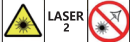


Laser displacement sensor PDE 485 series

Operation manual



Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

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Precautions

- Please do not use in the following environment
 - Direct sunlight
 - Places with high humidity or easy condensation
 - Places containing corrosive gases
 - Places subject to severe vibration or shock
- Connection and installation
 - Do not use the sensor in an unstable state immediately after the power is turned on, it is recommended to test after 30 minutes of power on to achieve desired accuracy
 - Be sure to carry out wiring with the power off. If a wrong wiring occurs, it will cause a malfunction
 - Please make sure that the power supply voltage is within the rated value before powering on
 - Please use rated load
 - The RS485 signal line cannot be short-circuited with the power supply, otherwise it may cause product failure or damage the product
 - When installing the sensor, do not subject the sensor to severe external forces (such as hammering, etc.), as this may damage the sensor performance
 - Do not bend the lead out of the cable with excessive force, and avoid applying pressure such as pulling
- Cleaning
 - Thinner will corrode the surface of the filter, it is best to avoid using it
 - If the surface of the display window is covered with dust, turn off the laser emission first, and then wipe it gently with a dry dust-free cloth

Safety warning (LASER RADIATION: CLASS 2 LASER PRODUCT)

- Do not use in an environment with flammable, explosive or corrosive gases
- The RS485 communication line should not be too long
- Do not disassemble, repair or modify this product without authorization
- This product is dangerous, please do not look directly at the laser or observe the optical system through the lens
- Do not look into the laser beam intentionally
- Never point the laser beam at people's eyes
- Current national regulations regarding laser protection must be observed

Maintenance/scrap treatment

- When the product is scrapped, please dispose of it as industrial waste
- Do not disassemble the sensor. If the sensor fails, contact the relevant supplier or manufacturer

Précautions

- Veuillez ne pas l'utiliser dans les environnements suivants
 - Endroits exposés à la lumière directe du soleil
 - Endroits très humides ou sujets à la condensation
 - Lieux contenant des gaz corrosifs
 - Lieux sujets à de fortes vibrations ou impacts
- Connexion et installation
 - Veuillez ne pas utiliser ce capteur dans un état instable peu de temps après la mise sous tension. Il est recommandé de tester après la mise sous tension pendant 30 minutes pour obtenir une précision idéale
 - N'effectuez pas de travaux de câblage sans couper l'alimentation électrique. Un mauvais câblage peut provoquer des dysfonctionnements
 - Veuillez vous assurer que la tension d'alimentation est comprise dans la tension nominale avant de mettre sous tension
 - Veuillez utiliser la charge sous la valeur nominale
 - La ligne de signal RS485 ne peut pas être court-circuitée avec l'alimentation, sinon cela pourrait provoquer une panne du produit ou l'endommager
 - Lors de l'installation du capteur, ne soumettez pas le capteur à une force externe importante (telle que des coups de marteau, etc.), car cela pourrait endommager les performances du capteur
 - Ne pliez pas excessivement la partie de sortie du câble et évitez d'appliquer une pression telle que tirer

Operating instructions

1. Normal detection

- When conducting basic teaching, please ensure that the detection output is set to [Normal Detection] in the PRO mode beforehand.

Distance

Background object

Sensing object

Reference value

ON

OFF

① In the presence of a background object, press the TEACH button.

② When an object is detected, press the TEACH button.

The stable detection is successful

Unstable display failed

- This method is recommended when there are small object and background object.
- For normal detection, please ensure that the detection output is set to [Normal Detection] in the PRO mode beforehand.

When the background object is the reference

Distance

Background object

Reference value

Teach value

UP Key

When the sensing object is the reference

Distance

Background object

Reference value

Teach value

DOWN Key

① In the state of the background object or the state of the sensing object, press the TEACH key

② Press the UP /DOWN key to adjust the reference value

③ Press the TEACH key to confirm

- faire le ménage
 - Le diluant corrodera la surface du filtre, évitez son utilisation
 - Si la surface de la fenêtre d'affichage est recouverte de poussière, veuillez d'abord éteindre l'émission laser, puis essuyez délicatement avec un linge sec et sans poussière

Avertissement de sécurité (Rayonnement optique : produit laser de class 2)

- Ne pas utiliser dans des environnements contenant des gaz inflammables, explosifs ou corrosifs
- Ne rendez pas la ligne de communication RS485 trop longue
- Veuillez ne pas démonter, réparer ou modifier ce produit sans autorisation
- Ne regardez pas directement dans le laser et n'observez pas le système optique à travers la lentille
- Ne regardez pas intentionnellement dans le faisceau laser
- Ne dirigez pas le faisceau laser vers les yeux humains
- Veuillez respecter les réglementations nationales en vigueur concernant la protection laser

Réparation/traitement des déchets

- Lorsque le produit est mis au rebut, veuillez le jeter comme déchet industriel
- Veuillez ne pas démonter le capteur par vous-même. Si le capteur rencontre un dysfonctionnement, veuillez contacter le fournisseur ou le fabricant concerné

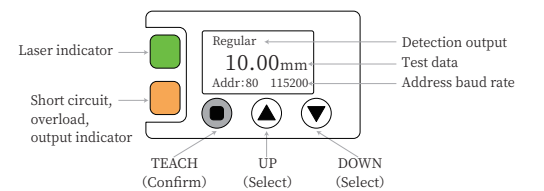
Laser label description



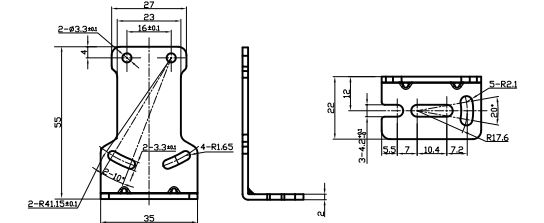
- This sensor series are Class 2 LASER PRODUCTS, please do not into beam. Warning labels are affixed to this series, please use them according to label instructions.

Cette série de produits est un produit laser de classe 2. Veuillez ne pas regarder directement le laser ni observer à travers le laser. Une étiquette d'avertissement est attachée, veuillez l'utiliser conformément aux instructions de l'étiquette.

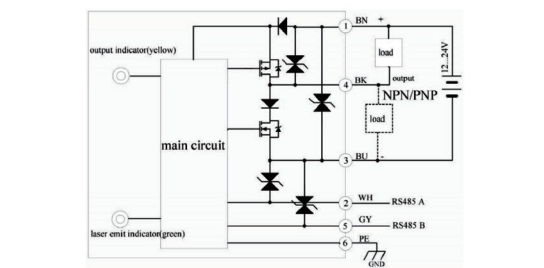
Keys and display instructions



Accessory dimensions



Wiring diagram



2. 1-point teaching (window compare mode)

- For distance measurement from the detection object's reference surface, do not use the 1-point teaching method. Instead, set an upper and lower limit value. The system will make judgments within this range.
- When performing 1-point teaching (Window Comparison mode), please set the detection output to "1-Point Window" in the PRO mode in advance. For setting method, please refer to "10 PRO Mode Operating Instruction".

Distance

Sensing object

Reference value 2_SL

Reference surface

Reference value 1_SL

ON

OFF

① In the case of sensing object, press the TEACH key twice

② End of teach

3. 2-point teaching (window compare mode)

- Method of conducting 2-point teaching and setting reference value range.
- In the case of performing 2-point teaching (window compare mode), please set the detection output in PRO mode to [2-point window] in advance. For setting method, please refer to "10 PRO Mode Operating Instruction".
- When conducting teaching, please use sensing objects in different distances (P-1, P-2).

Distance

Sensing object P-1

Sensing object P-2

2nd time (reference value 2_SL)

1st time (reference value 1_SL)

ON

OFF

① Press the TEACH key in the presence of sensing object P-1 (1st time).

② Press the TEACH key in the presence of sensing object P-2 (2nd time).

Display "OK" for stable detection.

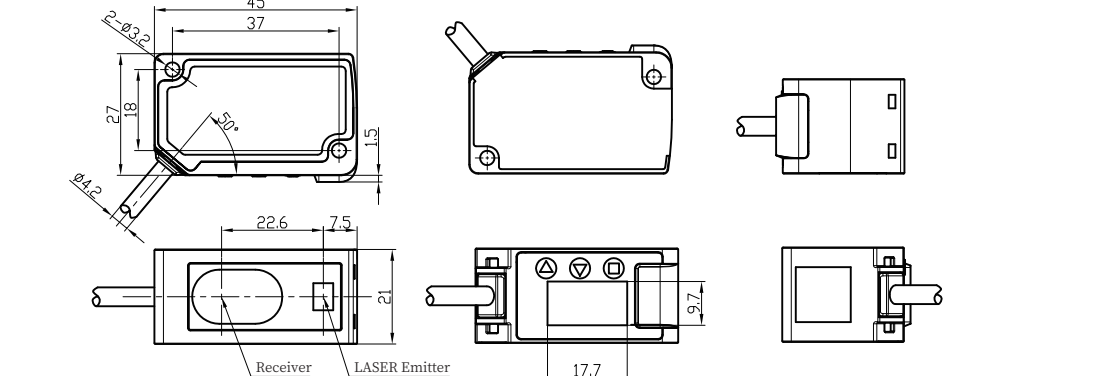
Display "Fail" for unstable detection

Technical specifications

Type	RS-485+switch value					
Model ^④	PDE-CR30TGR	PDE-CR40TGR	PDE-CR50TGR	PDE-CR100TGR	PDE-CR200TGR	PDE-CR400TGR
Center distance	30mm	43mm	50mm	100mm	200mm	400mm
Measuring range	±5mm	±12mm	±15mm	±35mm	±80mm	±200mm
Full scale(F.S.)	25-35mm	31-55mm	35-65mm	65-135mm	120-280mm	200-600mm
Supply voltage	12...24VDC					
Consumption power	≤960mW					
Load current	≤100mA					
Voltage drop	<2V					
Light source	Red laser (658±8nm);Laser level:Class2;Max average power:1mW;Pulse duration:450μs; Emission angle:0.06°;Frequency:1.67kHz					
Beam diameter ^①	About Φ50μm (at 30mm)	About Φ70μm (at 43mm)	About Φ70μm (at 50mm)	About Φ120μm (at 100mm)	About Φ300μm (at 200mm)	About Φ500μm (at 400mm)
Resolution	1μm	10μm		10μm	100μm	100μm
Linear accuracy ^②	±0.1%F.S.	±0.1%F.S.		±0.1%F.S.	±0.2%F.S.	±0.2%F.S.(measuring distance 200mm-400mm) ±0.3%F.S.(measuring distance 400mm-600mm)
Repeat accuracy ^③	10μm	30μm		70μm	200μm	300μm@200mm-400mm 800μm@400mm(include)-600mm
Output	Digital value:RS-485(support modbus protocol);Switch value:NPN/PNP and NO/NC settable					
Distance setting	Keypress/RS-485 setting					
Response time	<10ms					
Dimension	45mm*27mm*21mm					
Display	OLED display (size:18*10mm)					
Temperature drift	<0.04%F.S./°C	<0.03%F.S./°C			<0.04%F.S./°C	
Indicator	Laser working indicator:green light;Switch output indicator:yellow light					
Protection circuit ^③	Short circuit protection,reverse polarity protection, overload protection					
Built-in function	Slave address & Baud rate setting;teach mode;reference value fine tuning;Peak/bottom keeping; Zero setting;Keypad lock;Factory data reset;Chinese-English interface;Eco mode					
Operating environment	Operation temperature:-10...+45°C;Storage temperature:-20...+60°C; Ambient temperature:35...85%RH(no condensation)					
Anti ambient light	Incandescent light:<3,000lux; Sunlight interference:≤10,000lux					
Protection degree	IP65					
Material	Housing:Zinc alloy;Lens:Glass;Diaplay:Glass					
Vibration resistant	10...55Hz Double amplitude 1.5mm,0.5H each in X,Y,Z directions					
Impulse resistant	500m/s ² (about 50G)3 times each in X,Y,Z directions					
Connection	2m PVC cable(0.2mm ²)					
Accessory	M3*30 screw ×2,nut ×2,gasket ×2,mounting bracket×1					

Remark: ① This data is a value that measures the distance from the center and is defined as 50% of the center light intensity.
② The measurement conditions are as follows: power supply voltage: 24V DC, ambient temperature: 23±5°C, response time: high precision, object: 90% reflectivity white card, test after preheating 30 minutes, 1000 statistical results (following 2σ criteria).
③ The circuit protection is only for switch output version.
④ This operation manual is only for the listed models. The functions and operations may be different for the customized models of other industries or customers. For details, please check the actual specifications.

Dimensions



4. 3-point teaching (window compare mode)

- When conducting 3-point teaching (P-1, P-2, P-3). Set the reference value 1_SL between the 1st and 2nd times, and set the reference value 2_SL between the 2nd and 3rd times.
- In the case of performing 3-point teaching (window compare mode), please set the detection output in PRO mode to [3-point window] in advance. For setting method, please refer to "10 PRO Mode Operating Instruction".
- When conducting teaching, please use sensing objects in different distances (P-1, P-2, P-3).
- After teaching, the reference points P-1, P-2, P-3 are automatically sorted in ascending order.

Distance

Sensing object P-1

Sensing object P-2

Sensing object P-3

3rd time

Reference value 2_SL

2nd time

Reference value 1_SL

ON

OFF

① Press the TEACH key in the presence of sensing object P-1 (1st time).

② Press the TEACH key in the presence of sensing object P-2 (2nd time).

③ Press the TEACH key in the presence of sensing object P-3 (3rd time).

Display "OK" for stable detection.

Display "Fail" for unstable detection.

5. Rising /Trailing differential span adjustment

- Ignore gradual change measurement and only use when detecting sharp measurement changes.
- In the case of using rising differential or trailing differential mode, please set the detection output in PRO mode to [rising differential] or [trailing differential] in advance.
- For setting method, please refer to "10 PRO Mode Operating Instruction". The reference value can be set by the reference value fine adjustment function.
- function. For this function, please refer to "6 reference value fine adjustment function".

① Press the TEACH key to enter.

② Press UP key/DOWN key to choose span.

③ Press the TEACH key to confirm.

6. Reference value fine adjustment function

- The reference value can be fine-tuned in the measurement screen.
- The reference value can be fine-tuned after teaching.

6.1 Normal detection/rising differential/trailing differential mode

Press the UP/DOWN key to enter.

Press the UP/DOWN key to adjust the value.

Press the UP/DOWN key to adjust the value.

Press the TEACH key to confirm.

Press the TEACH key to confirm.

6.2 Window compare mode

- When the detection output is set to window compare mode, press the TEACH key for 1s to switch between 1_SL and 2_SL.

Press the TEACH key for 1s to switch between 1_SL and 2_SL.

Press the TEACH key for 1s to switch between 1_SL and 2_SL.

- When you want to fine-tune the reference value of 1_SL or 2_SL, press the UP key or DOWN key, and after 1_SL or 2_SL is displayed, you can fine-tune the reference value.

Press the UP/DOWN key to enter.

Press the UP/DOWN key to adjust the reference value.

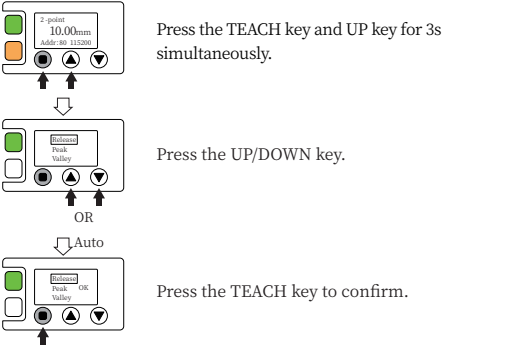
Press the UP/DOWN key to adjust the reference value.

Press the TEACH key to confirm.

Remark: ① The reference value is the action point

7. Peak and bottom hold function

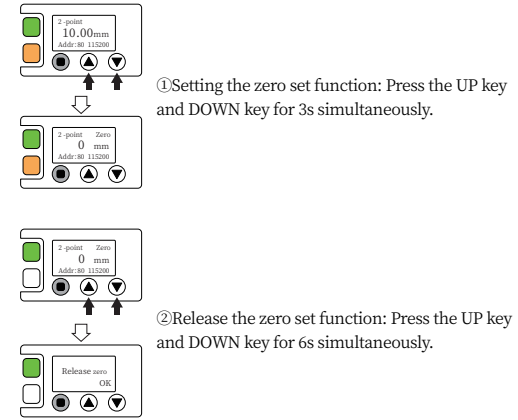
- Peak and bottom hold function is the function that display peak and bottom values.
- This function can only be realized by selecting [Setting Hold]-[Open].



Name	Function
Release	Release the peak and bottom hold state and hold the measured value out of range.
Peak	Hold the maximum value of the measurement when out of range.
Bottom	Hold the minimum value of the measurement when out of range.

8. Zero set function

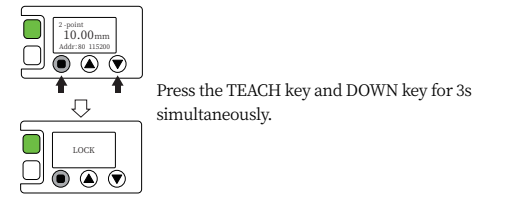
- Zero set function is the function of forcing the measurement value to "zero".
- This function cannot be set when the display setting is set to offset.



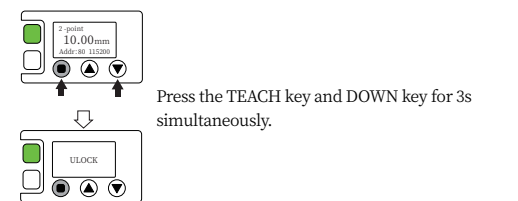
9. Key lock function

- The key lock function is the function that not accept key operation so as not to change the setting conditions in each setting mode incorrectly.
- After setting the key lock, if you operate the keys, "LOCK" will be displayed.

9.1 Setting the key lock function



9.2 Release the key lock function

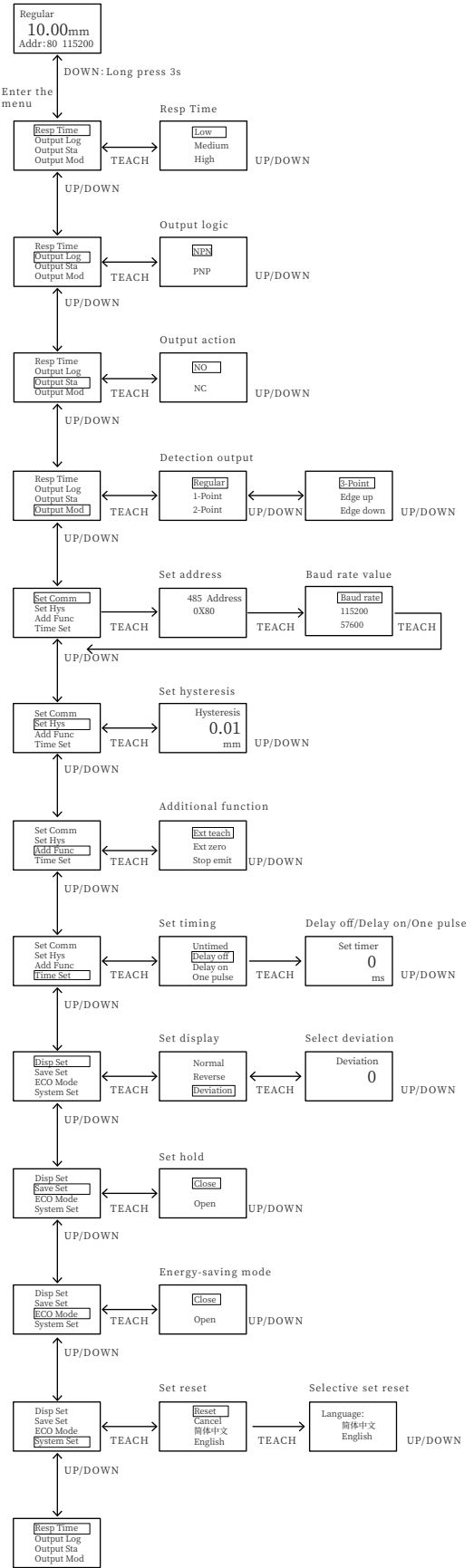


10. PRO mode setting

- In the process of setting PRO mode, if you press the DOWN key for more than 3s, you will return to the measurement interface.

Item	Initial state	Content
Response time	High precision	Set response time. High precision, standard, high speed
Output logic	NPN	Select output logic NPN, PNP
Output status	NO	Select output status. NO, NC
Detection output	Normal detection	Set detection output. Normal detection/1-point window/2-point window/3-point window/rising differential/trailing differential
Communication setting	Address setting (0x80) Baud rate value (115200)	Select the address and baud rate for the 485 communication. address setting (0x80~0xF4), baud rate value (115200/57600/38400/19200/9600)
Hysteresis setting	PDE-CR30TGxx: 0.010mm PDE-CR40TGxx: 0.01mm PDE-CR50TGxx: 0.01mm PDE-CR100TGxx: 0.02mm PDE-CR200TGxx: 0.1mm PDE-CR400TGxx: 0.2mm	Hysteresis range PDE-CR30TGxx: 0.001~5.000mm PDE-CR40TGxx: 0.01~12.00mm PDE-CR50TGxx: 0.01~15.00mm PDE-CR100TGxx: 0.02~35.00mm PDE-CR200TGxx: 0.1~80.0mm PDE-CR400TGxx: 0.2~200.0mm
Additional function	Teaching	Additional function setting. Teaching, zero set, stop emission
Timer setting	No timer setting	Set the timer action. No timer setting, Off-delay (0~100ms), On-delay (0~100ms), one pulse (0~100ms)
Display setting	Normal	Switchable measurement value display. Normal, Invert, Offset Offset range: PDE-CR30TGxx: 0~25mm PDE-CR40TGxx: 0~31mm PDE-CR50TGxx: 0~35mm PDE-CR100TGxx: 0~65mm PDE-CR200TGxx: 0~120mm PDE-CR400TGxx: 0~200mm
Hold setting	Off	Control output and analog output actions are set when measurement errors occur (due to insufficient light, light saturation, out of measurement range). off, on
Eco mode	Open	If the key is not operated within 5 minutes, the digital display can be partially extinguished. Current consumption can be controlled. Open and close
System setting	Set reset	Set the system mode. Set reset, cancel reset, Chinese, English

Measurement screen



11. Error display

The following measures should be taken in case of error

Error display	Content	Proposal
----	The reflected light is insufficient, and the sensing object is out of the measurement range.	Please confirm whether the sensing object is within the measuring range. Please adjust the mounting angle of the sensor.
Short circuit overload, the yellow indicator blinks at 4Hz	Detects excessive current caused by short circuit of the output load.	Please cut off the power s supply to confirm the load.
Laser damage	The semiconductor laser is damaged or has reached the end of its useful life.	Please consult our company.

12. 485 Protocol

- Communication Specifications

Communication way	RS485
Synchronization method	Asynchronous
Baud rate	115200/57600/38400/19200/9600bps
Data length	8 bits
Stop bit	1 bits
Parity check	None

- 0x03 Instruction (read input register)

1.Communication frame format

Address code	Function code	Input register address	Data amount	CRC code
1 BYTE	1 BYTE	2 BYTE	2 BYTE	2 BYTE

2.Response frame format

Address code	Function code	Bytes 2N	Data amount	CRC code
1 BYTE	1 BYTE	2 BYTE	2 BYTE	2 BYTE

Read data						Response					
Address code	Function code	Input register address	Data amount	CRC	Read description	Address code	Function code	Bytes	Data amount	CRC	Response description
80	03	9C50	0001	B45A	Measured value	80	03	04			Measured value
									FFFF FFFF	6AAF	Over range
											Reference value
											1_SL
80	03	9C63	0001	4455	Reference value	80	03	04			Reference value
80	03	9C65	0001	A454	1_SL	80	03	04			1_SL
80	03	9C67	0001	0594	2_SL	80	03	04			2_SL
80	03	9C52	0001	159A	Response time	80	03	02	0000	845A	High precision
									0001	459A	Standard
									0002	059B	High speed
80	03	9C53	0001	445A	Output logic	80	03	02	0000	845A	NPN
									0001	459A	PNP
80	03	9C54	0001	F59B	Output status	80	03	02	0000	845A	NO
									0001	459A	NC
									0000	845A	Normal detection
									0001	459A	1-point window
									0002	059B	2-point window
80	03	9C55	0001	A45B	Detection output	80	03	02	0003	C45B	3-point window
									0004	8599	Rising differential
									0005	4459	Trailing differential
80	03	9C58	0001	3598	Hysteresis setting	80	03	02			Hysteresis value

- 0x06 command (write multiple hold registers)

1.Communication frame format

Address code	Function code	Input register address	Data amount	CRC code
1 BYTE	1 BYTE	2 BYTE	2 BYTE	2 BYTE

2.Response frame format

Address code	Function code	Input register address	Data amount	CRC code
1 BYTE	1 BYTE	2 BYTE	2 BYTE	2 BYTE

Write the command						Response				
Address code	Function code	Input register address	Data amount	CRC	Function setting	Address code	Function code	Input register address	Data amount	CRC
80	06	9C5E	00A5	1822	Address	A5	06	9C5E	00A5	1F17
00	06	9C5E	0088	C7FF	Unicast	88	06	9C5E	0088	D977
80	06	9C5F	0000	8999	115200	80	06	9C5F	0000	8999
			0001	4859	57600				0001	4859
			0002	0858	38400				0002	0858
			0003	C998	19200				0003	C998
			0004	885A	9600				0004	885A
80	06	9C63			Reference value	80	06	9C63		/
80	06	9C65			1_SL	80	06	9C65		/
80	06	9C67			2_SL	80	06	9C67		/
80	06	9C61	0000	E855	Release	80	06	9C61	0000	E855
80	06	9C61	0001	2995	Peak	80	06	9C61	0001	2995
80	06	9C61	0002	6994	Bottom	80	06	9C61	0002	6994
80	06	9C52	0000	185A	High precision	80	06	9C52	0000	185A
80	06	9C52	0001	D99A	Standard	80	06	9C52	0001	D99A
80	06	9C52	0002	999B	High speed	80	06	9C52	0002	999B
80	06	9C53	0000	499A	NPN	80	06	9C53	0000	499A
80	06	9C53	0001	885A	PNP	80	06	9C53	0001	885A
80	06	9C54	0000	F85B	NO	80	06	9C54	0000	F85B
80	06	9C54	0001	399B	NC	80	06	9C54	0001	399B
80	06	9C55	0000	A99B	Normal detection	80	06	9C55	0000	A99B
80	06	9C55	0001	685B	1-point window	80	06	9C55	0001	685B
80	06	9C55	0002	285A	2-point window	80	06	9C55	0002	285A
80	06	9C55	0003	E99A	3-point window	80	06	9C55	0003	E99A
80	06	9C55	0004	A858	Rising differential	80	06	9C55	0004	A858
80	06	9C55	0005	6998	Trailing differential	80	06	9C55	0005	6998
80	06	9C58			Hysteresis value	80	06	9C58		

- Error feedback

Address and CRC Check Errors will not receive data feedback from the slave device; other errors will return an error code to the host. The second bit of the data frame (function code), when added to 0x80, indicates that an error has occurred (illegal function code, illegal value, etc.). If the sum of the second bit of the data frame (function code) and 0x80 exceeds 0xFF, the second bit will return 0xFF.

1.Return error instruction as follows (illegal function code):

Address code	Function code	Error code	CRC	
80	91	1	MSB	LSB

An invalid function code is considered when the code is not 0X03 or 0X06. For example: send command: 80 11 9C 74 00 00 8D 92 return: 80 91 01 DC 78 send command: 80 88 9C 74 00 00 91 8E return: 80 FF 01 F0 18

2.Return error instruction as follows (write illegal register address):

Address code	Function code	Error code	CRC	
80	86	2	MSB	LSB

An invalid register is considered when the register address is incorrect. For example: send command: 80 06 9C 00 00 00 B9 8B return: 80 86 02 93 89

3.Return error instruction as follows (read illegal register address):

Address code	Function code	Error code	CRC	
80	83	2	MSB	LSB

An invalid register is considered when the register address is incorrect. For example: send command: 80 03 9C 00 00 00 75 8B return: 80 83 02 90 D9

4.Return error instruction as follows (write illegal data value)

Address code	Function code	Error code	CRC	
80	86	3	MSB	LSB

An invalid data value is considered when the data value is incorrect. For example: send command: 80 06 9C 52 00 10 19 96 return: 80 86 03 52 49

5.Return error instruction as follows (read illegal data value):

Address code	Function code	Error code	CRC	
80	83	3	MSB	LSB

An invalid data value is considered when the data value is incorrect. For example: send command: 80 03 9C 52 00 10 D5 96 return: 80 83 03 51 19

- Communication example (obtain distance)

Send command 80 03 9C 50 00 01 B4 5A

Address code	Function code	Register address	Data amount	CRC
80	03	9C50	0001	B45A

Information feedback 80 03 04 80 03 03 8D 72 6E

Address code	Function code	bytes	Data amount	CRC
80	03	04	8003038D	726E

0x8003038D indicates the distance information, 0x80xxxxxx indicates the negative value and 0x00xxxxxx indicates the positive value, in um. 0x8003038D is a negative value and the hexadecimal 0x03038D converted to decimal is 197517, so the distance is -197517um. 0x000637DC is a positive value and the hexadecimal 0x0637DC converted to decimal is 407516, so the distance is 407516um.

- Communication example (set the baud rate to 9600)

Send command 80 06 9C 5F 00 04 88 5A

Address code	Function code	Register address	Data amount	CRC
80	06	9C5F	0004	885A

PDE-Ver. 2.0 Y1226

This specification doesn't relate to patent responsibility. Moreover, our company is always devoting to improving product quality, and reserves the right to improve products by changing pattern or size without prior notice. We have considered all the notes when compiling this specification, but for the wrong or clipped parts, and any loss caused by using this manual information, we bear no responsibility.

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