AKUSENSE

LASER DISPLACEMENT SENSOR
MLD25 Series

User's Manual

Thank you for choosing Akusense .Please read the manual carefully before using this product.
1. The product should be applied by someone with a certain level of electrical knowledge.
2. Please read and make sure that you understand how to operate the product before using it.
3. Please keep this manual readily accessible for future reference when needed.

SYMBOL

The following symbols are important information in this manual, please be sure to observe the following.

⚠	There is the risk of causing malfunction or fire, please do not exceed the rated voltage when using.
⚠	There is a risk of rupture, do not use AC power.
⚠	Danger of burns at high temperatures. .

NOTICE FOR USE

- The light source of this product is visible semiconductor laser.
- Please pay attention to prevent the laser directly or through the mirror reflection into the eyes.
- If shot into the eye, it may cause blindness.
- This product is not explosion-proof structure.
- Please do not use it in the environment with flammable or explosive gas or liquid.
- This product does not have the function of automatically stopping laser projection after decomposition .
- Please do not decompose or transform. .
- Please do not use this product as a safety device for the purpose of protecting human body.
- Improper use may cause personal injury, fire and electric shock

NOTED FOR USE LASER

Laser label

The product is classified as class 2 (II) laser product according to laser safety standard. If the laser label on the machine is covered when installing the product, please stick the attached laser label in the visible position
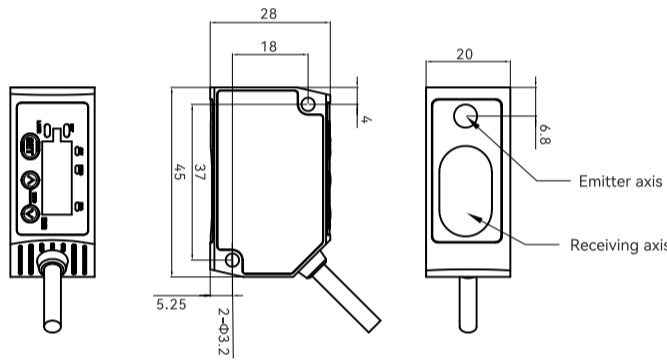
CONFIRMATION OF PACKAGE CONTENTS

- Laser displacement meter body 1 set
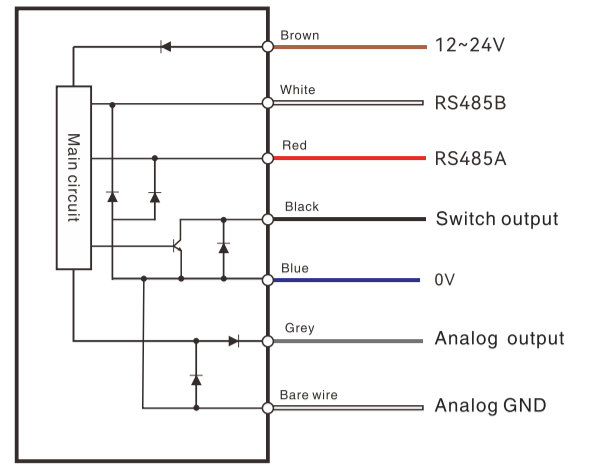- User Mannual 1 copy

SPECIFICATION

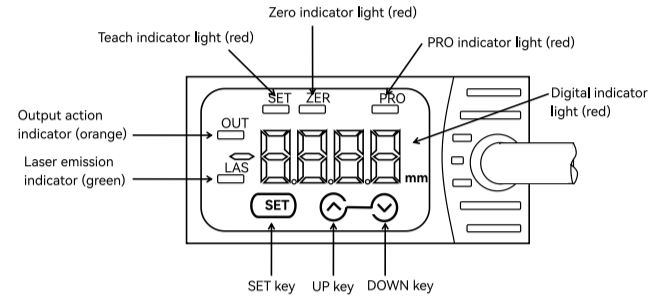| Model name		MLD25-200NV	MLD25-200PV
Principle		Triangle measurement	
Sensing range		120~280mm	
Setting distance		±80mm	
Repeat accuracy		Min.1um	
Light source	Wavelength	655nm	
	Max. Output	1mW	
	Laser class	Class2	
Applicable specification		EMC directive	
Temperature characteristics		±0.03%/℃ F.S.	
Light diameter		AboutΦ300μm	
Linearity		±0.1% F.S.	
Temperature characteristics		0.03% F.S./℃	
Operating voltage		12~24V DC±10%, Pulse below P-P10%	
Consumption current		Below 40mA at 24V DC, Below 65mA at 12V DC	
Output		<NPN> NPN open collector transistor · Max. current: 50mA · Applied output: below 30V DC · Residual output: below 1.5V (when current is 50mA) · Leakage output: below 0.1mA	<PNP> PNP open collector transistor · Max. current: 50mA · Applied output: below 30V DC · Residual output: below 1.5V (when current is 50mA) · Leakage output: below 0.1mA
Output method		Light on/dark on switchable	
Short circuit protection		Yes	
Response time		1.5ms / 5ms / 10ms for option	
External output		（NPN) NPN non-contact input · Enter conditions Invalid: +8 ~ +V DC or open circuit Valid: 0 ~ +1.2V DC · Input impedance: about 10kΩ	<PNP> PNP non-contact input · Enter conditions Invalid: 0 ~ +0.6V DC or open circuit Valid: +4 ~ +V DC · Input impedance: about10kΩ
Pollution degree		2	
Usage altitude		Below 2,000m	
Environment data	Protection degree	IP67(IEC)	
	Operating temperature	–10 ~ +45℃(no freezing) Storage: –20 ~ +60℃	
	Operating humidity	35%RH ~ 85%RH Storage: 35%RH ~ 85%RH	
	Operating ambience	below 3,000 lx	
	Vibration resistance	10 ~ 55Hz double amplitude 1.5mm, 2 hours each for XYZ direction	
	Shock resistance	Durable 500m/s2 (about 50G) 3 times in each direction of XYZ	
Cable		Length: 2m	
Material		Housing: Die-cast aluminum Cover: PC	

SIZE SPECIFICATION

Unit: mm

- Emitter axis
- Receiving axis

28
18
20
4
45
37
6.8
5.25
2-Φ3.2

CIRCUIT DIAGRAM

Brown	12~24V
White	RS485B
Red	RS485A
Black	Switch output
Blue	0V
Grey	Analog output
Bare wire	Analog GND

Main circuit

DESCRIPTION OF EACH PART

- Zero indicator light (red)
- Teach indicator light (red)
- PRO indicator light (red)
- Digital indicator light (red)
- Output action indicator (orange)
- Laser emission indicator (green)
- SET key
- UP key
- DOWN key
- SET ZER PRO
- OUT
- LAS

TEACH

（1）2-point teaching

Basic teaching methods

- Distance
- ON
- OFF
- Datum value
- Background object
- Detected object

---

1. In the state of background objects, press the SET key.

⬇

2. In the state of background objects, press the SET key.

⬇

If it can be detected stably, Good is displayed.

When stable detection cannot be performed, HArd is displayed.

(2) Limited teaching

It is very convenient to use this teaching method when there are tiny objects and background objects.

〈When the detection object is the reference〉

- UP key
- Datum value
- Taught value
- Distance
- Background object

- Datum value
- DOWN key
- Taught value
- Distance
- Background object

---

1. In the state of background objects, press the SET key.

⬇

2. In the state of background objects, press the UP key to increase the reference value.In the state with background objects, press the DOWN key to lower the reference value.

⬇

automatic

3. Teaching ends.

(3) 1-point teaching (window comparison mode)

For the distance from the reference surface of the sensing object, the method of setting the upper limit and lower limit is performed instead of one-point teaching. exist use this function when judging within the upper and lower limits.
When implementing 1-point teaching (window comparison mode), please set it to [1-point teaching (window comparison mode) in the detection output setting of PRO mode in advance.port compare mode)].
For the setting method, please refer to "PRO Mode Operation Instructions".

- OFF
- ON
- OFF
- Datum value 2_sl
- Datum
- Datum value 1_sl
- Detected object

1. In the state of background objects, press the SET key twice.
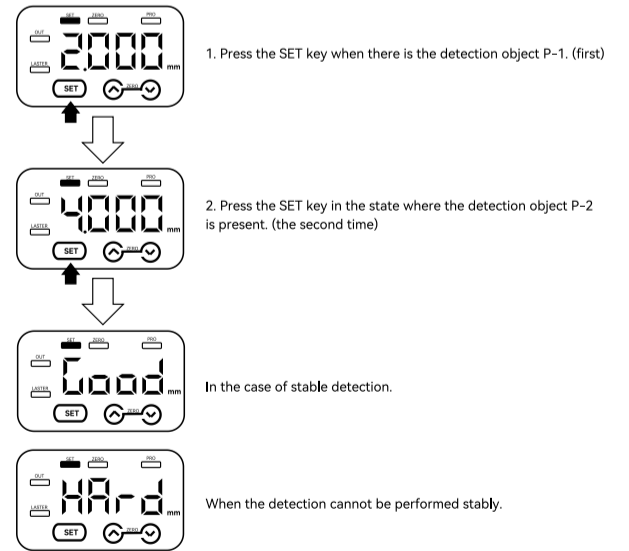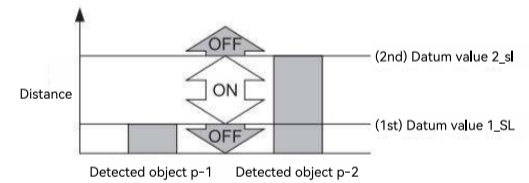(first time: SET mode, second time: teaching)

⬇

automatic

2. Teaching ends.

(4) 2-point teaching (window comparison mode)

This is the method to execute 2-point teaching and set the reference value range.
When implementing 2-point teaching (window comparison mode), please set it to [2-point teaching (window comparison mode) in the detection output setting of PRO mode in advance.or compare mode).
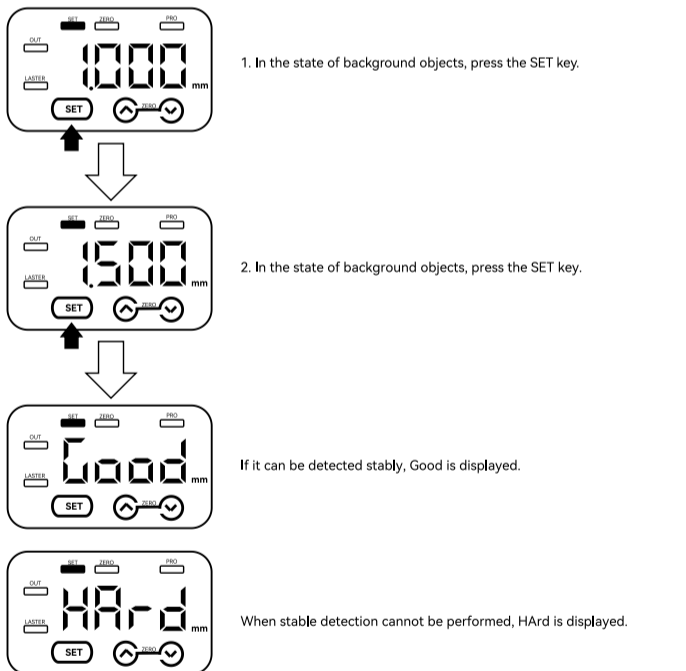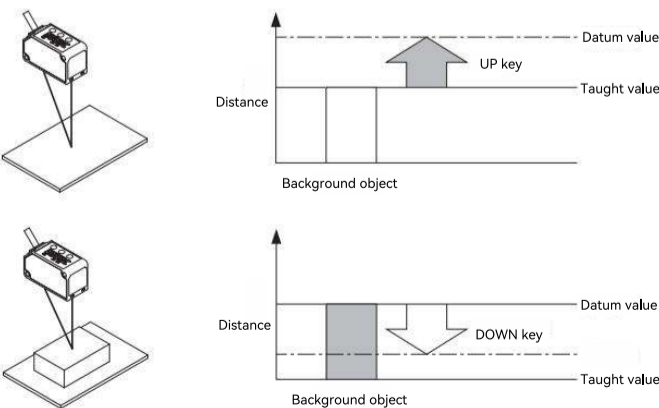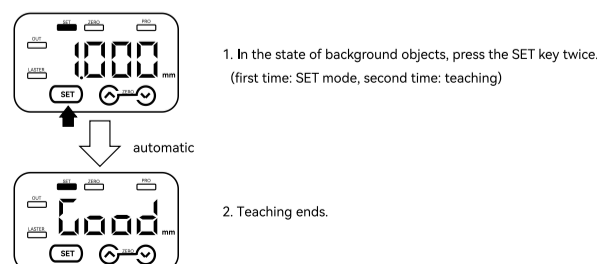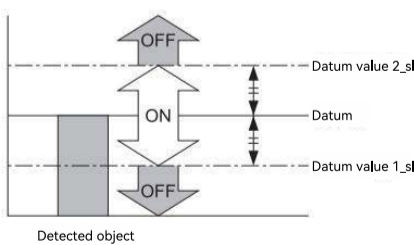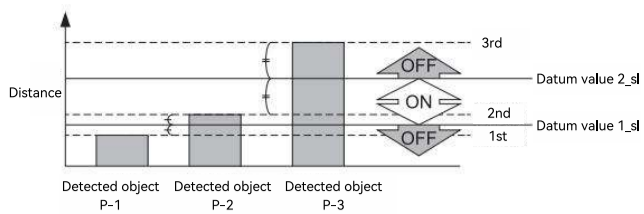
For the setting method, please refer to "PRO Mode Operation Instructions".
When performing teaching, use sensing objects with different distances (P-1, P-2).

- OFF
- ON
- OFF
- (2nd) Datum value 2_sl
- (1st) Datum value 1_SL
- Distance
- Detected object p-1
- Detected object p-2

1. Press the SET key when there is the detection object P-1. (first)

⬇

2. Press the SET key in the state where the detection object P-2 is present. (the second time)

⬇

In the case of stable detection.

When the detection cannot be performed stably.

(5) 3-point teaching (window comparison mode)

Perform 3-point (P-1, P-2, P-3) teaching, as shown in the figure below, set the reference value 1_SL between the 1st and 2nd time.It is a method to set the threshold value 2_SL between the first and third times and set the threshold value range.When performing 3-point teaching (window comparison mode), please set it to [3-point teaching (window comparison mode) in the detection output setting of PRO mode in advance.port compare mode)].

For the setting method, please refer to "PRO Mode Operation Instructions".
When performing teaching, use sensing objects with different distances (P-1, P-2, P-3).
After teaching, P-1, P-2, P-3 will follow the automatically arranged in ascending order.

1. Press the SET key when there is the detection object P-1. (first)

2. Press the SET key in the state where the detection object P-2 is present. (the second time)

3. Press the SET key when there is the detection object P-3. (the third time)

In the case of stable detection.

When it cannot be detected stably.

(6) Span of ascending differential mode or descending differential mode

Please use it only when detecting sudden measured value changes while canceling gentle measured value changes.
When using the rising differential or falling differential mode, please set the detection output setting of the PRO mode to "rising differential" or "downward differential" in advance.down-differential mode".

For the setting method, please refer to "PRO Mode Operation Instructions"
The reference value can be set using the reference value fine-tuning function.
For the fine-tuning function of the threshold value, please refer to "fine-tuning function of the threshold value".

1. Press the SET key to enter.

2. Press the UP key or DOWN key to select the span.

span too short   span too long
d-01 ⇒ d-02 ⇒ · · · ⇒ d-07 ⇒ d-08

3. Press the SET key to confirm.

BENCHMARK FINE-TUNING FUNCTION

The reference value can be fine-tuned on the measurement screen.
The reference value can also be fine-tuned after teaching.
<Normal detection mode, rising differential mode or falling differential mode>

Sure

(After 3 seconds, it will be automatically determined)

<window comparison mode>

When the detection output is set to the window comparison mode, press the SET key for 1 second to change the display of "1-5L" and "2-5L"switch.

Press the SET key for 1 second   Measured value changes   Measurement screen

To fine-tune the reference value of "1-5L" or "2-5L", press the UP key or DOWN key to display "1-5L" or after "2-5L", you can fine-tune the reference value.

Press the UP/DOWN key

automatic

Press the UP/DOWN key

OK (after 3 seconds, it will be automatically confirmed)

PEAK VALUE AND VALLEY VALUE HOLD FUNCTION

The peak and valley hold function refers to the function of displaying peak and valley values.
When the peak and valley hold function is set to "peak hold" or "valley hold", the measured value held when the zero adjustment function is executed the set value will be reset to zero.

Array display	Name	Function
P.oFF	Release hold function	Contact hold state, output the current measured value
P_H	Peak Hold	Hold the maximum value of the measured value
b_H	Valley Hold	Keep the measured value to a minimum

1. Press the SET key and UP key simultaneously for 3 seconds.

2. Press UP/DOWN key.

or   or   or

3. Press the SET key.

4. Confirm (after 3 seconds, it will be confirmed automatically).

ZERO ADJUSTMENT FUNCTION

The zero-adjustment function is a function to forcibly "zero-adjust" the measured value.
When zero adjustment is set, the zero adjustment indicator (red) lights up.
When the peak value and bottom value hold functions are enabled, once the zero adjustment function is executed, the held measurement values will be reset.
Indicates that when the offset is set, the zero adjustment function cannot be set.

<ZERO ADJUST SETTING>

Press the DOWN key and the UP key simultaneously

Sure

<Release zero adjustment>

Press the DOWN key and the UP key simultaneously

automatic

KEY LOCK FUNCTION

The key lock function means that the key operation is not accepted, so as not to change the setting conditions in each setting mode by mistake.
After setting the key lock, if the key is operated, the display of "Loc" will appear on the digital display.

<Set key lock>

Simultaneously press the keys SET and DOWN for 3 seconds

automatic

<Unlock key lock>

Simultaneously press the keys SET and DOWN for 3 seconds

automatic

PRO MODE SETTING

Press the DOWN key for more than 3 seconds to enter the PRO mode. When the PRO mode is set, the PRO indicator (red) will light up.
In the process of setting PRO mode, if the DOWN key is pressed for 3 seconds or more, it will return to the measurement screen.

Key description of each part of PRO

PRO indicator light (red)

DOWN key (select next)

SET key (confirm)   UP key (select previous)
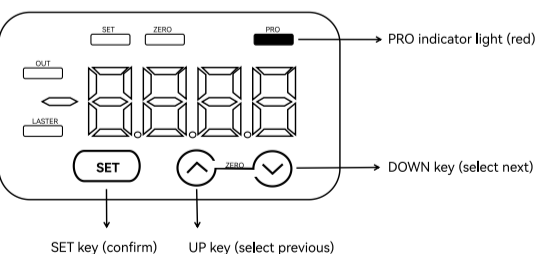
PRO mode setting content:

Project	Initial state	Contents
Set reaction speed	H.rSo	Set the reaction time. H.rSo: High precision 20 times average 10ms Std : Standard 10 average 5ms FASt : High speed 3 times average 1.5ms
Set output state	L-on	Select the operating mode of the control output. L-on: Light incident on, normally off d-on: the incident light is normally open
Set detection output	_ _ [^	Set the detection output. _ _ [^ : Normal detection mode _ N_ 1: 1 point teaching _ N_ 2: 2 point teaching _ N_ 3: 3 point teaching d_L : rising differential d ^ [: Descent Differential
Set hysteresis	0.2	Set the hysteresis when comparing output, the range is 0.1mm~80.0mm.

Set timer	non	Set the action state of the timer. non: no timing oFD: delayed shutdown ond: delayed action oSD: single shot mode
Set delay output	5.0	Set output delay time 0.1~999.9ms.
Set analog output	U_5	Set the analog output mode. U_5 : 5V voltage output I.oUE: current output mode
Set display	Std	Set the display method of measured values. Std : standard, display +80 ~ -80mm InvE : reverse, display -80 ~ +80mm oFSt: offset, display 160 ~ 0 mm
Set hold	OFF	Control output and mode when measurement error occurs (insufficient light, light saturation, outside the measurement range). Analog output settings. OFF: off, over-range display "-----" ON: open, keep the last valid measurement value, and flash
Automatic screen off setting	OFF	If there is no button operation within 30s, the display screen goes out and the current consumption is controlled. OFF: off ON： Turn on, turn off the digital tube display if there is no key operation for 30 seconds
Baud rate setting	115.2	Set the baud rate of 485 communication. 9600 19200 38400 57600 115200 230400 312500 468750 500000 625000 833333 937500 1250000
Reset settings	NO	Erase the memory to save and return to the original state. Yes: Confirm reset (restore factory settings) NO: Do not reset

PRO mode operation instructions:

① On the measurement screen, press and hold the DOWN key for 3 seconds to enter the PRO mode;

② Press the SET button in PRO mode to confirm the selection;

③ Press the UP key in PRO mode to select the previous one;

④ Press the DOWN key in PRO mode to select the next one;

⑤ In PRO mode, long press the DOWN key for 3 seconds to exit.

Introduction to PRO menu operation

A menu	Secondary menu	Submenu
Measurement screen	SPEd: set reaction speed	H.rSo: high precision
		Std: standard
		FASt: high speed
	L-d: set the output state	L-on: Light incident on, normally off
		d-on: the incident light is normally open
	SEnS: Set detection output	_ _	: Normal detection mode
		_ n_ 1: 1 point teaching
		_ n_ 2: 2 point teaching
		_ n_ 3: 3 point teaching
		d_| : rising differential
		d^L : Falling Differential
	HYS: set hysteresis	Set the hysteresis when comparing the output, the range is 0.1mm~80.0mm
	dELY set timer	non: no timing
		oFd: delayed shutdown
		ond: delayed action
		oSd: single shot mode
	dLYn: set delay output	Set output delay time 0.1~999.9ms
	A.oUt: set analog output	U_5 : 5V voltage output
		I.oUt: current output mode
	dISP: setting display	Std : standard, display +80 ~ -80mm
		InvE : reverse, display -80 ~ +80mm
		oFSt: offset, display 160 ~ 0 mm
	HoLd: setting hold	oFF: off, over-range display "-----" on: on, keep the last valid measured value, and flash
	Eco: automatic screen off setting	oFF : off
		on: open, no button operation for 30 seconds to turn off the digital tube display
	bAud: baud rate setting	9.6
		19.2
		38.4
		57.6
		115.2
		230.4
		312.5
		468.8
		500.0
		625.0
		833.3
		937.5
		1250
	rSEt: reset setting	Yes: Confirm reset (restore factory settings)
		no： do not reset

ERROR DISPLAY

The following actions should be taken when an error is displayed:

Error display	Contents	Deal with
<Save OFF> - - - - <Save ON> Measured value blinks	The amount of reflected light is insufficient, and the detected object is out of range.	Please confirm whether the detection object is within the measurement range. please adjust the installation angle of the sensor.
Er01	The flash memory is damaged, or its service life has expired.	Please consult our company.
Er11	detects the excessive current caused by the output load short circuit.	Please cut off the power and confirm the load.
	The semiconductor laser is damaged or has reached the end of its service life.	Please consult our company.
Er31	· During zero adjustment, normal measurement is not possible. · Because the display setting is set to offset or peak/valley is turned on the value hold function, so the zero adjustment function cannot be used.	· Please confirm whether the detection distance is within the specification range. · Set the display setting to something other than offset.
Er41	Failed to measure normally when performing teaching.	Please confirm whether the detection distance is within the specification range.
	system error.	Please consult our company.

COMMUNICATION INSTRUCTION FORMAT AND INSTRUCTION TABLE

Communication instruction format: follow the standard **ModbusRTU** protocol

Address code	Function code	Data area	CRC16 checksum
1 byte	1 byte	N bytes	2 byte
01H	03H read 06H Write	Register address 2Byte + data 2Bytes register device address 2Byte+ data nBytes	Verify all previous data areas CRC16 high byte first

Communication order table:

Function	Deposit Device (high)	Deposit Device (low)	R/W (Write/read)	Illustrate	Remark
Model	C 8H	00H	R	C8H=200mm model	
Measurements	C 8H	01H	R	Range 1180~2820, 0=over range or none effect	
Read output status	C 8H	02H	R	0=OFF	
				1=ON	
Output mode	C 8H	03H	RW	0=L-ON normally open	
				1=D-ON normally closed	
Output response speed	C 8H	04H	RW	0=high precision (10ms)	
				1=Standard (5ms)	
				2=High speed (1.5ms)	
Threshold 1	C 8H	05H	RW	Setting range 1200~2800	
Threshold 2	C 8H	06H	RW	Setting range 1200~2800	
Differential amount	C 8H	07H	RW	Setting range 1~800	
Differential span	C 8H	08H	RW	Setting range 0~7	
Hysteresis width	C 8H	09H	RW	Setting range 1~800	default 0.2
Time-lapse mode	C 8H	0AH	RW	0=OFF	
				1=delay off	
				2=Delay on	
				3=single output	
Delay output time	C 8H	0BH	RW	Setting range 0.1~999.9ms 0=normal detection	Default 5.0ms
Detection and teaching Mode	C 8H	0CH	RW	mode, basic teaching and limit fixed teaching	
				1= 1 point teaching, window comparison	
				2= 2 point teaching, window comparison	
				3= 3 point teaching, window comparison	
				4= Rising differential mode	
				5=Drop differential mode	
Zero amount	C 8H	0DH	RW	Setting range 1200~2800	default 2000
Zero switch	C 8H	0EH	RW	0=OFF	
				1=ON	
Display method	C 8H	0FH	RW	0=normal	
				1=Reverse	
				2=offset	
Effective measurement value guarantee hold	C 8H	10H	RW	0=OFF	
				1=ON	
Peak hold setting	C 8H	11H	RW	0=OFF	
				1=Peak	
				2=Bottom	
				3=reset	
ECO economy mode	C 8H	12H	RW	0=OFF	
				1=ON	
Key lock	C 8H	15H	RW	0=OFF	
				1=ON	
Analog output Module mode	C 8H	16H	RW	0=U_5(5V)	
				1= LoUt(4~20mA)	
Baud rate	C 8H	18H	RW	0= 9600	
				1= 19200	
				2= 38400	
				3= 57600	
				4= 115200	
				5= 230400	
				6= 312500	
				7= 468750	
				8= 500000	
				9= 625000	
				10= 833333	
				11= 937500	
				12= 1250000	
Setup save settings	C 8H	19H	W	0=Abandon the current setting and restore the previous setting	
				1=Save, and overwrite previous settings	
Restore factory settings	C 8H	1AH	W	0=OFF	
				1=ON	
Hardware version	C 8H	1FH	R	sensor hardware version	
Software version	C 8H	20H	R	sensor software version	
Product number	C 8H	21H~29H	R	Product reference (18 bytes)	
Production serial number	C 8H	2AH~35H	R	Production serial number (24 bytes)	

For example, to obtain the measured value sending format: 0103C8010001EBAA