LAMPERT.

Operating Manual
PUK U4

PUK U4

OPERATING MANUAL (translation)
"PUK U4" with welding microscope "USM"

Dear Customer,

This operating manual is intended to familiarise you with the commissioning process and operation of your "PUK U4" as well as the associated "USM" welding microscope. Please read the operating instructions carefully and follow the advice given here diligently. Disruptions and operational faults will thus be avoided. Your personal safety, constant availability and long service life can be assured by this.

THE COMMISSIONING OF THE DEVICE MUST ONLY BE UNDERTAKEN BY TRAINED SPECIALISTS AND ONLY WITHIN THE SCOPE OF APPROPRIATE USE. THE MANUFACTURER ACCEPTS NO LIABILITY FOR DAMAGES CAUSED THROUGH INAPPROPRIATE USE AND IMPROPER OPERATION. THE “GENERAL SAFETY REQUIREMENTS” AND "PERSONAL BODY PROTECTION" CHAPTERS MUST BE READ BEFORE COMMISSIONING.

Please keep these operating instructions safe.

The equipment produced by “Lampert Werktechnik GmbH” fulfils the conformity requirements of the CE mark and is constructed in accordance with the VDE guidelines. The device safety of the PUK04 is certified by the DGUV (German statutory accident insurance) test and documented by the GS (tested safety) mark. The eye protection systems used on the "SM04" welding microscope are tested and certified by DIN-CERTCO (DIN department for eye protection).

Only use original spare parts for maintenance and overhaul work. Our customer service department will naturally be happy to help you.

THE DEVICE MUST ONLY BE OPENED OR MODIFIED BY AUTHORISED CUSTOMER SERVICE PERSONNEL, OTHERWISE ALL GUARANTEES AND WARRANTIES ARE VOID.

LAMPERT WERKTECHNIK GMBH

June 2016

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1. WARNING AND INFORMATION SIGNS

	Warning! “Warning” identifies a potentially dangerous situation. If this is not avoided, the consequences can be death or severe injuries.
	Caution! "Caution!" identifies a potentially hazardous situation. If this is not avoided, the consequences can be slight or minor injuries as well as property damage.
	Note! “Note” identifies the product at risk from the hazard and possible damage to the equipment.
	Important! "Important!" designates user tips and other especially useful information. This is not a signal word for hazardous or dangerous situations.

2. APPROPRIATE USE (FIELD OF APPLICATION)

- Outdoor operation is impermissible. Use this device only in dry rooms!
- PUK U4: The application of spot welds on precious metals and precious metal alloys, steel and steel alloys as well as titanium and various non-ferrous metals.

NOT APPROVED FOR WELDING DENTAL PROTHESIS! (DENTAL TECHNOLOGY)

GENERALLY NO LIABILITY IS ACCEPTED FOR THE DURABILITY OF THE WELDING. WE RECOMMEND THAT THE WELDING BE CHECKED IN EVERY CASE.

- USM: Observation and microscopic viewing of objects through the ocular of the microscope and illumination of the working area.
- The USM unit may only be used for welding if it has been properly connected to a PUK fine-welding device.

3. SAFETY INSTRUCTIONS

3.1 GENERAL SAFETY REQUIREMENTS

PERSONS WHO WEAR ACTIVE IMPLANTS (HEART PACEMAKERS) MUST MAINTAIN A SAFETY DISTANCE OF 20CM BETWEEN THE WELDING CURRENT CABLE / SOURCE OF THE WELDING CURRENT AND THE IMPLANT.

The opening of the device is only permitted when undertaken by an electrician of the authorised customer service. Before opening remove the mains cable and ensure that the device is de-energised. Discharge any components in the device that could hold electrical charge.

In case of doubt or uncertainty, always consult with a specialist. Our customer support department is naturally always available to assist you with their professional trained personnel, appropriate tooling and equipment.

Always use the original cables and ensure that workpiece clamps are properly attached.

Both the mains and welding currents can be a source of danger.

Always remove the mains plug when exchanging the LED unit. (Only use original replacement LED units from Lampert).

The device must be isolated from the mains power when undertaking any repair or maintenance work on the power source. The power socket is to be clearly blocked when undertaking any work on the system beyond minor manipulations where it is necessary to leave the workplace, even for brief periods.

If it can be assumed that risk-free operation is no longer possible, the unit must be put out of operation and secured against being unintentionally restarted.

It can be assumed that risk-free operation is no longer possible, if

- the equipment shows visible signs of damage,
- malfunctions occur,
- or the equipment is no longer working.

The PUK U4 must, as standard, be operated with a mains voltage of 115V~.

Yellow-green wire = protective earth terminal (PE). The other wires L1 and N are to be connected to the phase and neutral conductors of the power plug.

The welding device is factory-adjusted to 115V!

This means that as a result of the tolerance range +/-10%, the system can also be operated at 110V~. Devices configured to voltages other than 115V will be designated as such by means of a label.

THE DEVICE MUST ONLY BE OPENED BY AUTHORISED SERVICE PERSONNEL!

IF THE DEVICE HAS BEEN CONFIGURED FOR A CUSTOM VOLTAGE, THE TECHNICAL DATA ON THE DEVICE SPECIFICATION PLATE APPLY!

THE FUSING FOR THE MAINS SUPPLY MUST BE MATCHED TO THE POWER CONSUMPTION OF THE WELDING EQUIPMENT!

ONLY USE THE SUPPLIED MAINS CABLE!

THE PUK U4 IS A PIECE OF ELECTRICAL EQUIPMENT. NATIONAL REGULATIONS ON TESTING INTERVALS AND THE SCOPE OF REQUIRED RECURRING SAFETY-RELATED TESTS MUST BE OBSERVED.

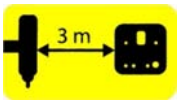
3.2 INSTALLATION CONDITIONS FOR THE PUK IN WELDING WORKSHOPS WITH MULTIPLE WELDING SETS

To avoid the electrical interconnection of two or more welding sets, there must be no electrical connection between sets (e.g. by way of a shared, electrically conductive welding table)!

This could result in a cumulative no-load voltage on the welding sets that exceeds the permitted voltage and causes **danger to personnel**!

There is also a risk of damage occurring to the welding sets involved.

Welding sets with HF ignition (high voltage ignition) generate a strong electric field (radiation), which could damage electrical devices in the vicinity.



When using welding sets with HF ignition (high voltage ignition), be sure to observe a spatial separation from the PUK, in order to rule out the possibility of interference and damage.

Also pay attention in this regard to the instructions from the manufacturer of the welding set with HF ignition!

3.3 HAZARDS AND PERSONAL BODY PROTECTION

Protective gloves should be worn on both hands whenever possible when welding, as sparks and spatters can never be completely excluded when welding. The protective gloves must not contain a high proportion of easily melting plastic fibres.

Uncovered areas of the skin are exposed to UV radiation produced during welding, which can cause skin damage.

Wear suitable clothing; do not wear articles of clothing made with synthetic fibres.

The workpiece and electrode tip can become extremely hot during welding operation - risk of burns.

The tip of the electrode fastened into the hand piece can present a risk of injury (stab injuries and scratches e.g. to the hands, face and eyes)

EYE PROTECTION WHEN WELDING:

Never look into the arc without eye protection; always use a welding mask with certified protective glass. (min. protection class 10)

In addition to light and thermal radiation, which can cause dazzling and burning, the electric arc also emits UV radiation. With insufficient protection this invisible ultraviolet radiation causes very painful conjunctivitis, which can first be noticed hours later.

The USM welding microscope with its integrated LCD protective welding screen offers reliable protection against these risks and provides permanent protection from UV / IR rays in both light and dark state. The protective class of the filter is defined such that dazzling by the arc is effectively prevented.

Persons who are nearby to the electric arc and assistants must also be informed of the dangers and equipped with the appropriate protection; if necessary set up protective partition walls.

EYE PROTECTION WHEN OPERATING THE LED ILLUMINATION:

Never look into the LED lamp or its reflections without eye protection; always use a welding mask with certified protective glass (min. protection class 3).

When welding, especially in small spaces, it is necessary to ensure that there is an adequate fresh air supply as smoke and hazardous gases can arise.

It is not permitted to carry out welding on containers that have been used for storing gases, propellants, mineral oils or similar, even if they have been empty for a long time, as there is a risk of explosions caused by residues.

Particular regulations apply to fire and explosion endangered spaces.

3.4 RISK OF ALLERGIC REACTIONS:

Please note that the device's raw materials that could come into contact with the operator's skin may cause allergic reactions in susceptible people.

3.5 HAZARDS OF SHIELDING GAS CYLINDERS

Observe all applicable safety measures when handling gas cylinders as well as the safety regulations for handling gases. Gas tanks must especially be secured against falling over / falling down and heat (max. 50°C); it is particularly important to ensure they are not subjected to sunlight for extended periods and that they are protected from severe frost.

4. SETUP AND INSTALLATION

4.1 SET-UP OF THE DEVICE

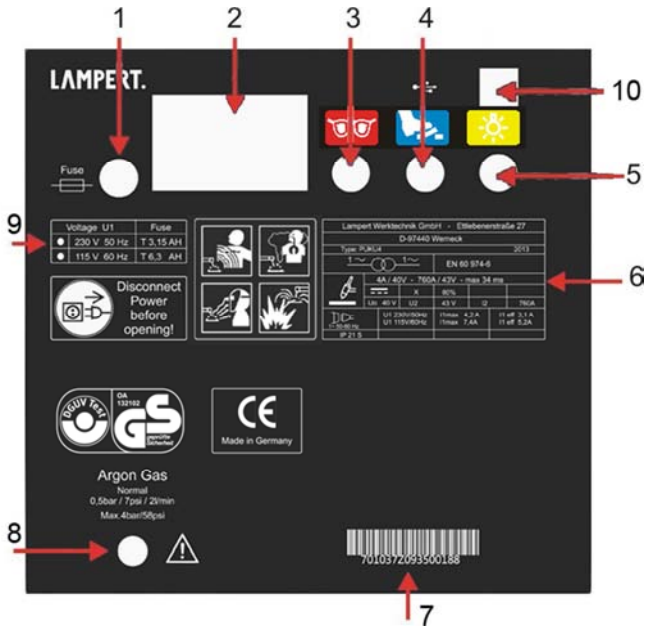
The system is to be set up so that cooling air is able to reach all of the surfaces of the housing without hindrance. The device may not be covered! The device is to be placed on a non-combustible surface! The device should be set up on a base that is solid, level, and insulated - ideally on a suitable workbench.

For additional information please refer to chapter 3.2 “Installation conditions for multiple welding sets”.

Fasten the two hand supports for the microscope with 2 Allen screws using the supplied Allen key by inserting the screws into the designated holes from underneath the microscope baseplate and into the hand supports.

4.2 DESCRIPTION OF THE REAR OF THE DEVICE

(Fig. 2)



(1) FUSEBOX ("Fuse")
(2) MASTER MAINS SWITCH as well as AC POWER SOCKET (for connecting the mains cable)
(3) CONNECTION SOCKET FOR EYE PROTECTION SYSTEM
(4) CONNECTION SOCKET FOR FOOT SWITCH
(5) CONNECTION SOCKET FOR LED MICROSCOPE ILLUMINATION
(6) TYPE PLATE
(7) SERIAL NUMBER
(8) PROTECTIVE GAS CONNECTION ("ARGON GAS") for 6.0 mm diameter pressure hose
(9) APPROVED MAINS VOLTAGE FOR THIS DEVICE
(10) USB SOCKET FOR SERVICE CONNECTION

4.3 CONNECT EYE PROTECTION AND LED ILLUMINATION FOR THE USM WELDING MICROSCOPE TO THE PUK U4:

The circular connector for the eye protection system should be inserted into the connecting socket (3) marked with the red eye protection symbol on the rear side of the device and is to be tightened in place with the coupling nut (hand tight). The LED illumination connector should be inserted into the connecting socket (5) marked with the yellow illumination symbol on the rear of the PUK welding device. In doing so, observe the colour coding of the connection cables.

Please shut down the device prior to removing the LED illumination connector.

WARNING!
ONLY SUITABLE ORIGINAL EYE PROTECTION SYSTEMS FROM LAMPERT MAY BE CONNECTED TO THE WELDING SYSTEM!

OTHER EYE PROTECTION SYSTEMS ARE NOT APPROVED AND CAN LEAD TO PERMANENT HEALTH DAMAGE OR DAMAGE TO THE WELDING DEVICE.

ALWAYS OBSERVE THE OPERATING INSTRUCTIONS FOR THE CONNECTED EYE PROTECTION SYSTEM

4.4 CONNECT SHIELDING GAS SUPPLY:

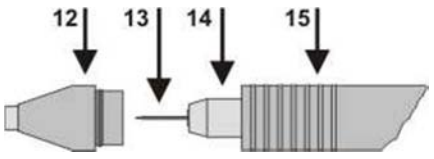
Fasten the suitable flow regulator to the shielding gas tank. ATTENTION: In doing so, always observe the enclosed special operating instructions provided. (Where possible, use argon with min. 99.8% purity, e.g. "Argon 4.6"). The pressure hose is to be fastened by hand with the help of the quick coupling adapter to the flow regulator as well as the shielding gas connector (10) on the rear of the device.

CHECK REGULARLY THAT ALL OF THE HOSE CONNECTIONS AND GAS HOSES ARE IN OPTIMAL CONDITION, ARE PROPERLY FASTENED AND ARE AIRTIGHT!

4.5 INSERTING THE ELECTRODES INTO THE WELDING HAND PIECE:

PLEASE ALWAYS CHECK THAT THE MACHINE IS SWITCHED OFF, PRIOR TO EXCHANGING THE ELECTRODES. THIS PREVENTS UNCONTROLLED TRIGGERING OF THE WELDING PROCESS.

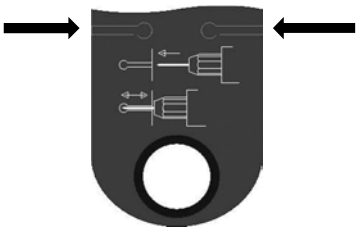
(Fig. 3)



Lightly rotate the nozzle (12) back and forth and in doing so, pull it off of the hand piece (15). It is only pushed-on, not screwed in place.

Release the threaded electrode connection (14), insert a well sharpened tungsten electrode (13) and tighten up (hand-tight – do not use a tool to tighten).

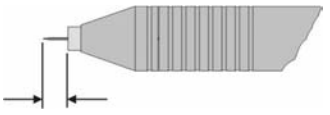
(Fig. 4)



The correct length for the electrode can easily be checked and corrected if necessary by means of the milled marks on the handpiece clamping arm (Fig. 4).

Now replace the nozzle.

(Fig. 5)



The electrode must protrude approx. 4 - 6mm out of the nozzle (Fig. 5).

ONLY USE THORIUM OXIDE FREE ORIGINAL ELECTRODES

Subsequently insert the connector of the hand piece as straight as possible into the socket (28) on the front of the PUK and fasten in place by tightening the coupling nut hand-tight in a clockwise direction. Insert the connecting cable used into one of the sockets (27) on the front side of the housing.

4.6 CONNECT POWER SUPPLY:

Insert the power cable with the mains connector into the corresponding socket (2) on the rear of the housing and insert the mains plug into a suitable socket with the correct mains voltage.

CAUTION!

AS SOON AS THE MASTER MAINS SWITCH ON YOUR PUK U4 IS SWITCHED ON, THE VOLTAGE IS APPLIED TO THE CONNECTED CROCODILE CLIPS OR CABLES. IT IS TO BE ENSURED THAT THESE PARTS ARE NOT ALLOWED TO COME INTO CONTACT WITH ELECTRICALLY CONDUCTIVE OR EARTHED PARTS, SUCH AS THE HOUSING, ETC. IN DOING SO, THERE IS NO RISK FOR THE OPERATOR, WITH THE EXCEPTION OF POSSIBLE CIRCUMSTANCES ARISING FROM OPERATING ERROR.

4.7 CONFIGURATION OF THE WELDING MICROSCOPE:

ESSENTIAL PRIOR TO THE INITIAL WELDING OPERATION: PRECISE CONFIGURATION OF THE MICROSCOPE OPTICS

FIRST STEPS

Align the handpiece holder so that you are able to comfortably introduce a workpiece with your hands to the tip of the hand piece mounted in the supporting arm. It should be possible to comfortably place both hands and palms on the baseplate hand supports. You also have the option of changing the angle of inclination for the microscope. In order to do so, release the locking screw

(16) on the stand, angle the microscope to the desired position and re-fasten the screw. A metal pin extends from the stand to support the microscope on your working surface.

ADJUSTING THE INTEROCULAR DISTANCE

Look through the two oculars (19) and move the ocular tubes (17) inwards or outwards by holding the prism housing (20) still and moving them in or out. The interocular distance is correct if the range of vision as viewed through the two oculars is complete and is united into a single image. The interocular distance should be individually set for each user.

FOCUSING

Mount a welding handpiece with clamped electrode into the supporting arm. Rotate the focusing knob (22) to a medium focus range. Adjust the mounting height of the microscope head: Hold the microscope head (21) with one hand, without touching one of the lenses, and use the other hand to release the screw on the head bracket. The head can now be moved. Look through the oculars and move the microscope head up or down until the object appears focussed. The correct distance between the handpiece holder and the microscope head amounts to approx. 6 cm on the stand rod. Now re-tighten the adjusting screw on the head bracket once more. Subsequently use the focusing knob (22) to focus the image.

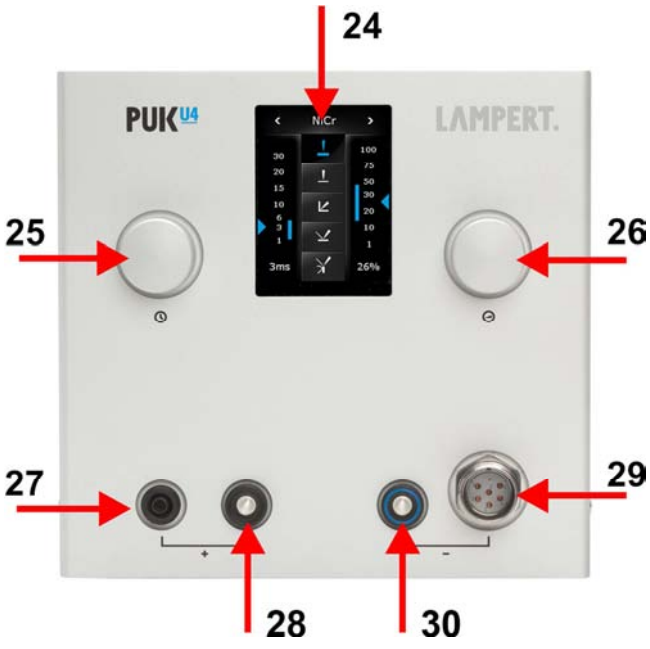
DIOPTRE ADJUSTMENT

The sleeve for adjusting the dioptre (18) is fitted to the left-hand ocular (19). In the normal position, the lower part of the tube is aligned to the marking on the ocular tube. In the event of differing vision in both eyes: Open the right eye only, look into the right-hand ocular (17) and adjust the focus using the focusing knob (22). Now look through the left-hand ocular with your left eye and adjust the focus by turning the dioptre control (18) on the left tube (20) until the image appears focused.

5. COMMISSIONING

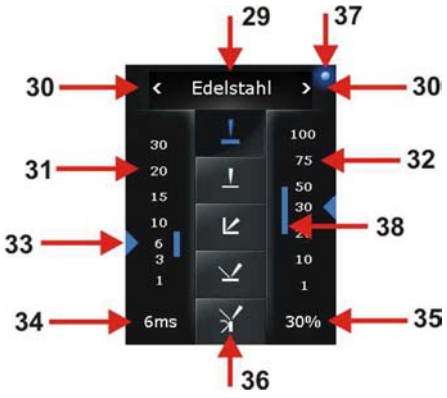
5.1 DESCRIPTION OF THE FRONT-SIDE CONTROLS

(Fig. 1)



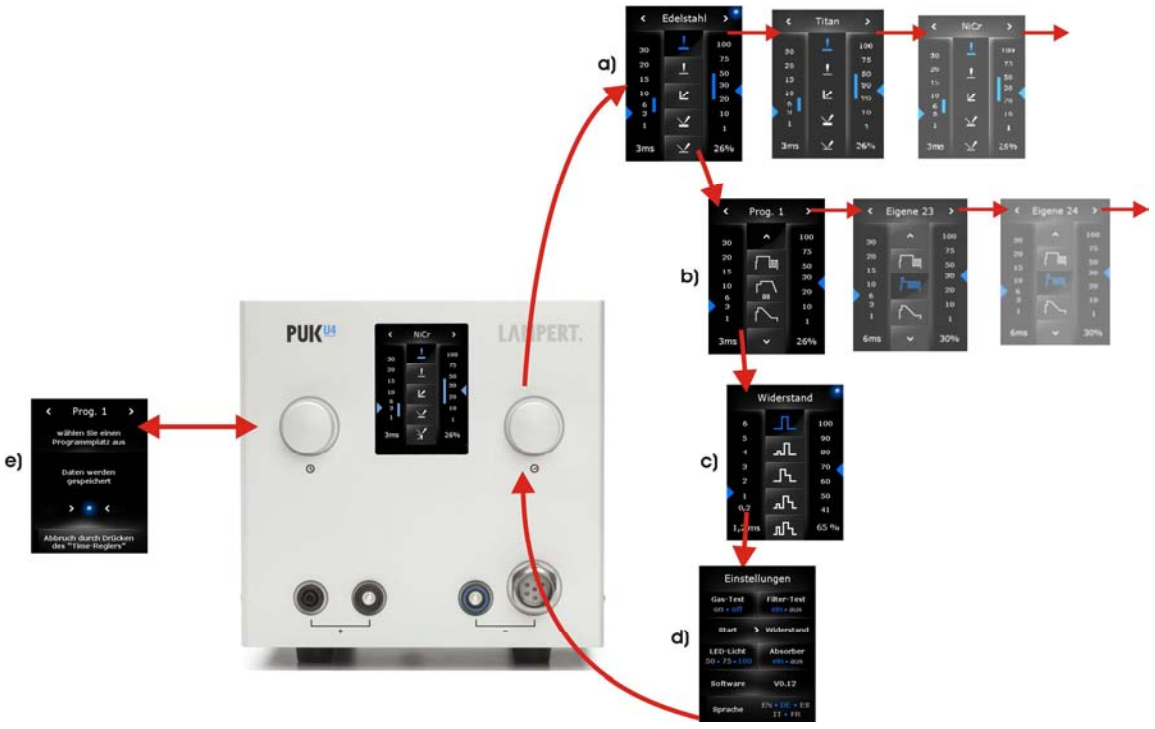
(24) TOUCHSCREEN DISPLAY
(25) PULSE DURATION / WELDING-TIME CONTROL
(26) WELDING POWER CONTROL
(27) SOCKET (+)
- 4 mm socket for connecting TIG-welding contact elements such as welding bench, contact terminals and clamps.
(28) SOCKET (+)
- 6 mm socket for connecting resistance welding contact elements as well as resistance welding devices.
(29) CONNECTION SOCKET FOR HAND PIECE (-)
(30) SOCKET (-)
6 mm socket for connecting the blue contact terminal for resistance welding as well as resistance welding devices.

TOUCHSCREEN



(29) Welding program (depending on user level)
(30) Scroll within the selected user level
(31) Pulse duration scale in milliseconds (ms)
(32) Output scale as a percentage (%)
(33) Indicator
(34) Pulse duration in milliseconds (ms)
(35) Welding output as %
(36) Preselect welding situation and pulse shape (depending on user level)
(37) Foot switch display (when active)
(38) Recommended setting range (only TIG-welding)

5.2 EXPLANATION / OVERVIEW OF MENUS



(Fig. Schematic diagram of user levels)

ONCE IT IS SWITCHED ON, THE PUK U4 STARTS UP IN ITS SELECTED START LEVEL (a, b or c – see chapter 5.5). THE FOLLOWING USER LEVELS CAN BE NAVIGATED AFTER PRESSING THE POWER REGULATOR (26):

a) TIG-welding:
   Preselection of the material to be welded and preselection of the welding situation with display of the recommended settings range for welding power and pulse duration

b) User TIG-welding programs and stored custom settings
c) Resistance welding mode
d) Settings

In user level TIG-welding it is possible to use the arrow keys to scroll back and forth between the various pages, e.g. between the preconfigured programs or your custom stored settings, depending on the selected user level.

Beginners using the PUK system are advised to remain within the start level.

PRESSING THE WELDING-TIME CONTROL (25) CAUSES THE PROGRAMMING MENU TO BE LAUNCHED:

e) **TIG-welding**
   Selection of the memory location and saving the settings.
   Storing custom welding parameters (33 memory slots)
   Resistance welding
   Saving of parameters power, time and pulse form (1 memory slot)
   Micro stud welding
   Saving of parameters power and time (1 memory slot)

5.3 SWITCHING ON THE DEVICE

First, carefully open the gas tank valve. Then switch the master mains switch (2) on the rear of the housing to the **"I"** position – the display shows the safety prompt regarding eye protection and the operating manual. Confirm your compliance with the safety instructions by pressing one of the rotary controllers or by touching the display.

5.4 ADJUSTING FOR THE CORRECT GAS VOLUME

PLEASE CONSIDER THAT GOOD WELDING RESULTS CAN ONLY BE ACHIEVED WITH A CORRECTLY ADJUSTED GAS FLOW.

In order to configure the correct gas volume, activate the "Gas Test" in the "Settings" menu (see chapter 5.5). This opens the gas valve in the welding device. Now set the flow regulator to the correct flow rate of approx. 2 litres/min. In doing so, also observe the instructions provided with the flow regulator. Once the gas volume is correctly adjusted, quit the "Gas Test" by pressing the corresponding button.

5.5 OPERATING LEVEL "SETTINGS"

The "Settings" user level can be used to modify basic settings and launch various test functions.

- **Gas Test:**

Pressing the corresponding button causes the gas valve to be opened. This function is important in order to set the correct gas flow on the flow regulator (see chap. 5.4). Pressing the button again causes the gas valve to be closed once more. In addition, any other operation of the device will automatically quit the gas test.

- **Shield Test:**

Pressing this button causes repeated switch-over of the eye protection filter from light to dark. This enables correct function of the eye protection filter to be checked. Pressing the button again quits the test.

- **Home screen selection:**

This menu allows to preselect the start screen of the PUK U4. With the next start of the unit the selected home screen (WIG welding, pin welding or resistance welding) appears.

- **LED lamp:**

Pressing the button enables the brightness of the LED lamp on the welding microscope to be adjusted in 3 steps.

- **Language**:

Pressing the button with the country codes enables the system language for the welding device to be changed. The system can be toggled between German, English, Spanish, French and Italian.

6. SELECTION OF THE WELDING PARAMETERS AND PROGRAM SAVING

6.1 SELECTION OF THE TIG-WELDING PARAMETERS

BASIC INFORMATION ABOUT THE EFFECTS OF WELDING POWER AND WELDING TIME:

POWER:

The welding power or the strength of welding energy is set with the power control (26).
The size and intensity of the welding points are controlled in this way, i.e. the higher the power the larger the welding point.
With very thin materials too high a power level can also quickly result in damage, i.e. it makes sense to experiment with samples for beginners with the PUK system to find the optimum power level, starting at a power of 20% or with very fine welding, even lower. Power settings between 35 and 50% are considered medium welding powers.
Other metals can be welded with higher power levels, just as with stainless steel. Power levels above 70% are only practical in the most unusual circumstances. There is a danger of inhomogeneous welds and only experienced users should move outside this range.

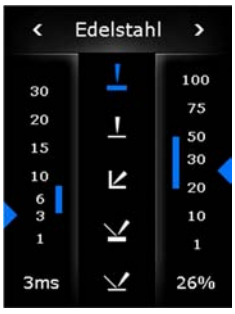
WELDING TIME OR PULSE DURATION:

The pulse duration / welding time control (25) determines for how many milliseconds the welding power is applied, i.e. a longer pulse duration results in a longer and deeper application of the energy to the workpiece and thus simultaneously a greater development of heat.
With very thin materials, wires or other heat-sensitive materials it is recommended to use a shorter welding time. Welding times of no more than 4ms are recommended here.
With many alloys and other highly conductive metals a longer welding time can be advantageous in order to avoid hot cracks, starting at 10ms.

<u>IMPORTANT FOR SUCCESSFUL OPERATION WITH THE PUK:</u>
Welding power and pulse duration must be considered in close context with each other in all cases! The total energy applied to the workpiece is comprised of these two parameter settings together - prior to welding this must be considered carefully following an in-depth analysis of the welding task, the materials and the workpiece geometry.

SELECTION OF THE WELDING PARAMETERS ON PUK U4:

The welding parameters are set in two stages:



1.
In the upper area of the display, the metal to be welded is selected by means of pressing the arrow buttons.

2.
Pressing one of the 5 buttons in the centre of the display selects the given welding situation.

This selection causes numerous settings to be made in the background. The important information for the user is then shown on the display:

- A welding time is preselected and the recommended setting range for the selected welding situation is marked next to the scale by means of a blue bar (only TIG-welding). Settings outside of the recommended blue setting range are always possible, however, they are not recommended for the selected welding situation.
- The power is also preselected and the recommended setting range for the power is marked with a blue bar (only TIG-welding). Settings outside of the recommended blue setting range are always possible, however, they are not recommended for the selected welding situation.

DESCRIPTION OF THE WELDING SITUATION WITH ASSOCIATED SYMBOL ON TOUCHSCREEN:

- In the TIG-welding level, the meaning of the following symbols is always the same for each of the preconfigured materials.
- The TIG-welding level shows in addition to the welding power and pulse duration for each stored material also the recommended working range in the respective scales of the touchscreen, highlighted in colour.

Universal setting for material thicknesses from 0.3mm. This is well suited for most applications (≥0.3mm).

Setting for thin sheet metal or wire parts equal to or less than 0.3mm (≤0.3mm). This setting offers very low development of heat, especially for short welding times.

Welding in sharp angles and tight joint situations. Here it is IMPORTANT to use short welding times of 2 to 5 ms.

Melting of welding wire. Use identical alloy wire with a diameter of 0.3 to 0.4 mm.

Particularly low energy fusing of thin welding wires of a max. 0.25 mm.

PUSHING/TOUCHING THE RESPECTIVE BUTTON FOR AN EXTENDED PERIOD BRINGS UP AN INFO WINDOW ON THE DISPLAY. SEE 6.2 "HELP FUNCTION"

6.2 HELP FUNCTION

The buttons in the centre of the display are provided with accessible info screens in all user levels. Touching / pressing the button for an extended period causes the info screen to appear for the respective button, which contains explanatory information for the button's function. Touching the display button again causes the active user screen to be shown once more.

6.3 PROGRAMMING

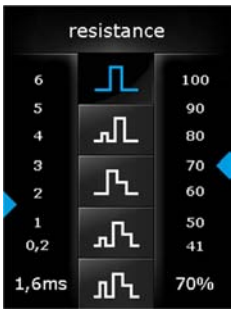
SAVING CUSTOM PROGRAMS

Pressing the welding-time control (25) causes the programming menu to be launched. In the first step, use the arrow key to select the program slot into which you want to store your custom settings. Then save your data by pressing the button with the blue dot. The process can be aborted at any time without saving the data by pressing the welding time regulator (25).

6.4 LOADING SAVED TIG-WELDING PROGRAMS AND THE USER LEVEL "CUSTOM PROGRAMS"

All custom stored programs are summarised in the "Own Programs" user level. This user level displays the settings in "Expert Mode". This means that the corresponding underlying energy characteristic curve is shown in addition to the settings for time and power.
The other controls within "Own Programs" function as "Expert Mode". The individual energy characteristic curves can be selected here in addition to welding duration and welding power.

6.6 RESISTANCE WELDING MODE



The resistance welding mode appears as a separate user level, which can be accessed by pressing the power regulator.

The welding process is released with the foot switch, which is permanently activated in this welding mode.

7. WELDING INSTRUCTIONS

NOTE!

PRIOR TO WELDING, ALWAYS CHECK THE FUNCTION OF THE EYE PROTECTION FILTER AS DESCRIBED IN CHAPTER 5.5 "FILTER TEST". IF THE EYE PROTECTION FILTER (SHUTTER) FAILS TO SWITCH OVER FROM LIGHT TO DARK, THEN IT MUST BE IMMEDIATELY EXCHANGED BY **AUTHORISED CUSTOMER SERVICE PERSONNEL**.

7.1 TIG-WELDING INSTRUCTIONS

- First connect a metallic blank section of the workpiece with the contact clamp.
- Lightly touch the area to be welded with the tip of the electrode until welding begins. In doing so, it is important to remain in the position where initial contact is made until welding begins, i.e. neither to follow the electrode with the workpiece if it retracts slightly in the handpiece, nor to pull back.

APPLY EXTREMELY LIGHT PRESSURE OR NO PRESSURE TO THE TIP OF THE ELECTRODE!

The welding process proceeds automatically:

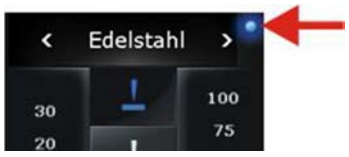
- shielding gas flows around the welding point.
- A signal tone announces the arc.
- The arc triggers and the electrode retracts slightly in the handpiece.
- The shielding gas supply cuts off.

THE WELDING PROCESS CAN BE HALTED AT ANY TIME BY MEANS OF LIFTING THE ELECTRODE AWAY FROM THE WORKPIECE.

7.2 TIG-WELDING WITH FOOT SWITCH

With the PUK U4 switched off, connect the foot switch to the socket (4) marked with the blue foot switch symbol on the rear of the device. Switch the device on, confirm the safety prompt by pressing an arbitrary button and wait for the self-test to conclude. The device is now ready for operation.

THE FOOT SWITCH CAN BE ACTIVATED BY PRESSING AND HOLDING IT (APPROX. 2 SEC.). A BLUE DOT APPEARS IN THE DISPLAY.



Connect a metallic blank section of the workpiece with the contact clamp. Now lightly touch the workpiece with the electrode, so that the shielding gas flows out. If the foot switch is operated in this mode, the welding process will begin automatically as described in chapter 7.1.

PRESSING AND HOLDING THE FOOT SWITCH (APPROX. 2 SEC.) (WITHOUT TOUCHING A WORKPIECE) CAUSES IT TO BE DEACTIVATED AND THE BLUE DOT ON THE DISPLAY DISAPPEARS.

7.2.1. RESISTANCE WELDING

☛ THE BLUE CONNECTION CABLE MAY ONLY BE CONNECTED AFTER THE MODE HAS BEEN ACTIVATED. AFTER WELDING IS COMPLETE, IT IS VITAL THAT THIS CABLE IS REMOVED AGAIN, BEFORE SWITCHING TO ANOTHER MODE, IN ORDER TO AVOID FAULTY WELDS!

Connect both of the workpieces which are to be fixed at an area of bare metal with a connection terminal, one to the blue one and the other to the black. When the two parts are touching, the welding process can be triggered, using the foot switch. The hand piece is not used during this process.

The required welding power is determined by the strength of the connection desired as well as the workpiece geometry. The welding time setting is of secondary importance in this mode, and can only be varied to a very limited extent.

☛ **BEFORE SWITCHING TO ANOTHER USER LEVEL, PLEASE REMOVE THE BLUE CONNECTION CABLE FROM PUK U4!**

NOTE: DURING FIXATION WELDING, THE FOOT SWITCH IS ALWAYS ACTIVE, AND CANNOT BE DEACTIVATED!

7.3 BASICS AND TIPS

IMPORTANT!

- Always work with a well sharpened electrode (see point 7-4 for information about sharpening the electrodes).
- Ensure extremely good contact between the workpiece and the contact clamp, i.e. make contact between the workpiece and the connection cable terminal at a point which is metallically blank.
- Never weld "free hand", i.e. use the hand rests of the microscope USM. Shaking hands can cause the configured parameters to be falsified.
- Apply only light force to the electrode tip.
- Weld with the correct gas flow of 2 litres/minute and check this regularly.
- With a little experience you will notice that the angle with which you touch the workpiece with tip of the electrode affects the "direction of flow" of the welding point.
- The electrode can easily be clamped in somewhat longer for welding recessed areas.
- In many cases it is helpful to work with welding wire as a welding supplement, but never with solder.

7.4 ABRADING THE ELECTRODES

Please switch off the machine prior to exchanging the electrodes. This prevents uncontrolled triggering of the welding process.

If possible, the electrodes should be sharpened with a diamond disk with fine or medium grain.

The recommended angle of grinding is approx. 15°.

8. CARE OF THE SYSTEM COMPONENTS

8.1 CARE OF WELDING DEVICE AND WELDING MICROSCOPE

Your PUK U4 as well as the welding microscope require a minimum of maintenance under normal working conditions. However, it is essential that a few points are observed in order to guarantee the functionality and to keep the spot welding device fully operational for years to come.

- Check the mains plug and cable as well as all welding and connection cables regularly for damage.
- Check that the moving parts of the handpiece move easily.
- If necessary, clean the electrode threaded assembly on the handpiece, in order to ensure optimal contact with the electrodes.
- Clean the device occasionally with a suitable cloth.
- Use the supplied dust cover to cover up the microscope after use.

IF WORK OR REPAIRS THAT ARE NOT DESCRIBED IN THESE OPERATING INSTRUCTIONS ARE NECESSARY THEN CONTACT YOUR DEALER.

WARNING!

IF FUSES REQUIRE EXCHANGING, THEN THEY MUST BE REPLACED WITH FUSES OF THE SAME TYPES AND VALUES.THE GUARANTEE IS VOID IN THE EVENT OF EXCESSIVLY HIGH FUSING!

THE DEVICE MAY ONLY BE OPENED BY AUTHORISED CUSTOMER SERVICE PERSONNEL!

8.2 CARE OF THE OPTICAL COMPONENTS

Do not attempt to disassemble optical components. Please contact the local technical customer service department for repairs which are not covered by this manual.

Remove dust from the lens surface with a special brush prior to cleaning. You can obtain suitable accessories in any photography store.

Cleaning the oculars: Do not remove the oculars (19) from the ocular tubes (17).

Clean the outer surfaces. In doing so, blow on them. Subsequently dry the lens with suitable cloth or paper for the purpose. Dry the lens with circular movements from the centre to the outside. Do not wipe over a dried lens as they can easily be scratched.

<u>Cleaning and exchanging the protective glass of the eye protection filter:</u>

Never dismantle the eye protection filter (shutter)!

Only clean the surface. Use a cotton cloth with glass cleaner.

If the protective glass requires exchanging, slide it forwards out of the bracket and insert a new protective glass in the same manner.

9. TECHNICAL DATA

9.1 TECHNICAL DATA WELDING DEVICE

Device suitable for welding in dry rooms

Mains voltage	~115 V / 50-60 Hz +/-10%
Mains fusing	T 6.3 A
Power consumption	400VA
Closed-circuit voltage	30 – 43 V
No-load voltage	43 V
Duty cycle X	80 %
Max. charging time	0.8 s
Shielding gas	min. ARGON 99.8%
Maximum gas pressure	4 bar
Protection class	I
Insulation class	B
Protection type	IP 21S
Weight	8.8 kg

9.2 TECHNICAL DATA MICROSCOPE

Optical visual protection and illumination unit for exclusive use with PUK fine welding devices.

>>>Use only in dry rooms.

Operating temperature	+5°C to +40°C
Lamp "LED unit"	2.5W / 800mA
Protection class	III
Insulation class	B
Protection type	IP 20
Weight	3.6 Kg

9.3 OPTICAL DATA MICROSCOPE

Lens	1.0
Ocular	10x
Working distance	140 mm
Magnification factor	10x
Field of view	20 mm

9.4 TECHNICAL DATA LCD SHUTTER M11 (BL)

Light shade	DIN 3
Dark shade	DIN 11
Switching time	<50ms
UV protection	>UV 11
IR protection	>IR 11

MARKING ON THE LCD SHUTTER: 3/11 LWT 1/1/1/3/379

Protection shade number in open state	3
Protection shade numbers in closed state	11
Manufacturer identification code	LWT
Optical quality	1
Light scattering	1
Homogeneity	1
Angular dependence	3
Number of the standard	379

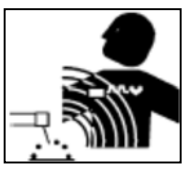
Notified body for CE testing of the LCD Shutter: DIN CERTCO, Alboinstrasse 56, 12103 Berlin

9.5 TYPE PLATE

Explanation of pictographs:

A	Current	V	Voltage	IP	Protection type	Hz	Hertz
~	Alternating current (AC)	⎓	Direct current	1 ~ 50-60Hz	Mains input 1 phase / AC / 50-60Hz		Read operating manual
U_0	No-load voltage	U_1	Mains voltage	U_2	Voltage at nominal load		Tungsten inert gas welding
	Earthing (earth)	I_2	Nominal welding current	I_{1max}	Power consumption under max. load	I_{1eff}	Power consumption under nominal load
X	Cyclic duration factor	1~ 1~	Single-phase transformer		Keep away from water		

9.6 WARNING NOTICES:

	Breathing welding fumes and gases can be hazardous to your health.
	Welding sparks, hot workpiece, and hot equipment can cause fires and burns.
	Arc rays from the welding process can burn eyes and skin.
	Magnetic fields can affect pacemakers.

10. TROUBLESHOOTING

10.1 WELDING DEVICE

	FAULT	CAUSE	REMEDY
1	**No welding current**		
	Mains master switch on, display remains off	Mains cable interrupted	Check mains cable and mains voltage
		Device fuse blown	Replace device fuse with identical fuse (same type and value)
2	**No welding current**		
	Mains master switch on	Welding cable connections interrupted	Check plugged connections
		Poor or zero contact to the workpiece	Establish connection to the workpiece, fasten contact clamps directly to the workpiece
3	**No welding current**		
	Mains master switch on	Fault due to leakage current	Switch device off and back on again
			If fault reoccurs, arrange for servicing of device
4	**Mains fuse blows or automatic circuit breaker trips**	Mains insufficiently fused or incorrect automatic circuit breaker	Fuse mains properly
		Mains protection trips during idling	arrange for servicing of device
5	**Poor welding characteristics**	Incorrect shielding gas	Use inert shielding gas (Argon 4.6)
6	**Poor ignition characteristics**	Electrode clamped loosely in hand piece	Tighten the clamping nut in the handpiece (chap.11, no.41) by hand, however, tighten **firmly**.
7	**Oxidation and rusting**	Excessive gas pressure	Reduce flow rate - approx. 2 l/min is recommended
8	**Severe oxidation of the welding points**	Incorrect shielding gas	Use inert shielding gas (Argon 4.6)
9	**Tungsten inclusions in base material**	Excessive pressure of the electrodes on the workpiece	Touch workpiece with extremely light pressure.
10	**Tungsten electrode welds to workpiece**	Excessive pressure of the electrodes on the workpiece	Touch workpiece with extremely light pressure.
11	**Tungsten electrode melts off immediately**	Electrode sharpened too steeply	Use the recommended angle of grinding (approx. 15°)
12	**Static discharge over the surface of the device**	Special local conditions	Use special foot mat for the workspace
13	**Device begins to weld immediately when touching the workpiece (no gas pre-flow)**	Fault	Immediately shut down the device, arrange for servicing.

10.2 MICROSCOPE

	PROBLEMS WITH ELECTRICAL COMPONENTS		
A	**The LED illumination fails to operate**	Cable not connected.	Connect the plug to the connecting socket (5) marked with the yellow illumination symbol on the PUK U4.
		LED faulty	Exchange LED unit (only use original replacement LED units from Lampert)
B	**Eye protection system (shutter) fails to operate**	Cable connected incorrectly	Connect the plug to the designated socket (3) marked with the red eye protection symbol on the PUK U4.

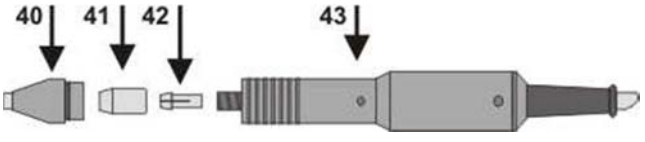
		Eye protection filter faulty	Arrange to have eye protection unit replaced by authorised customer service personnel
	IMAGE QUALITY		
D	**Poor resolution**	Oculars dirty.	Clean oculars.
E	**Marks or soiling in field of vision**	Oculars dirty.	Clean oculars.
		Protective glass dirty	Clean or exchange protective glass
	* Note: Marks in the field of vision can also be caused by soiling in the interior of the oculars. For this reason, it is recommended to have the lenses cleaned by an authorised customer service engineer		
	PROBLEMS WITH MECHANICAL COMPONENTS		
F	**Focus is not retained**	The sight slides down	Readjust the tension of the focusing knob

REPAIR

If the stereo microscope requires repair or adjustment by qualified personnel, we recommend sending it back to the dealer (authorized customer service) in its original packaging. Include a description of the problem or the desired adjustment.

WARNING: THE DEVICE MAY ONLY BE OPENED BY AUTHORIZED CUSTOMER SERIVICE PERSONNEL!

11. SPARE PARTS LIST



Hand piece

(40)	Nozzle (D 3mm)	100 150K
(41)	Clamping nut	100 152
(42)	Chuck	100 151
(43)	Hand piece complete	100 100 04

Electrodes:

10 x electrodes D 0.5 mm (thorium oxide free), incl. diamond grinding disk	100 400
10 x electrodes D 0.6 mm (thorium oxide free), incl. diamond grinding disk	100 401
Grinding disk: diamond grinding wheel	100 701
Gas hose: 3m gas hose 6x4mm	100 153

PLEASE NOTE!

Nozzle(40), clamping nut (41), electrodes and clamping tongs (42) are wearing parts and are not covered by the guarantee.

12. DISPOSAL INFORMATION:

Render discarded devices unusable by removing the mains cable.
Only for EU countries: In accordance with EU directive 2012/19/EU regarding the disposal of used electrical and electronic equipment, discarded electrical devices must be separated and collected and sent for recovery in an environmentally friendly manner.

13. EC – DECLARATION OF CONFORMITY

Please find enclosed to this shipment the separate document – Declaration of Conformity.

Text and illustrations represent the technical status at the time of printing. Subject to change.

Born in Germany.

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