

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 combustive-gas atmosphere. It may cause an explosion.

⚠

CAUTION

- This product has been developed / produced for industrial use only.
- 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

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

A semiconductor laser is used as the sensor's light source.

The **ANR11□** has a 650nm wavelength and a maximum output of 0.4mW making it fall under the category of products described in Class 1 according to IEC standards' class separation.

- These sensors are not equipped with an automatic laser emission halt function when the sensor is disassembled. Therefore, in case of damage or breakage, be sure to notify our office. If having disassembled for repair purposes, there always exists the danger of being exposed to radiation from the laser.
- Do not use these sensors in a way other than the operation methods described in this manual.
 - Note—Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
 - The use of optical instruments with this product will increase eye hazard.
- The warning label are attached to the sides of the sensor.

The **ANR12□** has a 650nm wavelength and a maximum output of 1.6mW making it fall under the category of products described in Class 2 according to IEC standards' class separation.

- Be careful not to look directly at it or looking at its reflection off a mirrored surface.
- In order not to have the laser beam go directly into the eyes, position it in a way so that it is higher or lower than the height of the eyes. Also, point the laser towards a diffuse reflective or an absorptive substance.
- These sensors are not equipped with an automatic laser emission halt function when the sensor is disassembled. Therefore, in case of damage or breakage, be sure to notify our office. If having disassembled for repair purposes, there always exists the danger of being exposed to radiation from the laser.
- Do not use these sensors in a way other than the operation methods described in this manual.
 - Note—Use of controls or adjustments or performance of procedures other than those those specified herein may result in hazardous radiation exposure.
- The warning label are attached to the sides of the sensor.

1

CE MARKING

- The models listed under '1.2 SPECIFICATIONS' come with CE Marking. As for all other models, please contact our office.



2

PART DESCRIPTION

●Sensor (ANR11 series)

●Sensor, Relay cable (ANR12 series)

●Controller

Single comparator type

Window comparator type

◆For each type

① ② 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.

③ 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.

④ Alarm LED

Lights up when measurement is not possible (not enough light [DARK] or too much light [BRIGHT]).

⑤ 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.

⑥ 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.

⑦ 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.

⑧ I/O cable

◆Only for single comparator type

⑨ Operation indicator LED

Lights up when NEAR / DARK ON output is ON.

⑩ Analog displacement output switch

Switches between the displacement data / intensity data output and the comparative value setting output.

⑪ 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

⑫ Operation indicator LED

The LED lights up that corresponds to the comparative output currently being output.

⑬ Display / Analog displacement output switch

Switches between the displacement data output and the comparative value setting output.

⑭ LCD display

3-digit display of the displacement data or the upper and lower limit value.

⑮ HIGH limit setting potentiometer

⑯ 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.

Thank you very much for using our products. Please 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.

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 measuring 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.

Range indicator LED

OFF

Blink

ON

Blink

OFF

■Eccentricity measurement

■Step measurement

■Extremely different adjacent color or materials

Not good

Good

Not good

Good

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

(Unit: mm)

Model No.	a	b	c
ANR1150			
ANR1151	40	20	70
ANR1182	50	60	110
ANR1115	80	100	150
ANR1250	50	40	90
ANR1282	80	80	130
ANR1215	120	140	190
ANR1226	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

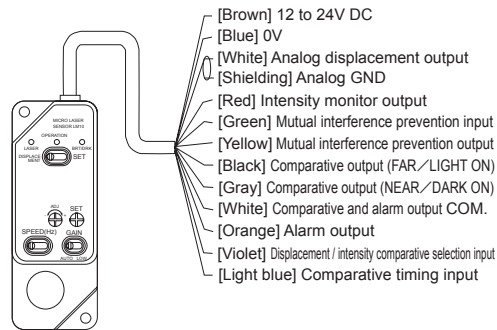
- Operating environment
 - Use in an ambient temperature between 0 to +50°C. Store in a location where the temperature stays between -20 to +70°C.
 - Use in an ambient humidity between 35 to 85% RH. Avoid use in locations with drastic humidity changes which cause condensation.
 - Use in locations where the illuminance from incandescent lamps received at the light receiving surface is below 2,500 lx (ANR11□ and ANR1226), or below 3,000lx (ANR1250, ANR1251, ANR1282, ANR1215). 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.
 - Ground the metal case of the sensor head to the frame ground (F.G.) of an equipment.
 - 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.
 - In case of using this product as a CE marking conformity product, cable extension of the power wire and I/O wire must be withn 30m.
- Warm-up time
 - Allow at least 30 minutes, after turning on the unit, for the unit to properly warm up.

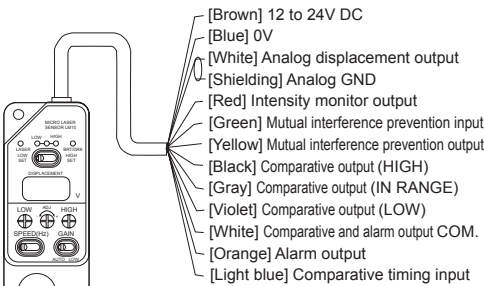
5 WIRING AND FUNCTIONS

●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)]

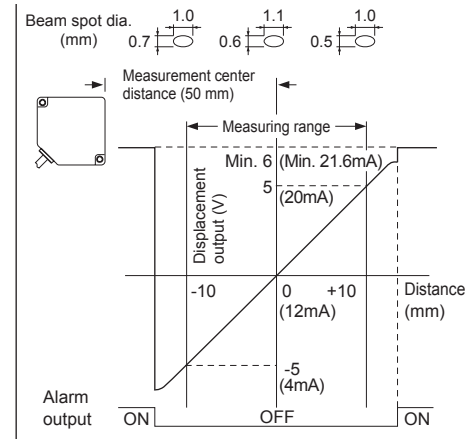
An analog voltage / analog current (for each type separately) is is output that corresponds to the displacement of the target within the measurement range. When the output selection switch is in the SET position, each comparative setting is outputted as voltage / current (for each type separately).

* In case of window comparator type

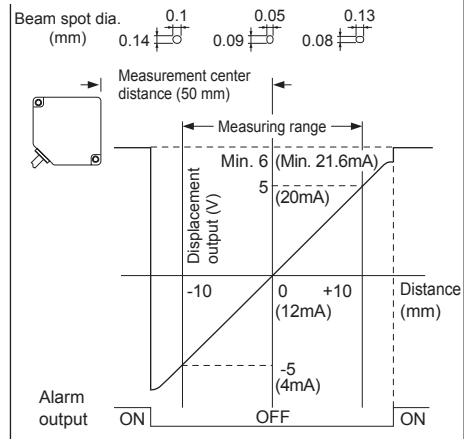
—In both the voltage output and current output types, the LCD displays the voltage ($\pm 5V/F.S.$).

—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.

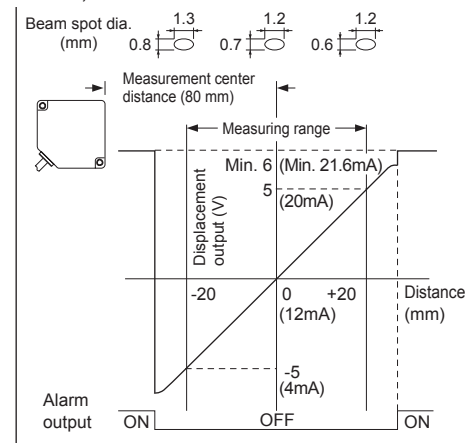
ANR1150, ANR1250



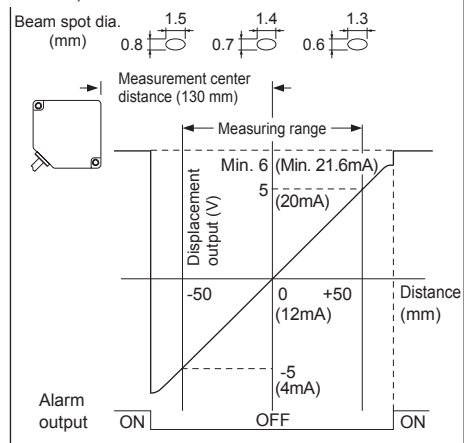
ANR1151, ANR1251



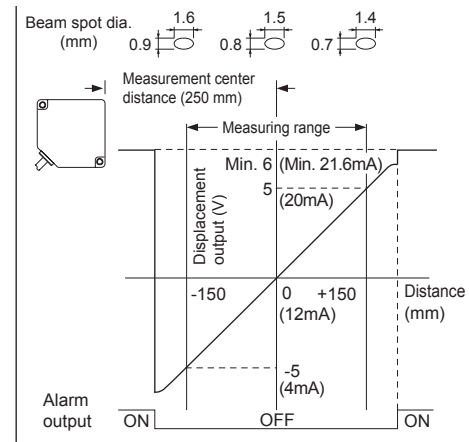
ANR1182, ANR1282



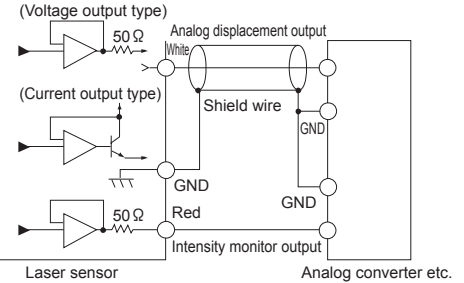
ANR1115, ANR1215



ANR1226



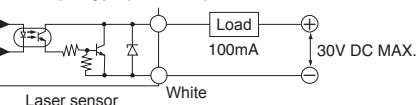
<Analog displacement output, intensity monitor output connection example>



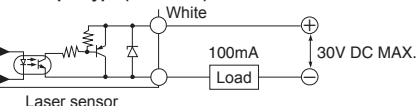
Note: Take care not to short-circuit between analog outputs or apply voltage to them.

<Comparative output, alarm output connection examples>

NPN output type (ANR5XX1)

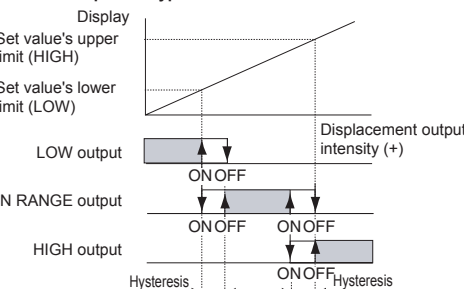


PNP output type (ANR5XX2)



<Description of comparative output operations>

Window comparator type



●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.	ANR1150	ANR1151	ANR1182	ANR1115
Item				
Measurement center distance	50mm	50mm	80mm	130mm
Measuring range	± 10 mm	± 10 mm	± 20 mm	± 50 mm
Light source	Laser diode (Wavelength: 650nm)			
Pulse width / Max. output / Laser class	15 μ s (Duty 50%) / 0.4mW (Peak value) / Class1 (IEC 60825-1)			
Beam spot diameter	Representative values from a measurement center distance			
	0.6 $\times$ 1.1mm approx.	0.09 $\times$ 0.05mm approx.	0.7 $\times$ 1.2mm approx.	0.7 $\times$ 1.4mm approx.
Resolution	10Hz	5 μ m	5 μ m	20 μ m
(2 σ)	100Hz	16 μ m	16 μ m	65 μ m
	1kHz	50 μ m	50 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.	ANR1250	ANR1251	ANR1282	ANR1215	ANR1226
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: 650nm)				
Pulse width / Max. output / Laser class	15 μ s (Duty 50%) / 1.6mW (Peak value) / Class2 (IEC 60825-1)				
Beam spot diameter	Representative values from a measurement center distance				
	0.6 $\times$ 1.1mm approx.	0.09 $\times$ 0.05mm approx.	0.7 $\times$ 1.2mm approx.	0.7 $\times$ 1.4mm approx.	0.8 $\times$ 1.5mm approx.
Resolution	10Hz	1 μ m	1 μ m	4 μ m	150 μ m
(2 σ)	100Hz	3.5 μ m	3.5 μ m	13 μ m	500 μ m
	1kHz	10 μ m	10 μ m	40 μ m	1.5mm
Linearity error (Note)	Within $\pm 0.2\%$ of F.S.				Within $\pm 0.4\%$ of F.S.
Protection (excluding connector)	IP67 (IEC)				
Ambient illuminance (Fluorescent lamp)	3,000lx or less				2,500lx 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.	NPN output	ANR5131	ANR5141	ANR5231	ANR5241
Item	PNP output	ANR5132	ANR5142	ANR5232	ANR5242
Comparative output type	Single comparator				Window comparator
Analog output	$\pm 5V/F.S.$ (2mA max.)				$\pm 5V/F.S.$ (2mA max.)
Output impedance	50 Ω				50 Ω
Zero-point adjustment	Within $\pm 10\%$ of F.S.				—
Temperature drift (Sensor and controller set)	Within $\pm (0.03\%$ of F.S.) / °C				Within $\pm (0.04\%$ of F.S.) / °C
Response frequency(-3dB)	1kHz / 100Hz / 10Hz				0.4ms / 4ms / 40ms (Switchable)
Response time (10 to 90%)	1kHz / 100Hz / 10Hz				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 $\pm 10\%$ 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.				—

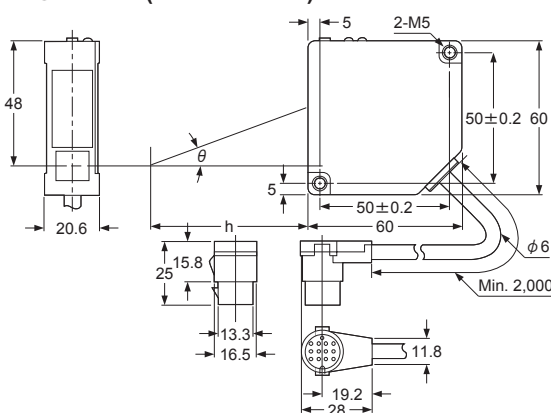
Note: The value of the linearity characteristics, resolutions and response time might get worse.

●Common

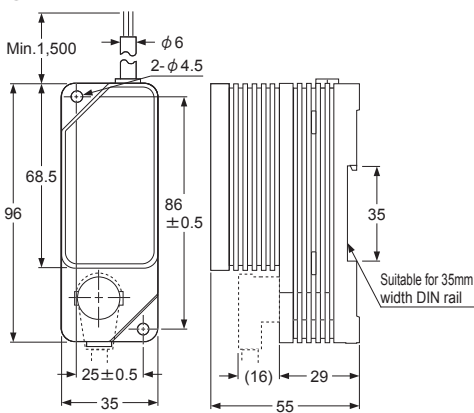
Insulation resistance (Initial)	Between external DC input and sensor metal parts (except for connector metal parts) 20M Ω or more (at DC 500V megger)
Voltage withstandability (Initial)	Between external DC input and sensor metal parts (except for connector metal parts) AC 500V 1 min.
Vibration resistance (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)

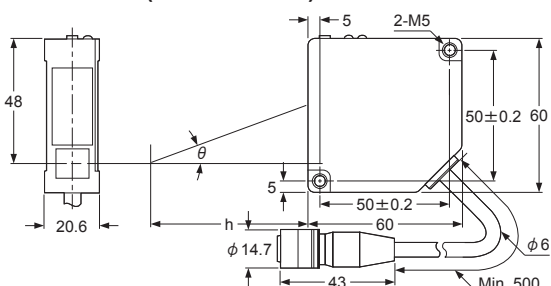
●Sensor (ANR11 series)



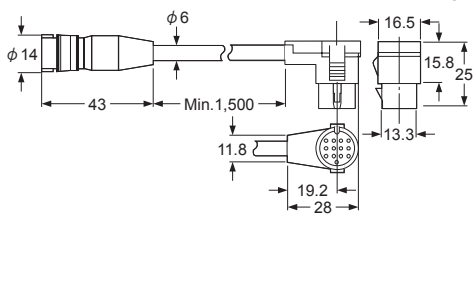
●Controller



●Sensor (ANR12 series)



●Intermediate cable (ANR12 series only)



Model No.	Symbol	h	θ
ANR1150, ANR1151, ANR1250, ANR1251		50mm	20°
ANR1182, ANR1282		80mm	16°
ANR1115, ANR1215		130mm	11°
ANR1226		250mm	5.8°

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