

# Panasonic

ideas for life

## UV Curing System **Aicure** LED spot type **UJ20 series**

**Most powerful intensity 8,000mW/cm<sup>2</sup> in its class.**  
**Easy operation, installation, energy efficiency**  
**and environmental friendliness in a compact size.**  
**More reliable UV irradiation achieved by higher head-cooling efficiency.**



Temperature feedback:  
Provides excellent and stable  
UV irradiation performance

Fan-less controller:  
No need for an exhaust process  
or vibration-proofing measures

Estimated light source life:  
20,000 hours

Low running cost

LED for thermal distortion-less

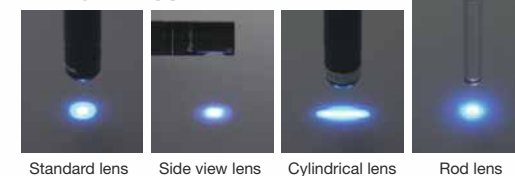
UV irradiation for distortion-less

Easy UV meter



2007  
Good Design Award

**Wide selection of lenses  
to fit your application**



Standard lens Side view lens Cylindrical lens Rod lens

**Most powerful**  
**8,000mW/cm<sup>2</sup>**

**Smallest**  
Controller:  
**80×130×145mm**  
Head:  
**12 dia. ×50mm**

**Minimum**  
**Low power**  
**consumption:**  
**60VA**

CE RoHS 10

\* Most powerful, Smallest and Minimum in its class is  
according to our research as of 1st October 2007.

**UV Curing System LED-Aicure UJ20 series**  
**ARCT1B282E-1 '07.11**

**New**

### ⚠ Safety Precautions

- In order to use this product properly, be sure to read the Installation Instructions and Manual before use.

These materials are printed on ECF pulp.  
These materials are printed with earth-friendly  
vegetable-based (soybean oil) ink.



Please contact .....

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# Panasonic®

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## Extensive know-how condensed into a compact size.

UV Curing System  
LED spot type

# Aicure UJ20

**8,000 mW/cm<sup>2</sup> highest output in its class. More reliable UV irradiation achieved by the feedback control and high head-cooling efficiency.**

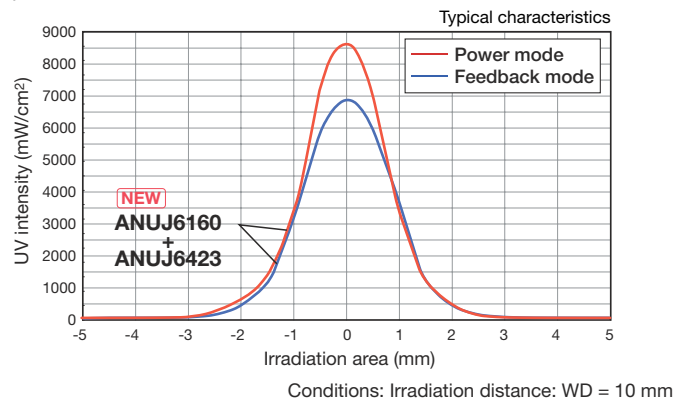
Increased UV intensity equates to greater ease of use by shrinking tact time, expanding irradiation area, and allowing greater freedom in head installation. Years of experience have enabled us to create a compact size that's equipped with an irradiation display function that works with an UV sensor. Environmentally friendly, it is CE and RoHS compliant. UJ20 (LED type Aicure) not only enables precision bonding through control over curing distortion caused by temperature rises, but offers great running cost savings.



## ▶ The most powerful UV No.1

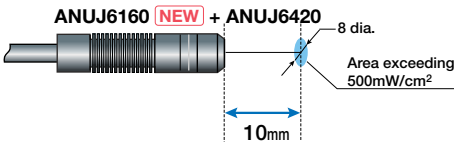
### ■ Most powerful 8,000mW/cm<sup>2</sup>

The high intensity of 8,000 mW/cm<sup>2</sup> is possible by using the ANUJ6160 LED head and ANUJ6423 lens in power mode. Even in high accuracy mode, an intensity of 6,400 mW/cm<sup>2</sup> is possible.



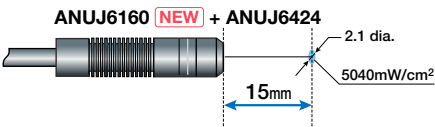
### ■ Merit of 8,000 mW/cm<sup>2</sup>

#### Increased intensity and area



Through increased irradiation intensity, power in excess of 500 mW/cm<sup>2</sup> is possible in an wide 8 mm dia. area.

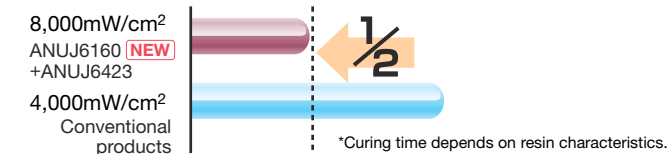
#### Greater positional leeway for installation.



Installation becomes easier with increasing irradiation intensity. The work distance can be increased and the irradiation area can be enlarged.

#### Reduced tact time

Production tact time can be reduced, because irradiation intensity (8,000 mW/cm<sup>2</sup>) is twice that of our previous products.

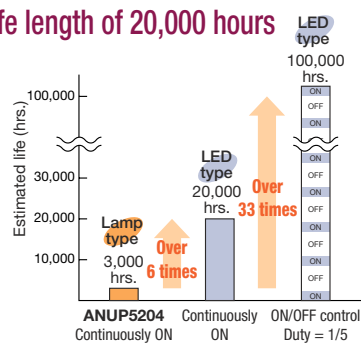


### ■ Estimated Light Source life length of 20,000 hours

Set output	Intensity when a 3-mm dia. lens is used	Estimated light source life*
100%	8,000mW/cm <sup>2</sup>	20,000 hrs.
75%	6,000mW/cm <sup>2</sup>	30,000 hrs.

\* When the temperature of the LED in the ANUJ6160 head is 60° or less. The lamp life of 20,000 hours is not a guaranteed value.

With the LED system UV irradiation turns on instantly, only when it is needed. With a duty of 1/5 (process tact time is 5 and irradiation time is 1), the LED system equates to 100,000 hours using the lamp system (approximately 33 or more times greater). This amounts to a great decrease in maintenance needed for lamp replacement and running cost.

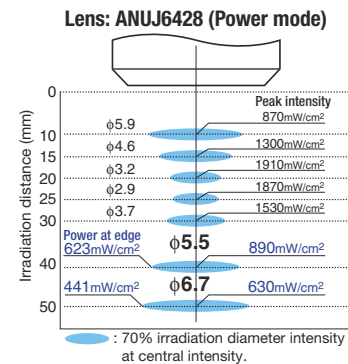


### Increased light-source life

Since achieving 8,000 mW/cm<sup>2</sup>, you can perform irradiation with the energy required for curing even if the irradiation output has been narrowed. By narrowing the set irradiation output, you can stretch the light-source life even further.

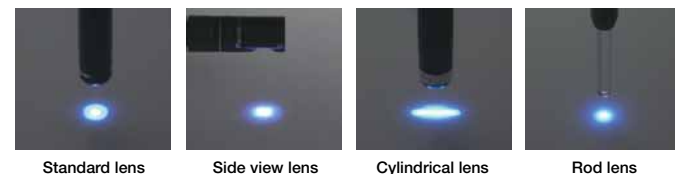
### Irradiation intensity range that equals the lamp type.

Sufficient power is available even for wide areas. For example, using lens: ANUJ6428 in a 5.5 mm diameter area (WD = 40 mm), an irradiation intensity on par with previous lamp systems is available: over 623 mW/cm<sup>2</sup> in Power Mode and over 518 mW/cm<sup>2</sup> in feedback Mode. Also, there is no drop in intensity caused by branching as seen in the lamp system.



### Greater possible applications.

Sufficient power is available even with special lenses. In addition to five types of standard lens (3, 4, 6, 8, and 10 dia.), side view lens, cylindrical and rod lens are available to your UV application.



## ▶ UV irradiation technology Unique

### ■ Two irradiation modes with excellent irradiation stability

ANUJ6160, which features improved heat irradiation performance of the head, is capable of continuous high efficiency and stable UV irradiation.

Irradiation mode	Max. irradiation intensity*	Detection functions	Temperature feedback control	Remarks
Power Mode	8,000mW/cm <sup>2</sup>	Overheat, broken wire, short circuits	Output setting: 0 to 90%	Ideal for high-output irradiation The feedback control functions up to 7,200 mW/cm <sup>2</sup> *
Feedback Mode	6,400mW/cm <sup>2</sup>		Output setting: 0 to 100%	Stable irradiation with intensity variations within ±3%

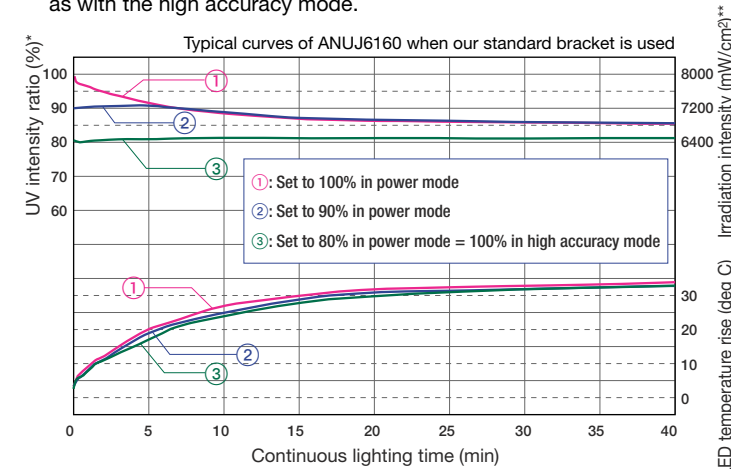
\* ANUJ6160 equipped with the ANUJ6423 lens

### ■ Stable UV irradiation

Generally, when the LED temperature rises, the output decreases. The heads for UJ20 have improved heat radiation efficiency, which reduces such temperature rises. The heads are equipped with a temperature sensor, which gives feedback of the light source output based on the LED temperature to prevent the output from decreasing. The feedback control and the improved heat irradiation performance of the heads have achieved stable UV irradiation even during continuous lighting of the UV-LED.

**High accuracy mode** Feedback control is possible at all output settings from 0 to 100%, keeping the UV intensity variations within ±3%.

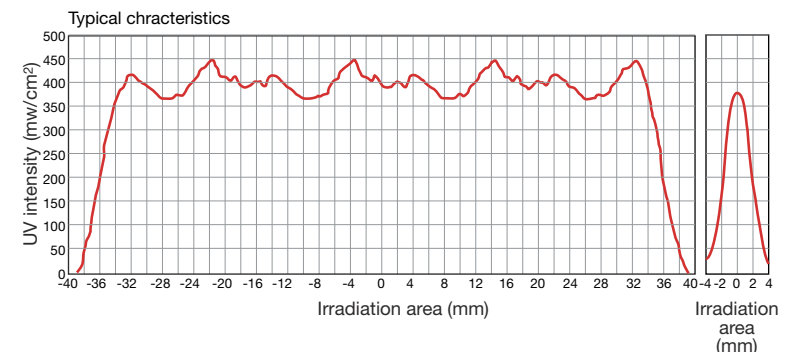
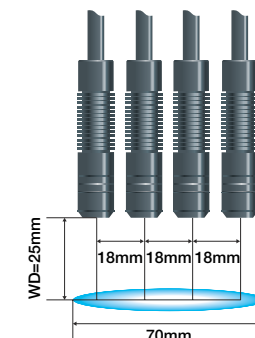
**Power mode** When the ANUJ6423 lens is used, irradiation up to 8,000 mW/cm<sup>2</sup> is possible. Feedback control is possible in the output setting range from 0 to 90%. At 0 to 80%, the UV intensity variations can be kept within ±3% as with the high accuracy mode.



\* 100: Output setting of 100% in the power mode  
\*\* When equipped with the ANUJ6423 lens

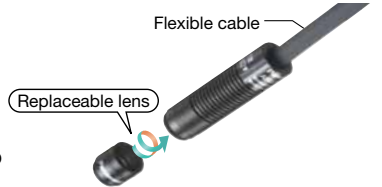
### ■ Individual feedback control for reliable irradiation

The temperature feedback control operates for each head individually. Even if four heads are used in a line, a reliable and uniform irradiation is possible. When ANUJ6160 heads equipped with ANUJ6475S (cylindrical lens) are used with 18-mm pitches as shown in the figure, an area of approx. 70-mm wide can be reliably irradiated at 350 mW/cm<sup>2</sup> or higher intensity.

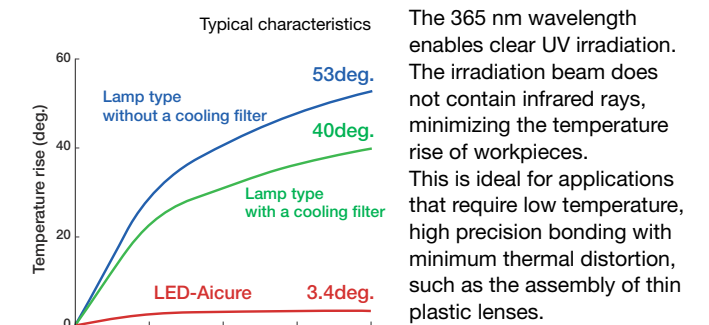


### ■ Reliable self-diagnosis function

Each head (smallest in its class, 12-mm dia. x 50 mm when equipped with a standard lens) has a built-in temperature feedback sensor. The controller directly reads and displays the LED temperature. Therefore, users can easily make optimum settings with a sufficient margin. This function detects breaks and short-circuits in the head and monitors individual irradiation time. In case of an abnormal temperature rise, an alarm is output, and if the temperature exceeds the maximum allowable level, an error is output to protect the LED lamp from damage.



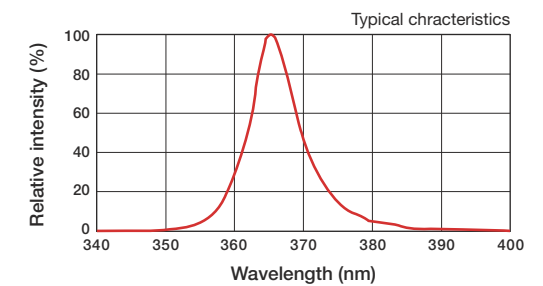
### ■ Precision adhesion for thermal distortion-less.



Conditions Workpieces:  
Optical pickup lenses  
UV intensity: 250 mW/cm<sup>2</sup>  
Irradiation distance: 20 mm

### ■ 365 nm wavelength ideal for UV curing

The ideal wavelength for UV resin curing is 365 nm and this is used as the main wavelength. The problem of insufficient curing below the surface caused by UV energy absorption at the resin surface due to the influence of a short wavelength component, and the problem of heat generation caused by infrared radiation, are both eliminated. You can use your existing UV meter as is.



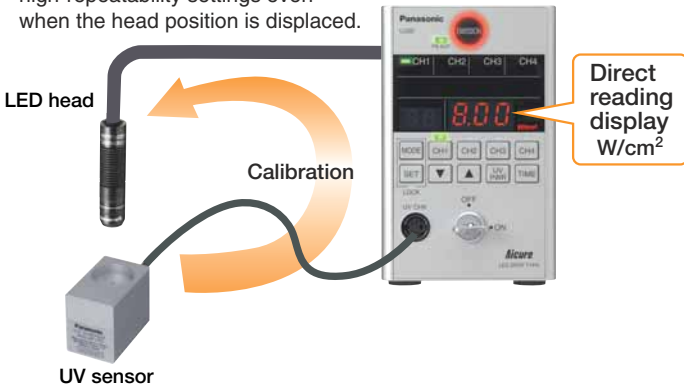


## ► Easy to operate

### ■ UV sensor connection

Display intensity on the controller by connecting an optional UV sensor. This simple UV meter lets you easily manage intensity. Automatic calibration of the intensity is also possible. When changing the head position, a setting of high quantitative reproducibility is possible using the calibration function.

The calibration function allows for high-repeatability settings even when the head position is displaced.



### ■ Easy operation

Switches are located where they are easiest to operate. The large color LED increases visibility and easy operation is achieved through a universal design that includes an ergonomic button layout. This design won the 2007 Good Design Award.

In Simple Mode, [UV-POWER] and [TIME] are set after connecting the head and irradiation is performed by simply pressing [EMISSION]. You can use the UJ20 from day one.



- (1) Press [SET] and enter the TYPE00 Simple Mode. Press the head [CH1] that you will set.
- (2) Set the irradiation intensity using the up and down [▽/△] buttons and then press [SET].
- (3) Set the irradiation time using the up and down [▽/△] buttons and then press and hold down [SET]. Press [EMISSION] to start UV irradiation.

### ■ Easy setting

Utility software is available that lets you perform tasks with a PC such as operation, settings, copying, and saving data. Using a PC reduces the time required to get up and running. Download this software free of charge from <http://www.mew.co.jp/ac/>. It supports Japanese, English, Chinese, and Korean.



## ► Easy installation and reduced running cost

### ■ Smallest controller head



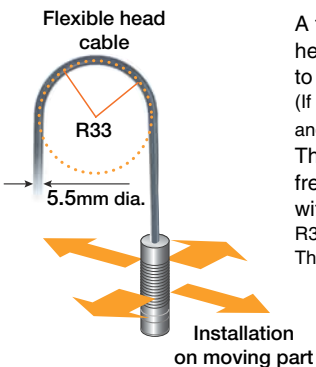
This controller, which won the 2007 Good Design Award, is 80 mm wide and the smallest in its class. It can be easily installed in cell production lines or compact assembly equipment. All connector ports other than the one for the optional UV sensor are located on the rear side for higher operability and workability. The UV irradiation head is 12-mm dia. x 50 mm, which is also the smallest in its class (ANUJ6160 equipped with a standard lens, without cable dimensions).

### ■ Environmental friendliness

Unlike the lamp type, the LED type does not contain mercury in its light source. UJ20 conforms to RoHS, China RoHS, and CE, ensuring environmentally safe use.  
(Please follow the proper industrial waste disposal procedures.)



### ■ Max. 10 m flexible cable



A flexible cable is used for repeated head movement. It can be extended up to 10 m for each head. (If exceeding 2 m, use the controller output and install a UV indicator.) The head moves with complete freedom, because it won't break as with previous quartz fiber cables. (The R33 will flex over 10,000,000 times) The cable of 5 m or more is 7.6 diameter.

### ■ Fan-less structure ideal for precision bonding

Since the structure without a cooling fan eliminated the need for vibration-proofing and dust-proofing measures, it is ideal for precision bonding. Also, this structure does not need an exhaust ventilation duct, reducing initial costs for ducting and connection work when installing the system or changing the layout, as well as reducing the running costs of exhaust ventilation and air conditioning. Furthermore, this fan-less structure eliminated the need to replace the parts in the controller.

### ■ Low power consumption, contributing for reduction of CO2 emissions: 60 VA (at 100 V AC)

Even when all heads are turned on, the power consumption is 60 VA (at 100 V AC), which is one-sixth of our previous model\*, contributing to a reduction of CO2. The low power consumption and heat generation allow a reduction of the power for air conditioning even in a narrow clean room.

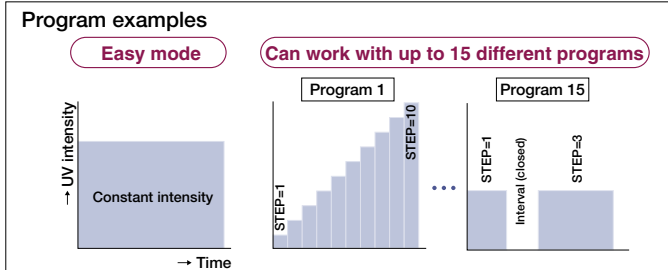
\* Compares with ANUP5252L

Smallest

## ► Expanding the possibilities of UV curing

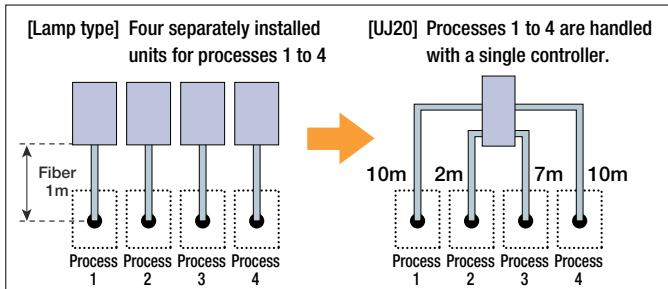
### ■ Programmable irradiation cuts distortion

Programmable irradiation controls not only heat distortion using the LED system, but also contraction distortion when curing resin. This makes it perfect for high quality curing applications that demand low temperature and high precision. This feature can be set for each head.

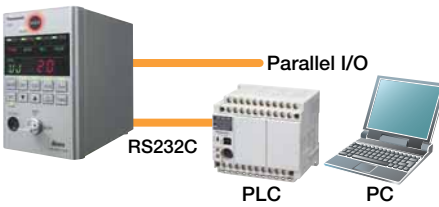


### ■ Individually head control

Four heads can be controlled individually with one controller. Initial investment is less compared to the previous lamp system.

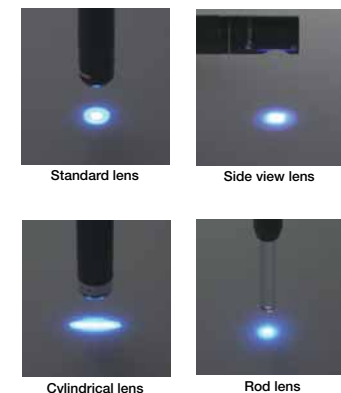


### ■ Compatible with many configurations

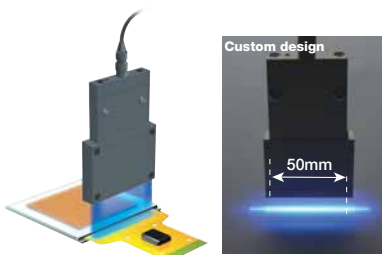


Equipped with RS232C port and external I/O. Usage tracking (history function) is easily performed using a PLC or PC.

### ■ Custom design example and a variety of lens types



A line-type irradiation head (lens width = 50 mm) and dedicated controller are available for applications such as reinforcement after COG bonding and attachment of TAB terminals. In addition to the five standard lens, we have side view, cylindrical, and rod lens. This selection provides UV irradiation ideal for the purpose. For details, please visit [webmaster@aiplasma.com](mailto:webmaster@aiplasma.com)



## ► Product number table

Irradiation intensity and area are determined by the head and lens.

#### ● UJ20 controller

Item	Specification	Product No.
Controller	Up to four heads can be connected. With an AC adapter*1	ANUJ5024

#### ● Head

Item	Specification	Product No.
LED head	8-12 dia. head (with higher cooling efficiency)	ANUJ6160
	8-12 dia. head	ANUJ6150

#### ● Lens

Item	Specification	Product No.
Standard lens	3 dia.	ANUJ6423
	4 dia.	ANUJ6424
	6 dia.	ANUJ6426
	8 dia.	ANUJ6428
	10 dia.	ANUJ6420
Side view lens	6 dia. Angle: 90 degrees	ANUJ6426SV
	8 dia. Angle: 90 degrees	ANUJ6428SV
	10 dia. Angle: 90 degrees	ANUJ6420SV
Cylindrical lens	Cylindrical R5	ANUJ6450S
	Cylindrical R7.5	ANUJ6475S
Rod lens	4 dia. R7 L=43mm	ANUJ6447L
	6 dia. R7 L=43mm	ANUJ6467L

#### ● Connection cable

Item	Specification	Product No.
Connection cable	1.7m Cable radius 5.5 dia.	ANUJ6220
	3.0m Cable radius 5.5 dia.	ANUJ6230
	5.0m Cable radius 7.6 dia.	ANUJ6250
	7.0m Cable radius 7.6 dia.	ANUJ6270
	10m Cable radius 7.6 dia.	ANUJ6200

#### ● Options and repair parts dedicated for UJ20

Item	Specification	Product No.
UV sensor	UV sensor for UJ20	ANUJ6100
AC adapter*1	100 to 240 V AC adapter: Supplied with the UJ20 controller With a 100 V AC power cable	ANUJ6802
200 V AC power cable	200 V AC power cable for ANUJ6802*2	ANUJ6803
Mounting bracket	Single-piece block type*3	ANUJ6801
	Split type	ANUJ6804
Goggles	UV protective goggles	ANUP5001SG

\*1 The ANUJ6802 AC adapter is supplied with the UJ20 controller.  
The ANUJ6802 AC adapter is compatible with 100 to 240 V AC; however, the primary-side power cable is compatible with 100 V AC only.  
For use in a 200 V AC region, purchase the ANUJ6803 primary-side power cable (for 200 V AC) separately.  
\*2 (For China only)  
\*3 For new purchases, please order ANUJ6804.

## ■ Specifications

#### ● Controller

UJ20 controller product number		• ANUJ5024
Connectable heads		• 1 to 4 head
Connectable UV sensor		• 1 (ANUJ6100 dedicated UV sensor sold separately)
UV irradiation		• One pattern in Simple Mode and pattern irradiation (up to 10 steps and 15 patterns) by programming • Collective/Individual control of the heads
Pattern switching		• Stores 16 patterns, selectable by external signals
Intensity/irradiation control		• Digital intensity and irradiation control: Manual or timer control (0.1 to 999.9 sec.) • Calibration function using UJ20 dedicated sensor
Setting/Operation		• Setting by operation switches • Power key switch
Display		• Large color switching LED • Large 7-segment LED
External control	Method	• RS232C Parallel I/O
	External input/output	• Individual irradiation/stop input, emergency stop, interlock, full-irradiation input, pattern switching, manual operation switching • READY signal, error signal, alarm output, BUSY output (each head separately), +5VDC (for indicator)
Operating voltage		• With AC adapter: 100 to 240VAC (±10%) 50/60Hz 60VA (AC100V)
Ambient temperature/humidity range		• Controller: 0 to 35°C, 85% max. (no condensation)
Storage temperature/humidity range		• Controller: -10 to 60°C, 85% max. (no condensation)

#### ● Head

Product number (head only)		ANUJ6160				
Applicable lens	Spot radius (mm)	3 dia.	4 dia.	6 dia.	8 dia.	10 dia.
	Product number (lens only)	ANUJ 6423	ANUJ 6424	ANUJ 6426	ANUJ 6428	ANUJ 6420
Irradiation intensity (mW/cm²) *1 *2		8000mW/cm²	6850mW/cm²	2990mW/cm²	1740mW/cm²	580mW/cm²
Irradiation distance (mm)		10mm	12mm	20mm	25mm	30mm
Light source		Max. output: 660 mW; wavelength: 365 ±5 nm; Class 4 LED product				
Estimated lamp life*3		20,000 hours (When the temperature of the LED in the head is 60°C or less.) *1				
Ambient temperature/humidity range		Head: 5 to 35°C, 85% max. (no condensation)				
Storage temperature/humidity range		Head: -10 to 60°C, 85% max. (no condensation)				

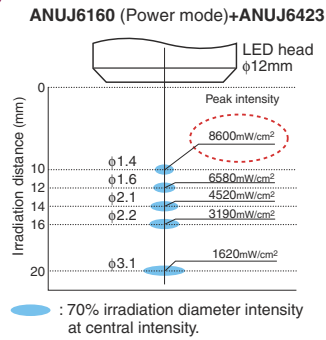
\*1 Secured to standard installation bracket and with 100% initial output at 25°C ambient temperature.

\*2 When power mode \*3 Not a guaranteed value.

## How to read UV intensity data

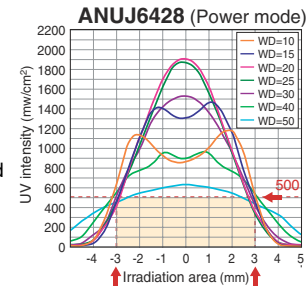
### Intensity vs head distance

When ANUJ6160 and ANUJ6423 are used in combination in power mode, the peak intensity in the center position at an irradiation distance of 10 mm is 8,600 mW/cm<sup>2</sup>. A 1.4-mm-diameter area can be irradiated at 70% of the center intensity (6020 mW/cm<sup>2</sup>).



### Irradiation distance vs intensity and area

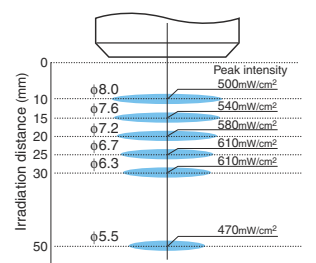
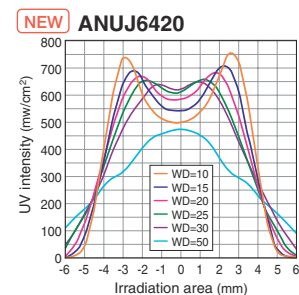
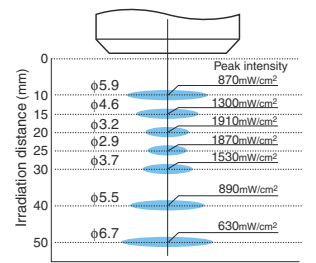
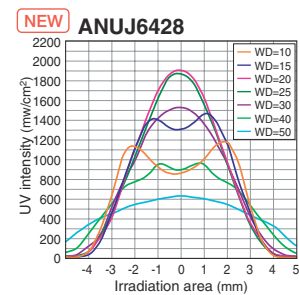
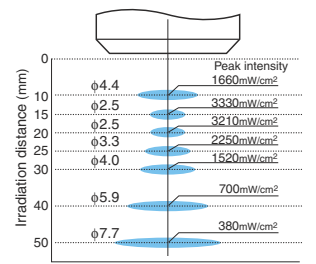
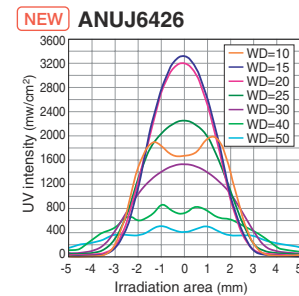
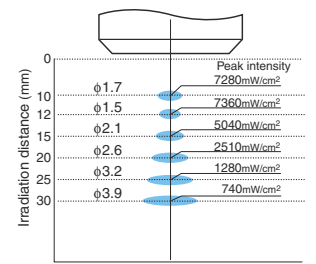
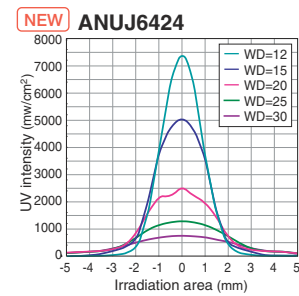
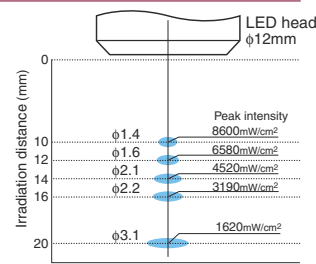
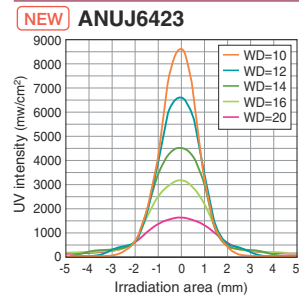
If an intensity of 500 mW/cm<sup>2</sup> and irradiation area of 6 mm diameter are required, draw a line on the graph that covers the  $\pm 3$  and 500 mW/cm<sup>2</sup> positions. This determines the lens that will satisfy the area this line surrounds and the lens irradiation distance. In this case, we can see that the ANUJ6428 (in Power Mode) can maintain an intensity of 500 mW/cm<sup>2</sup> or higher with an irradiation distance of 40 mm and area of 6 mm diameter.



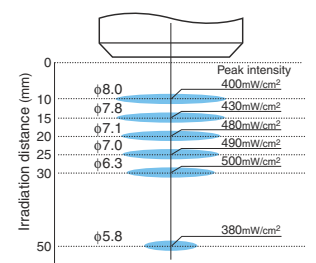
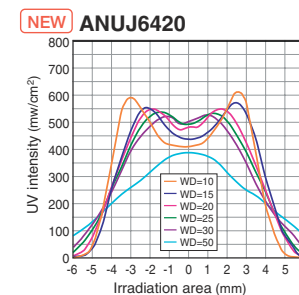
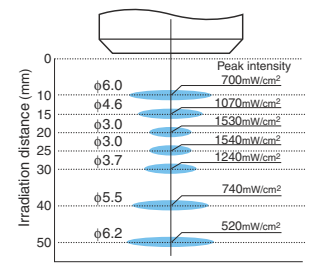
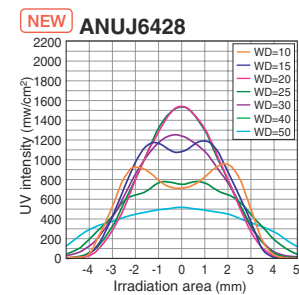
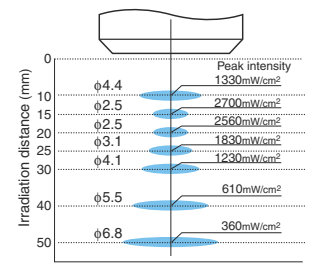
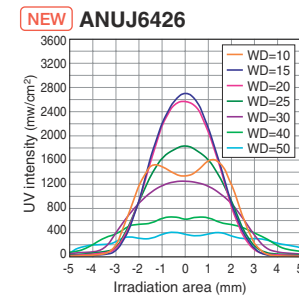
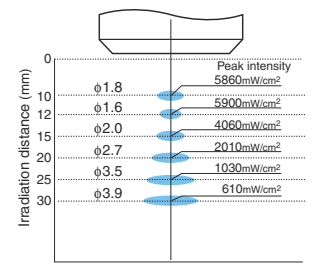
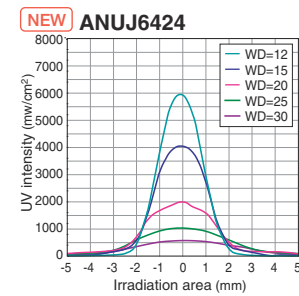
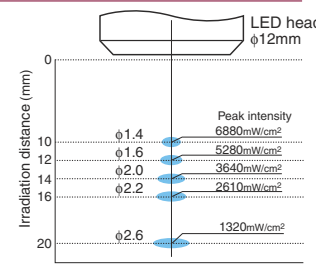
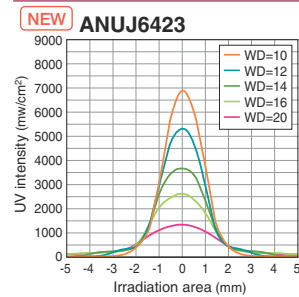
## Standard lens data (Typical characteristics)

### New head: ANUJ6160

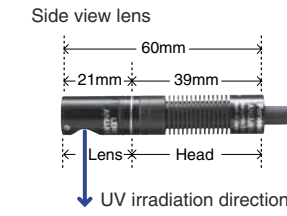
#### Power mode



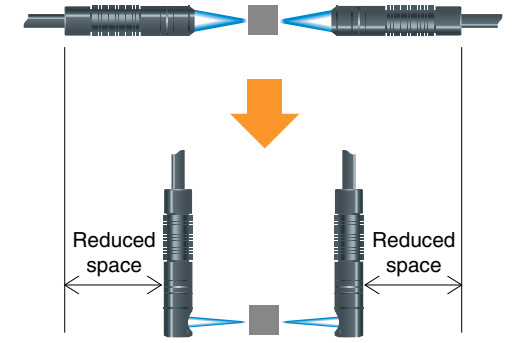
#### Feedback mode



## Side view lens



The side view lens bends the light path at 90 degrees, broadening the choice of head installation locations.

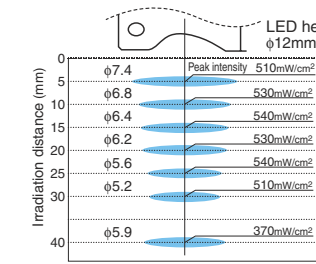
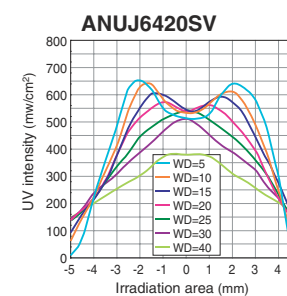
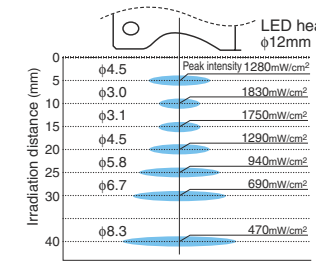
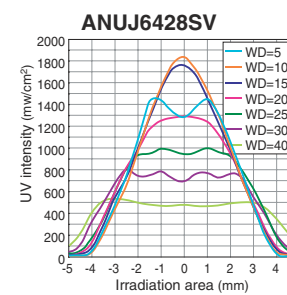
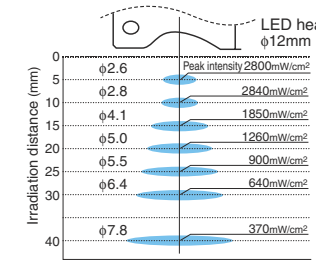
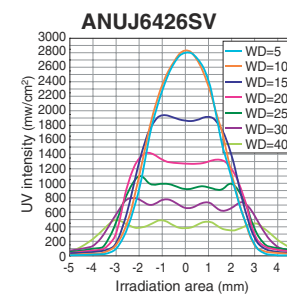


The head length and the cable leading direction are different from those of the standard type, significantly reducing the required space.

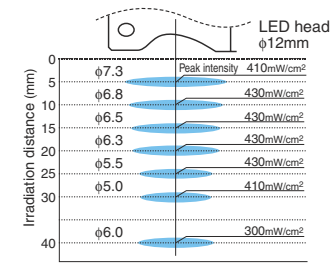
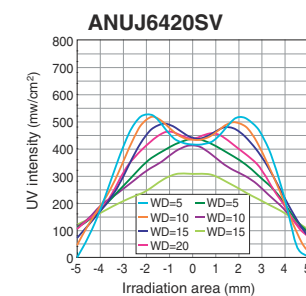
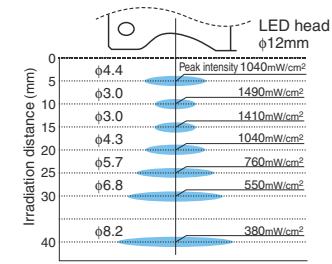
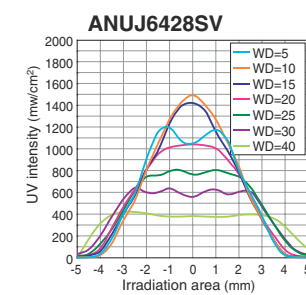
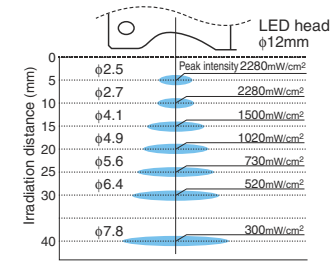
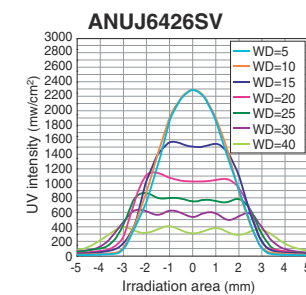
## Side view lens data (Typical characteristics)

### New head: ANUJ6160

#### Power mode



#### Feedback mode



## Applications

Ideal for applications needing reduced heat and curing distortion.

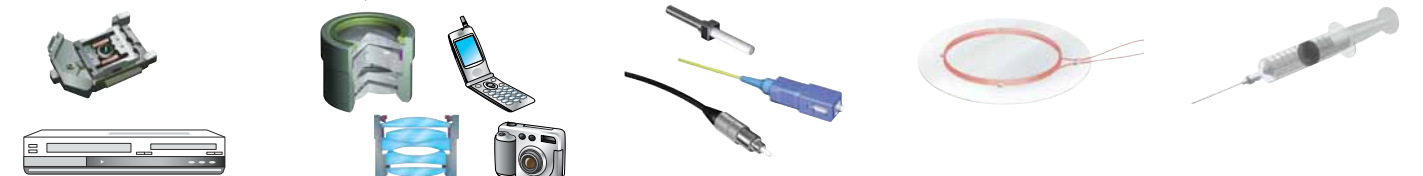
● Optical pickups assembly  
Bonding of lenses and prisms for Blu-ray Disc recorders, DVD-HD recorders, etc.

● Lens module assembly  
Bonding of lens units and filters for mobile phones, digital cameras, etc.

● Ferrule parts assembly  
Part fixation after alignment

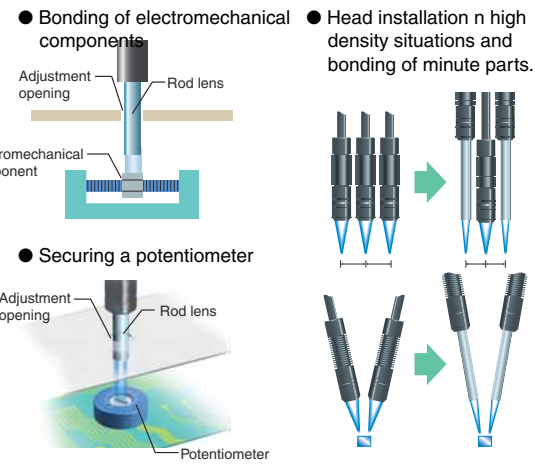
● Coil wire processing  
Coil wire fixation and end processing

● Injection needle fixation





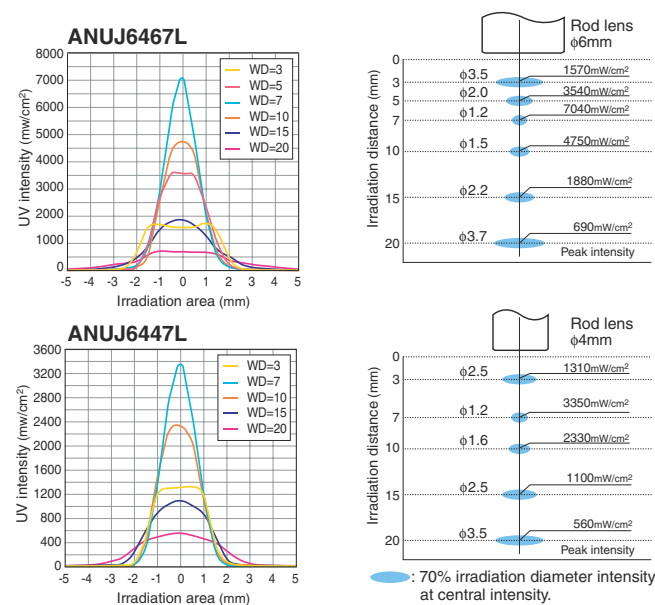
## Rod lens



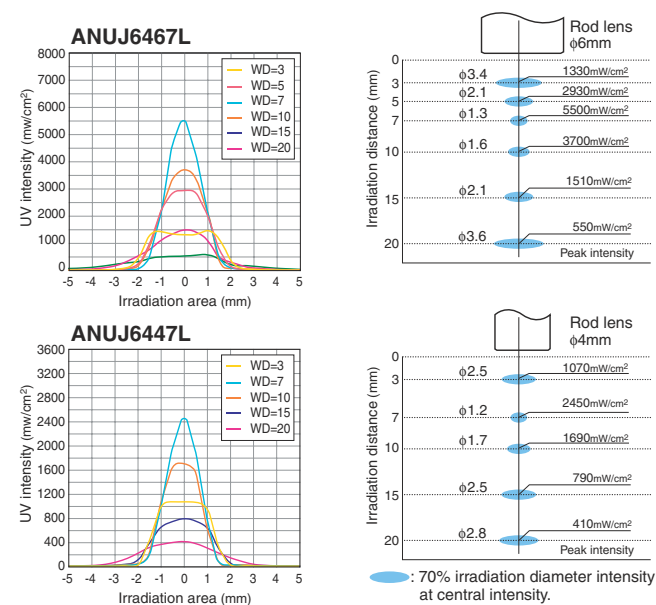
## Rod lens data (Typical characteristics)

### High power head: ANUJ6160

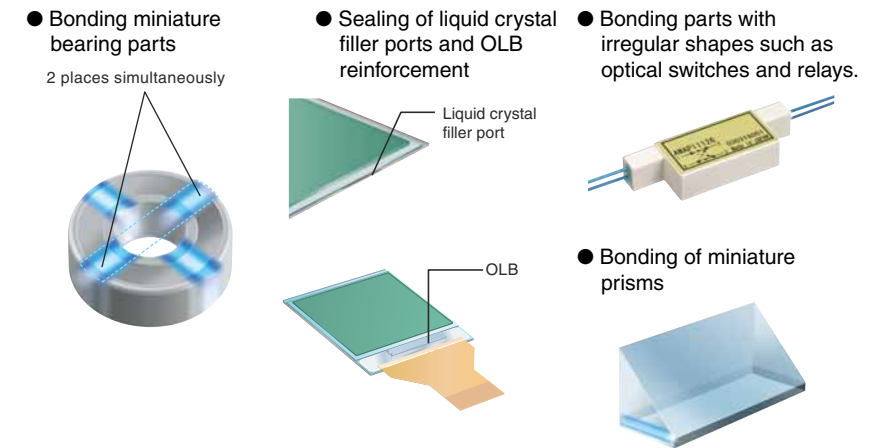
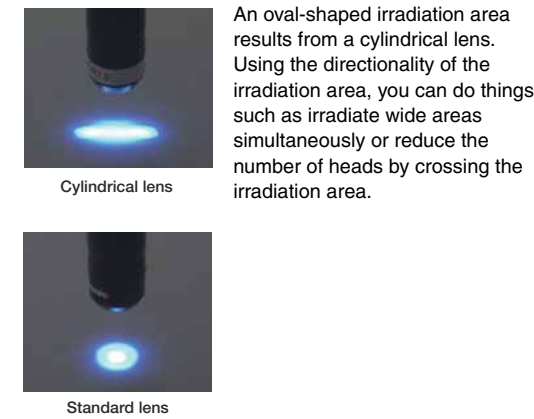
#### Power mode



#### Feedback mode



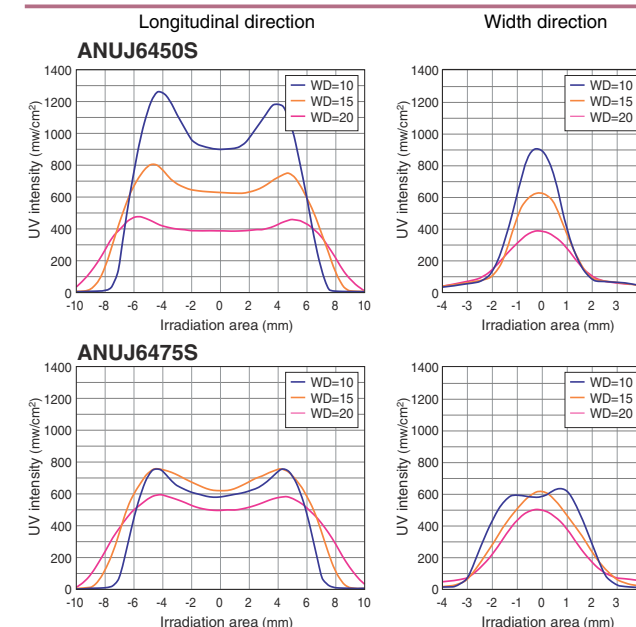
## Cylindrical lens



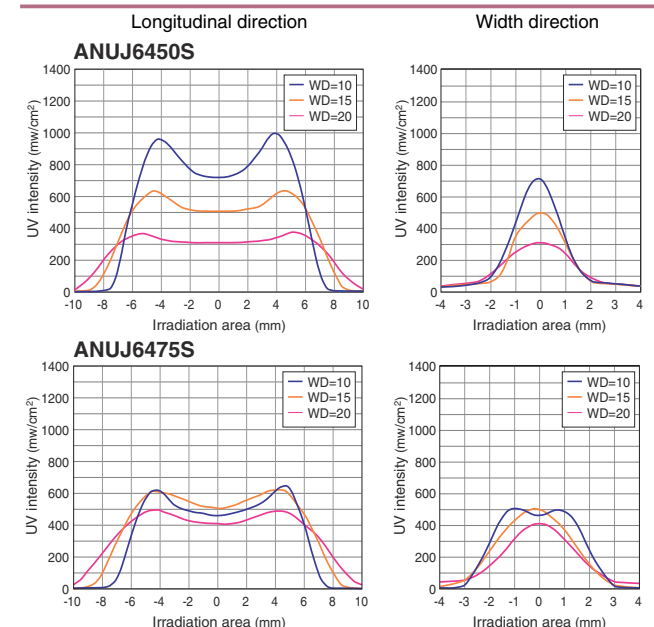
## Cylindrical lens data (Typical characteristics)

### High power head: ANUJ6160

#### Power mode



#### Feedback mode



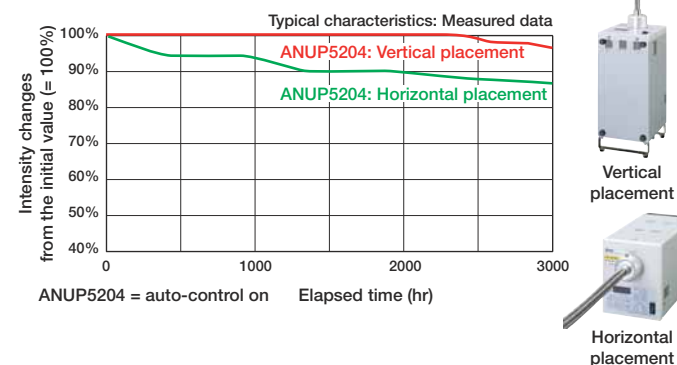
## Both LED and Lamp type UV curing systems are included in the lineup to meet a wide variety of applications

### International standard spot-type model ANUP5204

- High output of 4,000 mW/cm²
- Worldwide compatible power supply range from 100 to 240 V AC
- By consuming 40% less power than conventional models, this unit reduces electric power costs.
- Low temperature filters to prevent temperature rises are available.
- Instructions manuals are available in Chinese and English.

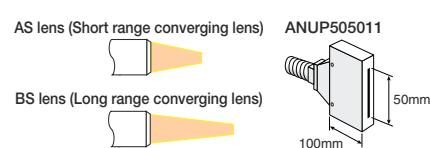


### The UV auto control function provides stable, high output UV irradiation over the entire lamp life.



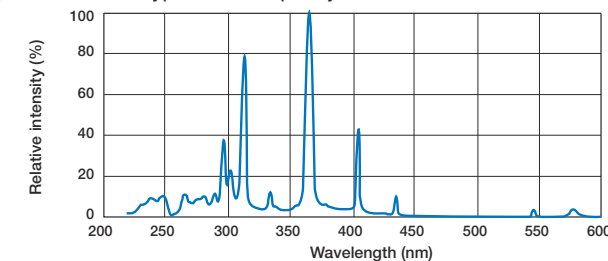
### Wide variation

In addition to 1 to 4 branches and 3.5, 5 and 8 mm diameters, a wide range of other irradiation fibers are available.



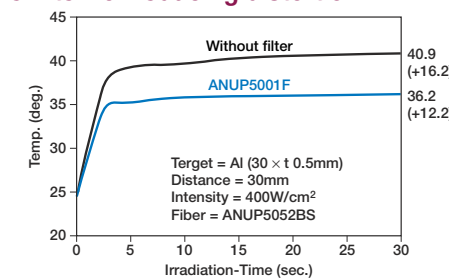
## Ideal UV wavelength

The 365 nm wavelength is supported as the main wavelength. Short wavelengths are also supported, so surface tacking caused by different resin types can be quickly removed.



## Low temperature filter for reducing distortion

Filters are available that apply the right amount of heat to suit the resin type.



## For uniform irradiation of wider areas

ANUP5256 offers the convenience you get with a spot type.

### ANUP5256

For lens adhesion and stamp UV curing, etc., this system can be added to existing facilities. The slim controller takes up narrow space.



Power supply units up to 12 kW available. Supports irradiation widths from 4 cm up to 120 cm.

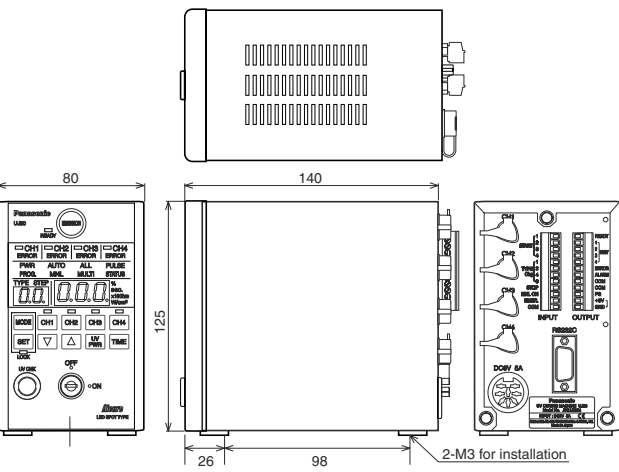
To meet your needs, power supply units ranging from 1kW to 12 kW are also available for the irradiation units you are using such as integrated belt-conveyor types, batch types, and separate lamp house types.



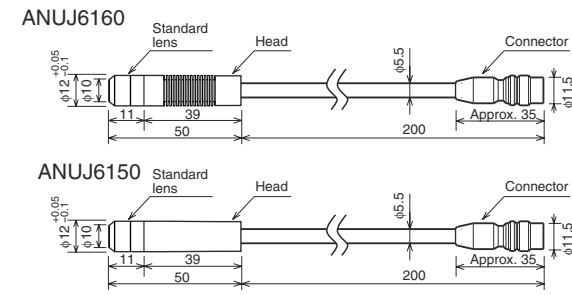
■ Dimensions

(Unit: mm)  
Protruding portion not included.

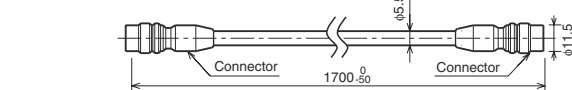
● Controller (weight: 1.0kg) ANUJ5024



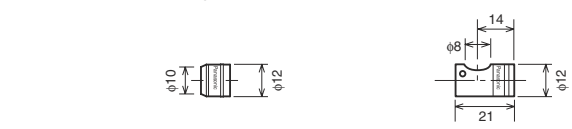
● Head



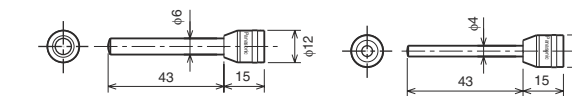
● Connection cable ANUJ6220



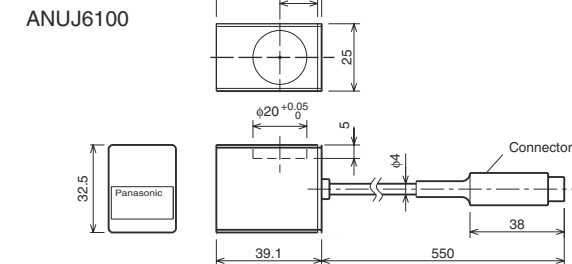
● Standard lens, Cylindrical lens ● Side view lens



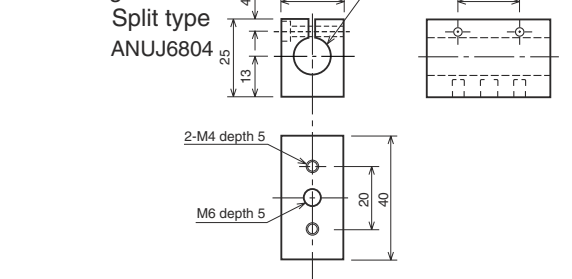
● Rod lens ANUJ6467L ANUJ6447L



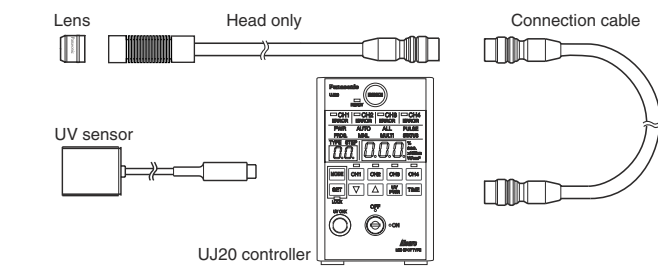
● UV sensor



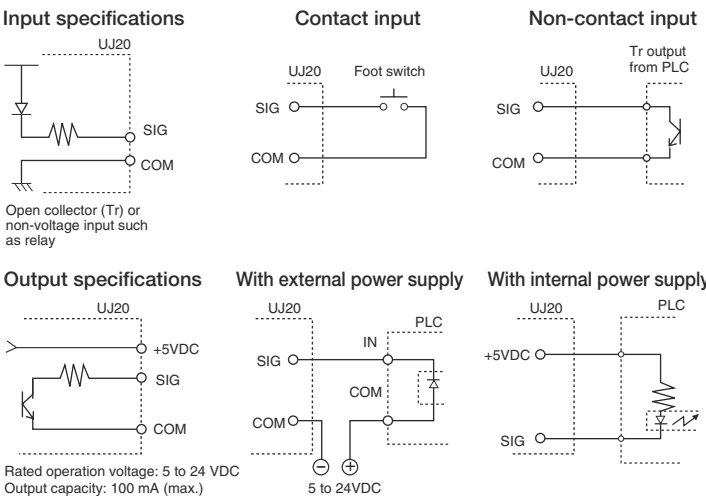
● Mounting bracket



■ Configuration diagram



■ I/O specifications



● I/O list

INPUT		OUTPUT	
No. of terminal	Signal	No. of terminal	Signal
1	START1	13	READY
2	START2	14	BUSY1
3	START3	15	BUSY2
4	START4	16	BUSY3
5	TYPE Chg1	17	BUSY4
6	TYPE Chg2	18	ERROR
7	TYPE Chg4	19	ALARM
8	TYPE Chg8	20	COM
9	STOP	21	COM
10	MNL ON	22	FG
11	EMER.	23	+5V
12	COM	24	GND

■ Safety precautions

This LED UV curing system uses a Class-3B ultraviolet LED. Safety labels are affixed to the product.



UV curing system

Customer Inquiry Sheet

Matsushita Electric Works, Ltd.  
Automation Control Device Division

**Aicure** representative

FAX: +81-(0)6-6908-0628

Tel: +81-(0)6-6908-1019

Email: webmaster@aiplasma.com

Day	Month	Year
:	:	:

To request consultation, please fill in this inquiry sheet and fax it to us.

Company name	Person in charge	
Address	e-mail:	
	FAX.	
Intended date of installation	Budget	
Application	Curing Bonding Other ( )	Workpiece name
Workpiece allowable temperature		Workpiece type
UV resin name		Workpiece material

■ Production tact or UV irradiation time

\_\_\_\_\_ pc./sec. or \_\_\_\_\_ sec./pc.

■ Irradiation area

\_\_\_\_\_ mm × \_\_\_\_\_ mm

■ Irradiation intensity

\_\_\_\_\_ mW/cm<sup>2</sup> or \_\_\_\_\_ mJ/cm<sup>2</sup>

■ Irradiation distance

\_\_\_\_\_ mm

■ Simultaneous irradiation points

\_\_\_\_\_ 1, 2, 3, 4, ( ) points

■ Other

We will give you a simulation of the costs involved for switching from a lamp-based UV curing system to an UJ20 LED UV curing system

Price of purchasing the main unit and fiber of a lamp-based UV curing system:

\_\_\_\_\_ USD

Lamp purchase price

\_\_\_\_\_ USD

Lamp replacement timing

\_\_\_\_\_ Hours

Equipment running time

\_\_\_\_\_ hrs./day

