O-Net Industrial Technologies (Shenzhen) Limited

CMOS displacement sensor

DL-G45N

Instruction Manual

Thank you for choosing O-net products. Before use, be sure to abide by the following.

- Please read this manual carefully and use it correctly on the basis of full understanding.
- Keep this manual in a safe place after reading it so that it can be used at any time.

Safety Precautions

WARNING	• This product is only intended to detect object(s). Do not use thisp-roduct for the purpose to protect a human body or part of a human body. This product is not intended for use as an explosion-proof product. Do not use this product in a hazardous location and/or potentially explosive atmosphere.

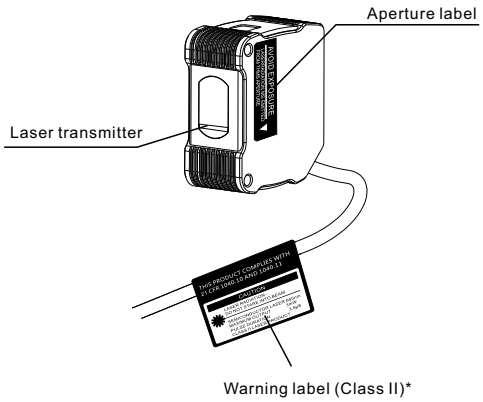
Safety Precautions on Laser Products

WARNING	• This product employs a semiconductor laser for its light source. • Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure. • Follow the instructions mentioned in this manual. Otherwise, injury to the human body (eyes and skin) may result. • Do not disassemble this product. Laser emission from this product is not automatically stopped when it is disassembled. **Precautions on classII/2 laser products** • Do not stare into the beam. • Do not direct the beam at other people or into areas where other people unconnected with the laser work might be present. • Be careful of the path of the laser beam. If there is a danger that the operator may be exposed to the laser beam reflected by specular or diffuse reflection, block the beam by installing an enclosure with the appropriate reflectance .

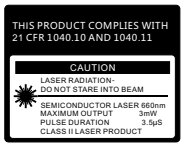
Safety Measures for The Laser

Laser warning labels

The following diagrams show the type and position of laser warning labels according to the DL Series.



● Warning label



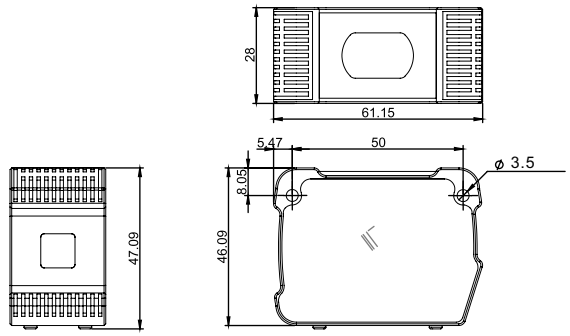
The FDA (CDRH) warning labels are only affixed to Class II laser products

● Emitter label

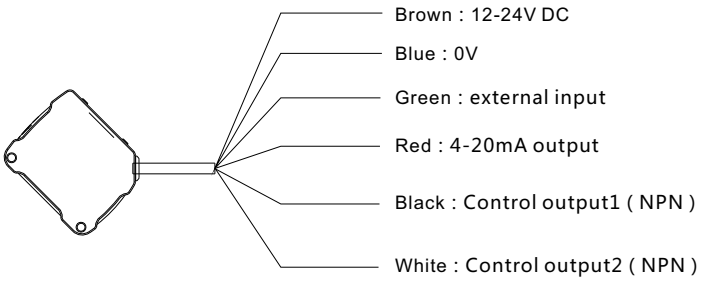
Mounting and Wiring the Sensor

Sensor shape size

Unit : mm



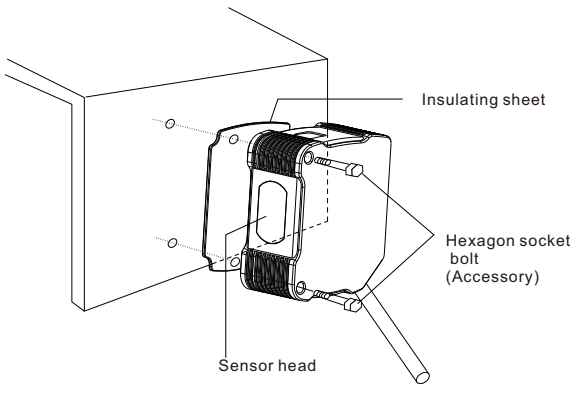
Wiring



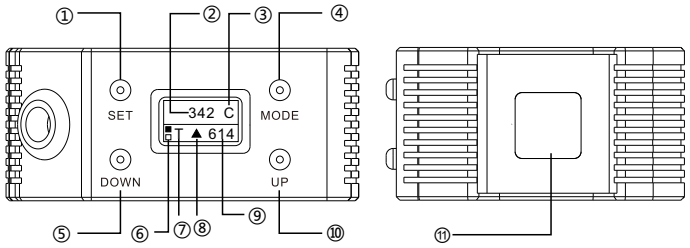
Mounting the Sensor

Use the dedicated mounting bracket to mount the sensor head.
When not using the dedicated mounting bracket, the included insulating sheet must be inserted between the mounting surface and the sensor head as shown in the diagram.(When using the dedicated mounting bracket, the insulating sheet is not necessary.)

① Put the sensor in the way of drawing.
② Insert the Hexagon socket bolt into the screw hole.
③ Tighten the Hexagon socket bolt .



Sensor Parts and Parameter Introduction



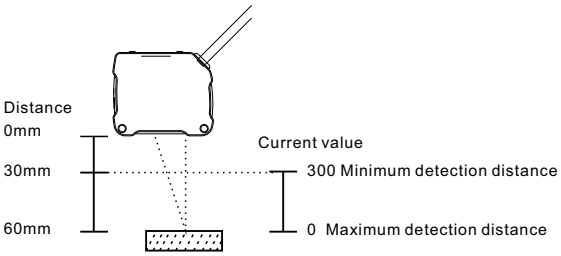
① [SET] button.
② Ch1: channel NO. display.
③ F-1:Current detection mode.
④ Setting clamp function
⑤ [MODE] button.
⑥ [DOWN] button.
⑦ Setting value display.
⑧ Display bar.
⑨ Current value display.
⑩ [UP] button.
⑪ The lower limit mark on the regional model.

NOTE:The sensor turns on the energy saving mode by default, and the main screen will be turned off if there is no operation button within 5 minutesOn the main screen, press the [DOWN] and [UP] button to make the current value 0, please refer to the manual switching target setting.

⑪Red and blue indicator, corresponding control output 1 and 2.

NOTE:The red indicator indicates the output control status of channel 1 , When output 1 (black line) output is controlled, the red indicator lights up , The blue indicator indicates the output control status of channel 2.When control output 2 (white line) output, blue indicator light.

Example



For example, when using the defaults with the setting value at 150, the comparator output turns on when the current value is 150 or greater and turns off when it is less than 148.(The hysteresis value is set to 2 by default, and if the hysteresis value is set to 0, the current value is closed when the value is less than 150).

Current value and display resolution

In the default state, the current value shows 0 when the workpiece is located at the maximum detection distance. Bringing the workpiece closer to the sensorhead gradually increases the value and displays it up to the minimum detection distance.

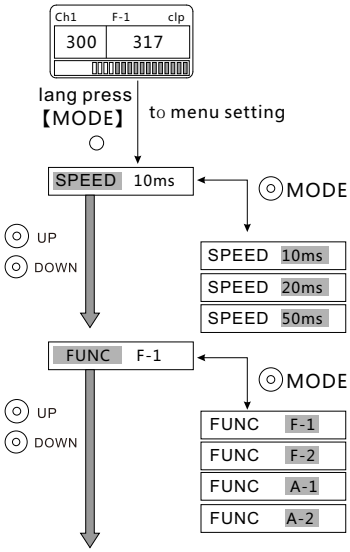
Item	DL-G70N
Detecting range (mm)	30mm-60mm
Digital display (initial)	300-0
Display resolution	1 (0.1mm)

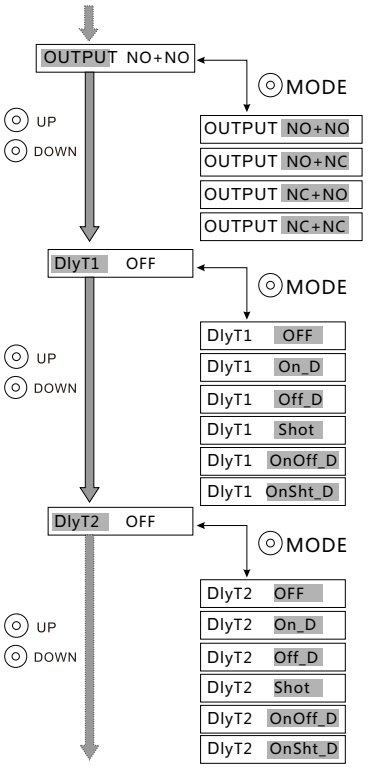
Setting value

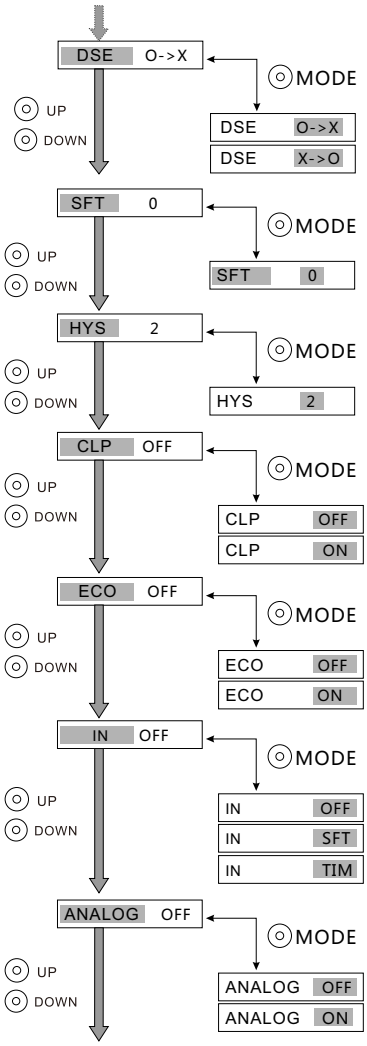
The following table shows the default setting values for each channel.

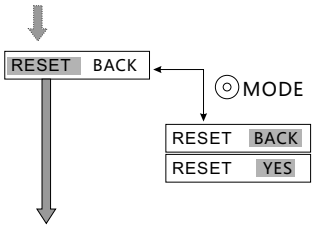
FUNC	Item	Default value	
F-1 A-1 A-2	Control output 1 (black) (select Channel 1)	150	
	Control output 2 (white) (select Channel 2)	125	
F-2	Control output 1 (black) (select Channel 1)	upper limit	150
		lower limit	100
	Control output 2 (white) (select Channel 2)	upper limit	125
		lower limit	75

Function Setting









lang press【MODE】(>3s) to complete
the setting and return to the detection state.

○

Functional

FUNCTION MODE

Detection method : It is divided into"Distance detection method" and Reference surface (DATUM) detection method".The reference surface (DATUM) detection method can only be used when performing reference surface calibration.

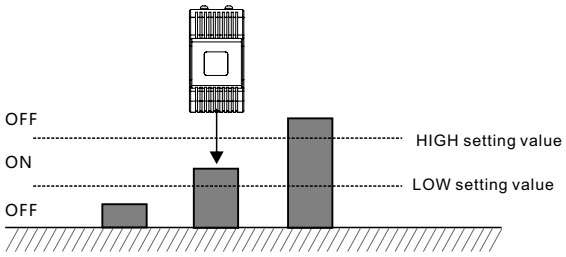
NOTE:Control output 2 is fixed to distance detection method(Normal) for all operation modes.

● Distance detection method (Normal)

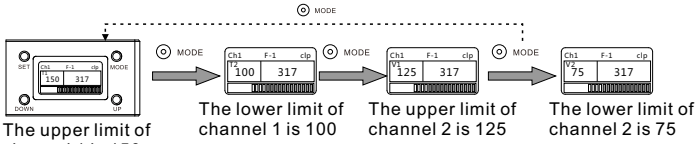
Detects the distance between the detection target and the sensor head, and then performs control output. The following table shows each operation mode and the auto calibration that can be used.

Operation mode		Description	Usable auto calibration
General	F-1	**Normal detection mode** The most general mode. ON/OFF judgment is performed based on one setting value.	2-point calibration Full auto calibration
Special	F-2	**Area detection mode** On/OFF judgment is performed on an area based on two settings.	
	A-1	**Edge hold mode** Detects the change in distance (derivation) to the target and holds the display.	
	A-2	**Surface detection mode** When multiple beams of light are reflected from the detection target, the closest reflected light is judged as the detection value.	

Area detection mode (F-2 mode)



When using the F-2 mode, the channel No. indicator switches in the following order each time the [MODE] button is pressed (The triangle upwards is the upper limit of the region,the triangle downwards is the lower limit of the region).



The upper limit of channel 1 is 150

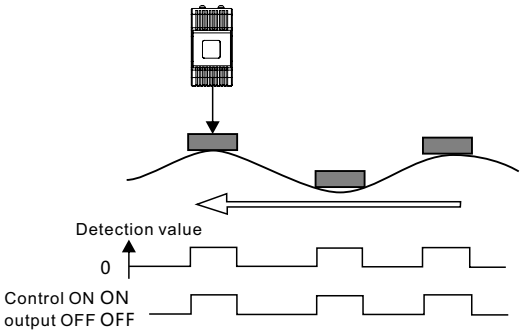
The lower limit of channel 1 is 100

The upper limit of channel 2 is 125

The lower limit of channel 2 is 75

Edge hold mode (A-1 mode)

This operation mode is suitable for detecting workpieces on a conveyer or detecting workpieces with waving backgrounds. It ignores slow distance changes and only detects workpieces (sudden changes in height).
When height differences greater than the setting value are detected (lowareas become high), the value at the detected time are held and displayed, and control output starts. If the difference is small and does not exceed the setting value, the display stays as 0. When height differences greater than the setting value are detected (high areas become low), detection value becomes 0 and control output is stopped.



● Reference surface detection (DATUM) method (Application)

This method memorizes the background (reference surface) and uses it to perform comparator output when there is a workpiece (when the state differs from the reference surface).
The reference surface detection (reference surface calibration) can only be used on Channel 1 of operation mode F-1/F-2.

NOTE:The letter below the screen changes to D when using reference surface detection after performing reference surface (DATUM) calibration.

Operation mode		Description	Changes to the setting value
General	F-1	Turns on control output when the detected surfaces is not the same as the memorized reference surface.The current value for the memorized surface is forciblyset to 0.	The setting value can be configured around 0. Individual setting values cannot be changed.
Special	F-2		The setting value can be configured around 0. Individual setting values can be adjusted.

■ Setting sensitivity

● Configuring the sensitivity setting for distance detection method

2-point calibration(operation modes: F-1, A-1, A-2)

1、Press the [SET] button once without a workpiece in place.The current value without the workpiece is read.

2、Place a workpiece in the detection position, and quickly press the [SET] button once again.

The setting value is calculated as the mean value between the value obtained in step 1 and the value obtained in step 2. This concludes 2-point calibration and thesensor returns to the detection state.

2-point area calibration (operation mode: F-2)

1.Place a workpiece on the upper limit that you want the sensor to detect, and press the [SET] button once.That upper limit becomes the HIGH setting value.

2.Place a workpiece on the lower limit that you want the sensor to detect, and press the [SET] button once.That lower limit becomes the LOW setting value.

Full auto calibration

This method performs calibration while the target is moving.

1 .Press and hold the [SET] button for at least three seconds while the target workpiece is passing through the detection area for the sensor.The sensitivity is set according to thedetection value while the [SET] button is pressed.

2 .Release the [SET] button when "SEt" flashes on the display. This concludes calibration and the sensorreturns to the detection state.

NOTE: When fully automatic calibration is used in the f-2 regional model, the maximum value will be designated as the area limit, and the minimum value will be defined as the region

● Configuring the sensitivity setting for reference surface (DATUM) detection method

Reference surface (DATUM) calibration (operation mode: F-1, F-2)

This method memorizes the state without a workpiece (reference surface) and use it to perform comparator output when the state differs from the reference surface (when there is a workpiece).

When performing reference surface calibration, the values are set for slightly above and slightly below the reference surface. When the detection value falls within this range, comparator output is turned off. When it falls outside of this range, comparator output is turned on.

1. Press the [SET] button once without a workpiece in place.

2. Press and hold the [SET] button for at least three seconds without the workpiece in place.

Operations during F-1 mode : The setting value can be adjusted by using the [Up] and [Down] arrow buttons

Operations during F-2 mode: The HIGH and LOW setting values can be adjusted individually by using the [Up]and [Down] arrow buttons.

NOTE: Reference surface calibration cannot be used during the following states

1.A mode other than F-1 mode or F-2 mode is being used.

2.Currently in channel 2

Clearing reference surface (DATUM) detection method

When the reference surface (DATUM) detection indicator is lit, press and hold the [Up] and [Down] arrow buttons for at least three seconds.The sensor returns to distance detection method.

The value is canceled if a form of calibration other than reference surface calibration.

■ Other Settings

● Zero point positioning

Sets the current value to zero (shift target value).

Operation: Press the [Up] and [Down] arrow buttons simultaneously without a workpiece in place. The current value becomes "0" and zero point positioning is complete.

NOTE：When the shift target value is set, performing zero point positioning does not make the current value "0". Instead, it becomes the set value for the shift target value.Pressing the [Up] and [Down] arrow buttons simultaneously for at least three seconds cancels the zero point (shift target value).

● Keylock Function

The keylock function prevents accidental operation of the buttons during detection. While using the keylock function, operations other than switching the display for the main screen are prohibited.

Operation: under the main screen, press the UP and MODE button at the same time, the channel indicates that the grid is locked and flash.

Note: unlocking is a long press UP and MODE button.

Setting Each Type of Function

■ Response speed setting

The response speed is the time the sensor begins to detect until the target is detected

Item	Setting range	Default value
Response speed	10/20/50 (Unit : ms)	10

■ Operation mode selection

Sets the operation mode.

Operation mode		Description	Default value
F-1	General	Normal detection mode	●
F-2	Special	Area detection mode	
A-1		Edge hold mode	
A-2		Surface detection mode	

Output mode setting

Sets the control output mode for each control output.

Item	Description			Default value
Output mode	Settings	Control output 1	Control output 2	NO+NO
	NO+NO	N.O	N.O.	
	NO+NC	N.O.	N.C.	
	NC+NO	N.C.	N.O.	
	NC+NC	N.C.	N.C.	

N.O. (normal open) and N.C. (normal close) operate in the following manner.

Output mode	During detection
N.O. (normal open)	ON
N.C. (normal close)	OFF

Delay timer setting

Delay setting of channel 1 and channel 2 by delay T1 and delay T2

Setting item	Description	Default value
Off	Delay timer is not used	●
On_D	On-delay	
Off_D	Off-delay	
Shot	One-shot	
OnOff_D	On-delay/off-delay	
OnSht_D	On-delay/one-shot	

Distance display setting

Setting item	Description	Default value
O->X	The display value increases as the target comes closer to the sensor head.	●
X->O	The display value decreases as the target comes closer to the sensor head.	

Setting the target value

Set this value to shift the current value by another amount.

Item	Setting range	Default value
target value	-50-320	●

At the same time, press the UP and DOWN buttons to switch the current value to the target value.The switching state can still be maintained even when the power is closed. You can press and keep the UP and DOWN buttons to clear the targetSwitching value

Hysteresis setting

Sets the hysteresis for judgment with control outputs 1 and 2.

item	Setting range	Default value
Hysteresis value	0 - 100	2

Clamp function setting

Set the operations when distance detection cannot be performed (such as when the detection object does not enter the detection range, or when there is insufficient light intensity).

Clamp	Description	Default value
OFF	The output is activated with the detection value, and the output changes when the target is not detected	●
ON	When the distance detection cannot be performed and "---" is displayed, , the comparator output operates in the same way as If the last detection object appears within the detection range	

Eco display setting

Set this parameter to reduce the consumption current,When running in power saving (eco) mode, pressing any button returns the sensor to normal operations. The main screen switches to eco mode if no operations take place for 5 minutes.

Eco display setting	Description	Default value
ON	Turns on the eco display.display screen close	●
OFF	Turns off the eco display	

Note: The ECO mode is turned on by default and can be set off in the menu

External input function setting

Sets the function assigned to the external input (green line).

Input	Description	Default value
OFF	external input	●
SFT	Used as "Bank switching input"	
TIM	Used as "Timing input".	

When external input is input, the current value is shifted by the value set for shifttarget value.Comparator output is only output over control output 1 when external input is on. Control output 2 continues to output comparator output, regardless of whether timing input is on or off.

NOTE: External input is low level effective.

Analog output Setting

The actual measured distance can be output by the analog output .

NOTE:The actual distance value corresponding to the default 4ma and 20ma current is 30mm and 60mm respectively

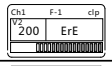
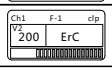
Iput	Description	Default value
OFF	Turn off analog output	●
ON	Turn on analog output	
D_4mA	The actual distance value corres ponding to 4ma current can be set	
D_20mA	The actual distance value corresponding to 20ma current can be set	

Factory setting

Returns all set default values to the factory

Factory setting	Description	Default value
BACK	No action	●
YES	Perform initialization.	

Error Displays and Corrective Actions

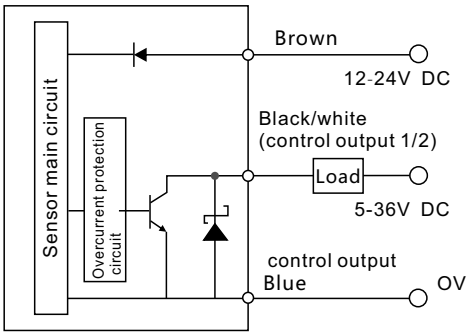
Error indication	Error contents	Remedy
	EEPROM damage	Please contact our office
	Output over current	Turn OFF the power and check the load

SPECIFICATION

Model			DL-G45N
type			Mid-range
light source	type		Visible semiconductor laser Wavelength: 655 nm
	Laser Class		Class II
Detection distance			30to60mm (300 to 0)
display range			320 to -50
Display resolution			1 (0.1mm)
Standard detection deviation			0.5mm
Response time			10ms/20ms/50ms
Spot diameter			Approx 0.5x2.5mm (Detection distance 45mm)
screen			0.96 inch OLED screen
Operation status indicators			Control output 1 (red) Control output 2 (blue)
specification	Power voltage		12-24 VDC, Ripple (P-P): 10% max Class 2
	Power consumption		2400 mW max. (at 24 V: 100mA max.)
	Control output		NPN open collector x 2ch, 36 V DC max. Max. 100 mA, residual voltage 1.8V max.
	External input		1. target value switching 2. timing input(Max 40V)
	protection circuit		Inverse current connection protection output surge protection
Environmental resistance	Enclosure rating		IP66
	Incandescent lamp	Surrounding light	5000lx
		Sunlight	5000lx
	Surrounding air temperature		-10 to +55°C (No freezing)
	storage temperature		-20 to +60°C (No freezing)
	Relative humidity		35 to 85% RH (No condensation)
	Vibration		10 to 55 Hz, 1.5 mm double amplitude in the X, Y, and Z directions, 2 hours respectively
Material			Housing material:aluminium alloy Display:PC Lens : Glass Cable : PVC
Shell size			61mm (L) × 47mm (W) × 28mm(H)

I/O Circuit Diagram

● Output circuit



● Input circuit