Infrared Lamps
More than radiation
Drying drum
What is Radiation?

There are different options to heat up objects – with and without direct contact:

Conduction
Transmittance by direct contact with the heat source

Convection
Transmittance by direct contact with the heated media

Radiation
Contact-free transmittance through electromagnetic radiation

Contact-free heating
An object irradiated by a heat source with short or medium wavelength can absorb more than 92% of the radiated energy. This radiation can be transformed into heat within the heated object. To gain the highest possible efficiency the material of the heated object has to have an absorption coefficient which matches the spectrum of the IR-lamp.

Invisible for human eyes
IR radiation lies beyond the range of visible light and therefore it cannot be seen by the human eye. According to DIN 5031 the spectral range of IR radiation is defined from 0.78 µm to 10.0 µm. The IR range is divided into the sections IR-A, IR-B and IR-C, as shown in the diagram.

Spectrum of the IR range
It is customary to use the terms short wave, medium wave and long wave to classify IR-lamps. These definitions are easily remembered, but from a technical point of view they are incorrect. Solid state or monolithic lamps, i.e. incandescent lamps, continuously emit radiation within two of the above-mentioned wavelength ranges.

Typical spectrum of an incandescent lamp at different colour temperatures.
Heating technology 
at its best

USHIO Infrared lamps (IR-lamps) are manufactured from quartz glass and constructed to ensure longevity of the lamps. The product range consists of lamps for short-wave and medium-wave applications.

- Available from 100 W up to 16000 W
- Colour temperature from less than 800 K up to 3200 K
- Available with or without integrated reflector
- Radiation adaptation in accordance with the application by use of additional tubes or coatings
- A unique feature for USHIO IR-lamps is the EasyFit technology. With this technology, the exchange of lamps – even of customized ones – is extremely fast and easy. EasyFit is individually adjustable and combines convenience and functionality. The lamp is both electrically attached and at the same time mechanically mounted
- The well-known quick plug-in connector (KSSV) can be assembled
- Customer-specific modifications or new developments of IR-lamps on request

Highly efficient in performance and costs
- Short IR-lamp reaction time: 1–3 seconds, i.e. very little delay during switch-on, control and switch-off
- Very important if the material supply is stopped!
- IR-lamps with short or medium wavelength are available to transform more than 92% of the total input of electrical power into IR radiation
- Typical average life of 5000 hours at rated voltage
- No heating of the surrounding air through short-wave radiation
- No warm-up costs or heat-up time
- High-quality quartz tubes guarantee mechanical and thermal robustness
- Dimmable with several electronic devices
- IR radiation can be directed by using an integrated reflector which leads to low IR power loss
- Specific area heating from 1 up to 500 kW/m²
- Construction of compact machines due to the small dimensions of the IR-lamps
- Specific power density from 10 up to 270 W per cm heat length
Heating technology

Spot welding unit with IR Pin-type lamps; image by bielomatik Leuze GmbH & Co. KG
Apply USHIO quality to meet your need

- Glass and PET thermoforming
- Plastic welding
- Keeping food warm in catering
- Heating of wafers in the semiconductor industry / epitaxy
- Drying of fillers and varnishes in the car industry
- Humidity control in the paper industry
- Medical applications
- Fixing of toner in copy and printing machines
- Release of tension on metal welding joints
- Soldering of printed circuit boards
- Activation of glue
- Hardening of resins
- Material testing
- Shrink-fitting of ball bearings
- Hardening of cement
- Heating air in halls and in public transport vehicles
- Shrinking of foils
- Evaporation of solvents (development of films)
- Evaporation of water in air humidifiers

Drying of ceramic bases
We provide for the perfect fit

Through close cooperation of the R&D and production departments, USHIO is able to develop and produce application-specific lamps. Sometimes a small modification is sufficient to optimize the application.

Single-tube lamps
Most applications use the typical single-tube lamp. It is available in different versions.

IR Pin-type lamps
Single-ended IR Pin-type lamp with reflective coating. Designed for spot heating of contours – especially in the plastic welding industry.

Twin-Tube lamps
Both tubes of the twin-tube lamps are melted together. This ensures very high stability for longer lamps. Twin-Tube lamps can be single-ended or double-ended.

Bended single-tube lamps
USHIO has developed an advanced production process and can therefore offer highly sophisticated bended lamps. The advantage of these lamps: they can be combined in a variety of ways to provide homogeneously heating fields.
Ushio IR-lamp sockets

- LirU
- EasyFit
- B
- LirM
- R7s
- R7s tube
- KSSV
- Fa4
- Lr
- LidU
- G
- Lin
- LIR
Heat up the power with reflectors

Integrated reflector
Due to the longitudinal dimensions of IR-lamps the radiation is radial. By using a reflector, the radiation can easily be directed, increasing usable IR power up to 170%. Integrated or external reflectors can be used depending on the application. Integrated reflectors guarantee high quality, easy handling and heat protection of the IR-lamps housing.

Integrated reflectors are directly flame-sprayed on the quartz tube. In most cases the reflector is made of alumina ceramic. It has an efficiency of approx. 80%. The temperature resistance of the alumina ceramic reflector is higher than the one of the quartz bulb. This guarantees – even in applications without forced air cooling – the reflectors functionality over its lifetime.

Relative, radial radiant power in % with and without reflector
How to operate
USHIO IR-lamps

General hints

• Clean gloves must be worn when handling IR-lamps to avoid contamination of the quartz tube.
• If cleaning is necessary, this should be done using rubbing alcohol or another suitable alcohol.
• IR-lamps may only be handled if disconnected from the power supply.
• Even after switching off, IR-lamps can be so hot that they can cause burns.
• When changing lamps, the lamp holders should be checked for charring and if necessary be replaced.
• It is important to take care to have the correct positioning when using IR-lamps with reflectors.
• The instructions which are enclosed with the lamp packing have to be observed at all times.

Permissible burning positions

During operations the burning position must be in accordance with the specification. The burning position is specified for every IR-lamp. If the IR-lamp is operated beyond the permitted burning position, its lifetime will decrease significantly. USHIO offers IR-lamps which are especially designed for vertical use.

Safety

USHIO IR-lamps are subject to continuous quality control measures and are designed not to cause any damage when used according to the instructions.

The lamps may be used only with suitable sockets. Please observe the manufacturer’s instructions for the maximum operation temperature and current of the sockets. Damaged sockets must be replaced.

IR-lamps generate a high amount of heat. When installing, care must be taken to maintain adequate distance between the emitter and the heated surface, as well as the reflector/fixture, to avoid damage.
Electrical design
USHIO IR-lamps are designed in a way to obtain a specific power at a certain voltage. The life span of the lamps depends directly on that. A frequent load change in the voltage of power can result in a shorter lifetime of the lamp. The operation at over-voltage will decrease the lifetime significantly. USHIO can adapt the production and handling of an IR-lamp in a way that its lifetime will not be affected by load changes. If you let us know beforehand, we will design the IR-lamp for your specific needs.

Permissible temperature range
To avoid melting of the quartz tube, interruption of the halogen cycle and oxidation of the molybdenum foil during operation of the lamp, care has to be taken to keep the operating temperatures as listed below.

Dimming
All USHIO IR-lamps are dimmable.
Develop together with USHIO

USHIO is a partner that listens to your ideas and requirements. Let us optimize your processes according to your specifications and expectations. Use our expertise to develop a tailor-made solution together that matches your needs.