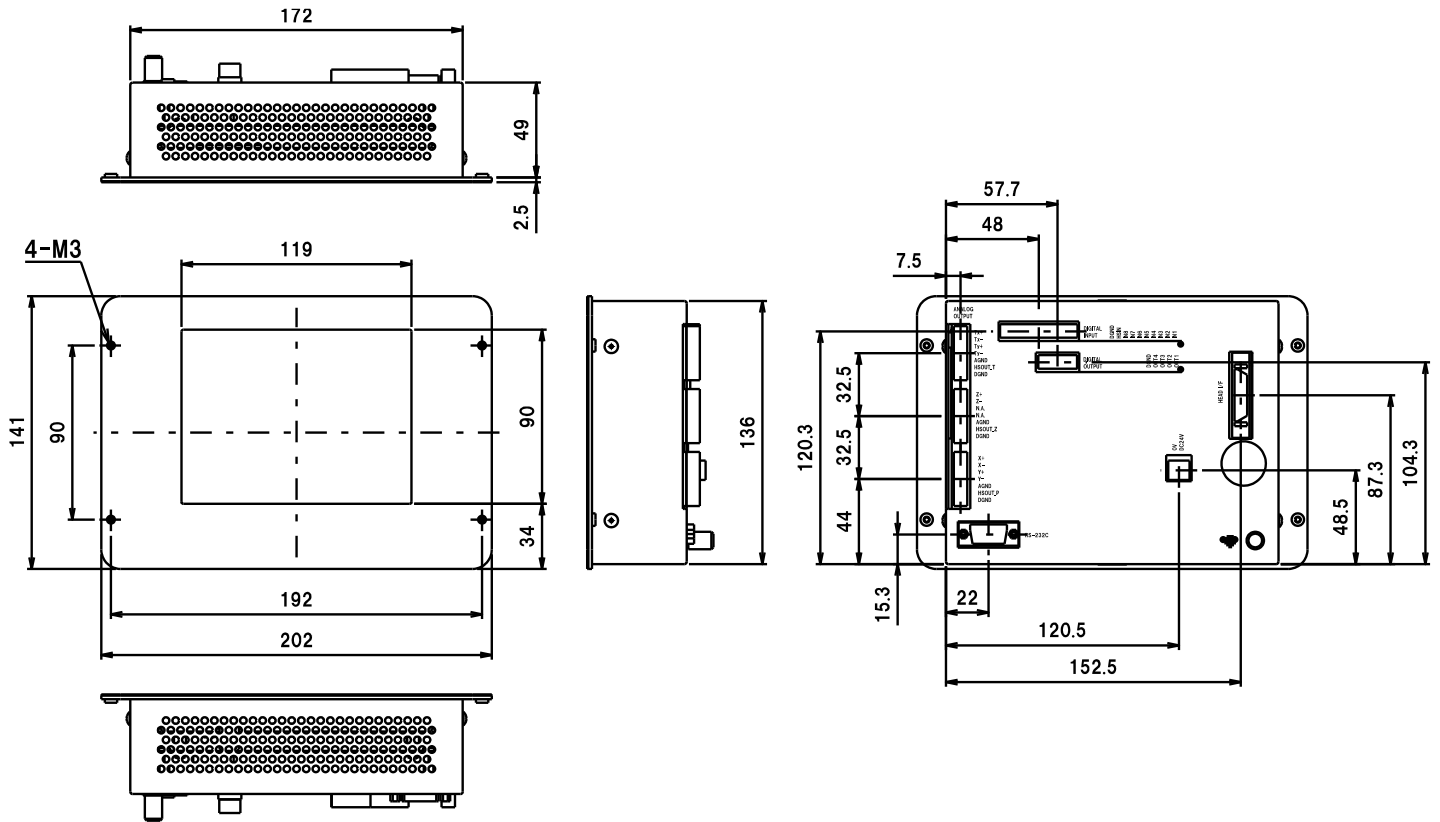
5.3 Product external appearance (产品外观图)

5.3.1 H920-P500 sensor head external appearance (H920-P500 传感器头外观图)



**Fig. 5-3-1. Sensor head external appearance**

5.3.2 H920-P500 processor external appearance (H920-P500 处理器外观图)



**Fig. 5-3-2. Processor external appearance (处理器外观图)**

## 6. Warranty and after sales service (质保及售后)

### ● Warranty (关于质保)

Make inquiries using the serial number on the product rear panel surface.

(咨询时, 请提供产品背面板上的序列号)

The warranty period is one year from delivery.

(质保期间为收货后一年)

The following situations, however, are out of warranty range; repairs will require fees.

(但是, 以下情况无免费维修义务, 可进行有偿维修)

- Failures or damage due to misuse or to modification or repair not performed by Suruga Seiki personnel

(由于错误使用以及非本公司人员改造及修理引起的故障和损伤)

- Removal of the modification prevention seal (防篡改封条被撕毁)

- Failures or damage due to unsuitable handling such as dropping during conveyance or transport

(因运输或移动过程中掉落等不当操作而导致的故障或损坏)

- Failures or damage due to natural or artificial disasters such as fire, salt damage, gas damage, abnormal voltage, earthquakes, lightning, storm damage, etc. (火灾, 盐害, 气体损坏, 异常电压和地震, 雷击, 风浪和水灾以及其他自然灾害引起的故障和损伤)

- Failures or damage due to handling in contravention of the methods and cautions in the instruction manual

(违反说明书上的操作方法及注意事项引起故障或损坏)

### ● After sales service (关于售后服务)

Before making a repair request, check the items on p. 64. (申请维修前请确认 P.64 页的各项目)

Contact Suruga Seiki Optical System Division sales personnel if anything is unclear.

(若有疑问, 请咨询本公司光学機器事业部售后)

<During warranty period> (质保期间内)

Failures taking place during normal use in accordance with the cautions in the user's manual will be repaired free of charge.

For the above failures out of warranty range, repairs will require fees.

(在遵照说明书的注意事项正常使用时发生故障, 提供无偿修理服务。若为上述情况引发的事故, 则为有偿修理服务)

<When the warranty period has passed> (已过质保期的情况)

When functions can be maintained through repair, requests for repair (fees required) will be accepted.

(若通过修理可是持续利用, 根据客户要求提供有偿修理服务)

### ● Repair period (关于可修理的期限)

The minimum retention period for performance parts for repair of this product (parts required to maintain functions) is one year from production end. Repairs are possible within this period. You may also contact Suruga Seiki Optical System Division sales personnel even after the part retention period has passed, as repairs are still sometimes possible.

(该产品维修用功能零件(维持功能所必需的零件)的最短保存期限为停产后的一年。此时间段内可以进行维修。此外, 即使部品已过最低保存期限也有可能进行维修, 具体情况请咨询本公司 OST 事业部售后)

**\*Regarding failures of this product, Suruga Seiki bears no responsibility for anything other than repairs free of charge based on the warranty.**

(除了根据保修提供免费维修外, 我们对本产品引起的任何故障概不负责。)

Inquiries about this product can be made as below.

(相关产品咨询请通过以下联络方式联系)

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**ミスミグループ**  
**駿河精機 株式会社**

**Optical System Division**

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