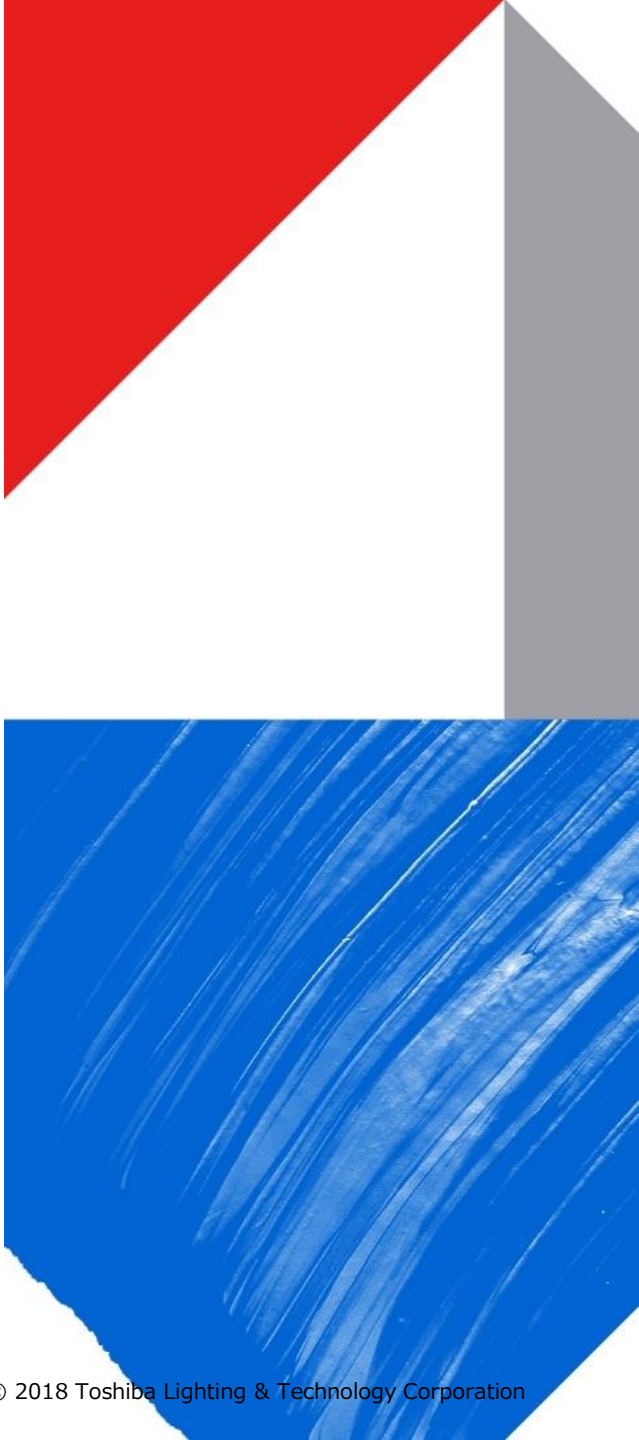




TOSHIBA

Toshiba Lighting & Technology Corporation

IR heaters

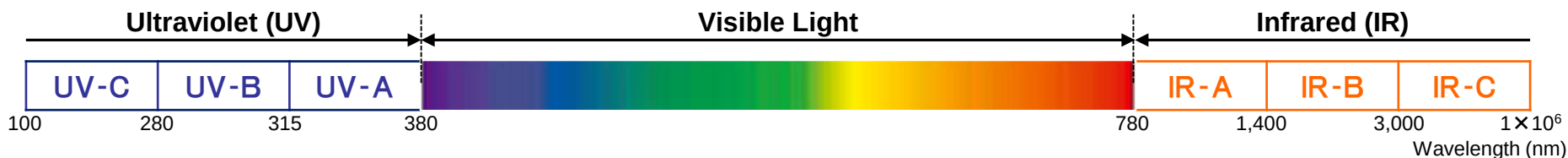
Toshiba Lighting & Technology Corporation
FY2019 Version

Scope of Disclosure: Participants of this meeting only

Information owner
department manager: Heater Engineering Group Manager

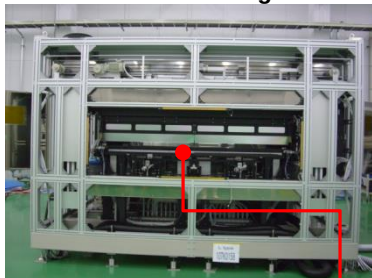
Industrial Light Sources (Industrial Device Div.)

Providing light sources in a wide range of wavelengths to increase customer product value

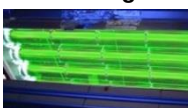


Industrial UV Light Sources

UV unit for liquid crystal manufacturing



MH UV lights



UV lamps & stabilizers for ballast water processing



On-board Light Sources

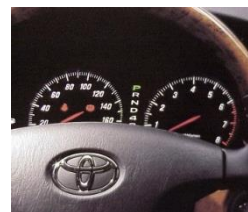
Automobile headlights



Exterior lightbulbs



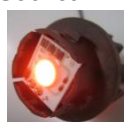
Interior light sources



Step lighting



Socket LEDs

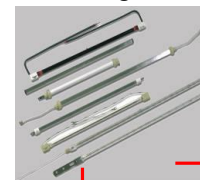


Industrial Heaters

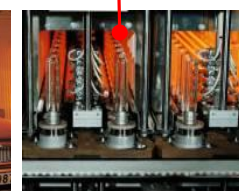
Ceramic heaters



Infrared halogen heaters

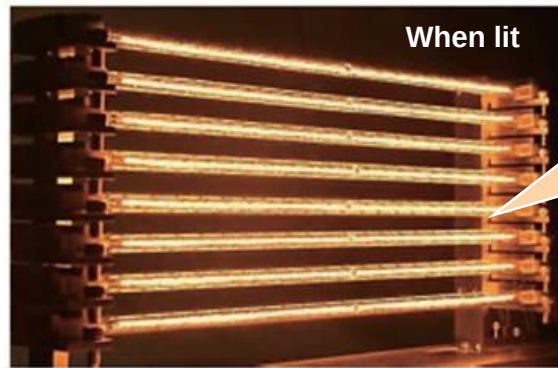


Paint drying

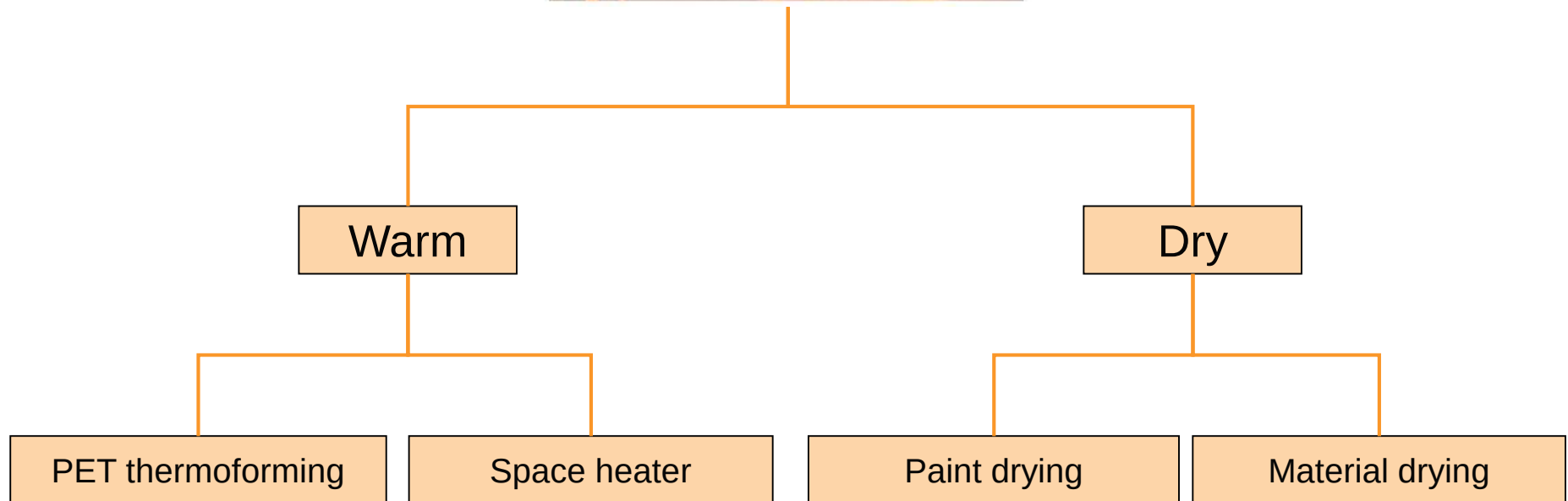


PET bottle forming

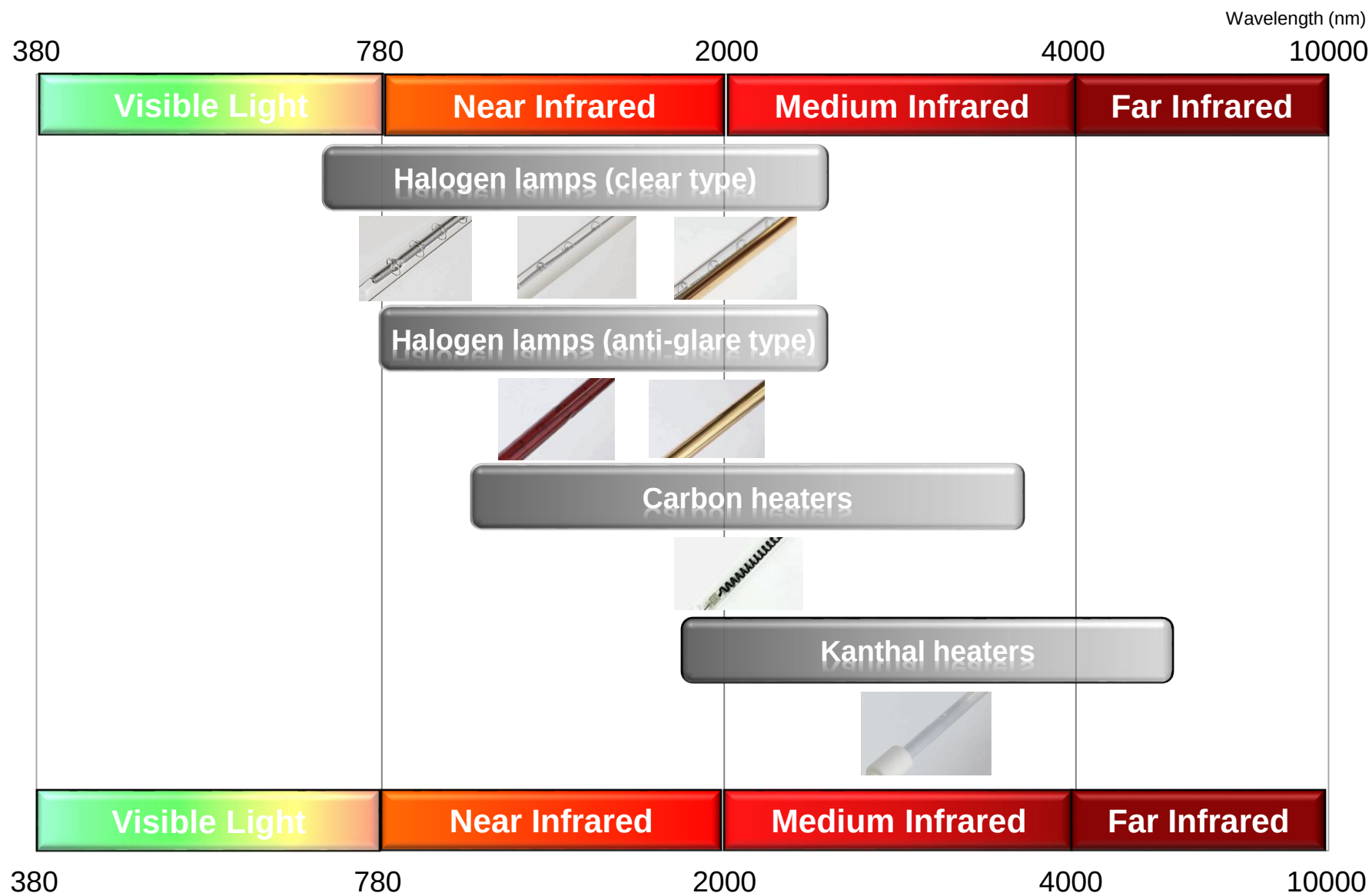
Example IR Heater Uses



Heating method that uses the radiated heat energy



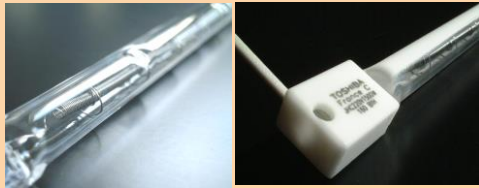
Product Introduction (IR Lamps)



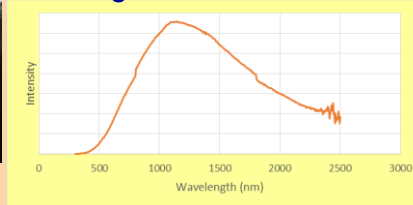
IR Heater Lineup

Heater products with excellent efficiency and IR light that matches the subject

Halogen heaters (clear type)



Halogen heater emission

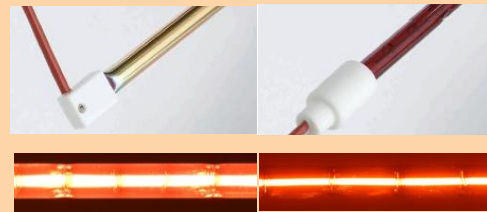


* Applications

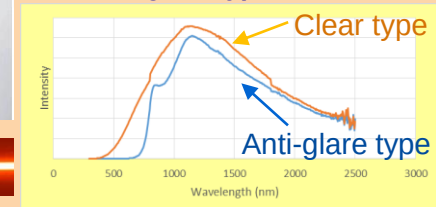
- [Used for drying paint and materials, etc.](#)
- PET bottle and other [plastic forming](#)

* Corresponding light length: Near infrared
(Power density: 13W/mm)

Halogen heaters (anti-glare type)



Anti-glare type emission



* Applications

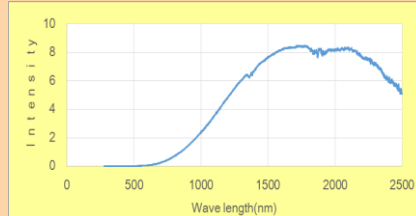
- Used for [heating outdoors, etc.](#)

* Corresponding light length: Near infrared
(Power density: 7W/mm)

Carbon heaters



Carbon heater emission



* Applications

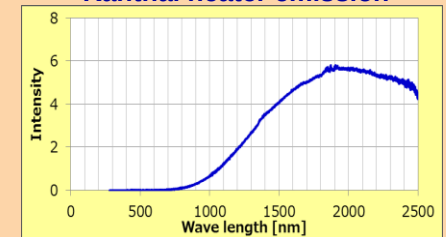
- Used for [heating outdoors, etc.](#)
- PET bottle and other [plastic forming](#)
- Used for [drying paint, etc.](#)

* Corresponding light length: Medium infrared
(Power density: 4.5W/mm)

Kanthal heaters



Kanthal heater emission



* Applications

- Used for [heating outdoors, etc.](#)
- Used for [drying paint, etc.](#)

* Corresponding light length: Medium infrared
(Power density: 2W/mm)

Heater Performance Comparison

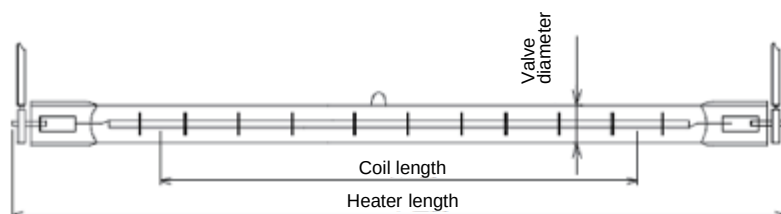
We provide heaters of our own design to match the quality of the irradiated material

	Halogen Heaters			Carbon Heaters	Kanthal Heaters
	Clear type	Reflective film type	Anti-glare type		
Heat generating material	Tungsten			Carbon fiber	Kanthal (Cr + Fe + Al)
Max. power density (power per single coil)	13.0 W/mm		7.2 W/mm	4.5 W/mm	2.0 W/mm
Installed orientation	Free orientation			Free orientation	Horizontal
Brightness	600 candela		50 candela (multi-layer thin film)	2 candela	1 candela or less
Life	5000 hr			5000 hr	20000 hr
	Initial output maintained until end of life			Power declines with usage time	
IR wavelength (peak wavelength)	Near infrared (1.0-1.6 μm)			Medium infrared (2.0-2.5 μm)	Medium infrared (2.0-3.0 μm)
Suitable irradiated body	Metals, plastics			Plastics, water applications	Water applications

Halogen Heaters (Clear type, Reflective film type)

- ✓ Clear type: Standard halogen heaters that radiate energy in all directions
- ✓ With reflective film: Highly efficient heaters that concentrate the radiated heat in one direction and eliminate the need for a reflective plate in the heater to save space and reduce costs.

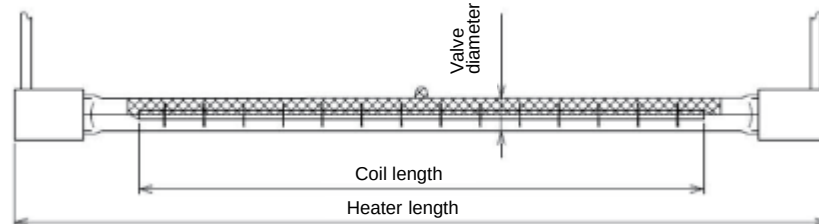
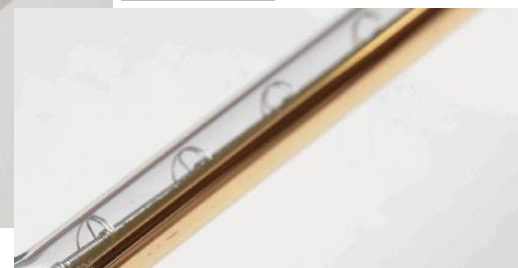
Clear type: JHS, JHP



With white reflective film: JHC/JHE



With metallic reflective film: JHG



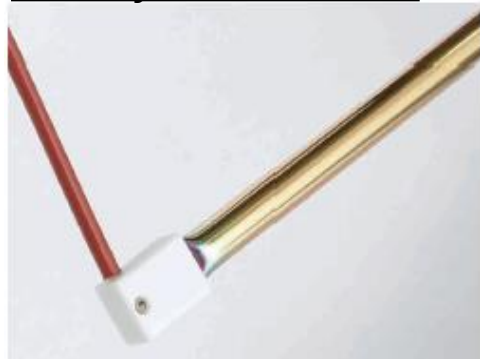
Type	Valve diameter	Heater length (mm)		Coil length (mm)		Max. power density	Glass external surface temperature
	(mm)	Min.	Max.	Min.	Max.	(W/mm)	°C
JHS	φ 10	160	1600	100	1530	12.0	800
	φ 12		1550		1480	12.5	
	φ 13		1450		1380	13.0	
	φ 15		1350		1280	15.0	

Type	Valve diameter	Heater length (mm)		Coil length (mm)		Max. power density	Glass external surface temperature
	(mm)	Min.	Max.	Min.	Max.	(W/mm)	°C
JHC (white standard)	φ 10	160	1600	100	1530	11.0	800
JHE (white high efficiency)	φ 12		1550		1480	11.5	
	φ 13		1450		1380	12.0	
JHG (metallic reflection film)	φ 10	200	1600	140	1530	3.5	600

Halogen Heaters (Anti-glare type)

This warning heaters cut the light in the visible range by 2 to 99% to reduce glare

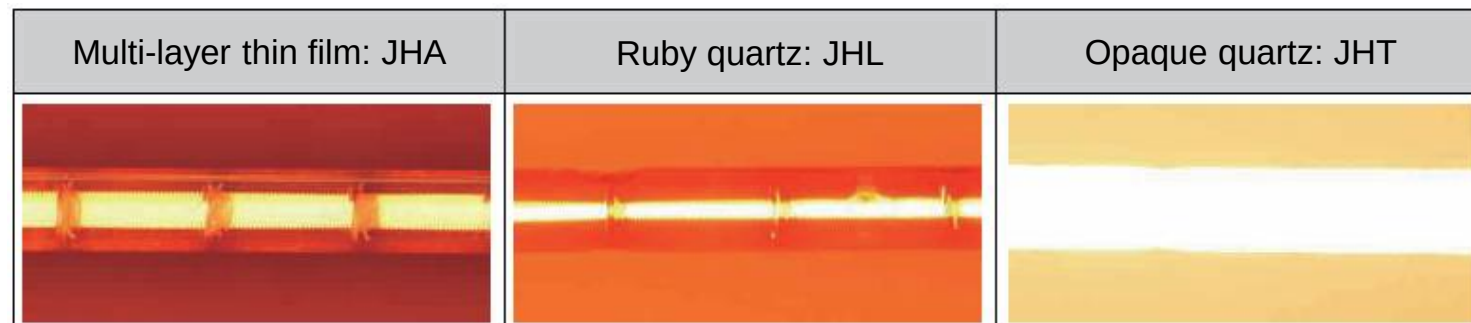
Multi-layer thin film: JHA



Ruby quartz: JHL



Opaque quartz: JHT



Type	Valve diameter	Heater length (mm)		Coil length (mm)		Max. power density	Glass external surface temperature	Shading rate
	(mm)	Min.	Max.	Min.	Max.	(W/mm)	°C	%
JHA (multi-layer thin film)	φ 10	260	355	180	290	7.2	750	99
	φ 12							
JHL (ruby quartz)	φ 10	160	700	100	635	6.0	700	90
JHT (opaque quartz)	φ 10	160	1000	100	935	3.5	600	2

Carbon Heaters/Kanthal Heaters

Warming heaters for plastics, water-soluble matter, etc., that absorbs the 2 μ m-3 μ m spectrum

Applications

Carbon heaters (JHF): Heating plastic/water, space heating

Kanthal heaters (JHK): Heating water, space heating



JHF

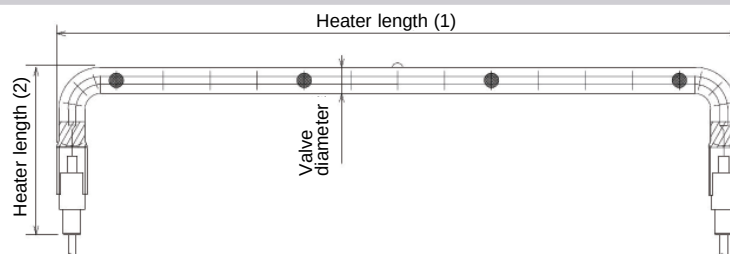


JHK

Type	Bulb Diameter	Heater length (mm)		Coil length (mm)		Max. power density	Glass external surface temperature	Light direction
	(mm)	Min.	Max.	Min.	Max.	(W/mm)	°C	
JHF (Carbon heater)	$\phi 10.5$	196	746	116	666	4.5	650	Free direction
	$\phi 12.5$							
JHK (Kanthal heater)	$\phi 10$	160	1600	100	1500	2.0	500	Horizontal light only
	$\phi 12.5$		1550		1480			

Other (Irregular Shape Types)

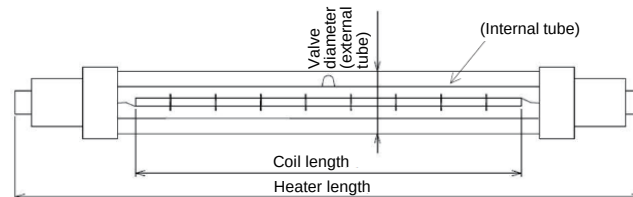
U-shaped type: JHU/JHUC



Application
PET bottle forming

Type	Valve diameter	Heater length (mm)		Coil length (mm)	Max. power density	Glass external surface temperature
	(mm)	(1)	(2)		(W/mm)	°C
JHU (U-shaped clear type)	φ 10.5	262	60	268	13.0	800
JHUC (U-shaped with reflective film)						

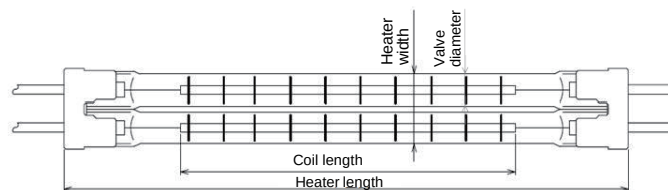
Double-tube type: JHDS, JHDL



Application
Heating food

Type	Valve diameter	Heater length (mm)		Coil length (mm)		Max. power density	Glass external surface temperature
	(mm)	Min.	Max.	Min.	Max.	(W/mm)	°C
JHDL (double-tube ruby type)	φ 20	180	700	100	625	7	550
JHDS (double-tube clear type)							

Twin type: JHX, JHXC, JHXG



Application
Heating unit

Type	Valve diameter	Heater length (mm)		Coil length (mm)		Heater width	Max. power density	Glass external surface temperature
	(mm)	Min.	Max.	Min.	Max.	(mm)	(W/mm)	°C
JHX (Twin clear type)	φ 10	180	700	100	625	22	10.0	800
JHXC (Twin with white reflective film)							9.0	
JHXG (Twin with metallic reflective film)							2.5	600

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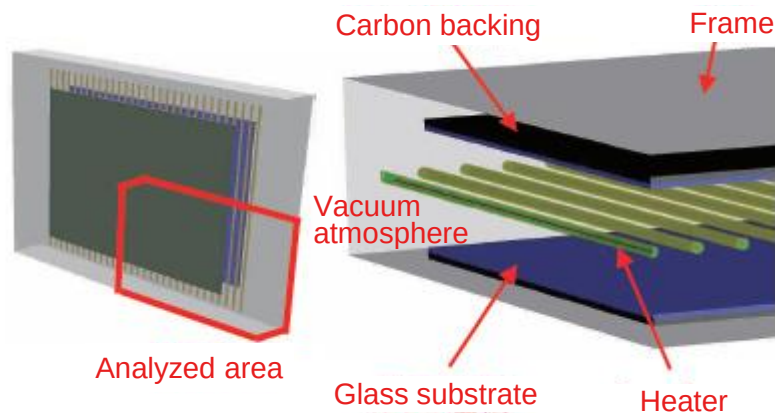
Thank you for your attention

Heater Units

- ✓ Abundant lineup supports various space sizes (supports the required temperature distribution)
- ✓ Simulations are used to obtain the optimum unit heating design to achieve high heat uniformity.



Simulation model



Simulation results

