

Panasonic INSTRUCTION MANUAL

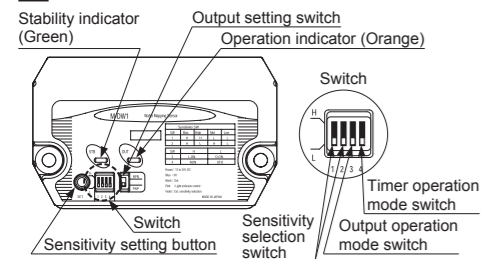
LED Beam Reflective Type Wafer Mapping Sensor M-DW1

Thank you very much for purchasing Panasonic products. Read this Instruction Manual carefully and thoroughly for the correct and optimum use of this product. Kindly keep this manual in a convenient place for quick reference.

WARNING

- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.
- In case the product may be subjected to electrostatic discharge, make sure to ground the stainless case.

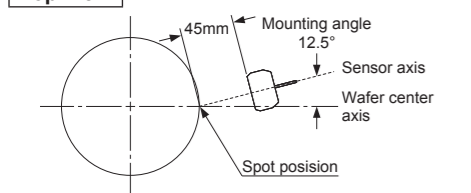
1 PART DESCRIPTION



2 MOUNTING

- Set the distance between the sensor detection surface and the wafer edge to be 45mm and mount the sensor so that sensing is done at an angle of 12.5° with respect to the wafer. Mount using M4 (length 16mm) screws. The tightening torque should be 1.2N·m or less. Further, although the sensing distance may change due to variation in the wafer position (wafer protrusion, orientation flat position, etc.), if it is within 5mm, stable sensing is possible.

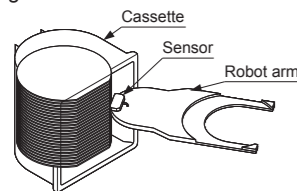
Top-view



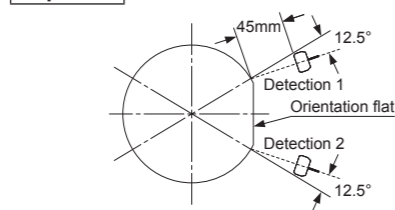
Note: If the wafer center axis and the sensor axis lie along a straight line, detection is not possible. Always mount the sensor at an angle to the wafer.

3 DETECTING WAFER HAVING ORIENTATION FLAT

- When detecting a wafer having an orientation flat, mount the sensor so that a portion other than the orientation flat is detected. Further, arrange to detect the wafer from two different angles by moving the robot arm, etc., and OR the signal so obtained.



Top-view



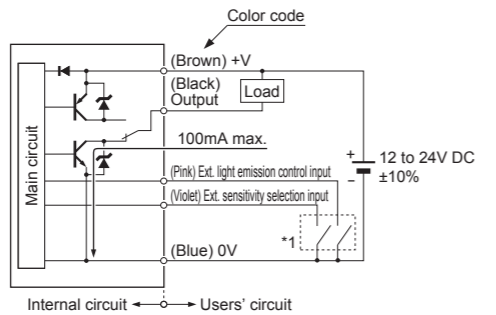
4 I/O CIRCUIT DIAGRAMS

- The output can be selected as NPN output or PNP output by the output setting switch.



Note: Make sure to operate the output setting switch in the power supply off condition. If it is operated with power on, it may get damaged.

NPN output

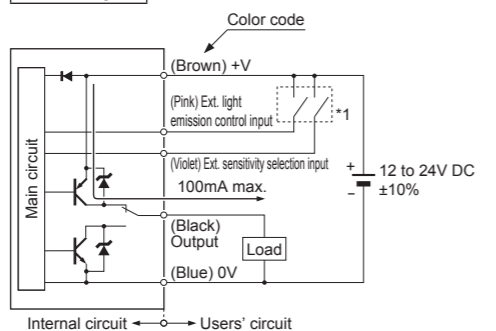


Non-voltage contact or NPN open-collector transistor



- External emission control input 0 to 3V, or 9V to +V (26.4V max.): Emission halted Open, or 4 to 8V: Emission
- External sensitivity selection input 0 to 3V, or 9V to +V (26.4V max.): Input ON Open, or 4 to 8V: Input OFF

PNP output



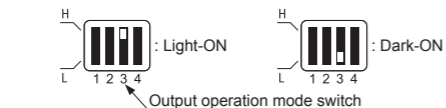
Non-voltage contact or PNP open-collector transistor



- External emission control input 0 to 3V, or 9V to +V (26.4V max.): Emission halted Open, or 4 to 8V: Emission
- External sensitivity selection input 0 to 3V, or 9V to +V (26.4V max.): Input ON Open, or 4 to 8V: Input OFF

5 OUTPUT OPERATION

- The output operation can be set either Light-ON or Dark-ON by the output operation mode switch.



6 SENSITIVITY SELECTION SETTING

- Sensitivity can be selected from four levels by appropriate setting of the sensitivity selection switch (2 bit).



Sensitivity selection switch	Sensitivity	Application
1 (MAX)	Maximum sensitivity (MAX)	Used for low reflectivity wafers with nitride or oxide film processing, or for thin wafers (0.3 to 0.4mm)
2 (HIGH)	High sensitivity (HIGH)	Sensitivity between maximum sensitivity and medium sensitivity
3 (MID)	Medium sensitivity (MID)	Used for high reflectivity polished wafers, etc., or for 3mm wafer pitch
4 (LOW)	Low sensitivity (LOW)	Lowest possible sensitivity setting

7 External sensitivity selection input

- The external sensitivity selection input (violet) becomes ON when it is connected to 0 to 3V, or 9V to +V (26.4V max.), and becomes OFF when it is kept open or connected to 4 to 8V.
- If the sensitivity is selected with the external sensitivity selection input, set the sensitivity selection switch as shown in the table below.

Sensitivity selection switch	Ext. sensitivity selection input	Sensitivity	Application
1 (MAX)	ON	Maximum sensitivity (MAX)	Used for low reflectivity wafers with nitride or oxide film processing, or for thin wafers (0.3 to 0.4mm)
2 (HIGH)	OFF	Medium sensitivity (MID)	Used for high reflectivity polished wafers, etc., or for 3mm wafer pitch
3 (MID)	ON	High sensitivity (HIGH)	Sensitivity between maximum sensitivity and medium sensitivity
4 (LOW)	OFF	Low sensitivity (LOW)	Lowest possible sensitivity setting

8 SENSITIVITY SETTING

- Although this sensor has an optical system which makes it difficult for the background to affect the detection, the background may have an effect when detecting small diameter wafers. Hence, if the background gets detected, or the stability indicator (green) lights off when the cassette has no wafers, sensitivity setting should be done so that the background does not have an effect. However, the sensitivity reduces when sensitivity setting is done.

Setting method

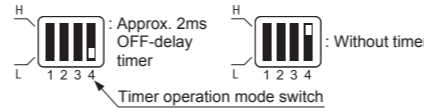
- Sensitivity setting is done when the background affects the detection. Press the sensitivity setting button in the actual environment where the sensor is to be used (place at which the background has an effect), but without any wafers being present.



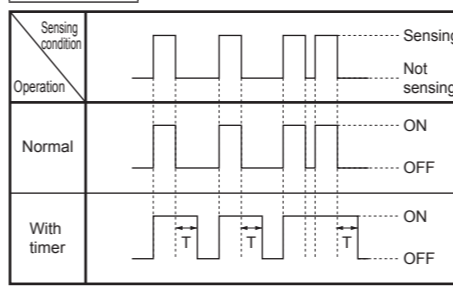
- The sensitivity is set at the time the sensitivity setting button is released. After the sensitivity setting, the output once turns into the detection state. If the sensitivity setting has been successfully done, the output turns to the non-detection state after 25ms approx. and the sensitivity is set so that the background does not have an effect. In case the output remains in the detection state, since this is a condition in which detection cannot be done, readjust the sensitivity selection switch. In this case, set the sensitivity selection switch to one level higher sensitivity than the present sensitivity level. However, if the sensitivity selection switch is already at maximum sensitivity (MAX), move the background further away.
- If sensitivity setting is done with nothing in the background, the sensitivity returns to the initial value.
- Since the sensitivity is stored in an EEPROM when the sensitivity setting button is pressed, the setting need not be repeated when the power is switched on again. However, note that the EEPROM has a lifetime and its guaranteed life is 100,000 write operation cycles.

9 TIMER FUNCTION

- Using the timer operation mode switch, it is possible to select an approx. 2ms fixed OFF-delay timer. Since the output is extended by a fixed period, it is useful when the connected device has a slow response time.



Time chart

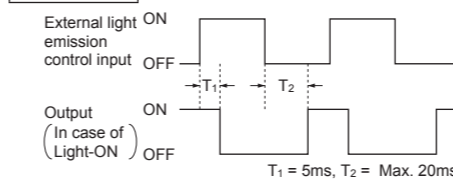


Timer period: T = Approx. 2ms

10 LIGHT EMISSION CONTROL FUNCTION

- Light emission is halted when the external light emission control input (pink) is connected to 0 to 3V, or 9V to +V (26.4V max.). In this case, the output turns to the dark state.

Time chart

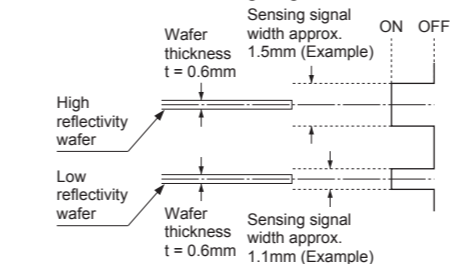


11 SENSING SIGNAL

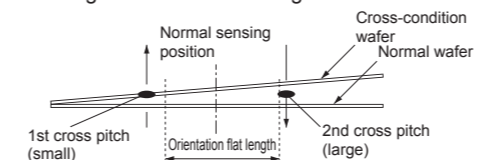
- Sensing signal width
- The sensing signal which is output from the sensor is as follows

- The sensing signal has a width larger than the thickness of the wafer.
 - The signal width also varies with the reflectivity of the sensing edge.
- High reflectivity (polish, aluminum film, etc.): Large signal width
 Example: Wafer thickness $t = 0.6\text{mm}$ → Signal width 1.5mm approx.
 Low reflectivity (nitride or oxide film processed): Small signal width
 Example: Wafer thickness $t = 0.6\text{mm}$ → Signal width 1.1mm approx.

- The signal width also changes with the sensing distance or the sensing angle.



- From the above, for determining the position of the wafer from the sensing signal, calculate the center position of the signal's ON region, while taking into consideration the response time.
- Narrow pitch sensing signal width
- In case of "3 DETECTING WAFER HAVING ORIENTATION FLAT," when the sensor is mounted at positions which avoid the wafer orientation flat, the pitch of a cross-condition wafer changes as shown in the figure below.



- The calculated pitch based on the wafer size is given in the table below.

Wafer size	Normal pitch	Orientation flat length	Wafer thickness	Cross pitch (small)	Cross pitch (large)
3 inch (75mm)	4.75mm	22.2mm	0.380mm	1.58mm	3.17mm
4 inch (100mm)	4.75mm	32.5mm	0.625mm	1.54mm	3.21mm
5 inch (125mm)	4.75mm	42.5mm	0.625mm	1.52mm	3.23mm
6 inch (150mm)	4.75mm	57.5mm	0.675mm	1.43mm	3.33mm
8 inch (200mm)	6.35mm	59.3mm	0.725mm	2.19mm	4.16mm

- From the above, it is seen that, since the pitch of the cross-condition wafer reduces, the pitch resolution required for high reflectivity wafers becomes more stringent than the specified resolution of 3mm. Hence, the sensing signal from two wafers may not be resolved and may become a continuous signal. Further, the sensing signal may also change due to the sensitivity setting, the reflectivity of the wafer, and the sensing conditions (sensing distance or sensing angle).

For the above reasons, in case of wafers which have been cross-inserted, since the small crosspitch side is similar to overlapping wafers, the sensing signal of two wafers may become a continuous signal or may get resolved.

- If the orientation flat happens to get in the position of sensing, sensing is not possible in one of the two sensing positions. Therefore, if the wafer is crossinserted, a resolved signal may not be output, and in this case, the information on the wafer position calculated from the sensing signal will be erroneous.

12 CAUTIONS

- This product has been developed / produced for industrial use only.
- Make sure that the power supply is off while wiring.
- Take care that wrong wiring will damage the product.
- Verify that the supply voltage variation is within the rating.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- In case noise generating equipment (switching regulator, inverter motor, etc.) is used in the vicinity of this product, connect the frame ground (F.G.) terminal of the equipment to an actual ground.
- Do not use during the initial transient time (0.5 sec.) after the power supply is switched on.
- Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.
- Extension up to total 10m, or less, is possible with 0.15mm², or more, cable. However, in order to reduce noise, make the wiring as short as possible.
- Make sure that stress by forcible bend or pulling is not applied directly to the sensor cable joint.
- Take care that the sensor is not directly exposed to fluorescent lamp from a rapid-starter lamp, a high frequency lighting device or sunlight etc., as it may affect the sensing performance.
- Make sure to use an isolation transformer for the DC power supply. If an autotransformer (single winding transformer) is used, this product or the power supply may get damaged.
- In case a surge is generated in the used power supply, connect a surge absorber to the supply and absorb the surge.
- Avoid dust, dirt, and steam.
- Take care that the product does not come in contact with water, oil, grease or organic solvents, such as thinner, etc.
- Do not allow any water, oil, fingerprints, etc., which may refract light, or dust, dirt, etc., which may block light, to stick to the sensing surfaces of the sensor. In case they are present, wipe them with a clean, dust-free soft cloth or lens paper.

13 SPECIFICATIONS

Item	Designation Model No.	LED beam reflective type wafer mapping sensor M-DW1
Center measuring distance	45mm	
Sensing object	3 inch or larger semiconductor wafer (Note 1)	
Detectable surface	Surface having a side edge which reflects light in the light receiving direction (Note 2)	
Sensing angle	12.5° ±5° (Note 3)	
Wafer pitch	Separate sensing is possible at normal sensitivity for 3mm pitch or more (Note 4)	
Suitable cassette	SEMI standard FOUP cassette / open cassette	
Supply voltage	12 to 24V DC ±10% Ripple P-P 10% or less	
Current consumption	65mA or less	
Output	<ul style="list-style-type: none"> NPN output / PNP output, selectable with output selection switch <NPN output> NPN open-collector transistor <ul style="list-style-type: none"> Maximum sink current: 100mA Applied voltage: 30V DC or less (between output and 0V) Residual voltage: 1V or less (at 100mA sink current) 0.4V or less (at 16mA sink current) <PNP output> PNP open-collector transistor <ul style="list-style-type: none"> Maximum source current: 100mA Applied voltage: 30V DC or less (between output and +V) Residual voltage: 1V or less (at 100mA source current) 0.4V or less (at 16mA source current) 	
	Output operation	Light-ON / Dark-ON, selectable by switch
Short-circuit protection	Incorporated (restored automatically)	
Response time	500μs or less	
External light emission control input	0 to 3V, or 9V to +V (26.4V max.): Emission halted Open, or 4 to 8V: Emission	
External sensitivity selection input	0 to 3V, or 9V to +V (26.4V max.): Input ON Open, or 4 to 8V: Input OFF	
Ambient temperature	0 to +55°C (No dew condensation) Storage: -10 to +70°C	
Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH	
Emitting element	LED (modulated)	
Material	Enclosure: ABS / Stainless steel (SUS 301) Lens: Acrylic	
Cable	0.15mm ² 5-core cabtyre cable, 300mm long	
Weight	Approx. 75g	

Notes: 1) In case of 8 inch or less wafers, the wafer pitch, orientation flat or the surface condition may affect the sensing.
 2) Polished wafers, etc., which have a sharp edge cannot be detected since they do not reflect the light in the light receiving direction.
 3) Since the position of the orientation flat may vary by ±20° due to its rotation, refer to "3 DETECTING WAFER HAVING ORIENTATION FLAT" for detection of a wafer having an orientation flat.
 4) This is the pitch of an 8 inch wafer near its center region when it is inserted in an inclined fashion. When detecting a wafer having an orientation flat, the wafer pitch becomes still smaller when sensing at positions which avoid the orientation flat. In this case, the sensing signal cannot be resolved and it becomes a continuous, broad signal. For details, refer to "11 SENSING SIGNAL."

14 INTENDED PRODUCTS FOR CE MARKING

- The models listed under "13 SPECIFICATIONS" come with CE Marking.
- As for all other models, please contact our office.

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