

Operating manual PUK5.1-System

PUK5.1 Welding system

PUK5.1 Fine welding device including PUK welding microscope SM5.1



PUK 5.1

Dear Customer,

We would like to thank you for the trust, and congratulate you on the purchase of your high quality PUK fine welding device. Please read the manual carefully, in order to familiarise yourself with the device, so you are able to optimally benefit from its advantages.

Please follow the safety instructions to ensure greater safety while using the device. This operating manual is intended to familiarise you with the set-up and operating process of your "PUK", as well as the associated PUK welding microscope. Please read the operating manual carefully prior to first use. Disruptions and operational faults will thus be avoided. Your personal safety, constant availability and long service life will be assured by this.

The set-up process of the device must only be exercised by qualified specialists and only within the scope of appropriate use. The manufacturer accepts no liability for damages caused by inappropriate use and improper operation. Before set-up, be sure to read carefully the chapter "Warning and information signs", as well as the "Safety instructions".

Please keep this operating manual within reach of the device, so that you have access to all information at all times.

Devices produced by "Lampert Werktechnik GmbH" fulfil the conformity requirements of the CE mark and are constructed in accordance with the VDE guidelines.

The eye protection system used on the PUK welding microscope is 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, warranties and liabilities are excluded!

LAMPERT WERKTECHNIK GMBH

January 2019




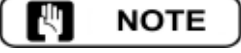

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1. Warning and information signs

Meaning of the safety information

If you see the following symbols, increased awareness is essential.

- | | |
|---|---|
|  | DANGER! Warns of directly imminent danger. If this is not avoided, the consequences are death or severe injuries. |
|  | WARNING! Identifies a potentially dangerous situation. If this is not avoided, the consequences can be death or severe injuries. |
|  | 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! Identifies the possibility of impaired work results or damage to the equipment. |
|  | IMPORTANT! Identifies user tips and other especially useful information. This is not a signal word for hazardous or dangerous situations. |

2. General information

The device has been built in accordance with state-of-the-art engineering and the recognised rules of safety. However, operating errors and misuse result in a risk for

- ◆ the life and limb of the operator or third parties,
- ◆ the device and other property of the owner,
- ◆ efficient work with the device.

All persons who are involved in the set-up process, operations, maintenance and servicing of the device must

- ◆ be appropriately qualified,
- ◆ be able to prove knowledge and experience of welding equipment, and
- ◆ have fully read and understood this operating manual and all operating instructions for the system components and must follow all instructions entirely.

The operating manual must always be kept at the site of use. Additionally all of the generally applicable regulations for accident prevention and environmental protection must be observed.

All safety and hazard information on the device must be kept in legible condition, must not be damaged, removed, covered, concealed or painted over.

The positions of the safety and hazard information on the device are available in the "Set-up and installation" chapter of the operating manual. Faults that may affect safety must be rectified before set-up.

Safety first!

3. Intended use

- ◆ The device is intended exclusively for work in accordance with the intended use.
- ◆ The device is intended exclusively for the welding process described on the rating plate. Any other or additional use is deemed to be improper use. The manufacturer is not liable for damages resulting from this.
- ◆ Intended use also includes reading and observing all instructions in the operating manual, reading and observing all safety and hazard information and complying with the inspection and maintenance tasks.
- ◆ Set-up and operating the device outdoors are not permitted. The protection gas would not be effective in this case. Only use this device in dry rooms with fresh air!
- ◆ The device is intended for welding on metals and alloys that are suitable for arc welding.
- ◆ The PUK welding microscope is used for the observation or microscopy of objects through the ocular of the microscope. The LED lighting serves to illuminate the working area.
- ◆ The PUK welding microscope may only be used for welding if it has been properly connected to the PUK fine welding device.

As a matter of principle, no liability is accepted for the durability of the welding results. The manufacturer accepts no liability for defective or deficient working results. We recommend that the welding results should be checked in every case.

4. Safety instructions

4.1 Ambient conditions

Operation or storage of the device outside the specified conditions is deemed to improper use. The manufacturer is thus not liable for damages. The device must be operated in a dry place. This should be free of dust, acids, corrosive gases or substances.

Temperature range of the ambient air:

- ◆ during operation: +10 °C to +40 °C
- ◆ during transport and storage: -20 °C to +55 °C

Altitude above sea level: up to 1,000 m

4.2 Duties of the operator

If the device is used in a commercial or industrial environment, the owner should ensure that only those persons work on the device, who are familiar with the fundamental provisions for industrial safety and accident prevention, who have been instructed on handling the device, who have read and understood this operating manual and in particular the chapter on "Safety instructions", and who have been trained with respect to the requirements for the working results. The safety-conscious working of the personnel should be checked on a regular basis. Similar obligations are applied for operators.

All persons who are instructed to work on the device are recommended to

- ◆ observe the fundamental regulations governing occupational safety and accident prevention.

- ◆ that they have read and understood this operating manual, and in particular the chapter on “Safety instructions”, and that they will observe this information.
- ◆ Before leaving the workplace, make sure that no personal injury or property damage could arise in absence.

4.3 Personal and personnel protection



Warning of heat or radiation, injury to the eyes and hands

When operating the device the following dangers might arise, such as:

- ◆ Flying sparks, ejected hot metal parts. A risk of burns.
- ◆ Arc radiation harmful to the eyes and skin
- ◆ Harmful electromagnetic fields that pose a risk of death to pacemaker users
- ◆ Electrical hazards due to mains and welding current
- ◆ The tip of the electrode fastened into the hand piece can present a risk of injury (due to puncture injuries and scratches, e.g. to the hands, face and eyes).
- ◆ Hazardous welding fumes and gases
- ◆ The workpiece and electrode tip can become extremely hot during welding. A risk of burns.

Wear suitable protective clothing when handling the device. Protective clothing shall include the following characteristics:

- ◆ Low flammability
- ◆ Insulating and dry
- ◆ Full body coverage, undamaged and in good condition
- ◆ Safety helmet
- ◆ Trousers without turn-ups

Protective clothing includes the following:

- ◆ Eye and face protection through protective shield with regulation-compliant filter element against UV radiation, heat and flying sparks.
- ◆ Wear regulation-compliant safety goggles with side protection behind the protective shield.
- ◆ Wear sturdy footwear that also insulates when wet.
- ◆ Protect hands with suitable gloves (electrically insulating, heat protection).
- ◆ Exposed areas of skin must be protected against the UV radiation while welding, in order to prevent skin damage.
- ◆ Wear suitable dry protective clothing. Synthetic clothing is not suitable.
- ◆ Never look into the arc without eye protection; always use a welding mask with certified protective glass.
- ◆ In addition to light and thermal radiation, which can cause dazzling or burning, the electric arc also emits UV radiation. With insufficient protection this invisible UV radiation causes very painful conjunctivitis, which can first be noticed hours later, and can also cause permanent eye damage. The PUK eye protection systems with the integrated LCD sight protection filter also provide reliable protection against these risks and sufficient protection against UV/IR radiation in the light and dark shade.
- ◆ The protective class of the filter is selected such that sufficient protection is provided against dazzling by the arc.

- ◆ Never look into the LED lamp or its reflections without eye protection; always use a protective shield or safety goggles with suitable protective glass.

Keep others, in particular children, away during operation of the devices and execution of the welding process. However, if persons are in close proximity inform them of all dangers (risk of dazzling by arc, risk of injury due to flying sparks, welding fumes that are harmful to health, possible dangers due to mains or welding current),

- ◆ make suitable means of protection available, or
- ◆ install protective walls and curtains.

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

4.4 Danger due to harmful gases and vapours



Welding work produces fumes that contain health-endangering gases and vapours. Welding fumes contain substances that may cause birth defects and cancer under certain circumstances.

The fumes and harmful gases produced

- ◆ must not be inhaled
- ◆ must be extracted from the working area using suitable equipment.

Ensure a sufficient fresh air supply - air flow rate of min. 20 m³/h. With insufficient ventilation, use a respiratory protection mask with air supply. When welding is not taking place, close the valve of the protection gas canister or the main gas supply. If you are unsure whether the extraction capacity is sufficient, compare the measured hazardous substance emission values with the permissible exposure limit values.

The following components all contribute to the degree of harmfulness of the welding fumes:

- ◆ The metals used for the workpiece
- ◆ Electrodes
- ◆ Coatings
- ◆ Welding wires
- ◆ Unsuitable cleaning substances and similar

Please consider the respective material safety data sheets and manufacturer's instructions for the components listed. Keep flammable vapours (e.g. solvent vapours) away from the radiation range of the arc.

4.5 Danger due to flying sparks



Flying sparks can trigger fires and explosions. Never weld in close proximity to flammable materials. Flammable materials must be kept at least 10 metres away from the arc, or covered with a tested and approved cover. Keep suitable, tested fire extinguishers at hand. Sparks and hot metal parts may also penetrate neighbouring areas through small cracks and openings. Implement appropriate measures so that no risk of injury and fire can arise. Do not weld in areas at risk of fire or explosion, or in connected tanks, barrels or pipes, if these have not been prepared in accordance with the respective national and international standards. It is prohibited to weld in tanks that contain or have contained gases, fuels, mineral oils or similar. Residues pose a risk of explosion.

4.6 Danger due to mains and welding current



Electric shock poses a fundamental risk of death and may be fatal. Do not touch live parts inside and outside the device. Ensure a sufficiently insulating and dry substrate or cover to ensure suitable personal and personnel protection with regards to earth or ground potential. The substrate or cover must completely cover the entire area between the body and earth or ground potential.

All cables and lines must be sound, undamaged, insulated and sufficiently dimensioned. Loose connections, charred, damaged or inadequately dimensioned cables and lines must be replaced immediately. Manually check the current connections for firm seating before each use. Never wind cables or lines around the body or body parts.

Double the no-load voltage of a welding device can arise between the electrodes of two welding devices for example. If the potentials of both electrodes are touched simultaneously, there may be a risk of death under certain circumstances. Have mains and device supply lines checked regularly by an electrician to ensure the functionality of the protective conductor. Only operate the device on a network with protective conductor and a socket with protective conductor contact. If the device is operated on a network without a protective conductor and a socket without a protective conductor contact, this constitutes gross negligence.

The manufacturer is not liable for damages resulting from this. Switch off devices when not in use. Switch off the device and unplug the mains plug before working on the device. Display a clear and comprehensible warning sign to prevent the device being plugged in again at the mains plug and being switched on again.

4.7 Stray welding currents

If the following information is not observed, stray welding currents may arise. These could cause the following:

- ◆ Risk of fire
- ◆ Overheating of components that are connected with the workpiece
- ◆ Destruction of protective conductors
- ◆ Damage to the device and other electrical equipment

Ensure secure connection of the workpiece clamp with the workpiece. Fasten the workpiece clamp as close to the welding area as possible. In case of an electrically conductive floor, ensure device installation with sufficient insulation against the floor.

4.8 EMC device classifications

Devices of emissions class A:

- ◆ are only designed for use in industrial environments
- ◆ can cause grid-bound and radiated interference.

Devices of emissions class B:

- ◆ satisfy the emissions requirements for residential and industrial areas. This also applies in particular to residential areas, in which the energy supply comes from the mains low voltage grid.

EMC device classification in accordance with the rating plate or technical data. EMC measures: In special cases, it is possible that influences can arise for the intended application area despite compliance with the standardised emissions limit values (e.g. if sensitive devices are at the installation site or if the installation

site is close to radio or television receivers). In this case, the operator is obligated to implement appropriate remedial measures. Test and evaluate the interference immunity of equipment in the environment of the device in accordance with the national and international provisions. Examples of interference-prone equipment that could be influenced by the device:

- ◆ Safety devices
- ◆ Mains, signal and data transmission lines
- ◆ IT and telecommunications equipment
- ◆ Equipment for measurement and calibration

Supportive measures for the avoidance of EMC problems:

1. Mains supply

- ◆ If electromagnetic interference arises despite mains connection in accordance with regulations, implement additional measures (e.g. use a suitable mains filter).

2. Welding lines

- ◆ must be kept as short as possible
- ◆ must be laid close together (also for the avoidance of EMC problems)
- ◆ must be laid far from other lines

3. Equipotential bonding

4. Screening, if necessary

- ◆ Screen other equipment in the environment
- ◆ Screen the entire welding installation

EMC measures: Electromagnetic fields could cause health damage that is not yet known:

- ◆ Electromagnetic fields can influence the health of persons in the vicinity, e.g. wearers of pacemakers and hearing aids
- ◆ Persons wearing pacemakers must consult their doctor before entering the immediate vicinity of the device and the welding process.
- ◆ Keep distances between welding cables and the head/torso of the welder as great as possible for safety reasons
- ◆ Do not carry welding cable and hose packages over the shoulder and do not wind around the body or body parts

4.9 During operation

- ◆ The workpiece can get hot during welding.
- ◆ Particular regulations apply to areas at risk of fire and explosion; observe the relevant national and international provisions.

If the device is equipped with a carry handle, this is intended exclusively for carrying by hand. The carry handle is not suitable for transport with a crane, forklift truck or other mechanical hoisting equipment.

4.10 Danger due to shielding gas canisters

Shielding gas canisters contain pressurised gas and could explode if damaged. Because shielding gas canisters are part of the welding equipment, they must be handled extremely carefully. Protect shielding gas canisters with compressed gas against

- ◆ heating above 50 °C, extended exposure to solar radiation, frost,
- ◆ mechanical impacts,
- ◆ clinker, naked flames, sparks and light arcs.

Install shielding gas canisters upright and secure in accordance with the instructions, so that they cannot topple. Keep shielding gas canisters away from welding current circuits and other electrical circuits. Never touch a shielding gas canister with an electrode. Risk of explosion - never weld on a pressurised shielding gas canister. Only ever use shielding gas canisters suitable for the respective application, and the associated suitable accessories (controller, hoses and fittings, etc.). Only use shielding gas canisters and accessories in good condition. If the valve of a shielding gas canister is opened, turn the face away from the outlet. When welding is not taking place, close the valve of the shielding gas canister. If the shielding gas canister is not connected, leave the cap on the valve of the shielding gas canister. Observe the manufacturer's information and the relevant national and international provisions for shielding gas canisters and accessory parts.

4.11 Danger due to leaking shielding gas

Danger of suffocation due to uncontrolled escaping shielding gas. Shielding gas is colourless and odourless and can displace oxygen in the ambient air if it escapes.

- ◆ Ensure a sufficient fresh air supply - air flow rate of min. 20 m³/h
- ◆ Observe the safety and warning information for the shielding gas canister or the main gas supply
- ◆ When welding is not taking place, close the valve of the shielding gas canister or the main gas supply.
- ◆ Check the shielding gas canister or main gas supply for any uncontrolled gas leaks before every start-up.

4.12 Safety measures at the installation site and during transport



A toppling shielding gas canister can mean a risk of death! The shielding gas canister must be erected on a level and firm sub-surface. Particular regulations apply to areas at risk of fire and explosion; observe the relevant national and international provisions.

Ensure, through internal instructions and checks, that the environment of the working area is always clean and clear. Only erect and operate the device in accordance with the protection type cited on the rating plate. When erecting the device, maintain a safety distance of 0.5 m so that the cooling air can enter and escape unimpeded. When transporting the device, be sure to comply with the applicable national and regional directives and accident prevention regulations. This applies in particular to directives pertaining to transport and conveyance. Do not lift or transport devices in operation. Switch off devices before transporting or lifting! Before start-up and after transport, always perform a visual inspection of the device for damage. Have visible damage repaired by trained service personnel before start-up.

4.13 Safety measures in normal operation

Only operate the device if all safety equipment is fully functional. If the safety equipment is not fully functional, there is a risk to

- ◆ the life and limb of the operator or third parties,
- ◆ the device and other property of the owner,
- ◆ efficient work with the device.

Repair all safety equipment that is not fully functional before switching on the device. Never bypass safety equipment or render this inoperable. Before switching on the device, ensure that this will place no one at risk. The device must be checked for externally visible damage and the functionality of the safety equipment at least once every week. Always safely erect shielding gas canisters such that these are stable and secure.

4.14 Original spare parts

In the case of parts sourced from third parties, there is no guarantee that these are designed and manufactured to meet the stress and safety requirements.

- ◆ Only use original spare and wearing parts (also applies to standard parts).
- ◆ Changes, modifications and additions to the device are prohibited without the approval of the manufacturer.
- ◆ Exchange parts immediately if these are not in flawless condition.
- ◆ When placing an order, cite the precise designation and part number in accordance with the spare part list, as well as the serial number of your device.

The housing screws constitute the protective conductor connection for earthing the housing parts.

4.15 Safety-related checks

The manufacturer recommends performing a safety-related check on the device at least every twelve months. A safety-related check by a qualified electrician is recommended

- ◆ after a modification
- ◆ after an installation or conversion
- ◆ after repair and care
- ◆ at least every twelve months.

When performing a safety-related check, observe the respective national and international standards and directives.

4.16 Disposal

Do not dispose of this device with household waste. In accordance with the European directive regarding the disposal of used electrical and electronic equipment and its application within national law, used electrical devices must be collected separately and sent in for recycling in an environmentally friendly manner. Make sure that you return your used device to your dealer, or obtain information regarding your local, authorised collection and disposal system.

4.17 Safety labelling

Devices with a CE mark satisfy the fundamental requirements of the low voltage and electromagnetic compatibility directive (e.g. relevant product standards from the standards series EN 60 974).

Lampert Werktechnik GmbH declares that the device satisfies directive 2014/53/EU. The complete text of the EU declaration of conformity is available at www.lampert.info

Devices bearing the CSA test mark satisfy the requirements of the relevant standards for Canada and the USA.

4.18 Data security

The operator is responsible for backing up changes to the factory settings. The manufacturer is not liable for the loss of personal settings.

4.19 Copyright

The manufacturer retains the copyright to this operating manual. Text and illustrations represent the technical status at the time of printing. Subject to change. The contents of the operating manual do not constitute grounds for any claims by the purchaser. We welcome any suggestions for improvements and information regarding errors in the operating manual.

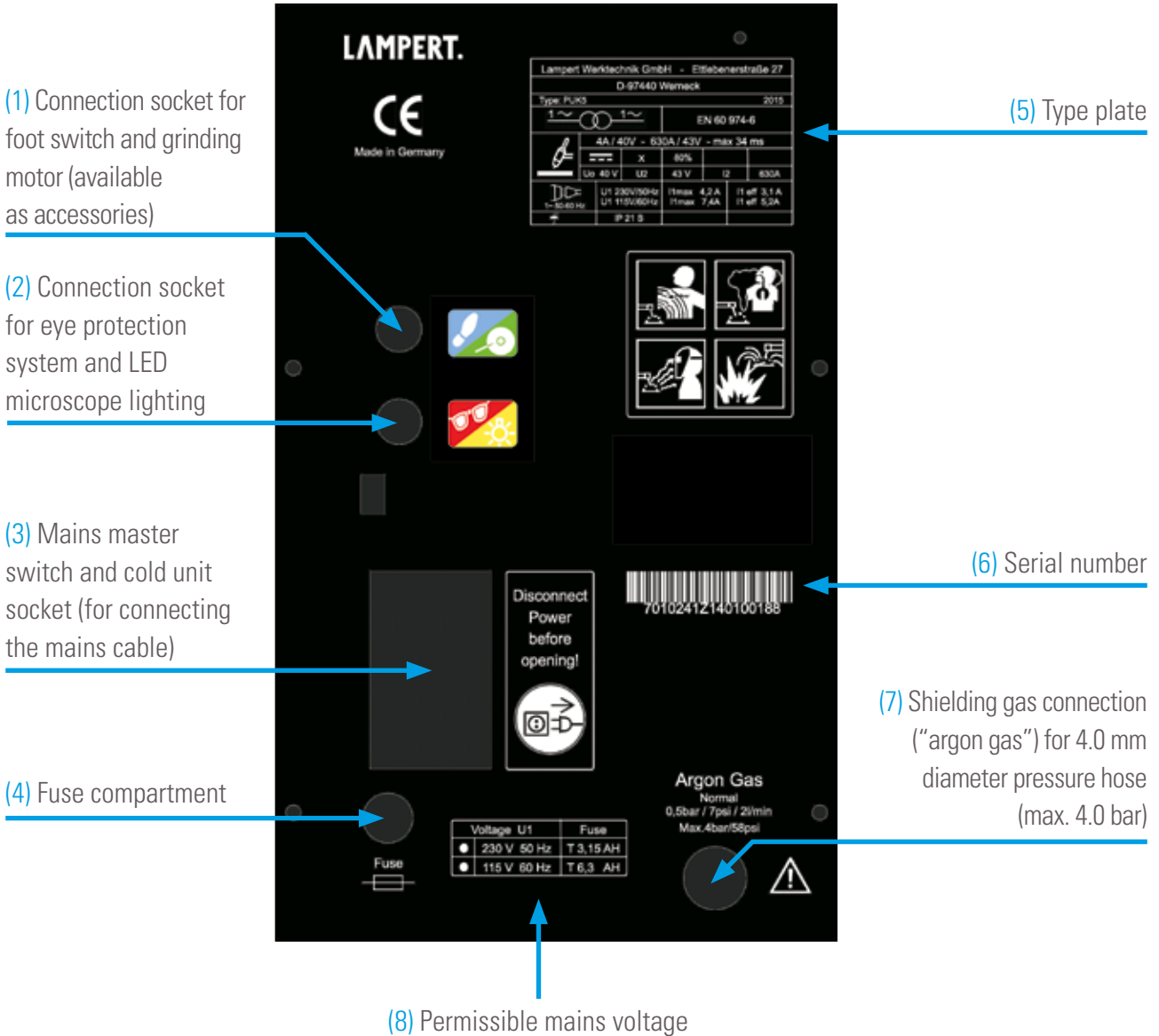
5. Set-up and installation

5.1 Device set-up

The device set-up location must satisfy the following conditions

- ◆ Cooling air must reach all housing surfaces unimpeded.
- ◆ The device must not be covered during operation.
- ◆ The device must 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.
- ◆ Fasten the two hand rests 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.

5.2 Description of the rear of the device

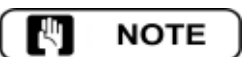


5.3 Connecting the welding microscope to the welding device

The circular connector M12 for the PUK eye protection system and the LED lighting is inserted in the connecting socket (2) marked in yellow/red on the rear side of the device and tightened with the union nut until hand tight.



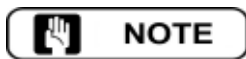
Only connect original PUK eye protection systems to the welding system. Other eye protection systems are not approved and can lead to permanent health damage or damage to the welding device.



Always observe the operating instructions for the PUK eye protection system connected!

5.4 Connecting the shielding gas supply

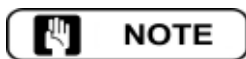
Fasten the suitable flow regulator to the shielding gas canister with the corresponding tool. In doing so, always observe the enclosed special operating instructions provided. We recommend argon with min. 99.99 % purity, e.g. "Argon 4.6". With the help of the quick couplings, screw the pressure hose to the flow regulator and the shielding gas connector (7) on the rear of the device until hand-tight.



NOTE

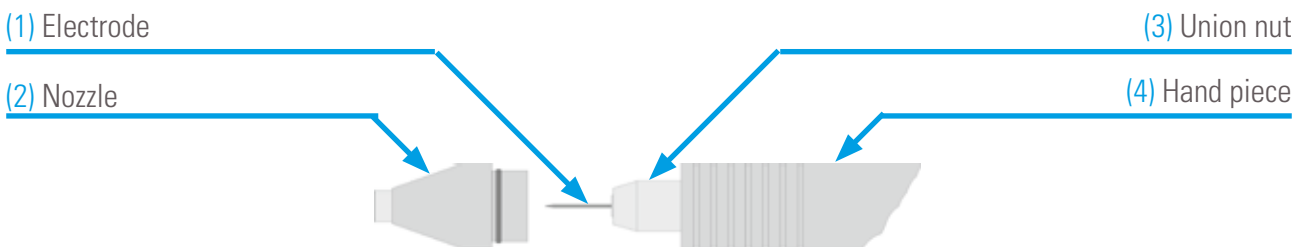
Check regularly that all of the hose connections and the gas hose are in optimal condition, are properly fastened and are airtight!

5.5 Inserting/changing the electrode

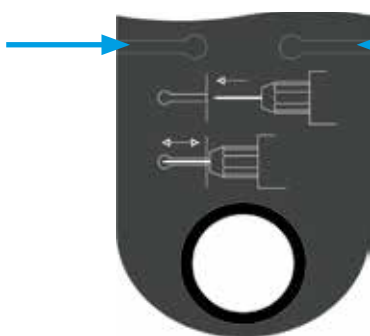


NOTE

Please always check that the device is switched off, prior to exchanging the electrode. This prevents uncontrolled triggering of the welding process. Caution: the electrode is sharp, risk of injury!

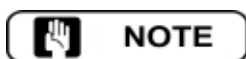
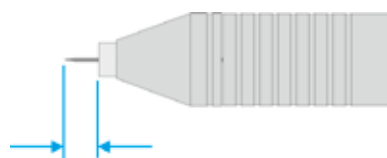


Lightly rotate the nozzle (2) and in doing so, pull it off of the hand piece (4). The nozzle is in place but not screwed on. Undo the union nut (3), remove the electrode (1) and insert the freshly abraded electrode with the freshly sharpened side facing outwards, tighten the union nut once more until hand-tight.



The correct electrode length can be easily set with the help of the measuring aid milled into the hand piece arm. Suitable for right and left-handed users.

Now place the nozzle back on the hand piece. The electrode should now protrude approx. 4-6 mm over the nozzle end.



NOTE

Only use thorium oxide free original electrodes.

Subsequently insert the connector plug of the hand piece straight into the connection socket for the hand piece on the front of the welding device housing and fasten in place by tightening the union nut hand-tight in a clockwise direction. Insert the plug of the connecting cable used (such as a crocodile clip) into the connection socket for contact elements on the front side of the housing.

5.6 Connecting the power supply

As soon as the mains master switch on your fine welding device is switched on, the voltage is applied to the connected contact clamps 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, but only undesirable operating errors under certain circumstances.

Insert the original power cable with the mains connector plug into the cold unit socket on the rear of the housing and insert the mains plug into a suitable socket with the correct mains voltage.

5.7 Adjusting the welding microscope

Before the first welding process, it is initially necessary to precisely set the microscope lens. Align the hand piece 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. To do so, undo the locking screw in the stand. A metal support now extends and forms an additional stand leg. Move the microscope into the desired position and tighten the screw again.

5.8 Adjusting the interocular distance

(1) Ocular with goggles support

(2) Dioptre setting

(3) Prism housing

(4) Focussing screw

(5) Ocular tube

(6) PUK eye protection filter with integrated LED lighting



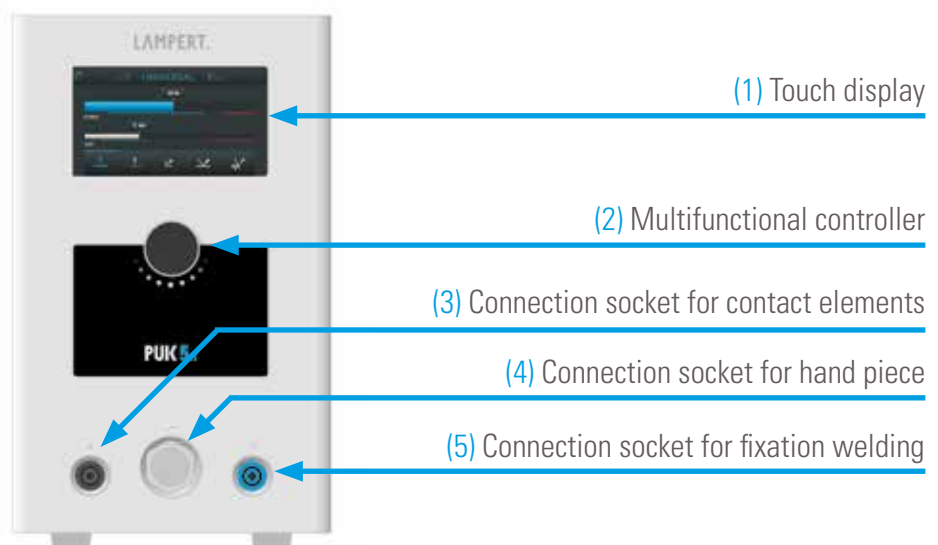
Look through the two oculars (1) and move the ocular tubes (5) inwards or outwards by moving the prism housing (3) in or out. The interocular distance is correct if the range of vision as viewed through the two oculars is complete and is united as a single complete image. The interocular distance should be individually set for each user. A spacer sleeve ensures the correct distance for focussing.

5.9 Dioptre setting

The dioptre setting (2) is located on the left-hand ocular (1). In the normal position, the lower part of the sleeve is aligned with 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 and adjust the focus using the focusing screw (4). Now look through the left-hand ocular with your left eye and adjust the focus by turning the dioptre setting (2) until the image appears focused.

6. Setup process

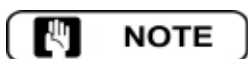
6.1 Description of the device front



6.2 Switching the device on

First, carefully open the gas canister valve. Then switch the mains master switch on the rear of the housing to the "I" position. After switching on the device, the display shows the precautionary safety instructions, in particular regarding eye protection and reading the operating manual carefully. The start menu is opened by pressing the multifunctional controller once or pressing on the display.

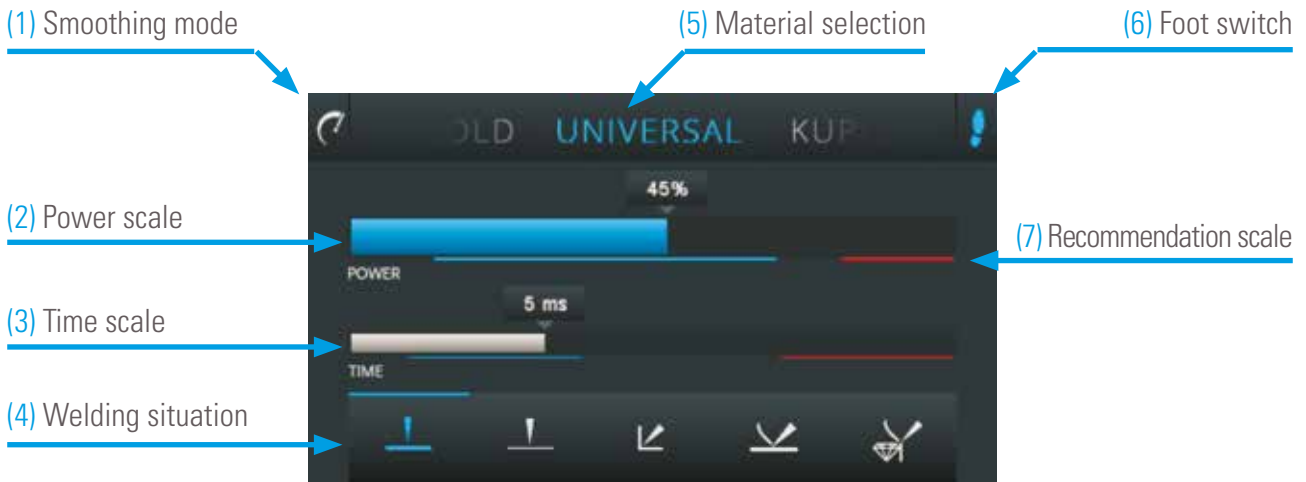
6.3 Setting the correct gas volume


NOTE

Please consider that good welding results can only be achieved with a correctly adjusted gas flow! It may be necessary to adjust the gas flow.

In order to configure the correct gas volume, activate the gas valve in the settings menu. This opens the gas valve in the welding device. Now set the flow regulator to the correct flow rate of approx. 2-3 litres/min. When doing so, also observe the instructions provided with the flow regulator. Once the gas volume is correctly adjusted, close the gas valve again by pressing the corresponding button.

6.4 Touch display



The smoothing mode (1) and welding situation (4) functions can be selected directly via the touch display by tapping with the finger. The power scale (2), time scale (3) and menu field (5) can be changed with the swipe function on the touch display. The recommendation scale (7) shows the recommended setting range. In the red range, the settings are no longer expedient and there is a possible risk of damaging the workpiece. The foot switch (6) can be activated by pressing it for 2 seconds.

6.5 Navigating through operation

Navigation through the user levels takes place by pressing and holding the multifunctional controller for longer than 1 second. When you do so, the system runs through the following user levels as an endless loop. When the controller is released, the display comes to a stop at the selected user level. Pressing and holding again changes to the next user level. It is now possible to implement or check further settings.

6.6 Start menu








In the start menu user level, it is possible to start welding immediately. At the top edge of the display it is possible to select the welding material, and at the lower edge you can select the geometries or welding situations.

With the help of the swipe function it is possible to select the following predefined materials:

- ◆ Universal
- ◆ Silver
- ◆ Bronze
- ◆ Gold
- ◆ Copper
- ◆ etc.

The activated material is shown in blue. At the bottom edge of the display, the desired welding situation is selected by pressing on the symbol. Here too, selection of the symbol is confirmed in blue. The following geometries or welding situations are available for selection:

- 
 ◆ Universal setting for material thicknesses from 0.3 mm.
- 
 ◆ Setting for thin sheet metal or wire parts equal to or less than 0.3 mm. This setting offers very low development of heat, especially for short welding times (≤ 0.3 mm).
- 
 ◆ Welding in sharp angles and tight joint situations. Here it is IMPORTANT to use short welding times.
- 
 ◆ Melting of welding wire. Use identical alloy wire with a diameter of 0.3 to 0.4 mm. Ideal is a diameter of 0.35 mm.
- 
 ◆ Application of welding wire on claws and stone settings. Particularly low-energy melting of welding wire, diameter of approx. 0.2 mm recommended.

After selecting the material and the welding situation, the recommended power and pulse duration parameters are set. The recommendation ranges are each marked with a thin blue line on the recommendation scale. The red range stands for parameters that experience has shown do not permit the desired welding results and that should be avoided. The power and pulse duration parameters can be adjusted with the swipe function on the one hand, and on the other hand set to discrete values with the aid of the multifunctional controller. The power is displayed as a percentage of the total power here, whilst the pulse duration is provided in milliseconds. Pressing the multifunctional controller once switches between the power scale and the pulse duration. The respective scale is then displayed as active, and the parameters can be selected. After around one second, the power scale is activated again as standard. This means it is simple to perform power scale readjustments, without needing to look away from the microscope.

6.7 Settings



In the "settings" user level, it is possible to implement basic settings and perform various test functions. The activated settings are shown in blue.

Gas valve:

Pressing the gas valve symbol on the display opens the gas valve. This function is important in order to set the correct gas flow on the flow regulator. Pressing the button again causes the gas valve to close once more. Pressing every other symbol on the display or pressing the multifunctional controller closes the gas valve automatically.

Filter test:

Pressing the symbol activates a function test of the eye protection filter. The eye protection filter is closed. Pressing the symbol again ends the test and opens the protection filter once more.

LED light:

Pressing the LED lighting symbol enables the brightness of the LED lamp on the welding microscope to be adjusted in three brightness steps, or switched off completely.

Expert menu:

The expert menu can be activated or deactivated here. If this menu is active, it appears as an additional user level.

Program memory:

You can activate or deactivate the saving and calling functions for programs that you created yourself here. If this menu is activated, it appears as an additional user level.

Fixing:

Pressing this button activates or deactivates the operating menu for fixation welding. If this menu is activated, it appears as an additional user level.

Micro:

Pressing the symbol allows the micro-mode to be activated or deactivated. If this menu is activated, it appears as an additional user level.

Welding sequence:

Pressing the symbol enables preselection of a "standard" or "short" basic welding cycle. If "short" is selected, the gas pre-flow time is shortened and it is possible to trigger a series of welding points in quicker succession.

Language:

Pressing the symbol enables the system language for the welding device to be set. It is possible to toggle between the languages German (DE), English (EN), Spanish (ES), French (FR), Italian (IT), Russian (RU), Japanese (JP), Polish (PL) or Czech (CZ). The messages descriptions are then displayed in the language that is currently set.

Welding beep:

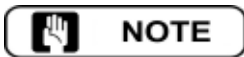
Pressing the symbol enables activation or deactivation of the signal tone before welding.

6.8 Expert menu (if activated in the settings)



The expert menu can be activated in the settings user level. After activation, the expert menu appears as a separate user level, which can be accessed by pressing and holding the multifunctional controller. The various welding characteristic curves are stored in the expert menu, which have been developed and defined in the start menu for the preconfigured metals and welding geometries. However, here they are shown without content-related assignment. This mode is designed

for experienced welders who want to experiment with the various stored energy characteristic curves (pulse modulations). In this user level it is possible to choose between the various energy curves and store these together with individual settings for the power and time.



NOTE

When switching from the start menu to the expert menu, the relevant settings are carried over from the start menu. This means that the welding curves stored here can be viewed.

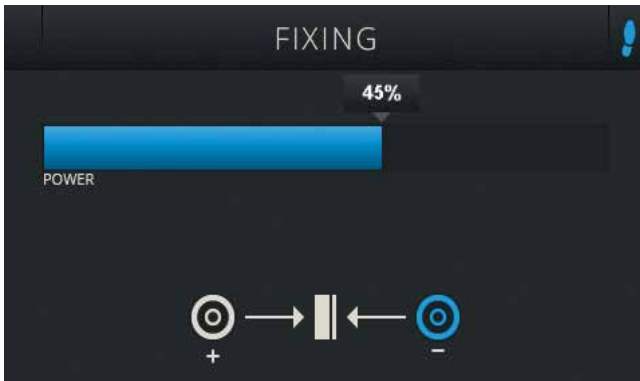
6.9 Program memory (if activated in the settings)



Pressing and holding the metal selection in the start menu or the welding curve in the expert menu results in the current parameters set being accepted in the program memory menu. 20 storage spaces are available here for individual storage. In the first step, the program space is selected by swiping to the left or right. The set data is then accepted by pressing the "continue" button. Saved data cannot be deleted. It can only be overwritten. A program name is assigned

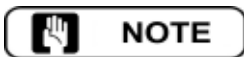
in the following window. The program name can comprise upper and lower case letters and special characters. Using the arrow buttons on the display, it is possible to set the active cursor position and select the desired characters with the multifunctional controller. The next character is then selected with the arrow keys. With this, it is also possible to perform corrections. After entering the name for the storage space, pressing the save button completes the entry. After saving, the program memory user level is displayed and the storage space is active.

6.10 Fixation welding (if activated in the settings)



The fixation welding menu can be activated from the settings user level. After activation, the fixation welding mode appears as a separate user level, which is accessed by pressing and holding the multifunctional controller. This mode is used for workpiece fixation. The fixation welding set is required for fixation welding (optional accessories). Connect both of the workpieces which are to be fixed to an area of bare metal, using the blue and the black connection terminal

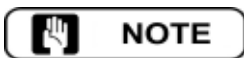
respectively. The shielding gas is deactivated in this setting. The foot switch is automatically activated in this menu. When the two parts are touching, the welding process can be triggered, using the foot switch. The hand piece is not used during this process.



NOTE

Fixation welding is particularly well suited for metals with low electrical conductivity, for example titanium or steel.

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 it is therefore not possible to change the pulse duration.



NOTE

Once welding has been successfully completed, and before switching to another user level, please remove the blue connection cable!

6.11 Micro (if activated in the settings)



The micro menu can be activated in the settings user level. After activation, the micro menu appears as a separate user level, which can be accessed by pressing and holding the multifunctional controller. In micro menu the welding parameters can be adjusted much finer allowing the welding of wires and sheets with material thickness down to less than 0.2 mm with even greater control.

6.12 Smoothing mode

Smoothing mode can be activated or deactivated by pressing on the symbol at the top left in the display. This function can only be activated in the start menu. This enables a faster welding cycle, e.g. to smooth surfaces or for increased heat transfer (e.g. to reduce the conductivity of silver). The welding device independently triggers three times here. If the user switches to a different user level, smoothing mode must be reactivated if required.

6.13 Foot switch (custom accessories)

With the welding device switched off, connect the foot switch plug to the socket marked with the blue foot switch symbol on the rear of the device. The device is then switched on. Pressing the multifunctional controller or touching the display confirms the safety information and the device is ready for operation.

The foot switch can be activated by pressing and holding it. The message "Foot switch activated" is shown on the display and the blue foot switch symbol at the top right of the display.

A bare metallic point of the workpiece is connected with a contact clamp. The workpiece and electrode are then guided together. The contact is indicated by a periodically alternating opening and closing of the eye protection system. The foot switch is now ready to perform the welding process.

The foot switch can be deactivated again by pressing and holding it (without workpiece contact). The blue foot switch symbol in the display goes out.

6.14 Help function

The buttons at the bottom edge of the display are supported in all user levels with a help function. Pressing and holding the button causes the info window to appear for the respective button, which displays explanatory information for the button function. Pressing on the display again results in the program returning to the active user level.

7. Basic information about the effects of power and pulse duration

7.1 Power

The size and intensity of the welding points are controlled by the power, i.e. the higher the power the larger the welding point. With very thin materials an excessive power level can also quickly result in damage. It makes sense for "PUK beginners" to experiment in order to find the optimum power level, starting with a power of 20% or with very fine welding, even lower. Power settings between 35% and 50% are considered medium welding powers. With silver alloys in particular it is generally not practical to increase the power level above 50% as the metal will otherwise very quickly start to "spatter" instead of welding. Other precious metals can be welded with higher power levels, just as with stainless steel. A power level above 70% is only practical in exceptional circumstances. There is a danger of inhomogeneous welds and only experienced users should move outside this range.

7.2 Pulse duration

The pulse duration determines for how many milliseconds the 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 or wires, it is advisable to select a shorter pulse duration. In particular when welding close to precious stones, pearls or other heat-sensitive materials, welding times of no more than 4 ms are recommended. With many silver alloys or other highly conductive metals a longer welding time, starting at 10 ms, can also be advantageous in order to avoid heat cracks.

For successful work with the welding device, it is important that the power and pulse duration always be carefully considered in close connection with each other. The total energy applied to the workpiece is comprised of these two parameter settings together - prior to welding this must be considered following an in-depth analysis of the welding task, the materials and the workpiece geometry.

8. Welding instructions



Prior to welding, always check the function of the eye protection filter. If the eye protection filter (shutter) fails to switch over from light to dark, it must be immediately exchanged by a qualified specialist. The device must not be operated until then.

8.1 Instructions for welding

- ◆ First free the workpiece of impurities with the PUK universal cleaner.
- ◆ A bare metallic point of the workpiece is then connected with the contact clamp.
- ◆ The welding process is triggered when the electrode tip lightly touches the area to be welded without pressure. It is important here that the electrode tip remains in the position where initial contact is made until welding takes place, i.e. neither follow the electrode with the workpiece if it retracts slightly in the hand piece, nor pull back.

The welding process runs through the following phases automatically, as soon as the electrode touches the workpiece:

- ◆ The gas valve is opened and the shielding gas is applied to the welding point through the hand piece.
- ◆ A signal tone (if activated in the settings) sounds and notifies of the arc.
- ◆ The welding protection filter is darkened.
- ◆ The arc is triggered with a slight delay and the electrode partly withdraws into the hand piece.
- ◆ The welding protection filter is switched off and the electrode returns to the initial position.
- ◆ The shielding gas supply cuts off and the welding process is ended.
- ◆ Touching the workpiece once more triggers the next welding process.

Apply extremely light pressure to the tip of the electrode when working!

The fine welding device is equipped with a function to prevent the electrode becoming welded to the workpiece by incorrectly pressing or pressing too hard. If a welding point has already been set and is pressed too hard to the workpiece when it comes into contact again, the welding process is not triggered; instead, the eye protection system will be darkened periodically to indicate that the electrode is pressing too hard against the workpiece. The electrode's contact to the workpiece must be stopped for a short time and the welding process must be started again.

The welding process can be interrupted at any time by lifting the electrode away from the workpiece.

8.2 Basics and tips

- ◆ The quality of the welding results is significantly dependent on the quality of the electrode abrasion.
- ◆ Always ensure faultless electrical contact between the workpiece and the contact clamp, i.e. establish contact between the workpiece and the connection cable terminal at a bare metallic point.

- ◆ Free-handed welding leads to poorer results due to uncontrollable independent movements of the hands. The hand supports on the microscope are intended to prevent this.
- ◆ The pressure on the electrode tip should only be light.
- ◆ A gas flow rate of approx. 2-3 litres/minute is recommended. The gas flow should be regularly checked at the flow regulator and adjusted if necessary.
- ◆ The angle with which the workpiece touches the electrode tip significantly influences the flow direction of the welding point.
- ◆ For welding tasks on deeper lying points, the electrode can be clamped such that it protrudes somewhat further out of the nozzle. The gas flow rate should be slightly increased here.
- ◆ In many cases it is helpful to work with welding wire as a welding supplement. The use of solder is not permissible.

8.3 Abrading the electrodes

Switch off the machine prior to exchanging the electrode. This prevents uncontrolled triggering of the welding process. The electrodes should be abraded with a diamond disk with a fine grain. The recommended angle of abrasion is approx. 15°. Abrading the electrodes should take place in an axial direction. The lower the roughness depth of the tip surface, the calmer the arc burns and the higher the service life of the electrode.

8.4 Further information is available online

Numerous practical user tips are available on the website www.lampert.info under Workshop News. It is also possible to subscribe to the newsletter here. Furthermore, the Showroom section contains informative videos and example photos.

9. Care of the system components

9.1 Care of welding device and welding microscope

The welding device and welding microscope require minimal maintenance under normal working conditions. However, it is essential that a few points are observed in order to guarantee the function and to keep the 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 hand piece move easily.
- ◆ If necessary, you can clean the electrode threaded assembly on the hand piece with a lint-free cloth to ensure optimal contact with the electrode.
- ◆ The device can be cleaned occasionally with a lint-free cloth. Avoid using cleaning agents.
- ◆ Use the supplied dust cover to cover up the device and the microscope after use.

If work or repairs are necessary, which are not described in this operating manual, contact your dealer.



If fuses require exchanging, they must be replaced with fuses of the same type. The guarantee is voided if the ratings of the fuses used are too high. The device must only be opened by an electrician.

9.2 Care of the optical components

Optical components must not be disassembled. In particular, the oculars must not be removed from the ocular tubes and the eye protection filter must not be disassembled. Your dealer is the first point of contact for repairs that are not covered by this manual.

Dust on the lens surface or the protective glass of the eye protection filter can be removed with a commercially available special brush. The external surface of the lens can be cleaned with a lint-free cloth. The cloth can be moistened with glass cleaner for more stubborn dirt, and the lens can then be cleaned and dried in circular movements from the centre outwards. Make sure to avoid wiping over a dried lens as they can easily be scratched.

If it is no longer possible to clean the protective glass, or if it is scratched or damaged, it must be replaced. To do so, slide it forwards out of the bracket and insert new protective glass in the same manner.

10. Technical data

10.1 Technical data for the welding device

The device must be used in dry rooms only.

Mains voltage	~230/115 V / 50 - 60 Hz +/-10 %
Mains fusing	T 3.15/6.3 A
Power consumption	400 VA
Working voltage	30 – 43 V
No-load voltage	43 V
Switch on duration	80 %
Max. charging time	0.8 s
Shielding gas	min. ARGON 4.6 (99.996 %)
Maximum gas pressure	4 bar
Protection class	I
Insulation class	B
Protection type	IP 21S
Weight	7.92 kg

10.2 Technical data for the microscope

Optical visual protection and illumination unit for use exclusively with PUK fine welding devices. Only use in dry rooms.

Operating temperature	+5 °C to +40 °C
Lamp "LED unit"	3 W / 800 mA
Protection class	III
Insulation class	B
Protection type	IP 20
Weight	3.58 kg

10.3 Optical data for the microscope

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

10.4 Technical data for the LCD shutter M11 (BL)

Light shade	DIN 3
Dark shade	DIN 11
Switching time	< 0.5 ms

UV protection	UV 11
IR protection	IR 11

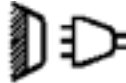






10.5 Identification on the LCD shutter: 3/11 LWT 1/1/1/3/379




Light state	3
Dark state	11
Manufacturer identification	LWT
Optical class	1
Scattered light class	1
Homogeneity class	1
Angle dependency class	3
Test standard	379

Designated point for CE tests on the LCD shutter: DIN CERTCO, Alboinstrasse 56, 12103 Berlin

10.6 Type plate

Explanation of pictographs:

A	Current	V	Voltage	IP	Protection type	Hz	Hertz
~	Alternating current	=	Direct current	1 ~ 50-60Hz 	Mains input 1 phase / alternating current / 50 – 60 Hz		Read operating manual
U ₀	No-load voltage	U ₁	Mains voltage	U ₂	Voltage at nominal load		Tungsten inert gas welding
	Protective earth (ground)	I ₂	Nominal welding current	I _{1max}	Power consumption under max. load	I _{1eff}	Power consumption under nominal load
X	Switch on duration		Single-phase transformer		Keep away from precipitation		
		Inhaling welding fumes can endanger your health.					

	Welding sparks may cause an explosion or fire.
	Arcs can damage the eyes and injure the skin.
	Electromagnetic fields may impair the function of pacemakers.

11. Correcting faults

Fault occurring	Possible cause	Fault rectification
Faults on the welding device		
Display is dark	Mains master switch is not switched on	Check mains master switch and switch on
	Circuit breaker has tripped	Use more powerful mains fuse, consult an electrician
	Device fuse blown	Replace device fuse
No welding current	Welding cable connection interrupted	Check cable connections
	Poor or zero contact with the workpiece	Establish connection to the workpiece, fasten contact clamps directly to the workpiece, clean the workpiece with the PUK universal cleaner
Poor welding characteristics	Incorrect shielding gas used	Use recommended inert shielding gas "Argon 4.6"
Poor ignition characteristic	Electrode clamped loosely in hand piece	Tighten clamping nut on the hand piece until hand tight
Oxidation or rusting	Gas pressure too high	Reduce gas flow rate, approx. 2-3 l/min is recommended
Severe oxidation of the welding points	Incorrect shielding gas used	Use recommended inert shielding gas "Argon 4.6"
Tungsten embedded in the workpiece	Electrode pressure on the workpiece too great	Touch workpiece with extremely light pressure

Fault occurring	Possible cause	Fault rectification
Electrode welds to workpiece	Pressure of the electrode on the workpiece too great	Touch workpiece with extremely light pressure
Electrode tip melts	Electrode abraded too steeply	Correct the angle of electrode abrasion, see "Abrading the electrodes", approx. 15° recommended
Static discharge over the surface of the device	Static charge from the environment	Use antistatic foot mat in the working area, use antistatic cables
Welding process begins, but a welding point is not produced	Internal protective circuit is triggered	Switch device off and back on again
Welding process is triggered immediately when touching the workpiece	Malfunction	Immediately put the device out of operation, contact customer service
Faults on the microscope		
LED illumination fails to operate	Cable not connected	Connect the plug to the connection socket marked with the red and yellow eye protection / lamp symbol on the device
	LED faulty	Contact customer service
Eye protection system (shutter) fails to operate	Plug not connected correctly	Connect the plug to the connection socket marked with the red and yellow eye protection / lamp symbol on the device
	Eye protection filter faulty	Arrange to have eye protection unit replaced by qualified personnel
Poor resolution	Oculars dirty	Clean oculars
Marks or soiling in field of vision	Oculars dirty	Clean oculars, 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 a qualified specialist
	Protective glass dirty	Clean protective glass
Undesired focussing changes occur and attachment slides down independently	Attachment not fitted correctly	Check fastening and re-tighten

12. Repair and guarantee

If the welding device or welding microscope require repair, overhaul or adjustment, your specialist dealer or authorised customer service centre should be your first point of contact.

**WARNING**

The device may only be opened by a qualified specialist!

The guarantee provisions are always binding. Excluded from the guarantee are hand pieces, wearing parts such as nozzles, clamping nuts, electrodes and chucks.

13. Disposal information



Render discarded devices unusable by removing the mains cable.

Only for EU countries: In accordance with European 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.

14. EC Declaration of Conformity

The manufacturer Lampert Werktechnik GmbH, Ettlebener Str. 27, 97440 Werneck, Germany

declares herewith that the following products:

Fine welding device PUK5.1 including PUK eye protection system comply with the stipulations of the directives identified below - including any changes applicable at the time of this declaration.

Applicable EC directives are:

- ◆ Low Voltage Directive 2014/35/EU
- ◆ EMC Directive 2014/30/EU
- ◆ Machinery Directive 2006/42/EC
- ◆ Directive governing personal protective equipment 89/686/EEC
- ◆ RoHS-Directive 2011/65/EU

The following harmonised standards have been applied:

- ◆ EEN 50581:2012
- ◆ EN 60974-6:2016
- ◆ EN ISO 12100:2010
- ◆ EN 61000-6-1:2007, EN 61000-6-3:2007+A1:2011
- ◆ EN 61000-3-2:2014, EN 61000-3-3:2013
- ◆ EN 379:2003+A1:2009

Werneck, January 2019



MARTIN BECKMANN

Lampert Werktechnik GmbH

Martin Beckmann (Dipl.-Wirtschafts-Ing.), Managing Director

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

15. Workshop News

Would you like to know more about the possible applications of our fine welding devices? Or are you looking for a few tips about working with your PUK? Then simply visit www.lampert.info to register for our Workshop News.

16. Showroom

Our video library presents many applications from the everyday life of a goldsmith, and the photo gallery contains numerous practical examples. Visit www.lampert.info and get inspired