

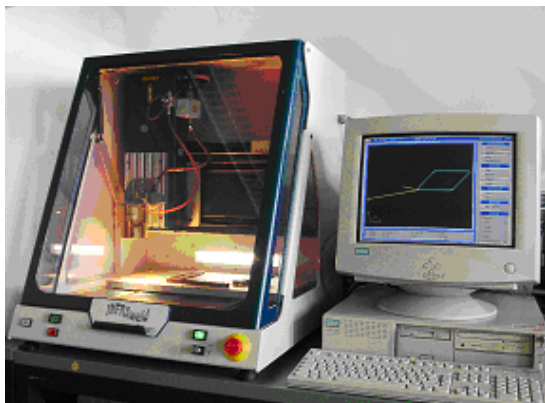
Infrared-Welding of thermoplastics

With infrared welding the welding energy is brought in contactlessly as with laser welding . The infrared-welding represents a economical alternative to the laser. The applicatino possibilities of this technology for thermoplastic plastics are various:

- Transmitted light welding
- Rivets and vent locking,
- Warming up, plastification for bending, butt welding
- Harden of adhesives ...

Description of the welding engineering

High performance halogen lamps in combination with ellipsoid reflectors can represent an inexpensive solution for many applications in the plastic connection technique. The infrared radiation of a source of infra-red light, lying in the focus of an elliptically formed reflector, is focused in the opposite focus (work area)By the very high temperature the plastic melts extremely fast. The energy can either brought in directly and at the same time e.g. for butt joint welding, rivets or vent locking into the joining parts or like the transmitted light welding through the first joining part into the second absorbing material.



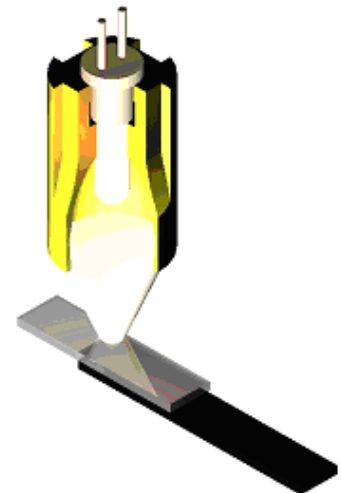
IR-Welding station as semiautomatic manual work place for plastic transmitted light welding

Halogenlamp

Ellipsoid-reflektor

Joining part

transparent
(above)
absorbend
(lower)

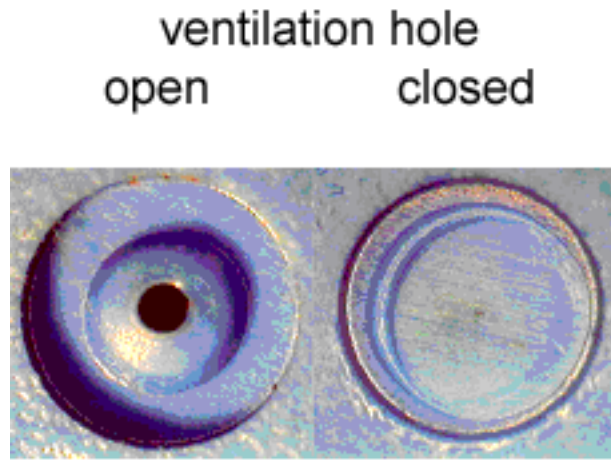


Advantages

- Bringing in the energy contactless
- No mechanical loads of the construction unit
- Good economy by small investments and operating costs
- Small plant complexity
- Simple, durable technology

Smaller safety requirements than the laser welding method

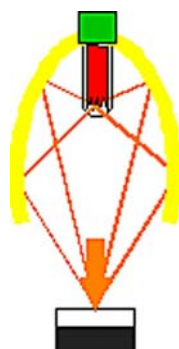
Example of application: Automatic manufacturing module for locking relay ventilation holes



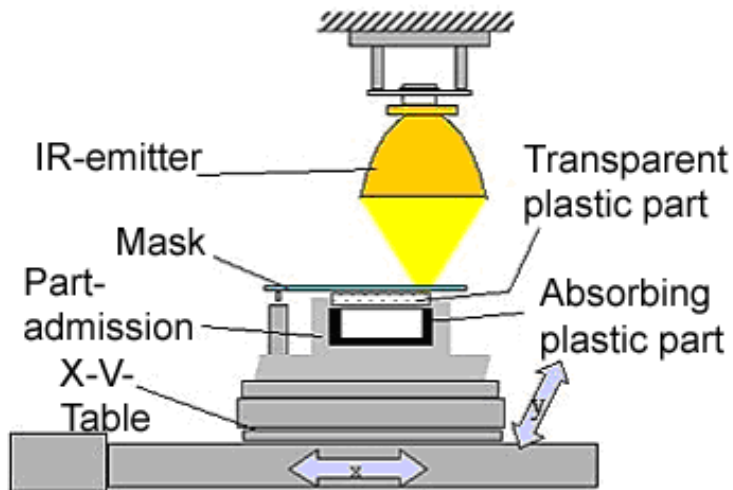
Infrared transmitted light welding for thermoplastic plastics

Operational principle for transmitted light welding:

The procedure is suitable for welding a thermoplastic component with an absorbing thermoplastic joining part, permeable for IR-radiation. The infrared radiation of a source of infrared-light lying in the focus of an elliptically formed reflector, is focused in the opposite focus (work area). The infrared radiation can pass the transparent component almost unhindered and is absorbed by the dark part, which melts by the heat entry. By the contact of both parts also the transparent part will become melted and in this kind both construction units are welded with one another. In applications, which demand a very high power density in combination with small jet diameters, the IR-radiation can be produced by IR-laser-systems. The IR lamp is characterised in relation to the laser systems by a small investments.



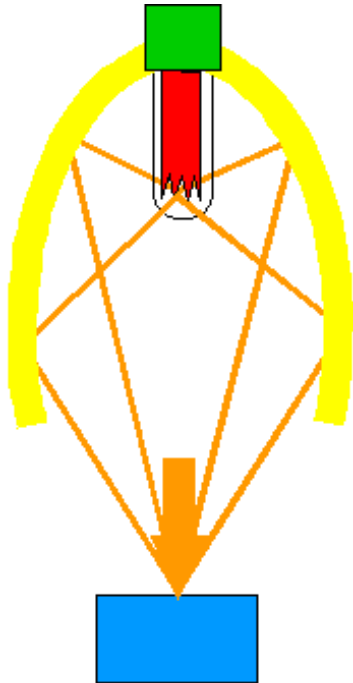
Principle of an infrared-light welding equipment for transmitted light welding:



Application references:

- Only suitable for IR-permeable plastics
- Fine seam structures can be manufactured by the use of masks
- Suitable for particle-free connections
- The procedure is suitable very well for automation and multiple's treatment
- Fillers and glass fibers should be avoided in the transparent part
- The transparent part can be dyed also permeable for IR-radiation

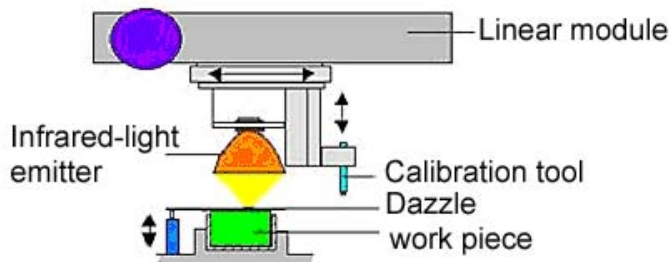
Infrared light welding of thermoplastic plastics



Operational principle of InfraWeld:

The IR-radiation is suitable in the focus of an elliptically formed reflector lying in the opposite focus.

The plastic melts extremely fast, because of the very high temperature, with a small depth effect the plastified range frequently is reproduced for small-area point of linear welding zones with a cold tool.



Application references:

- Suitable for small area ranges
- Small depth effect by necessary short impact time of the infrared radiation, in order to avoid a decomposing of the material
- Suitable for particle-free connections
- Compared to other procedures the mechanisms are more economical
- The procedure is suitable very well for automation

Satisfied materials:

Nearly all common thermoplastics can be processed without problems.

PE, PP, PA 66, PC, ABS-PC, PS-PMMA, ABS-PMMA, ABS-SAN, PBT, PBT-PC

Example of applications for the infrared welding:

Small area-connections, locking bores, rivets, flanges and fixing different materials

Infrared light welding of thermoplastic plastics

General description of function:

Due to its secondary influence (mechanical or thermal load) on the jointing part and its environment, conventional joining processes for thermoplastic plastics are frequently not applicable.

The assigned sources of light emit within the range of 500 – 1500 nm. In this wavelength coverage the transparent plastics absorption is only small. The infrared light penetrates the transparent body and the absorbed radiation leads to melting the jointing area of the not-transparent adding partner, which is pressed with a defined stress in the second jointing part. The heat of fusion becomes on the transparent adding partner by the existing form and grip transfer.

Special pigmentations permit a dyeing of thermoplastics, without reducing their light permeability crucially.

As heat source light emitter in form of high performance halogen sources of light serves. For the welding these special halogen lamps are characterized by a small thermal inertia < 1s and a good building of the jets.

With a focus diameter of 2mm e.g. for outline welding in the focus a light achievement $P > 3000 \text{ W/cm}^2$ is obtained.

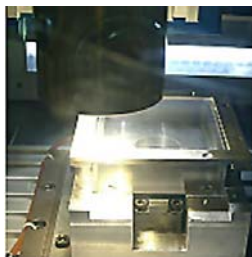
For certain applications (simultaneous and mask welding) also halogen line emitters can be used in combination with ellipsoid longitudinal reflectors.

By the high energy bringing in a very steep temperature distribution adjusts itself in the fusion layer, particularly with dark dyed parts. A too long warming up duration leads to reaching the decomposing temperature of the material. Therefore it can be worked only with small fusion layer thickness.

All thermoplastics with and without filler content are weldable. The energy bringing in into the workpiece can be controlled and steered exactly.

Depending upon adjusted light achievement the life span of the assigned halogen lamps lies between 300 and 20.000 h. Costs and maintenance costs are low.

The easy automatizableness permits application in the series and mass production.



Infrared welding of PVC-parts

Product program: Infrared-Emitter

SPOT



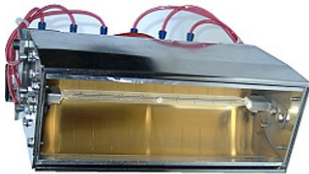
| | | | |
|-----------------------------------|-------|-------|----------------|
| Diameter | 45 mm | 45 mm | 70 mm |
| Length | 65 mm | 75 mm | 60 mm |
| Focus distance | 25 mm | 15 mm | 42 mm |
| Halogen lamp | 250 W | 250 W | 250 W 400 W |
| focus-diameter approx. | 3 mm | 3 mm | 3 mm 5 mm |
| light achievement in the focus | 70 W | 100 W | 100 W 180 W |

- Wavelength: 500 - 1500 nm
- Life span of the lamp, dependent on operating voltage: 100...3000 h
- Integrated cooling
- Completely with protecting glass of back reflector available



emitter Ø45 completely with protecting glass

LINE



Infrared line emitters

Infrared line emitters

- Dimensions: 235 x 91 x125 [mm]
- Focus distance: 25 mm
- Focus line lengthens: ca. 180 mm
- Wavelength: 500 – 1500 nm
- Achievement: 1600 W, 230 V
- Life span of longitudinal emitter: dependent on operating voltage approx. 100...1000 h
- Heatdecoupled housing with cooling and protecting glass

Product program: Power supply

Power supply **Universal**



- Supply of achievement dimmer and current measuring relay optionally for max. 2 emitters:
 - Spot emitter: 0-24V AC 250 VA
 - Spot emitter: 0-36V AC 400 VA
 - Line emitters: 0-230V AC 1600 VA
- Attitude of the lamp achievement over similar tension 0 ...10 V DC (makes Stand-by and efficient operation possible) or manually over potentiometer
- Measuring relay for the message of a defect lamp

Power supply **Production 19"**



- Lamp control with achievement dimmer and current measuring relay for spot emitter 250 VA
- Each 19"-unit supplies 2 IR-emitters
- Controlling of the lamp achievement over similar to tension 0 ...10 V DC

Power supply **Production basic**



- Production control for one or more emitters with achievement dimmer and current measuring relay for spot emitters 250 VA
- AP- housing
- Achievement dimmer control 0 - 10 V DC
- Switchgear cabinet cooler

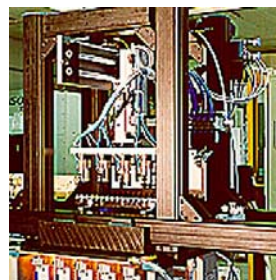
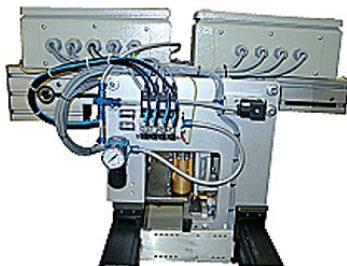
Product program: Welding machines

Basic module



- Welding machine for transmitted light welding
- Free programmable X, Y,Z axle
- Dimension: 610x665x705 [mm]
- Operating way: 295x200x130 [mm]
- In Combination with Power Supply
- „Universal“ for emitter types:
- Spot emitter: 0-24V AC 250VA
- Spot emitter: 0-36V AC 400VA
- Line emitter: 0-230V AC 1600VA
- Focus distance: 15 mm, 42 mm
- Around factor 4-5 more economically than diode laser systems
- Customized transmitted light plants on request

Special Production units



- Production modules for integration into automatic production lines
- Applicable to riveting, flanges, locking exhaust of filling openings, transmitted light spot welding
- Suitable for small-area point or line welding zones
- High productivity by the integration of several emitters into a production system
- Plants with pneumatic compressor rod screen, cold pressing down stamp as well as suction nozzle for the welding range
- Employment in combination with power supply production 19“ or production basic
- High reliability with the production of gas-tight connections

Customized solutions on request.