

INSTRUCTION MANUAL

Photoelectric Displacement Sensor Micro Laser Sensor **LM10**

CME-LM10F No.2148-00

Safety Precautions

Be sure to follow the precautions below to prevent any injury or accidents from occurring.

Be sure to read this instruction manual before installation, operation, maintenance and inspection. Before using the product, familiarize yourself with all product information, safety information and cautions. In this instruction manual, the safety precaution level is classified into 'Warning' or 'Caution'.

WARNING If the product is mishandled, death or serious injury could result.

CAUTION If the product is mishandled, serious injury or material damage could result.

WARNING

- When this product is used in applications where serious injury or serious material damage might result, take safety countermeasures, such as a double-safety mechanism etc.
- Do not use this product in a combustible-gas atmosphere. It may cause an explosion.

CAUTION

- Do not use this product outside the specifications. Abnormal heat or smoking could result.
- Never disassemble or modify the product. Electric shock or smoking could result.

Cautionary items for laser beam handling

This product is designated as a component intended for incorporation into another product and is based on the standards required by the U.S. Food and Drug Administration.

1. This product utilizes a Class II laser (wavelength 685nm) as the light source of the laser.
2. For safety reasons, avoid direct or indirect (e.g., reflection from the glossy target) exposure of human eyes to beam. For safety reasons, do not disassemble the unit. This product may not have an automatic laser-shutoff function when the unit is disassembled.
3. To avoid direct exposure to beam, it is recommended that the sensor be installed so that the beam height is higher or lower than operator's eyes.

Furthermore, the sensor should be fixed so that its beam hits diffuse-reflective or dark targets.

Be sure not to expose your eyes to the beam or the reflected beam from the glossy targets.

CAUTION-Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

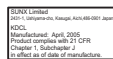
Labels

Cautions and Aperture labels, Identification and Certification label below are pasted on the sides of the sensor.

Caution and Aperture Label



Identification and Certification Label



Beam stopper

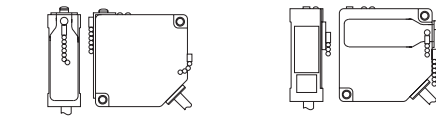
A beam stopper is attached to this product. To prevent accidental human exposure to laser radiation, set the beam stopper over the laser emitting faces when laser operation is not required.

When beam stopper is used:

Set the beam stopper to either side of the sensor with the accessory screws.

When beam stopper is not used:

Set the beam stopper to either side of the sensor with the accessory screws.



1 CE MARKING

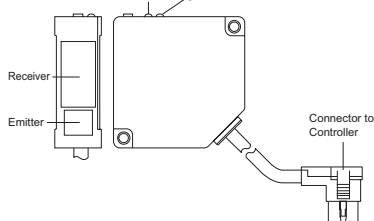
The Micro Laser Sensor LM10 conforms to the following standards under the EMC Directive and the Low voltage Directive.

- EMC Directive (89/336/EEC)
EN 50081-2 : 1993
EN 50082-2 : 1995

- Low Voltage Directive (72/23/EEC)
EN 60825-1 : 1994

2 PART DESCRIPTION

● Sensor (ANR11 series)



◆ For each type

- ① Laser emission indicator LED
The LED lights up during laser emission or just before its emission. To indicate an alarm condition, the LED on the sensor head blinks.
- ② Measuring range indicator LED
Blinks when a target is within the measurable range. Lights up when a target is around the measurement center. However, it may light up or blink even with a significant error in the measuring range when the alarm is enabled.
- ③ Alarm LED
Lights up when measurement is not possible (not enough light [DARK] or too much light [BRIGHT]).
- ④ Zero-point adjusting potentiometer
Adjusts the zero-point position to within a ±10% of F.S. Use to make minute adjustment after installing the sensor.
- ⑤ SPEED selection switch
The response speed can be set to one of three settings to allow adjustment for the target speed. When high response speed is unnecessary, set to the 10Hz mode.
- ⑥ GAIN selection switch
Under normal conditions, set to AUTO. During edge detection and other applications where you want to cut out the low light level areas, set to LOW.
- ⑦ I/O cable

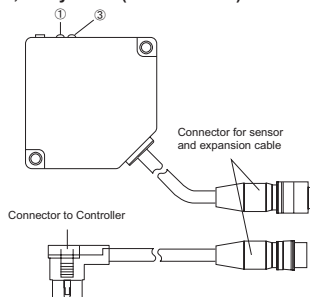
◆ Only for single comparator type

- ⑧ Operation indicator LED
Lights up when NEAR / DARK ON output is ON.
- ⑨ Analog displacement output switch
Switches between the displacement data / intensity data output and the comparative value setting output.
- ⑩ Comparative value setting potentiometer
Sets the comparative value. By setting the analog displacement output switch to the right, the set value can be monitored by the analog displacement output.

◆ Only for window comparator type

- ⑪ Operation indicator LED
The LED lights up that corresponds to the comparative output currently being displaced.
- ⑫ Display / Analog displacement output switch
Switches between the displacement data output and the comparative value setting output.
- ⑬ LCD display
3-digit display of the displacement data or the upper and lower limit value.
- ⑭ HIGH limit setting potentiometer
- ⑮ LOW limit setting potentiometer
Sets the comparative value's upper limit (HIGH) and lower limit (LOW). Set it so that the HIGH value is greater than the LOW value. By setting the display and analog displacement output switch to either LOW or HIGH, you can monitor the set value by display and analog displacement output. When not set, return the switch to the center position.

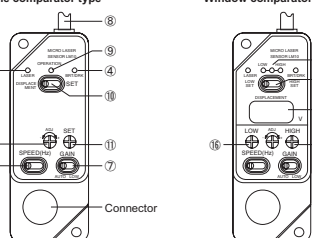
● Sensor, Relay cable (ANR12 series)



● Controller

Single comparator type

Window comparator type



Thank you very much for using SUNX products. Please read this Instruction Manual carefully and thoroughly for the correct and optimum use of this product. Always keep this manual in a convenient place for quick reference.

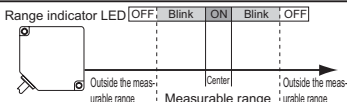


- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws or standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

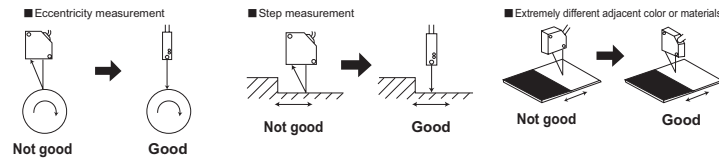
3 CAUTIONS DURING SETTING

● Procedure for setting the sensor head

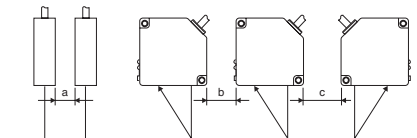
- While watching the measuring range indicator LED, set the sensor head so that the distance to the subject body is within the measurable range. It may light up or blink even with a significant error in the measuring range when the alarm is enabled.



- Be careful of the sensor head's orientation during mounting. When the subject body moves as shown below, errors will develop depending on the orientation of the sensor head. In order to minimize these errors, be sure to mount the sensor head in the correct orientation.



- Confirm the mutual interference area when using sensors side by side.



Model No.	a	b	c
ANR11501	40	20	70
ANR11511	50	60	110
ANR11821	80	100	150
ANR12501	50	40	90
ANR12511	80	80	130
ANR12821	120	140	190
ANR12261	210	350	400

● Mounting the sensor head

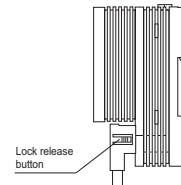
- Using two mounting holes, firmly mount the sensor head so that the sensor head's front surface is parallel to the target. Do not tighten the installation screws to a torque over 2N·m.
- Glass is used at the sensor head's light emitting and light receiving surfaces and, therefore, never subject it to impacts of any kind. Also, be very careful not to allow oils, finger prints, or other substances that may refract the light, to get on the glass during mounting.
- If light reflected off the target is then reflected off nearby objects or walls and then received by the sensor head, the sensor head reading will be adversely affected. To prevent this, either further separate the sensor head or apply a black delustering paint to prevent the unwanted reflection of light.

● Mounting the controller

- When mounting more than one controllers in a row, maintain at least 10m between each unit. Also, when mounting the controller inside control panels or areas where the air is not properly ventilated, the controller will cause the ambient temperature to rise. In these cases, ensure cooling facilities.

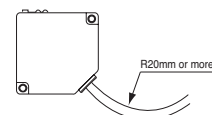
● Wiring

- Perform all wiring by faithfully following the input and output circuit explanations and documents that came with the instrument. Also, to protect the inner circuitry, arrange the lead wire that is not interconnected in a way so that it does not come into contact with other lead wires.
- When mounting or removing a connector, always first turn off the controller and then begin operations.
- All connectors are of the lock-on type. When connecting a connector, be sure to securely insert it until it locks into place. When removing a connector, first press in the lock release button on the connector side and then remove the connector.
- After removing a connector, do not touch the terminals located inside.



● Cable

- When the sensor head and controller are fixed and cables connected, do not subject the cables to a pull of more than 29.4N. Have no bends in the cables with a radius of less than 20mm. Also, do not bend a sensor head's cable near where the cable is attached to the sensor head.
- When the sensor head is to be moved while in use, do not have it so that the sensor head's cable becomes bent. If the location is such that it cannot be helped, we recommend purchasing the appropriate length extension cable. (ANR12□)



4 CAUTIONS

● Operating environment

- Use in an ambient temperature between 0 to +50°C (32 to 122°F). Store in a location where the temperature stays between -20 to +70°C (-4 to 158°F).
- Use in an ambient humidity between 35 to 85% RH. Avoid use in locations with drastic humidity changes which cause condensation.
- Use in locations where the illuminance from incandescent lamps received at the light receiving surface is below 2,500 lx (ANR11□ and ANR12261), or below 3,000lx (ANR12501, ANR12511, ANR12821, ANR12151). Also, locate the unit so that sunlight, does not directly hit the beam-receiving part. When exceptional accuracy is required, mount a shielding plate or other type of shading mechanism.
- The power supply voltage should be between 85 to 110% of the rated voltage.
- Since the internal circuits may become damaged if an external surge voltage exceeds 500V [±(1.2 × 50) μs unipolar full-wave voltage], always use a surge absorber or surge absorbing element.
- Keep the sensor head beam-emitting part and beam-receiving part surface clean and free of moisture, oil, finger prints, and other light refracting substances, and free of dust, dirt, and other light blocking substances. When cleaning the glass surfaces, wipe with a soft cloth or lens cleaning paper.
- Although the sensor head is of water proof construction, it does not mean that measurements can be taken underwater or in the rain. Moreover, the connectors are not watertight.
- Do not use the unit in locations with flammable or corrosive gases, locations with excessive dust, locations splashed by water, or locations subjected to vibrations or excessive shocks.
- Since the controller contains molded resins, do not use in environments that contain, or where contact with, benzene, thinners, alcohols and other organic solvents; and ammonia, caustic sodas, and other alkaline substances is possible.

● Noise precautions

- The connector's metal portion is internally connected to the analog output GND. In order to prevent affects from noise or damage to the internal circuits, be sure to insulate the metal portion with electrical tape or other means.
- Mount the unit as far away as possible from high voltage lines, power lines, or devices that generate large switching surges.
- Separate the sensor head cable wiring, high voltage circuit, and power circuit.
- If there is much noise on the power supply, it will affect the analog output. In such cases, use a noise filter or noise cut transformer.

● Insulation resistance and voltage withstandability

- Do not perform insulation resistance or withstand voltage tests between the connector's metal portion and input / outputs.

● Power supply

- Select a power supply with a ripple voltage below 0.5V (P-P) and a current capacity above 0.3A.
- In order to avoid high-frequency noises when using a commercially available switching regulator, be sure to ground the frame ground (F.G.) terminal.
- When using a power supply that uses a transformer, be sure to use an insulated transformer. When using an autotransformer (single-wound transformer), it is possible to damage this unit or the power supply.
- Do not turn the power on again within 10 sec. after turning the power off.

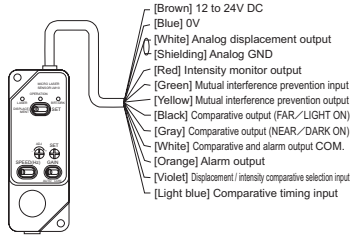
● Warm-up time

- Allow at least 30 minutes, after turning on the unit, for the unit to properly warm up.

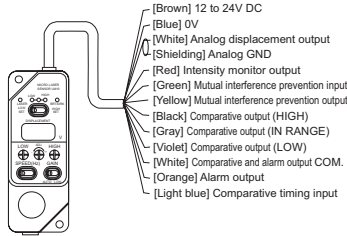
5 WIRING AND FUNCTIONS

Wiring

Single comparator type



Window comparator type



Functions

Power input [Brown (+), Blue (-)]

Input 12 to 24V DC.

Comparative timing input [Light blue]

While shorted to the 0V [Blue], comparative output is prevented. When using a transistor to establish the timing, use a transistor with a residual output voltage of 1.5V or less during output.

Mutual interference prevention I/O [Green (input), Yellow (output)]

When using two sensors, you can set the mutual interference prevention mode by connecting the input wire of each to the output wire of the other. Be aware that this mode may adversely affect the linearity characteristics, resolution, and response.

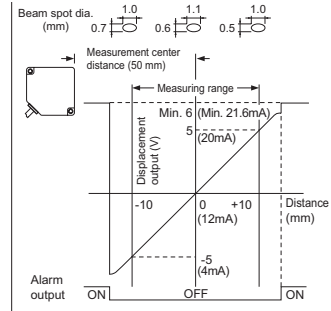
Analog displacement output [white, shielding wire (GND)]

An analog voltage / analog current (for each type separately) is output that corresponds to the displacement of the target within the measurement range. When the output selection switch is in the SET position, each comparative setting is outputted as voltage / current (for each type separately).

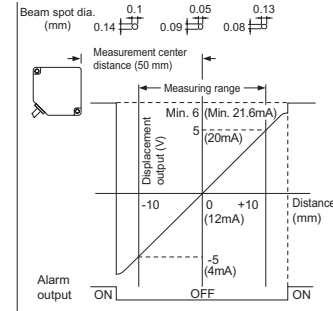
* In case of window comparator type

- In both the voltage output and current output types, the LCD displays the voltage ($\pm 5V/F.S.$).
- Between the current output type's analog displacement output and the LCD display, there is a maximum 3% of F.S. offset. Therefore, exercise caution when aligning the 0 setting the comparative values.

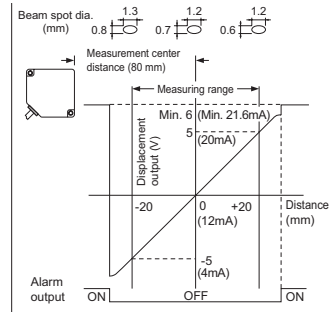
ANR11501, ANR12501



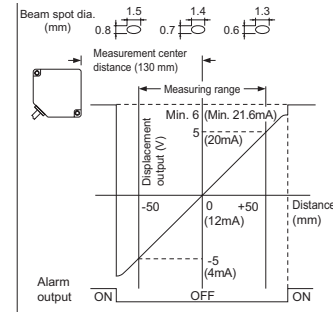
ANR11511, ANR12511



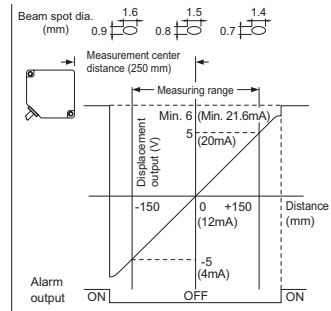
ANR11821, ANR12821



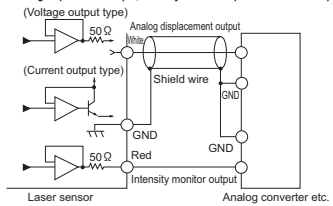
ANR11151, ANR12151



ANR12261

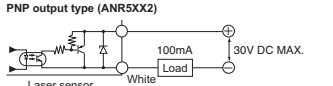
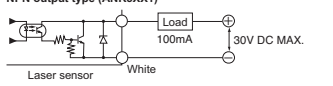


<Analog displacement output, intensity monitor output connection example>

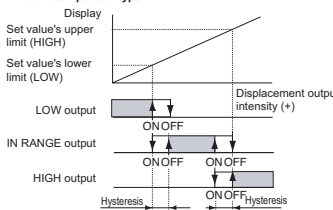


Note: Take care not to short-circuit between analog outputs or apply voltage to them.

<Comparative output, alarm output connection examples>



<Description of comparative output operations>



Intensity monitor output [red, shielding (GND)]

Analog voltage (-5V to +5V) is output corresponding to the amount of light reflected from the target. If the amount of light increases, the voltage value becomes larger and if it decreases, the voltage value becomes smaller.

Alarm output [orange, white (COM)]

Outputs during insufficient light (DARK) or too much (BRIGHT).

Comparative output

◆ Single comparator type [black, gray, white (COM)]

Displacement / intensity comparative selection input [Violet]	Comparing operations
When not connected	When displacement data is set value or over (far side): FAR / LIGHT ON output is ON. When displacement data is less than set value (near side): NEAR / DARK ON output is ON.
When connected to 0V [Blue]	When intensity data is set value or over (near side): FAR / LIGHT ON output is ON. When intensity data is less than set value (far side): NEAR / DARK ON output is ON.

* For single comparator type

Connecting the violet wire and blue wire changes from the analog displacement output to the light amount monitoring value output.

◆ Window comparator type [black, gray, violet, white (COM)]

Judgment result of analog displacement data is output.

LOW [violet]	Outputs when below the set value's lower limit.
IN RANGE [gray]	Outputs when between the set value's lower and upper limits.
HIGH [black]	Outputs when above the set value's upper limit.

6 SPECIFICATIONS

If there is no description for measurement conditions, the test is performed under operating voltage 24V DC, ambient temperature +20°C, gain AUTO, response frequency 10Hz, interference prevention OFF and white ceramics as a target at a measurement center distance.

Sensor (ANR11 series)

Model No.	ANR11501	ANR11511	ANR11821	ANR11151
Item				
Measurement center distance	50mm	50mm	80mm	130mm
Measuring range	± 10 mm	± 10 mm	± 20 mm	± 50 mm
Light source	Laser diode (Wavelength: 685nm)			
Pulse width / Max. output / Laser class	15 μ s (Duty 50%) / 0.4mW (Peak value) / Class II			
Beam spot diameter / Representative values from a measurement center distance	0.6 x 1.1mm approx.	0.09 x 0.05mm approx.	0.7 x 1.2mm approx.	0.7 x 1.4mm approx.
Resolution	10Hz 100Hz 1kHz	5 μ m 16 μ m 50 μ m	5 μ m 16 μ m 50 μ m	20 μ m 65 μ m 200 μ m
Linearity error (Note)	Within $\pm 0.2\%$ of F.S.			
Protection (excluding connector)	IP67 (IEC)			
Ambient Illuminance (Fluorescent lamp)	2,500lx or less			
Weight (including cable)	300g approx.			

Note: White ceramics is the target of this value.

Sensor (ANR12 series)

Model No.	ANR12501	ANR12511	ANR12821	ANR12151	ANR12261
Item					
Measurement center distance	50mm	50mm	80mm	130mm	250mm
Measuring range	± 10 mm	± 10 mm	± 20 mm	± 50 mm	± 150 mm
Light source	Laser diode (Wavelength: 685nm)				
Pulse width / Max. output / Laser class	15 μ s (Duty 50%) / 1.6mW (Peak value) / Class II				
Beam spot diameter / Representative values from a measurement center distance	0.6 x 1.1mm approx.	0.09 x 0.05mm approx.	0.7 x 1.2mm approx.	0.7 x 1.4mm approx.	0.8 x 1.5mm approx.
Resolution	10Hz 100Hz 1kHz	1 μ m 3.5 μ m 10 μ m	1 μ m 3.5 μ m 10 μ m	4 μ m 13 μ m 40 μ m	20 μ m 500 μ m 1.5mm
Linearity error (Note)	Within $\pm 0.2\%$ of F.S.				
Protection (excluding connector)	IP67 (IEC)				
Ambient Illuminance (Fluorescent lamp)	3,000lx or less				
Weight (including cable)	Sensor (including cable): 240g approx., Intermediate cable: 130g approx.				

Note: White ceramics is the target of this value.

Controller

Model No.	ANR5131	ANR5132	ANR5141	ANR5142	ANR5231	ANR5232	ANR5241	ANR5242
Item								
NPN output / PNP output	ANR5131	ANR5132	ANR5141	ANR5142	ANR5231	ANR5232	ANR5241	ANR5242
Comparative output type	Single comparator				Window comparator			
Analog output	$\pm 5V/F.S.$ (2mA max.)				4 to 20mA/F.S. (250 Ω max.)			
Output impedance	50 Ω				50 Ω			
Zero-point adjustment	Within $\pm 10\%$ of F.S.							
Temperature drift (Sensor and controller set)	Within $\pm (0.03\% \text{ of F.S.}) / ^\circ\text{C}$		Within $\pm (0.04\% \text{ of F.S.}) / ^\circ\text{C}$		Within $\pm (0.03\% \text{ of F.S.}) / ^\circ\text{C}$		Within $\pm (0.04\% \text{ of F.S.}) / ^\circ\text{C}$	
Response frequency (-3dB)	1kHz / 100Hz / 10Hz							
Response time (10 to 90%)	0.4ms / 4ms / 40ms (Switchable)							
Comparative output	<NPN output type> NPN open collector 2 Nos. (100mA 30V DC or less, residual voltage 1.5V or less) <PNP output type> PNP open collector 2 Nos. (100mA 30V DC or less, residual voltage 1.5V or less)				<NPN output type> NPN open collector 3 Nos. (100mA 30V DC or less, residual voltage 1.5V or less) <PNP output type> PNP open collector 3 Nos. (100mA 30V DC or less, residual voltage 1.5V or less)			
Hysteresis	0.15% of F.S. or less							
Alarm output	<NPN output type> NPN open collector 1 No. (100mA 30V DC or less, residual voltage 1.5V or less) <PNP output type> PNP open collector 1 No. (100mA 30V DC or less, residual voltage 1.5V or less)							
Intensity monitor output	$\pm 5V$							
Comparative timing input	No voltage input (when earthing, no comparative output allowed)							
Displacement display	Sensor: Measuring range display LED (RANGE)				Sensor: Measuring range display LED (RANGE) Controller: LCD 3 digit display			
Gain selection	AUTO / LOW (switchable)							
Mutual interference prevention (Note)	Between 2 sets							
Operation voltage range	12 to 24V DC $\pm 1\%$ including ripple 0.5V (P-P)							
Current consumption (Sensor and controller set)	250mA or less (at 12V DC), 125mA or less (at 24V DC)							
Weight (including cable)	180g approx.							

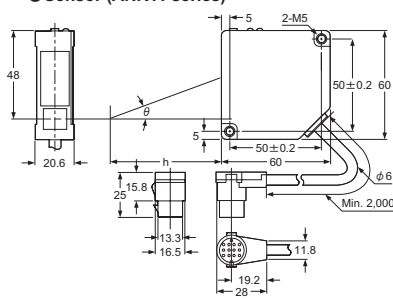
Note: The value of the linearity characteristics, resolutions and response time might get worse.

Common

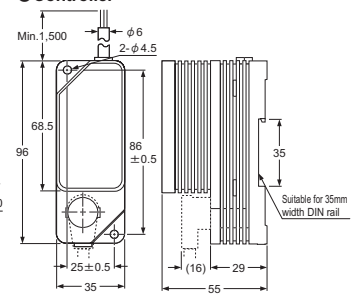
Insulation resistance (Initial)	Between external DC input and sensor metal parts (except for connector metal parts) 20M Ω or more (at DC 500V megger)
Voltage withstandability (Initial)	Between external DC input and sensor metal parts (except for connector metal parts) AC 500V 1 min.
Vibration resistance (Screw installation)	10 to 55Hz (1 cycle / min.) double amplitude of 1.5mm (sensor) / 0.75mm (controller), in X, Y and Z directions for two hours each
Shock resistance (Screw installation)	20G or more, in X, Y and Z directions for three times each
Ambient temperature	0 to +50°C. Storage: -20 to +70°C
Ambient humidity	35 to 85% RH (No dew condensation)

7 DIMENSIONS (Unit: mm)

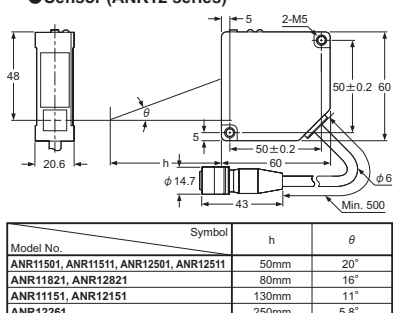
Sensor (ANR11 series)



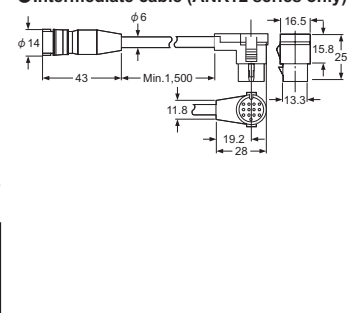
Controller



Sensor (ANR12 series)



Intermediate cable (ANR12 series only)



Model No.	Symbol	h	θ
ANR11501, ANR11511, ANR12501, ANR12511		50mm	20°
ANR11821, ANR12821		80mm	16°
ANR11151, ANR12151		130mm	11°
ANR12261		250mm	5.8°

SUNX Limited

Head Office 2431-1 Ushiyama-cho, Kasugai-shi, Aichi, 486-0901, Japan Phone: +81-(0)568-33-7211 FAX: +81-(0)568-33-2631

Overseas Sales Dept. Phone: +81-(0)568-33-7861 FAX: +81-(0)568-33-8591

PRINTED IN JAPAN