The PUK

Welding

- Work pieces are melted where they join each other and so fused together.
- Filler material (added metal), always has the same melting temperature as the work piece itself.
- The soldering processes always use a filler material (solder) with a lower melting temperature than the work piece itself, and the work piece is not melted.

PUK 3s professional plus

What is PUK?

The PUK is a precision welder that has been especially developed for work on jewellery. For a fraction of a second, it produces a tiny electric arc, also known as plasma. This arc (plasma), then generates a weld that can be varied in diameter between 0,3 and 3,5 mm.

PUK 2 and PUK 111

The principle:

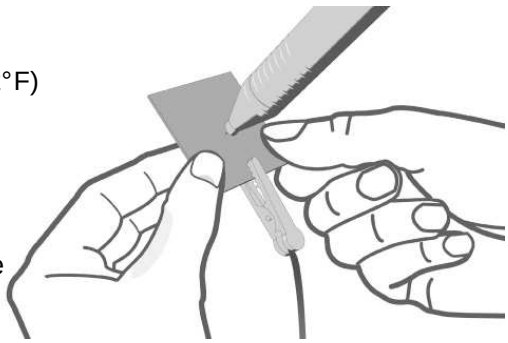
- Electrode made from Tungsten (melting temperature 3422℃ or 6192°F)

- The user touches the work piece with the tip of this electrode

- Protective gas flows out of the hand piece nozzle

- A charge of electrical current, "arc" is triggered between the tip of the electrode and the work piece

- Electrode retracts automatically from the point of contact



The PUK always creates single short welding impulses, this prevents the work piece from being overheated.

Protective Gas

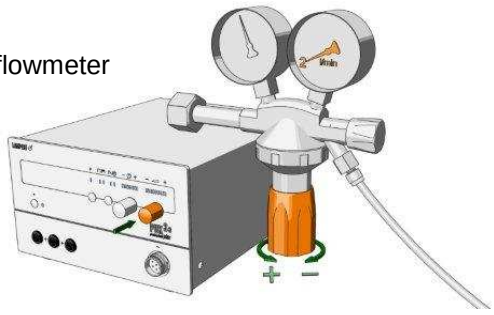
PUK always uses "**Argon 4,6**"
Like all inert gases it does not react: it can neither burn, nor is it toxic, or otherwise harmful.

A flow rate of max. 2 litres per minute is ideal!

Setting the flow rate:

- Switch on the PUK

- Open the valve on the gas bottle and the little black valve on the flowmeter regulator



- Press in and hold the rotary-knob "Power"

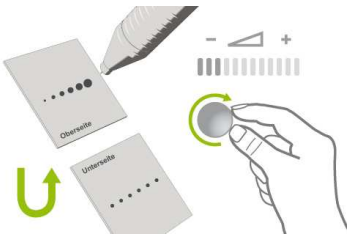
- The gas valve inside the machine opens

- the flowmeter shows the actual flow rate

- Adjust the large black knob on the underside of the regulator, until the required flow rate is reached (max. 2l/min)

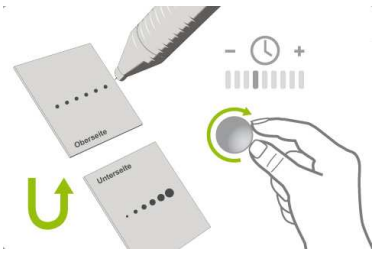
Power

The power level influences both the diameter of the weld, as well as the penetration depth



Impulse time

The impulse time describes the length of time that the electric arc remains on (active), after it is triggered.



In general, the impulse time is responsible for controlling the penetration depth of the weld. The longer the impulse, the deeper the penetration depth will be.

- Use the shortest possible impulse time when welding thin work pieces; this reduces the danger of melting a hole in the work piece

- When working near gemstones, use the shortest possible impulse time; this will minimise the risks of damaging the stone

The Modes

Standard mode

- Metals that readily give good welding results e.g. gold and platinum

HF-Pulse

- The HF-Pulse mode has been especially developed for the welding of silver alloys

- The electrical impulse is overlaid with a high-frequency (HF) wave

- The molten metal starts to vibrate when cooling down

- Finer grained structure is formed and the reason for increased stability and durability

Gap mode

- Uses an arc with a smaller diameter (also uses the "high-frequency technology")

- For welds in tight angles or recesses

Micro mode

- For welding very small or thin parts

The programmable memory
(professional plus only)

- 5 memory slots (freely programmable)

- 5 memory slots containing factory presets (PUK 3s only)

The electrode:

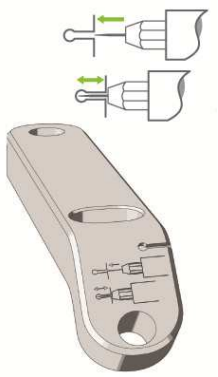
The most important influencing factor in PUK welding is the electrode: Here it is vital that the electrode is as sharp as a needle.

Always work with a sharp electrode!

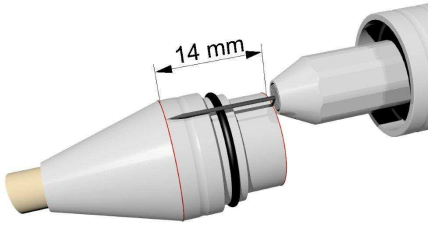
- The lower the power is that is used, the more important the condition of the electrode's tip becomes

- On the smallest and most delicate of welds, the electrode may already have to be changed or re-sharpened after a few welds.

Inserting and clamping the electrode



- Correct length can be set with the aid of the groove on the front of the hand piece arm of the microscope (left),
- or by comparing it with the nozzle (right).

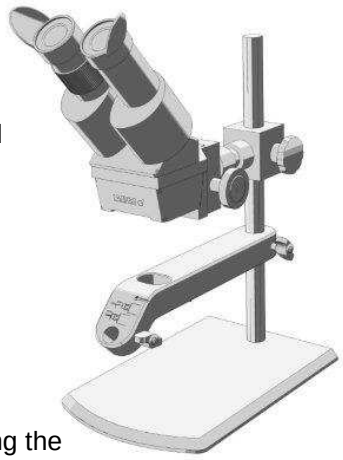


The less the electrode sticks out of the hand piece (the “shorter“ it is clamped into the hand piece), the better the protection by the argon gas will be. As a general rule, the electrode should not stick more than 4 - 5mm out of the nozzle.

- Never use pliers or similar for tightening as this can cause damage to the hand piece!

- Used electrodes can easily be re-sharpened

The microscope "Mezzo"



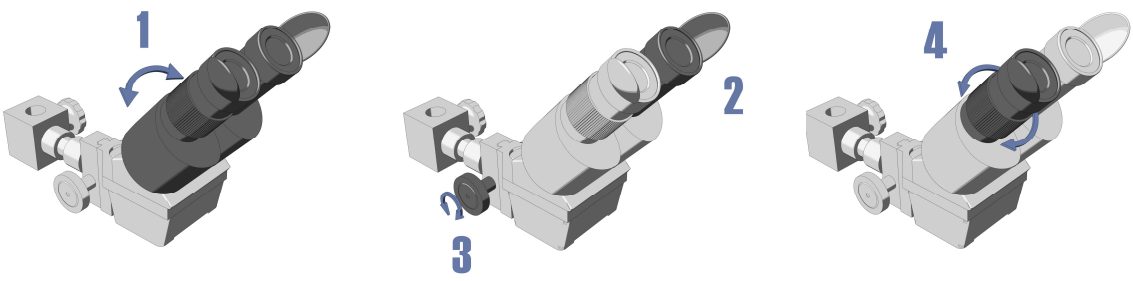
- Equipped with an electronically controlled eye protection filter, DIN-certified

Setting the microscope:

- First adjust the distance between the eyepieces (1)

- Then look through the microscope with the right eye only (2) and turn the focussing knob (3) until the tip of the electrode is clearly visible

- Then look through the microscope with the left eye only and focus by turning the eye-piece (4)



Placing the first weld

- Connect the plus pole to the work piece (e.g. with crocodile clip)

It is not possible to get an electric shock, even if you touch both poles at the same time! The PUK works only on metal.

- Hold the work piece directly, using both hands (do not just hold the crocodile clip)

- Rest your hands in a comfortable position on the work table

- Touch the work piece gently to the tip of the electrode. Do not press against the electrode

- Argon starts to flow

- After approx. 2 sec. the eye protection filter turns black

- The electrode is pulled back from the work piece, and the arc (plasma) is triggered

The deepest penetration is reached if the electrode contacts the work piece at a 90° angle; here the w eld will have a circular form.

Joining two metal sheets

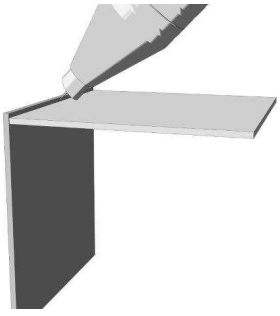
- Connect one of them with plus pole

- First tack the parts with two welds

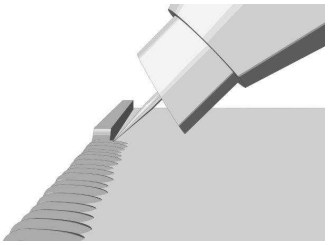
- Correct the angle or position

- Place the electrode on the outside edge of the previous weld to weld a continuous seam

Welding metal plates at right-angles



For sharp outside edges:



- One metal sheet overhangs the other slightly

- Place the electrode at a 45° angle to the seam

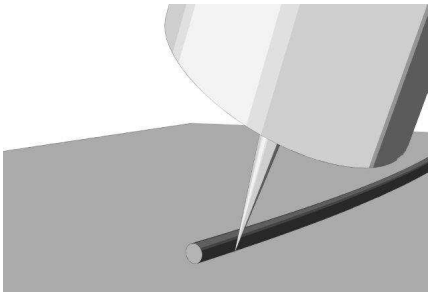
- The material from the overhanging edge will be pulled into the groove where the two pieces meet

- This way the metal can be precisely modelled or smoothened

Feeding in welding wire

- Use welding wires of the same alloy as the work piece - not solder!

- 0,2 to 0,4 mm diameter



- The wire is held flat on the work piece

- The electrode positioned under the wire

- Both the base material (work piece) and the end of the wire melt

- A drop of metal appears at the spot where the tip of the electrode was placed

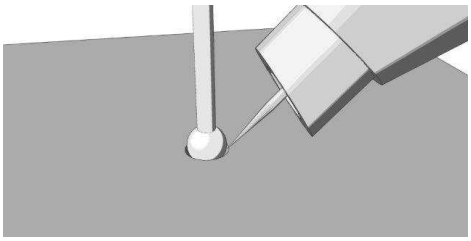
If for example a pore is to be filled, the electrode has to be put in the pore and the wire next to the electrode.

Welding ear posts

- Place a weld directly onto the end of the post, so that a "ball" is formed

- The "ball" should be about double the size in diameter as the post itself

- The ball can now either be filed flat; and the "half ball" can be welded to the base



or

- A small recess can be milled where the post is going to sit

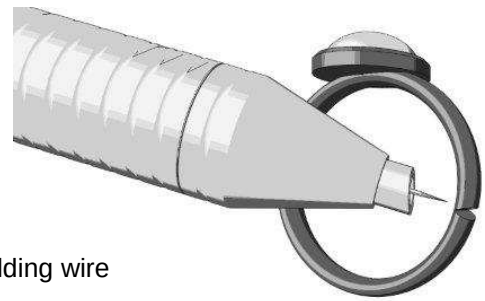
- The hole should be slightly larger than the ball. This way the weld penetrates deeper into the metal

- Place the ball end of the post into the hole and weld all around it

Ring sizing

Thicknesses up to a 1 mm:

- Both sides are filed flat and welded from both sides



Thicker than 1 mm:

- File a V-groove at the joint and fill it up again using welding wire

In most cases it is simpler to make the joint on the side of the ring shank, and not opposite the ring head as would normally be done. This way, the inside face of the seam can be accessed more easily, when welding.

Welding a loop (-bracelet)

Ends that are to be welded must be flat; there should not be any gap between them

- Hold the loop with a pair of pliers so that the ends are lightly pressed together

- On thicker loops (links), two or more welds may be necessary

PUK-welding pearls onto a wire

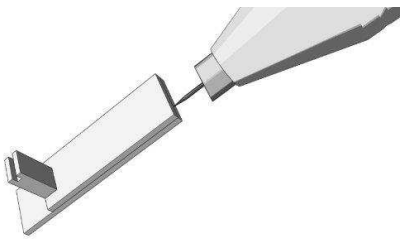
- Sensitive pearls should be protected against dirt with a piece of paper

- Weld using the shortest possible impulse time

Repairs in general

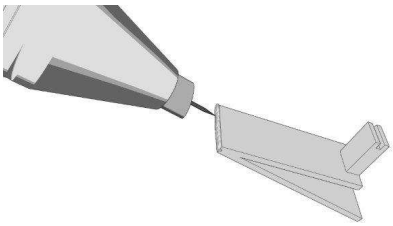
When doing repair work, please always keep in mind that glue, dirt, coatings such as paint or lacquer, all can have a negative effect on the welding result. Just like solder or residues of polishing paste, all these things have the tendency to burn when welded. If a weld is carried out in direct proximity to one of these materials, it is very likely that they will deflagrate (burn up instantly and explosively).
For this reason, parts that are to be welded should be cleaned thoroughly - or at the very least, in the direct area of the weld.
Galvanic coatings can also have a negative effect on the weld. Especially copper and nickel coatings should be removed from the welding area before beginning.

Latches



- Lay the two parts flat together and tack them with two welds

- Bent into the correct shape and weld the rest of the seam



- If the material is very thick, the two parts can first be tacked, then bent open to approx.. 90° and welded on the inside

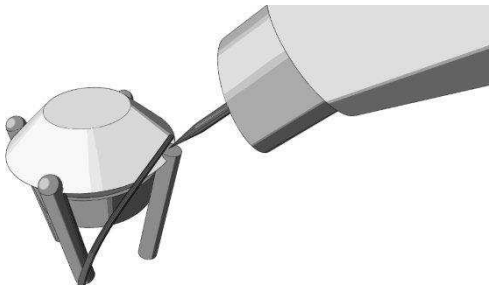
- After this bend the parts to the required angle and weld outside

Hollow or very thin work pieces

- Very thin material should always be welded using the shortest possible impulse time

Working next to gemstones

Always use shortest impulse time possible!



- Use the thinnest welding wire that you can get

- Lampert offers a range of welding wires with a diameter of 0.25mm. When using these wires, a power setting of 12 – 15% is sufficient

- Place the wire between the electrode and the gemstone

- In addition, the stone can also be covered with a strip of tape

- Always work away from the welding area, never across it; approach the welding area from the outside

When working at the lower end of the power scale, it is vital to welding success that the electrode is well sharpened. Whilst working on this type of application, it is advisable to change the electrode very often!

Silver

Heat conductivity

Metals with high heat conductivity are in general difficult to weld

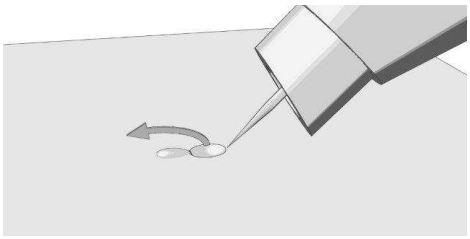
- The heat conductivity decreases when its temperature rises

That means:
- It is easier to weld silver when it is warm!

- Give a couple of welding impulses in quick succession to the welding area, to warm it up

Pushing the metal

Place a single weld with 70% power, in a 45°angle to the work piece: A hole is generated, out of which the metal flies in the opposite direction of the electrode.



This shows:
1.) The power is too high
(approximate max. 45% power on PUK3 professional plus / 60% power on the PUK 3 professional)

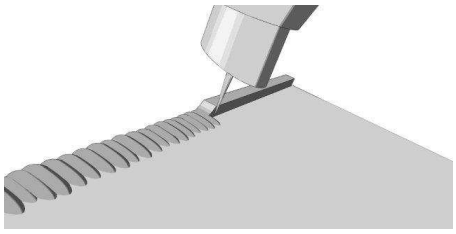
2.) It moves away from the welding energy, rather than being drawn toward it, like e.g. gold:
It is being pushed

In practical situations just keep in mind that the angle between the work piece and the electrode has to be very different than normally.

Joining silver sheets at right angles

- The electrode is inclined slightly over the overhanging edge

- Pushing down the overhanging metal

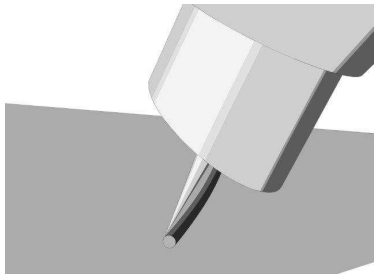


Adding Metal to silver

- Place the wire flat onto the work piece

- The electrode is held upright next to the wire inclined slightly over the wire

When filling porosity for example the procedure is similar; the wire is placed in the hole with the electrode upright next to it



Stress cracks

- Very fine crack lengthwise through the weld

- Due to the shrinkage of the metal while it cools down

- Longer impulse time is recommended (12 - 18ms)

Increasing the strength / stability of silver

- Silver forms a very clean and „pore-free“ joint structure, but nevertheless not that strong

- With the help of the "HF-pulse"-function of the PUK 3s, the grain structure of the weld becomes significantly finer and therefore stronger

- An additional increase in strength can be achieved by using the Pd-Ag-500 welding wire

- This welding wire is also very well suited to coping with a variety of other problems

- Another special welding wire for silver: Ag-940

- Has the same colour as regular Sterling

- Easier to apply