



EN

welding torch

PMW 20

099-002897-EW501

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22.06.2023

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General instructions

WARNING



Read the operating instructions!

The operating instructions provide an introduction to the safe use of the products.

- Read and observe the operating instructions for all system components, especially the safety instructions and warning notices!
- Observe the accident prevention regulations and any regional regulations!
- The operating instructions must be kept at the location where the machine is operated.
- Safety and warning labels on the machine indicate any possible risks. Keep these labels clean and legible at all times.
- The machine has been constructed to state-of-the-art standards in line with any applicable regulations and industrial standards. Only trained personnel may operate, service and repair the machine.
- Technical changes due to further development in machine technology may lead to a differing welding behaviour.

In the event of queries on installation, commissioning, operation or special conditions at the installation site, or on usage, please contact your sales partner or our customer service department on +49 2680 181-0.

A list of authorised sales partners can be found at www.ewm-group.com/en/specialist-dealers.

Liability relating to the operation of this equipment is restricted solely to the function of the equipment. No other form of liability, regardless of type, shall be accepted. This exclusion of liability shall be deemed accepted by the user on commissioning the equipment.

The manufacturer is unable to monitor whether or not these instructions or the conditions and methods are observed during installation, operation, usage and maintenance of the equipment.

An incorrectly performed installation can result in material damage and injure persons as a result. For this reason, we do not accept any responsibility or liability for losses, damages or costs arising from incorrect installation, improper operation or incorrect usage and maintenance or any actions connected to this in any way.

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The content of this document has been prepared and reviewed with all reasonable care. The information provided is subject to change; errors excepted.

Data security

The user is responsible for backing up data of all changes from the factory setting. The user is liable for erased personal settings. The manufacturer does not assume any liability for this.

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2 For your safety

2.1 Notes on using these operating instructions

DANGER

Working or operating procedures which must be closely observed to prevent imminent serious and even fatal injuries.

- Safety notes include the "DANGER" keyword in the heading with a general warning symbol.
- The hazard is also highlighted using a symbol on the edge of the page.

WARNING

Working or operating procedures which must be closely observed to prevent serious and even fatal injuries.

- Safety notes include the "WARNING" keyword in the heading with a general warning symbol.
- The hazard is also highlighted using a symbol in the page margin.

CAUTION

Working or operating procedures which must be closely observed to prevent possible minor personal injury.

- The safety information includes the "CAUTION" keyword in its heading with a general warning symbol.
- The risk is explained using a symbol on the edge of the page.



Technical aspects which the user must observe to avoid material or equipment damage.

Instructions and lists detailing step-by-step actions for given situations can be recognised via bullet points, e.g.:

- Insert the welding current lead socket into the relevant socket and lock.

2.2 Explanation of icons

| Symbol | Description | Symbol | Description |
|--------|---|--------|----------------------------------|
| | Indicates technical aspects which the user must observe. | | Activate and release / Tap / Tip |
| | Switch off machine | | Release |
| | Switch on machine | | Press and hold |
| | Incorrect / Invalid | | Switch |
| | Correct / Valid | | Turn |
| | Input | | Numerical value – adjustable |
| | Navigation | | Signal light lights up in green |
| | Output | | Signal light flashes green |
| | Time representation (e.g.: wait 4 s / actuate) | | Signal light lights up in red |
| | Interruption in the menu display (other setting options possible) | | Signal light flashes red |
| | Tool not required/do not use | | Signal light lights up in blue |
| | Tool required/use | | Signal light flashes blue |

2.3 Safety instructions

WARNING



Risk of accidents due to non-compliance with the safety instructions!
Non-compliance with the safety instructions can be fatal!

- Carefully read the safety instructions in this manual!
- Observe the accident prevention regulations and any regional regulations!
- Inform persons in the working area that they must comply with the regulations!



Risk of injury from electrical voltage!

Voltages can cause potentially fatal electric shocks and burns on contact. Even low voltages can cause a shock and lead to accidents.

- Never touch live components such as welding current sockets or stick, tungsten or wire electrodes!
- Always place torches and electrode holders on an insulated surface!
- Wear the full personal protective equipment (depending on the application)!
- The machine may only be opened by qualified personnel!
- The device must not be used to defrost pipes!



Hazard when interconnecting multiple power sources!

If a number of power sources are to be connected in parallel or in series, only a technical specialist may interconnect the sources as per standard IEC 60974-9:2010: Installation and use and German Accident Prevention Regulation BVG D1 (formerly VBG 15) or country-specific regulations.

Before commencing arc welding, a test must verify that the equipment cannot exceed the maximum permitted open circuit voltage.

- Only qualified personnel may connect the machine.
- When taking individual power sources out of operation, all mains and welding current leads must be safely disconnected from the welding system as a whole. (Hazard due to reverse polarity voltage!)
- Do not interconnect welding machines with pole reversing switch (PWS series) or machines for AC welding since a minor error in operation can cause the welding voltages to be combined, which is not permitted.



Risk of injury due to radiation or heat!

Arc radiation can lead to skin and eye injuries.

Contact with hot workpieces and sparks can lead to burns.

- Use hand shield or welding helmet with the appropriate safety level (depends on the application).
- Wear dry protective clothing (e.g. hand shield, gloves, etc.) in accordance with the applicable regulations of your country.
- Persons who are not directly involved should be protected with a welding curtain or suitable safety screen against radiation and the risk of blinding!

WARNING



Risk of injury due to improper clothing!

During arc welding, radiation, heat and voltage are sources of risk that cannot be avoided. The user has to be equipped with the complete personal protective equipment at all times. The protective equipment has to include:

- Respiratory protection against hazardous substances and mixtures (fumes and vapours); otherwise implement suitable measures such as extraction facilities.
- Welding helmet with proper protection against ionizing radiation (IR and UV radiation) and heat.
- Dry welding clothing (shoes, gloves and body protection) to protect against warm environments with conditions comparable to ambient temperatures of 100 °C or higher and arcing and work on live components.
- Hearing protection against harming noise.



Explosion risk!

Apparently harmless substances in closed containers may generate excessive pressure when heated.

- Move containers with inflammable or explosive liquids away from the working area!
- Never heat explosive liquids, dusts or gases by welding or cutting!



Fire hazard!

Due to the high temperatures, sparks, glowing parts and hot slag that occur during welding, there is a risk of flames.

- Be watchful of potential sources of fire in the working area!
- Do not carry any easily inflammable objects, e.g. matches or lighters.
- Ensure suitable fire extinguishers are available in the working area!
- Thoroughly remove any residue of flammable materials from the workpiece prior to starting to weld.
- Only further process workpieces after they have cooled down. Do not allow them to contact any flammable materials!

⚠ CAUTION**Smoke and gases!**

Smoke and gases may lead to shortness of breath and poisoning! The ultraviolet radiation of the arc may also convert solvent vapours (chlorinated hydrocarbon) into poisonous phosgene.

- Ensure sufficient fresh air!
- Keep solvent vapours away from the arc beam field!
- Wear suitable respiratory protection if necessary!
- To prevent the formation of phosgene, residues of chlorinated solvents on workpieces must first be neutralised using appropriate measures.

**Noise exposure!**

Noise exceeding 70 dBA can cause permanent hearing damage!

- Wear suitable ear protection!
- Persons located within the working area must wear suitable ear protection!



According to IEC 60974-10, welding machines are divided into two classes of electromagnetic compatibility (the EMC class can be found in the Technical data) > see 9 chapter:



Class A machines are not intended for use in residential areas where the power supply comes from the low-voltage public mains network. When ensuring the electromagnetic compatibility of class A machines, difficulties can arise in these areas due to interference not only in the supply lines but also in the form of radiated interference.



Class B machines fulfil the EMC requirements in industrial as well as residential areas, including residential areas connected to the low-voltage public mains network.

Setting up and operating

When operating arc welding systems, in some cases, electro-magnetic interference can occur although all of the welding machines comply with the emission limits specified in the standard. The user is responsible for any interference caused by welding.

In order to **evaluate** any possible problems with electromagnetic compatibility in the surrounding area, the user must consider the following: (see also EN 60974-10 Appendix A)

- Mains, control, signal and telecommunication lines
- Radios and televisions
- Computers and other control systems
- Safety equipment
- The health of neighbouring persons, especially if they have a pacemaker or wear a hearing aid
- Calibration and measuring equipment
- The immunity to interference of other equipment in the surrounding area
- The time of day at which the welding work must be carried out

Recommendations for reducing interference emission

- Mains connection, e.g. additional mains filter or shielding with a metal tube
- Maintenance of the arc welding system
- Welding leads should be as short as possible and run closely together along the ground
- Potential equalization
- Earthing of the workpiece. In cases where it is not possible to earth the workpiece directly, it should be connected by means of suitable capacitors.
- Shielding from other equipment in the surrounding area or the entire welding system

**Electromagnetic fields!**

The power source can create electrical or electromagnetic fields that may impair the function of electronic systems such as EDP and CNC devices, telecommunication, power and signal lines as well as pacemakers and defibrillators.



- Follow the maintenance instructions > see 7 chapter!
- Unwind the welding leads completely!
- Shield radiation-sensitive equipment or facilities appropriately!
- The function of pacemakers may be impaired (seek medical advice if necessary).

CAUTION



Obligations of the operator!

The respective national directives and laws must be complied with when operating the machine!

- Implementation of national legislation relating to framework directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work and associated individual guidelines.
- In particular, directive 89/655/EEC concerning the minimum safety and health requirements for the use of work equipment by workers at work.
- The regulations applicable to occupational safety and accident prevention in the country concerned.
- Setting up and operating the machine as per IEC 60974.-9.
- Brief the user on safety-conscious work practices on a regular basis.
- Regularly inspect the machine as per IEC 60974.-4.



The manufacturer's warranty becomes void if non-genuine parts are used!

- **Only use system components and options (power sources, welding torches, electrode holders, remote controls, spare parts and replacement parts, etc.) from our range of products!**
- **Only insert and lock accessory components into the relevant connection socket when the machine is switched off.**

Requirements for connection to the public mains network

High-performance machines can influence the mains quality by taking current from the mains network. For some types of machines, connection restrictions or requirements relating to the maximum possible line impedance or the necessary minimum supply capacity at the interface with the public network (Point of Common Coupling, PCC) can therefore apply. In this respect, attention is also drawn to the machines' technical data. In this case, it is the responsibility of the operator, where necessary in consultation with the mains network operator, to ensure that the machine can be connected.

2.4 Transport and installation

WARNING



Risk of injury due to improper handling of shielding gas cylinders!

Improper handling and insufficient securing of shielding gas cylinders can cause serious injuries!

- Observe the instructions from the gas manufacturer and any relevant regulations concerning the use of compressed air!
- Do not attach any element to the shielding gas cylinder valve!
- Prevent the shielding gas cylinder from heating up.

⚠ CAUTION**Risk of accidents due to supply lines!**

During transport, attached supply lines (mains leads, control cables, etc.) can cause risks, e.g. by causing connected machines to tip over and injure persons!

- Disconnect all supply lines before transport!

**Risk of tipping!**

There is a risk of the machine tipping over and injuring persons or being damaged itself during movement and set up. Tilt resistance is guaranteed up to an angle of 10° (according to IEC 60974-1).

- Set up and transport the machine on level, solid ground.
- Secure add-on parts using suitable equipment.

**Risk of accidents due to incorrectly installed leads!**

Incorrectly installed leads (mains, control and welding leads or intermediate hose packages) can present a tripping hazard.

- Lay the supply lines flat on the floor (avoid loops).
- Avoid laying the leads on passage ways.

**Risk of injury from heated coolant and its connections!**

The coolant used and its connection or connection points can heat up significantly during operation (water-cooled version). When opening the coolant circuit, escaping coolant may cause scalding.

- Open the coolant circuit only when the power source or cooling unit is switched off!
- Wear proper protective equipment (protective gloves)!
- Seal open connections of the hose leads with suitable plugs.



The units are designed for operation in an upright position!

Operation in non-permissible positions can cause equipment damage.

- ***Only transport and operate in an upright position!***



Accessory components and the power source itself can be damaged by incorrect connection!

- ***Only insert and lock accessory components into the relevant connection socket when the machine is switched off.***
- ***Comprehensive descriptions can be found in the operating instructions for the relevant accessory components.***
- ***Accessory components are detected automatically after the power source is switched on.***



Protective dust caps protect the connection sockets and therefore the machine against dirt and damage.

- ***The protective dust cap must be fitted if there is no accessory component being operated on that connection.***
- ***The cap must be replaced if faulty or if lost!***

3 Intended use

WARNING



Hazards due to improper usage!

The machine has been constructed to the state of the art and any regulations and standards applicable for use in industry and trade. It may only be used for the welding procedures indicated at the rating plate. Hazards may arise for persons, animals and material objects if the equipment is not used correctly. No liability is accepted for any damages arising from improper usage!

- The equipment must only be used in line with its designated purpose and by trained or expert personnel!
- Do not improperly modify or convert the equipment!

3.1 Applications

Welding torches for arc welding systems for plasma welding.

3.2 Documents which also apply

3.2.1 Warranty

For more information refer to the "Warranty registration" brochure supplied and our information regarding warranty, maintenance and testing at www.ewm-group.com!

3.2.2 Declaration of Conformity



This product corresponds in its design and construction to the EU directives listed in the declaration. On request, we will send you the relevant original declaration of conformity.

3.2.3 Service documents (spare parts)

WARNING



No improper repairs and modifications!

To prevent injuries and damage to the machine, only competent personnel (authorised service personnel) are allowed to repair or modify the machine.

Unauthorised manipulations will invalidate the warranty!

- Instruct competent personnel (authorised service personnel) to repair the machine.

Spare parts can be obtained from the relevant authorised dealer.

3.2.4 Part of the complete documentation

This document is part of the complete documentation and valid only in combination with all other parts of these instructions! Read and observe the operating instructions for all system components, especially the safety instructions!

The illustration shows a general example of a welding system.

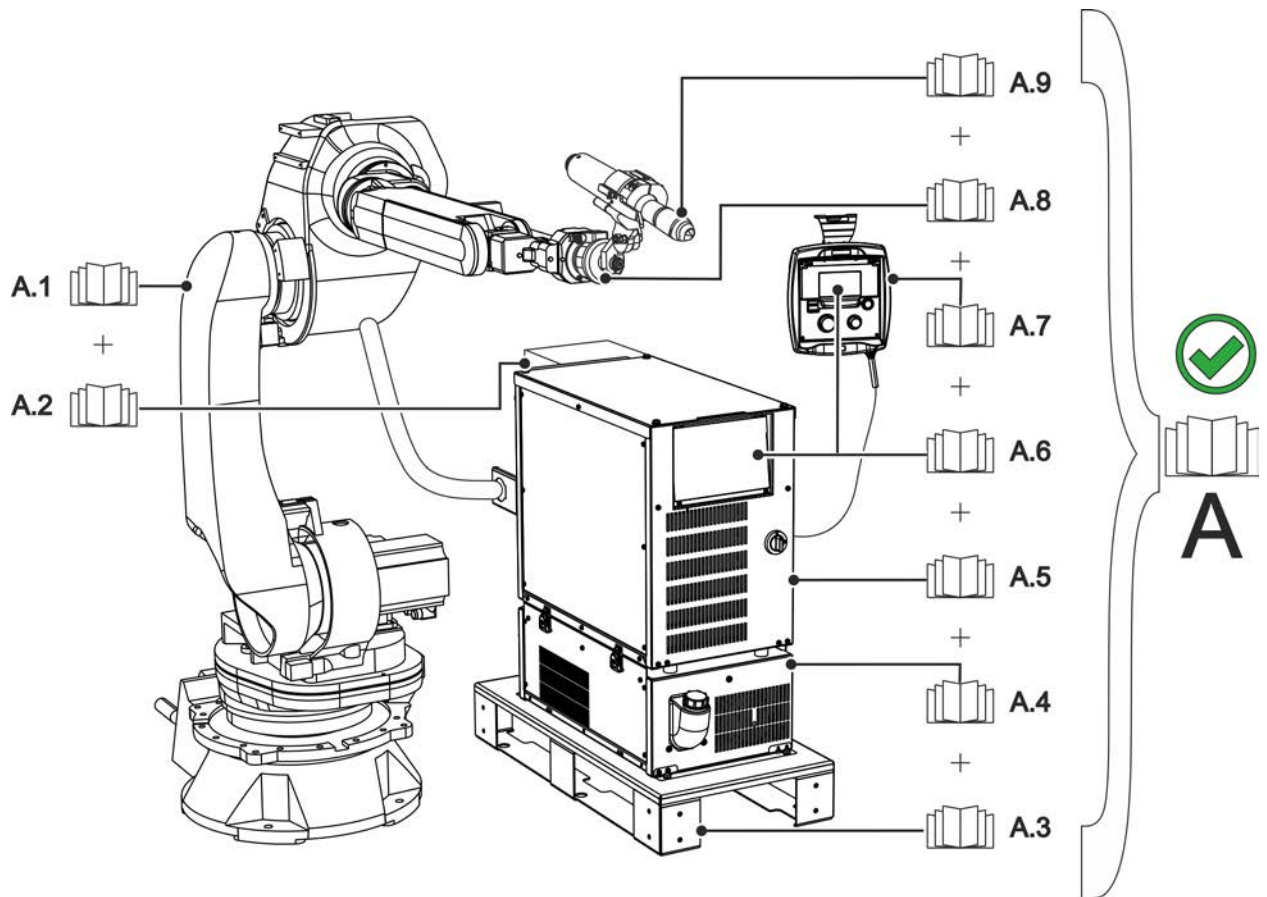


Figure 3-1

| Item | Operating instructions |
|------|--|
| A.1 | Robot |
| A.2 | Robot interface |
| A.3 | Transport pallet |
| A.4 | Cooling unit, voltage converter, media separation box etc. |
| A.5 | Power source |
| A.6 | Control |
| A.7 | Remote control |
| A.8 | Collision sensor |
| A.9 | Welding torch |
| A | Complete documentation |

4 Machine description – quick overview

4.1 PMW 20

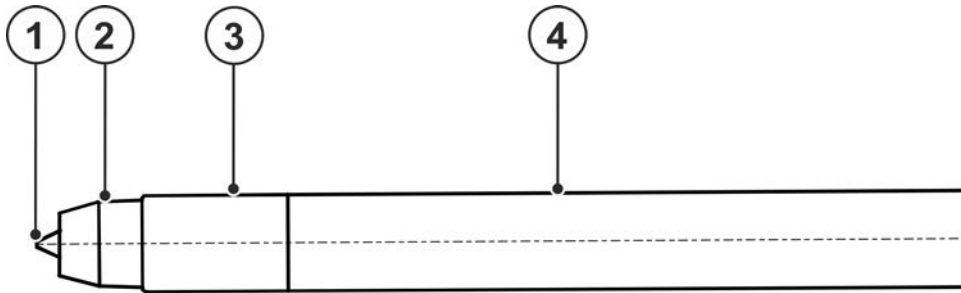


Figure 4-1

| Item | Symbol | Description |
|------|--------|----------------------|
| 1 | | Plasma nozzle |
| 2 | | Shielding gas nozzle |
| 3 | | Torch shaft |
| 4 | | Torch body |

5 Design and function

⚠ WARNING



Risk of injury from electrical voltage!

Contact with live parts, e.g. power connections, can be fatal!

- Observe the safety information on the first pages of the operating instructions!
- Commissioning must be carried out by persons who are specifically trained in handling power sources!
- Connect connection or power cables while the machine is switched off!



Risk of burns and electric shock on the welding torch!

Welding torch (torch neck or torch head) and coolant (water-cooled version) heat up strongly during the welding process. During assembly work, you may come into touch with electrical voltage or hot components.



- Wear proper protective equipment!
- Switch off the power source or torch cooling and allow the welding torch to cool!

⚠ CAUTION



Risk of injury from heated coolant and its connections!

The coolant used and its connection or connection points can heat up significantly during operation (water-cooled version). When opening the coolant circuit, escaping coolant may cause scalding.

- Open the coolant circuit only when the power source or cooling unit is switched off!
- Wear proper protective equipment (protective gloves)!
- Seal open connections of the hose leads with suitable plugs.



Risk from electrical current!

If welding is carried out alternately using different methods and if a welding torch and an electrode holder remain connected to the machine, the open-circuit/welding voltage is applied simultaneously on all cables.

- The torch and the electrode holder should therefore always be placed on an insulated surface before starting work and during breaks.



After each opening of the welding torch, using the "gas test" "gas flush" function and increased flow rates, remove moisture, atmospheric oxygen and any impurities from the welding torch.



**Machine damage due to incompletely assembled welding torch!
Incomplete assembly may destroy the welding torch.**

- **Always assemble the welding torch completely.**

Read and observe the documentation to all system and accessory components!

5.1 Scope of delivery

The delivery is checked and packaged carefully before dispatch, however it is not possible to exclude the possibility of damage during transit.

Receiving inspection

- Check that the delivery is complete using the delivery note!

In the event of damage to the packaging

- Check the delivery for damage (visual inspection)!

In the event of complaints

If the delivery has been damaged during transport:

- Please contact the last haulier immediately!
- Keep the packaging (for possible checking by the haulier or for the return shipment).

Packaging for returns

If possible, please use the original packaging and the original packaging material. If you have any queries on packaging and protection during transport, please contact your supplier.

5.2 Transport and installation

⚠ CAUTION



Risk of accidents due to supply lines!

During transport, attached supply lines (mains leads, control cables, etc.) can cause risks, e.g. by causing connected machines to tip over and injure persons!

- Disconnect all supply lines before transport!

5.2.1 Ambient conditions



Equipment damage due to contamination!

Unusually high amounts of dust, acids, corrosive gases or substances can damage the machine (observe maintenance intervals > see 7.2 chapter).

- **Avoid large amounts of smoke, steam, oily fumes, grinding dust and corrosive ambient air!**

In operation

Temperature range of the ambient air:

- -10 °C to +40 °C (-13 F to 104 F) ^[1]

Relative humidity:

- up to 50 % at 40 °C (104 F)
- up to 90 % at 20 °C (68 F)

Transport and storage

Storage in a closed area, temperature range of the ambient air:

- -25 °C to +55 °C (-13 F to 131 F) ^[1]

Relative humidity

- up to 90 % at 20 °C (68 F)

^[1] Ambient temperature dependent on coolant! Observe the coolant temperature range of the torch cooling

5.3 Functional characteristics

Liquid-cooled plasma torch for gas shielded arc welding of high-quality steels, copper and titanium alloys of different material thicknesses. Essentially, all metals can be welded that can be welded using the TIG process (DC). This also includes titanium, zirconium, gold, silver and copper with its alloys.

Operation requires the use of a power source in conjunction with a circulating-air or recooling unit. Trade and industry use the diversity of this process.

5.3.1 Procedure

In physics, a plasma is an electrically conductive gas consisting of a mixture of molecules, electrons, atoms and ions. Depending on the plasma gas used, temperatures of 15,000 to 20,000 K are reached in the plasma jet.

The welding torch works on the principle of the transferring arc. The arc burns between electrode and workpiece during welding and is constricted by the plasma nozzle, the composition and the amount of shielding gas used. This enables joints to be made with high quality at high working speeds.

To make the path between the electrode and the workpiece electrically conductive, the pilot arc is first ignited inside the torch between the electrode and the plasma nozzle by applying high-frequency high voltage. The pilot gas is ionised, emerges from the plasma nozzle and makes the path between the electrode and the workpiece electrically conductive. When the ionised gas jet touches the workpiece surface, the main circuit is closed. This forms the main arc between electrode and workpiece and the welding process begins.

The good cooling of the torch and the high welding speed help to keep the heat-affected zone and the thermal distortion of the material to be processed low.

Indirect electrode cooling ensures easy and fast electrode replacement. If handled correctly, no coolant water can get into the interior of the torch when changing the electrode leading to ignition failure and reduction of the service life of electrode and nozzle.

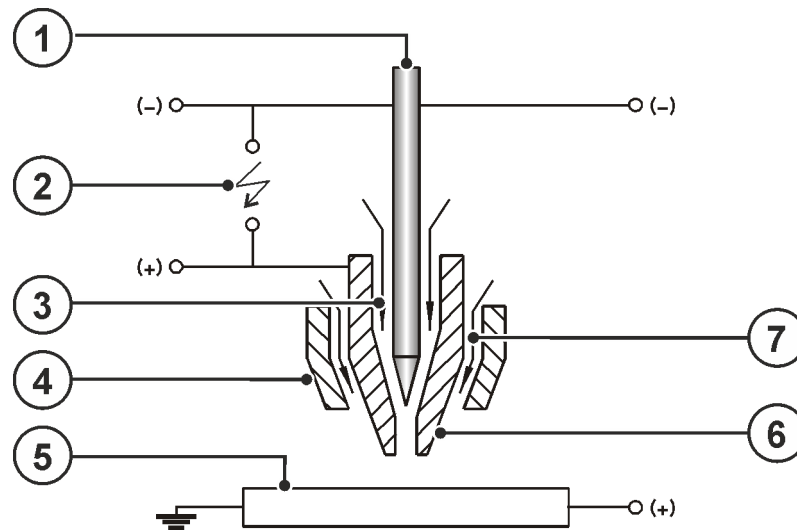


Figure 5-1

| Item | Symbol | Description |
|------|--------|---------------|
| 1 | | Electrode |
| 2 | | High voltage |
| 3 | | Plasma gas |
| 4 | | Gas nozzle |
| 5 | | Work piece |
| 6 | | Plasma nozzle |
| 7 | | Shielding gas |

5.3.2 Welding torch cooling system



Material damage due to unsuitable coolants!

Unsuitable coolant, coolants mixed with other types / liquids or use in an unsuitable temperature range will result in material damage and loss of the manufacturer's warranty!

- **Operation without coolant is not permitted! Dry running will destroy the cooling components such as the coolant pump, welding torch and hose packages.**
- **Only use the coolants described in these instructions for the specified ambient conditions (temperature range) > see 5.3.2.1 chapter.**
- **Do not mix coolants of different types (including those described in these instructions).**
- **When changing the coolant, all liquid must be replaced and the cooling system flushed.**

Dispose of the coolant in accordance with local regulations and the material safety data sheets.

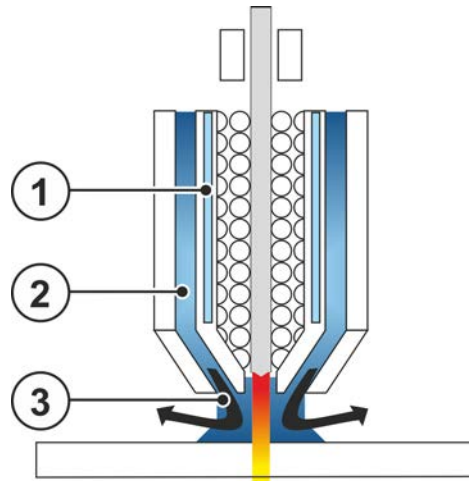


Figure 5-2

| Item | Symbol | Description |
|------|--------|--------------------|
| 1 | | Water cooling |
| 2 | | Shielding gas |
| 3 | | Shielding gas exit |

Part of the heat is released to the cooling system of the welding torch over the plasma nozzle and gas lens, and part of the shielding gas is blown out of the welding torch.

5.3.2.1 Permitted torch coolant

| Coolant | Temperature range |
|-------------------|-------------------------------------|
| KF 23E (Standard) | -10 °C to +40 °C (14 °F to +104 °F) |

5.3.2.2 Plasma torch - cooling circuit



Do not integrate any additional modules in the cooling circuit of the welding torch.

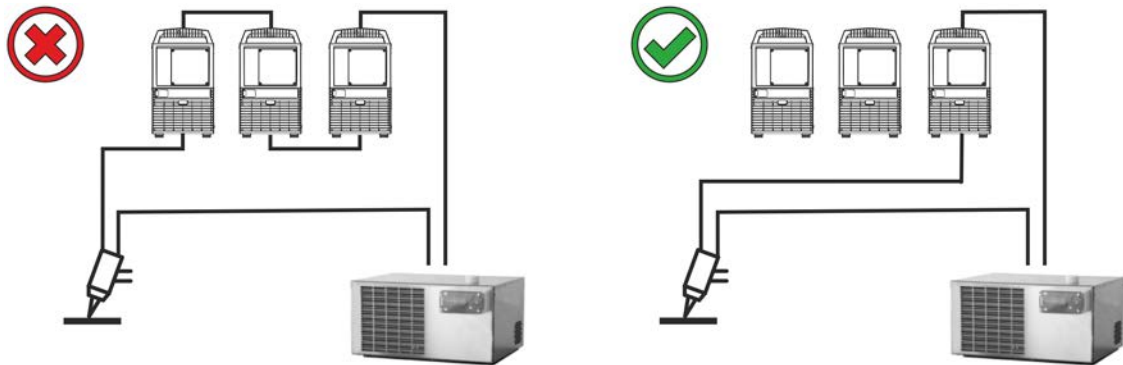


Figure 5-3

5.4 Welding torch connection

Depending on the machine, various adapter sets are required to connect the welding torch.

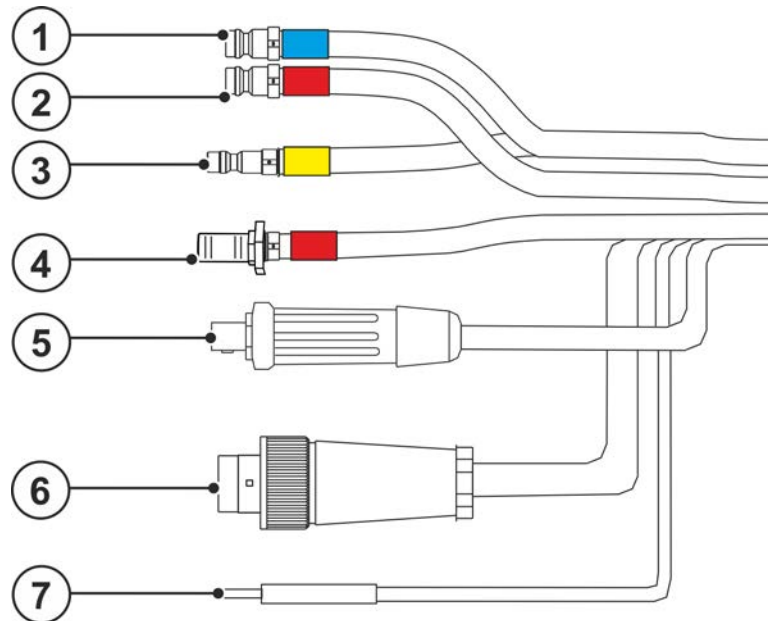


Figure 5-4

| Item | Symbol | Description |
|------|--------|---|
| 1 | | Quick connect nipple (9 mm / 0.35 inch) Coolant feed (blue) |
| 2 | | Quick connect nipple (9 mm / 0.35 inch) Coolant return (red) |
| 3 | | Quick connect nipple (5 mm / 0.2 inch) Shielding gas (yellow) |
| 4 | | Quick connect coupling (5 mm / 0.2 inch) Plasma gas (red) |
| 5 | | Connector plug (9 mm / 0.35 inch) Welding current connection |
| 6 | | Connector plug (5-pole) Control cable assembly |
| 7 | | Connector plug (4 mm / 0.16 inch) Pilot arc current |

5.5 Ultraviolet radiation

WARNING



Risk of injury due to radiation or heat!

Arc radiation can lead to skin and eye injuries.

Contact with hot workpieces and sparks can lead to burns.

- Use hand shield or welding helmet with the appropriate safety level (depends on the application).
- Wear dry protective clothing (e.g. hand shield, gloves, etc.) in accordance with the applicable regulations of your country.
- Persons who are not directly involved should be protected with a welding curtain or suitable safety screen against radiation and the risk of blinding!

| Welding current | Eye protection filter |
|-----------------|-----------------------|
| < 1 A | Level 5 |
| 1 to 2.5 A | Level 6 |
| 2.5 to 5 A | Level 7 |
| 5 to 10 A | Level 8 |
| 10 to 15 A | Level 9 |
| > 15 A | Level 10 |

5.6 Gas supply (shielding and plasma gas)

WARNING



Risk of injury due to improper handling of shielding gas cylinders!

Improper handling and insufficient securing of shielding gas cylinders can cause serious injuries!

- Observe the instructions from the gas manufacturer and any relevant regulations concerning the use of compressed air!
- Do not attach any element to the shielding gas cylinder valve!
- Prevent the shielding gas cylinder from heating up.



Allow the Plasma and shielding gas to flow through the welding torch for a few minutes to blow out any moisture. This prevents ignition problems and pores in the weld seam.

Using the special welding torch caps prevents the penetration of air humidity during longer breaks (overnight, weekend).

5.6.1 Hydrogen

Follow the safety precautions below to exclude the risk of explosion during plasma welding with hydrogen in the gas mixture:

1. Pipes, hoses, screw connections and machines through which gases flow must be gas-tight and kept that way. Therefore, it is necessary to check the leak-tightness at regular intervals (weekly) with a leak detection spray or soapy water.
2. A ceiling-mounted extraction system is recommended.
3. Set up the gas cylinders only in a place where no flying sparks can occur (even during the connection). The gas cylinder must be secured against falling over.
4. The connection nozzles of the gas cylinder valves and that of the pressure regulator must not be directed towards other gas cylinders.
5. Unused manometers for gas quantity must remain closed during welding.
6. After the welding has been completed, close the gas cylinder valves, depressurise the pressure regulator and disconnect the system from the mains.

5.6.2 Plasma gas

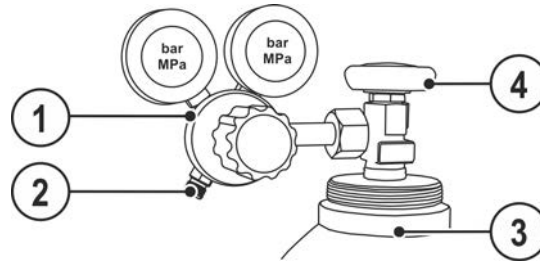


Figure 5-5

| Item | Symbol | Description |
|------|--------|---------------------------------------|
| 1 | | Pressure regulator |
| 2 | | Output side of the pressure regulator |
| 3 | | Shielding gas cylinder |
| 4 | | Cylinder valve |

- Place the shielding gas cylinder into the relevant cylinder bracket.
- Secure the shielding gas cylinder against falling over.

Use only 2-stage bottle pressure regulators with bar display on the output side.

Argon is usually used as a plasma gas. It is easier to ionise and, therefore, allows a low-energy arc. In some cases, a mixture of argon with up to 10% hydrogen or helium may be used. Larger additions may destroy the welding torch.

The amount of plasma gas required is directly related to the nozzle aperture. The larger the nozzle aperture, the more plasma gas is required. A plasma gas quantity that is too low leads to premature wear of the plasma nozzle.

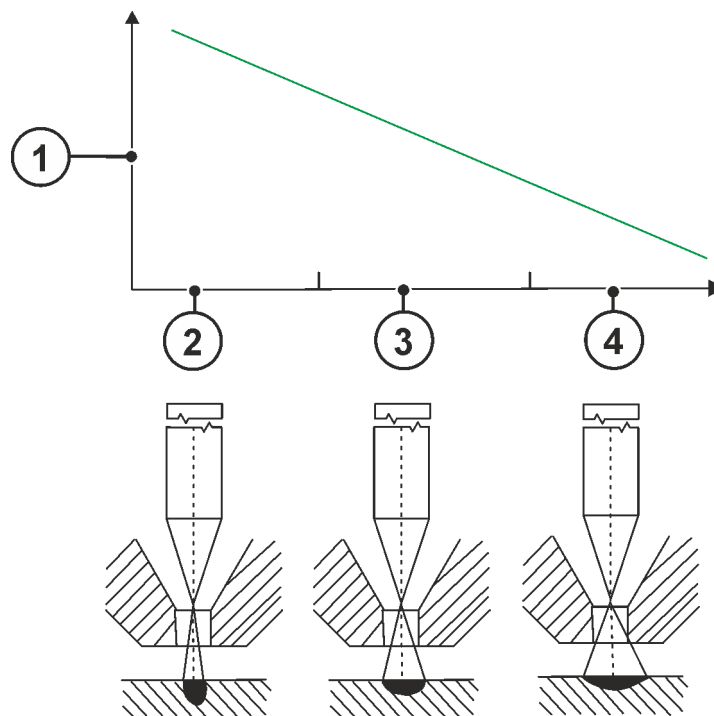


Figure 5-6

| Item | Symbol | Description |
|------|--------|--|
| 1 | | Plasma gas quantity |
| 2 | | deep penetration (small seam width) |
| 3 | | medium penetration |
| 4 | | shallow penetration (large seam width) |

A reduced quantity of plasma gas (item 2 on 4) results in a softer arc characteristic and a shallow penetration. An increased quantity of plasma gas (item 4 on 2) results in a deeper penetration > see 5.7.1 chapter.

5.6.3 Shielding gas

Argon is usually used as a shielding gas. To fully achieve the desired constriction effect, up to 10 % hydrogen can be added to the shielding gas. This reduces the surface tension of the weld pool and thereby promotes wettability.

The materials copper or copper-containing alloys and the reactive metals titanium, tantalum and zirconium are an exception. In these cases, helium is used as an additive instead of hydrogen.

5.6.4 Forming gas

The forming gas protects the underside of the seam from oxidation and prevents the root from sagging excessively thanks to its supporting effect. Depending on the materials to be welded, the following gas mixtures are used.

- Ar
- Ar/H₂
- N₂/H₂

5.7 Tables of current carrying capacity



The indicated gas flow rates are guide values. Depending on the application, other values may lead to a better welding result. The plasma gas must stream out with a minimum quantity dependent on the nozzle aperture and current. If the quantity falls below the minimum, damage to the welding torch can be expected.

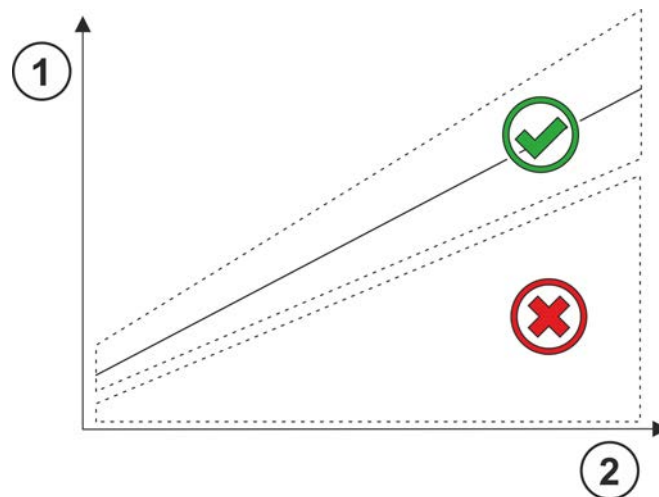


Figure 5-7

| Item | Symbol | Description |
|------|--------|---------------------|
| 1 | | Plasma gas quantity |
| 2 | | Plasma nozzle size |

The plasma nozzles and electrodes have a limited current consumption capacity that should not be exceeded. The limit values are listed in the table below:

| Diameter of the plasma nozzle | Maximum current | Plasma nozzle length |
|-------------------------------|-----------------|----------------------|
| 0.5 mm / 0.02 inch | 8 A | 24.2 mm / 0.95 inch |
| 0.8 mm (dental) / 0.03 inch | 10 A | 29.2 mm / 1.15 inch |
| 0.8 mm (normal) / 0.03 inch | 15 A | 24.2 mm / 0.95 inch |
| 1.0 mm / 0.04 inch | 20 A | 24.2 mm / 0.95 inch |

The load values of the plasma nozzles are closely related to other parameters, especially the selected plasma gas quantities and the position of the electrode tip in the plasma nozzle. In particular, the variation in the amount of plasma gas, even beyond the above-mentioned limits, causes a fundamental change in the plasma jet characteristics.

5.7.1 Guide values for various setting parameters

For the first welding tests, the following empirical values can serve as a guide for the various setting parameters:

| | |
|-------------------------------|--|
| Plasma gas quantity | 0.2 l/min / 0.05 gal/min |
| Shielding gas quantity | 2-5 l/min / 0.5-1.3 gal/min |
| Pilot arc current | 4-6 A |
| Welding current | 1-1.5 A/pro 0.05 mm/0.002 inch of material thickness |
| Start current | 0.7-3 A |
| Gas pre-flow | 0.4 sec |
| Gas post-flow | 4.0 sec |

5.8 Wear part replacement

When the welding quality deteriorates, the cause in most cases is worn electrodes and / or nozzles. To prevent damage to the welding torch, the replacement of wear parts must not be delayed unnecessarily.

Before starting any work on the welding torch, the welding system must be switched off and secured against accidental re-start. All machine components must have cooled down.

The threads of the wear parts are all right-hand threads:

- To loosen parts: turn anti-clockwise
- To mount parts: turn clockwise

All screw and or plug connections can be made without tools.

When changing wear parts, all individual components must always be checked for damage or wear and replaced if necessary. All part connections or sealing surfaces must be cleaned.

5.8.1 Deinstallation/Installation

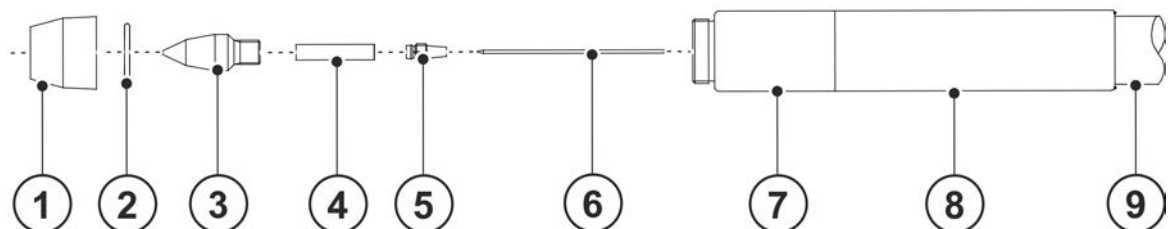


Figure 5-8

| Item | Symbol | Description |
|------|--------|--------------------------------|
| 1 | | Gas nozzle |
| 2 | | Sealing ring of the gas nozzle |
| 3 | | Plasma nozzle |
| 4 | | Centring piece |
| 5 | | Collet chuck |
| 6 | | Electrode |
| 7 | | Torch body |
| 8 | | Torch shaft |
| 9 | | Hose package |

5.8.2 Changing the contact tip

The choice of the plasma nozzle depends on the application and the associated current load > see 5.7 chapter.

The plasma nozzle should be replaced when the nozzle channel is damaged and therefore no longer circular.

When changing the nozzle, the electrode and the centring piece should always be checked for wear and damage.

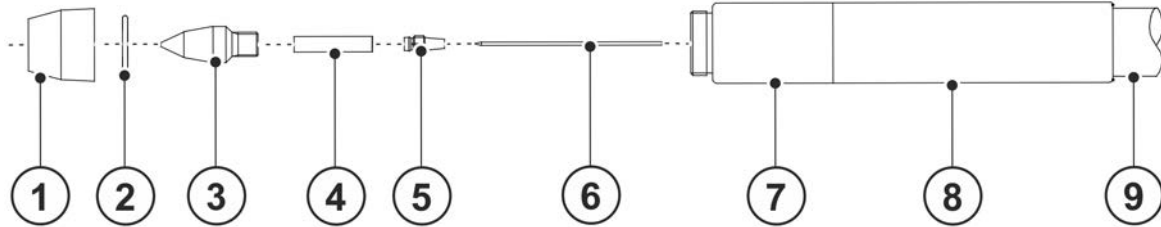


Figure 5-9

| Item | Symbol | Description |
|------|--------|--------------------------------|
| 1 | | Gas nozzle |
| 2 | | Sealing ring of the gas nozzle |
| 3 | | Plasma nozzle |
| 4 | | Centring piece |
| 5 | | Collet chuck |
| 6 | | Electrode |
| 7 | | Torch body |
| 8 | | Torch shaft |
| 9 | | Hose package |

Unscrew the gas nozzle (1) with the gas nozzle sealing ring (2) from the torch body (7).

Unscrew the plasma nozzle (3) from the torch body and pull the centring piece (4) out of the plasma nozzle.

- Rub the contact surface of the plasma nozzle lightly with thermally conductive paste > see 11 chapter towards the torch body (7) and push the centring piece into the plasma nozzle.
- Screw the plasma nozzle hand-tight into the torch body.
- Rub the gas nozzle sealing ring sparingly with lubricant VK 500, insert into the gas nozzle and screw hand-tight to the welding torch.

5.8.3 Electrode change



To prevent damage to the device and incorrect welding results, the electrode gap must be set with an electrode setting gauge each time the electrode is changed > see 5.8.3.2 chapter.

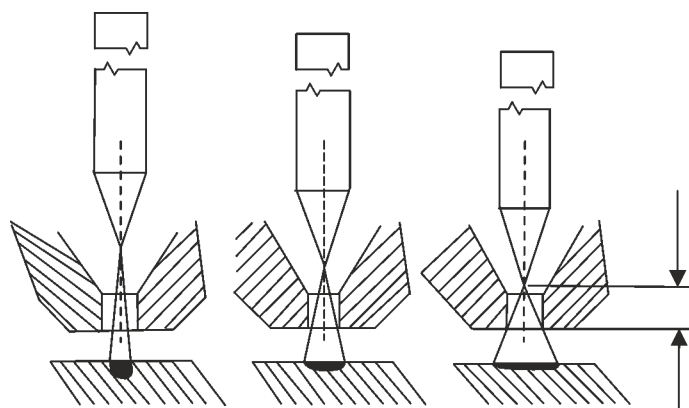


Figure 5-10

5.8.3.1 Regrinding the electrode

The electrode shape is decisive for a good welding result. Therefore, it is necessary to grind electrodes by machine to the correct shape before use. The electrode must be replaced if the electrode tip is excessively worn, tarnished too much or burned back asymmetrically. It is possible to regrind electrodes down to a minimum length of 42 mm. The regrinding of the electrode tip must be carried out by machine with a grinding angle of 30°.

Note the grinding direction

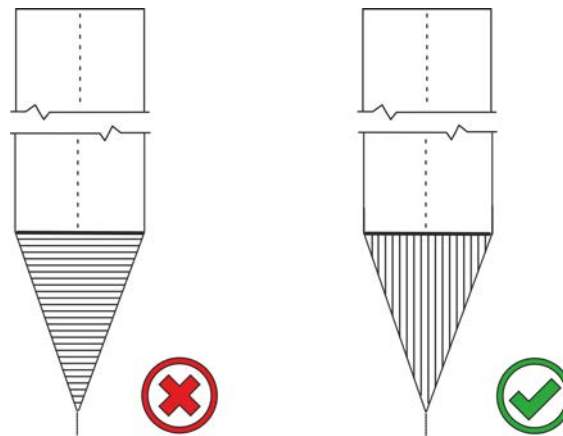


Figure 5-11

Regrinding electrodes centrally

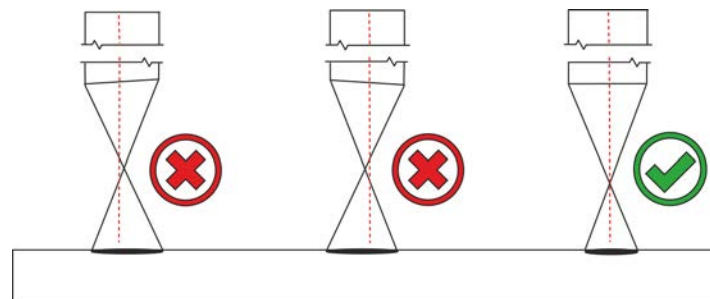


Figure 5-12

The tip of the electrode should be centred in the longitudinal axis of the electrode. In the case of deviations, there is a risk that the arc will become unstable. Especially in automated welding, a non-centred electrode tip leads to ignition next to the proper ignition point.

Penetration above grinding angle

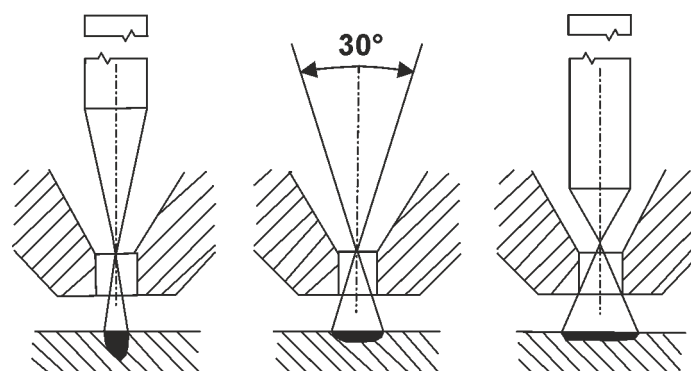


Figure 5-13

The more pointed the grinding cone, the deeper the penetration. The blunter the grinding cone, the shallower the penetration.

5.8.3.2 Setting the electrode gap

The electrode setting gauge is adjustable with a screw. As the electrode setting gauge is only pre-adjusted at the factory, make sure to check before first use that the electrode protrudes 14.8 mm / 0.58 inch (19.8 mm / 0.78 inch for the dental nozzle). It may be necessary to readjust the electrode setting gauge. Check the electrode setting from time to time.

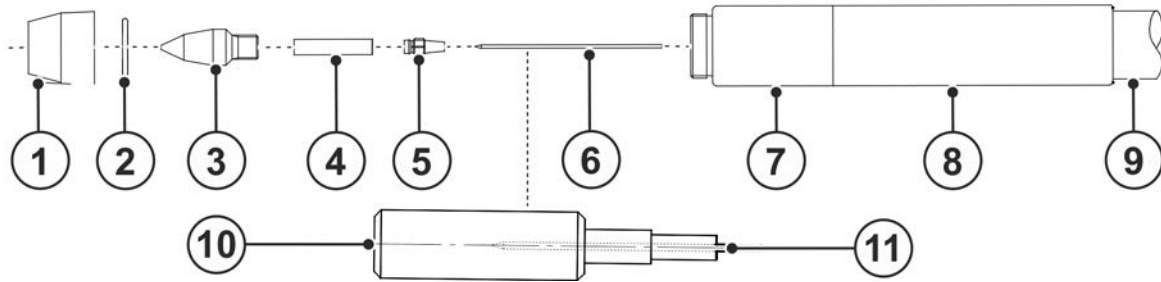


Figure 5-14

| Item | Symbol | Description |
|------|--------|--------------------------------|
| 1 | | Gas nozzle |
| 2 | | Sealing ring of the gas nozzle |
| 3 | | Plasma nozzle |
| 4 | | Centring piece |
| 5 | | Collet chuck |
| 6 | | Electrode |
| 7 | | Torch body |
| 8 | | Torch shaft |
| 9 | | Hose package |
| 10 | | Electrode setting gauge |
| 11 | | Carrier pin |

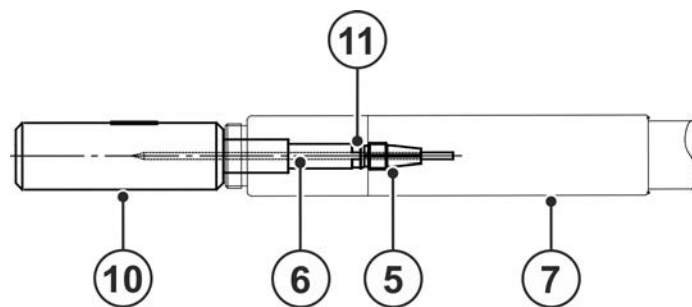


Figure 5-15

- Unscrew the gas nozzle (1), gas nozzle sealing ring (2), plasma nozzle (3) and centring piece (4).
- Push the thin side of the electrode setting gauge (10) over the electrode (6) into the torch body (7).
- Loosen the collet (5) by turning the carrier pin at the front of the electrode setting gauge. Remove the electrode together with collet.
- Insert the new or reground electrode with the tip first into the electrode setting gauge.
- Place the collet over the electrode so that the groove on the face of the collet fits into the carrier pin of the electrode setting gauge.
- Screw the collet together with the electrode into the torch body.
- Check gas nozzle sealing ring for wear and replace if necessary.
- Rub the gas nozzle sealing ring sparingly with lubricant VR 500 > see 11 chapter, insert into the gas nozzle and screw together with the centring piece and plasma nozzle hand-tight into the welding torch.

6 Commissioning

6.1 Start of welding

Before starting to weld, the arc has to briefly stabilise.

At this stage, the burning pilot arc is not centred.

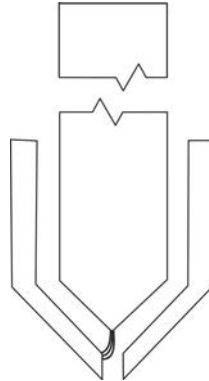


Figure 6-1

6.1.1 Double arc

When the current load is too high or the torch held at too steep an angle, a second arc will form between workpiece and plasma nozzle.

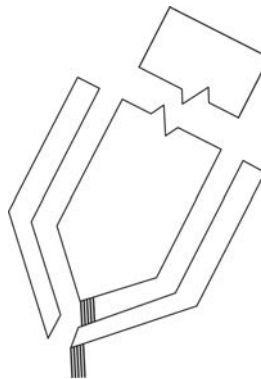


Figure 6-2



Increased current load and a torch position that is too skew lead to considerable plasma nozzle wear.

7 Maintenance, care and disposal

7.1 General

DANGER



Risk of injury due to electrical voltage after switching off!

Working on an open machine can lead to fatal injuries!

Capacitors are loaded with electrical voltage during operation. Voltage remains present for up to four minutes after the mains plug is removed.

1. Switch off machine.
2. Remove the mains plug.
3. Wait for at least 4 minutes until the capacitors have discharged!

WARNING



Improper maintenance, testing and repairs!

Maintenance, testing and repair of the machine may only be carried out by skilled and qualified personnel (authorised service personnel). A competent person is someone who, based on training, knowledge and experience, can recognize the hazards and possible consequential damage that may occur when testing power sources and can take the necessary safety precautions.

- Follow the maintenance instructions > see 7.2 chapter.
- If any of the test requirements below are not met, the unit must not be put back into operation until it has been repaired and tested again.

Repair and maintenance work may only be performed by qualified authorised personnel; otherwise the right to claim under warranty is void. In all service matters, always consult the dealer who supplied the machine. Return deliveries of defective equipment subject to warranty may only be made through your dealer. When replacing parts, use only original spare parts. When ordering spare parts, please quote the machine type, serial number and item number of the machine, as well as the type designation and item number of the spare part.

Under the specified ambient conditions and normal working conditions this machine is essentially maintenance-free and requires just a minimum of care.

Contamination of the machine may impair service life and duty cycle. The cleaning intervals depend on the ambient conditions and the resulting contamination of the machine. The minimum interval is every six months.

7.2 Maintenance work, intervals

7.2.1 Daily maintenance tasks

- Check welding torch, hose package and power connections for external damage and replace them if necessary or arrange for repair by specialist staff.
- Check gas and water connections for leaks. Seal properly if necessary.
- Check the cooling device for the welding torch cooling and, if necessary, power source cooling for proper functioning and the coolant level. If necessary, top up with demineralised water or the specified coolant. Arrange for repair if necessary.
- Check the wear parts in the welding torch including the gas lens and the sealing ring of the gas nozzle.
- For welding torches with cold wire feed: Check the wire feed nozzle and screws on the cold wire feed!

7.2.2 Monthly maintenance tasks

- Check the coolant system for contamination (sludge deposits or turbidity). If dirty, clean the coolant tank and replace the coolant. In the case of severe impurity, the cooling system must be flushed several times.
- Do not clean but replace the coolant filter (if present).
- Check the electrical conductivity of the coolant. If conductive, replace coolant.
- Check the condition of the sealing rings (welding torch / connections). Replace if necessary. Always use sealing rings with appropriate lubricant.
- Disassemble and check the plasma torch and the electrode clamping module. Clean if necessary. Danger of high-frequency flashovers in case of contamination.

7.2.3 Annual test (inspection and testing during operation)

A periodic test according to IEC 60974-4 "Periodic inspection and test" has to be carried out. In addition to the regulations on testing given here, the relevant local laws and regulations must also be observed. For more information refer to the "Warranty registration" brochure supplied and our information regarding warranty, maintenance and testing at www.ewm-group.com!

7.3 Disposing of equipment



Proper disposal!

The machine contains valuable raw materials, which should be recycled, and electronic components, which must be disposed of.

- **Do not dispose of in household waste!**
- **Observe the local regulations regarding disposal!**
- According to European provisions (Directive 2012/19/EU on Waste of Electrical and Electronic Equipment), used electric and electronic equipment may no longer be placed in unsorted municipal waste. It must be collected separately. The symbol depicting a waste container on wheels indicates that the equipment must be collected separately. This machine has to be disposed of, or recycled, in accordance with the waste separation systems in use.

According to German law (law governing the distribution, taking back and environmentally correct disposal of electrical and electronic equipment (ElektroG)), used machines are to be placed in a collection system separate from unsorted municipal waste. The public waste management utilities (communities) have created collection points at which used equipment from private households can be disposed of free of charge.

The deletion of personal data is the responsibility of the end user.

Lamps, batteries or accumulators must be removed and disposed of separately before disposing of the device. The type of battery or accumulator and its composition is marked on the top (type CR2032 or SR44). The following EWM products may contain batteries or accumulators:

- Welding helmets
Batteries or accumulators are easy to remove from the LED cassette.
- Device controls
Batteries or accumulators are located on the back of these in corresponding sockets on the circuit board and are easy to remove. The controls can be removed using standard tools.

Information on returning used equipment or collections can be obtained from the respective municipal administration office. Devices can also be returned to EWM sales partners across Europe.

Further information on the topic of the disposal of electrical and electronic equipment can be found on our website at: <https://www.ewm-group.com/de/nachhaltigkeit.html>.

8 Rectifying faults

All products are subject to rigorous production checks and final checks. If, despite this, something fails to work at any time, please check the product using the following flowchart. If none of the fault rectification procedures described leads to the correct functioning of the product, please inform your authorised dealer.

8.1 Checklist for rectifying faults

The correct machine equipment for the material and process gas in use is a fundamental requirement for perfect operation!

| Legend | Symbol | Description |
|--------|--------|-------------|
| | ↘ | Fault/Cause |
| | ⌘ | Remedy |

Welding torch overheated

- ↘ Insufficient coolant flow
 - ⌘ Check coolant level and refill if necessary
 - ⌘ Eliminate kinks in conduit system (hose packages)
 - ⌘ Vent coolant circuit > see 8.2 chapter
- ↘ Loose welding current connections
 - ⌘ Tighten power connections on the torch and/or on the workpiece
 - ⌘ Tighten contact tip correctly
- ↘ Overload
 - ⌘ Check and correct welding current setting
 - ⌘ Use a more powerful welding torch

Unstable arc

- ↘ Unsuitable or worn welding torch equipment
 - ⌘ Adjust contact tip to wire diameter and -material and replace if necessary
 - ⌘ Adjust wire guide to material in use, blow through and replace if necessary
- ↘ Incompatible parameter settings
 - ⌘ Check settings and correct if necessary

No arc ignition

- ↘ Incorrect ignition type setting.
 - ⌘ Setting the tungsten electrode
 - ⌘ Regrind or replace the tungsten electrode
 - ⌘ Ignition type: Select "HF start". Depending on the machine, the setting is defined by the change-over switch for ignition types or the \boxed{HF} parameter in one of the machine menus (see the "Control operating instructions", if applicable).

Bad arc ignition

- ↘ Material inclusions in the tungsten electrode due to contact with filler material or workpiece
 - ⌘ Regrind or replace the tungsten electrode
 - ⌘ Clean and change gas nozzle
 - ⌘ Adapt the amount of plasma gas to the welding task.
 - ⌘ Pilot arc current too low

Pilot arc ignites but no main arc forms

- ✓ Distance between workpiece and torch too high
 - ✗ Decrease distance to workpiece
- ✓ Contaminated workpiece surface
- ✓ Bad current transfer on ignition
 - ✗ Check the setting on the "Tungsten electrode diameter/Ignition optimisation" rotary dial and increase if necessary (higher ignition energy).
 - ✗ Setting the tungsten electrode
- ✓ Incompatible parameter settings
 - ✗ Check settings and correct if necessary

Pore formation

- ✓ Inadequate or missing gas shielding
 - ✗ Check shielding gas setting and replace shielding gas cylinder if necessary
 - ✗ Shield welding site with protective screens (draughts affect the welding result)
 - ✗ Use gas lens for aluminium applications and high-alloy steels
 - ✗ Check the O-rings on the Euro torch connector and torch neck and replace them if necessary.
- ✓ Unsuitable or worn welding torch equipment
 - ✗ Check size of gas nozzle and replace if necessary
- ✓ Condensation in the gas tube
 - ✗ Purge hose package with gas or replace
 - ✗ Check the O-rings on the Euro torch connector and torch neck and replace them if necessary.
- ✓ Splashes in the gas nozzle
- ✓ Gas distributor out of order or missing

Increased wear

- ✓ Increased electrode wear
 - ✗ Plasma gas purity too low
 - ✗ Check the electrode gap.
 - ✗ Insufficient water cooling
 - ✗ Gas supply leak
 - ✗ Shielding gas (argon) pre-/post-flow period too low
- ✓ Increased nozzle wear
 - ✗ Check the electrode gap.
 - ✗ Insufficient water cooling
 - ✗ Adapt the amount of plasma gas to the welding task.
 - ✗ Current limit exceeded

8.2 Vent coolant circuit

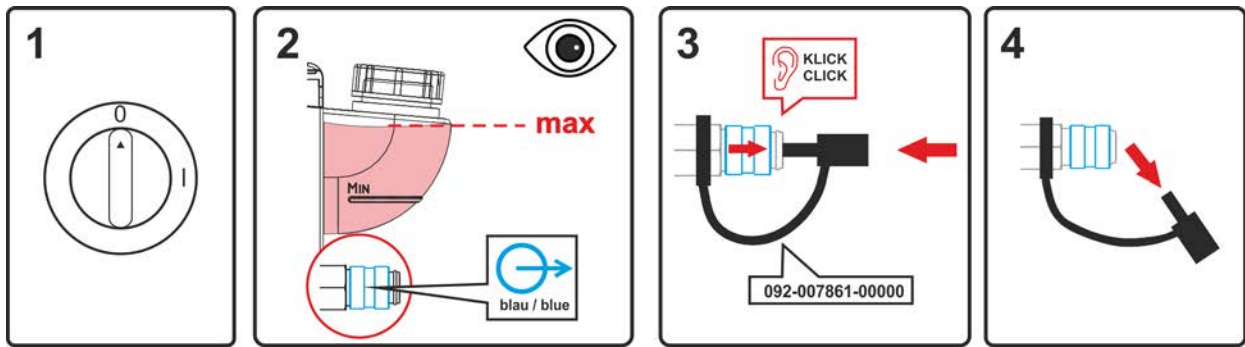


Figure 8-1

- Switch off the machine and fill the coolant tank to the maximum level.
- Unlock the quick-connect coupling with a suitable tool (connection open).

To vent the cooling system always use the blue coolant connection, which is located as deep as possible inside the system (close to the coolant tank)!

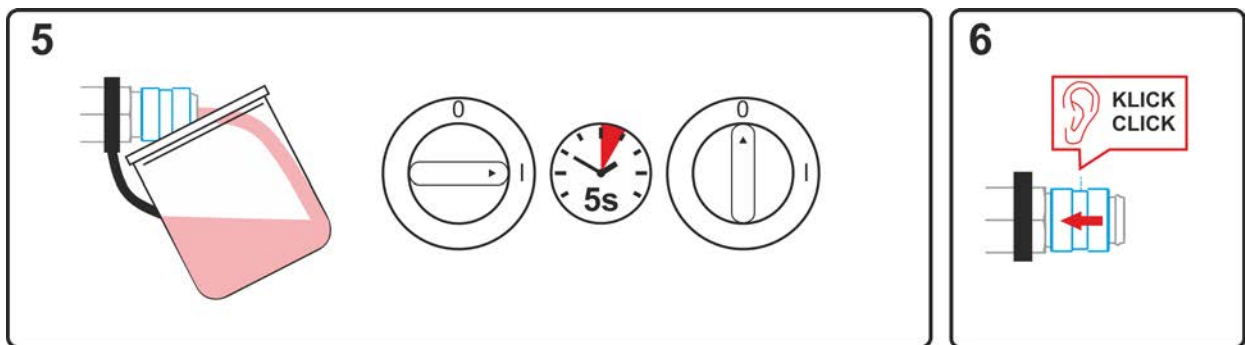


Figure 8-2

- Position a suitable collection container for collecting the escaping coolant at the quick-connect coupling and switch on the machine for approx. 5s.
- Lock the quick-connect coupling by pushing back the locking ring.

9 Technical data

9.1 PMW 20

| | |
|---------------------------------------|---|
| Duty cycle DC at 40° C ^[1] | 20 A (100 %) |
| Machine cooling | indirect water cooling |
| Coolant requirement | 1 l/min (2-3 bar) |
| Coolant pressure min. | 2,0 bar |
| Coolant pressure max. | 4,0 bar |
| min. Coolant flow | 0,5 l/min (Coolant return) |
| max. Coolant conductance | 30 µS/cm |
| Coolant feed | 15 °C |
| max. Return flow temperature | 25 °C |
| Hose package length | 3-, 4 m |
| Weight without hose package | 0,07 kg |
| Standards used | See declaration of conformity (appliance documents) |
| Test mark | CE |

^[1] Load cycle: 10 min. (60 % DC \triangleq 6 min. welding, 4 min. pause)

9.1.1 Dimensions

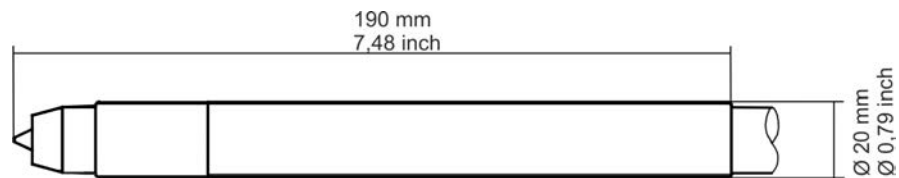


Figure 9-1

10 Accessories

Performance-dependent accessories like torches, workpiece leads, electrode holders or intermediate hose packages are available from your authorised dealer.

10.1 General

| Type | Designation | Item no. |
|------------|-------------------------|------------------|
| EAG PMW 20 | Electrode setting gauge | 094-025465-00000 |

10.2 Welding torch cooling system

| Type | Designation | Item no. |
|---------------|--------------------------------------|------------------|
| TYP1 | Frost protection tester | 094-014499-00000 |
| KF 23E-5 | Coolant up to -10 °C (14 °F), 5 l | 094-000530-00005 |
| Cool 50 MPW50 | Cooling module with centrifugal pump | 090-008818-00502 |
| RK1 | Reverse cooling unit | 094-002283-00000 |

11 Replaceable parts



The manufacturer's warranty becomes void if non-genuine parts are used!

- Only use system components and options (power sources, welding torches, electrode holders, remote controls, spare parts and replacement parts, etc.) from our range of products!
- Only insert and lock accessory components into the relevant connection socket when the machine is switched off.

11.1 PMW 20

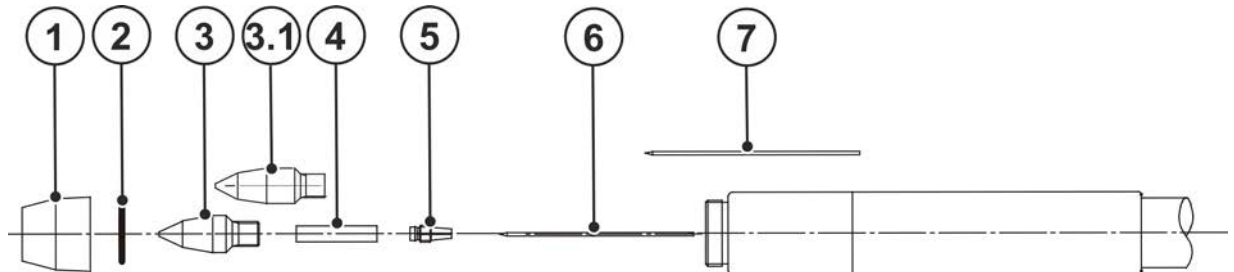


Figure 11-1

| Item | Order number | Type | Name |
|------|------------------|--------------------|--------------------------------|
| 1 | 394-002698-00000 | NW=11.0mm CERAMIC | Gas nozzle |
| 1 | 394-001117-00000 | NW=10.0mm BAKELITE | Gas nozzle |
| 1 | 394-001116-00000 | NW=9.0mm CERAMIC | Gas nozzle |
| 2 | 094-016466-00000 | 15.00 x 1.00 | Sealing ring of the gas nozzle |
| 3 | 394-001115-00000 | 0.8 x 24.2 | Plasma nozzle |
| 3 | 394-001114-00000 | 0.5 x 24.2 | Plasma nozzle |
| 3 | 394-000034-00000 | 1.0 x 24.2 | Plasma nozzle |
| 3 | 094-020283-00000 | 1.2 x 24.2 | Plasma nozzle |
| 3.1 | 394-002697-00000 | 0.8 x 29.2 Dental | Plasma nozzle (dental) |
| 4 | 394-001118-00000 | CP PHW 20 | Centring piece |
| 5 | 394-018934-00000 | C PMW 20 | Collet |
| 6 | 094-019147-00000 | 1.0X47mm WL10 | Plasma electrode |
| 7 | 394-002695-00000 | 1,0x52 | Tungsten electrode (dental) |
| | 094-025516-00000 | Set PMW 20 | Spare parts box |
| | 094-019445-00000 | VR 500 | Lubricant |
| | 094-025527-00000 | WLP 35 g | Thermally conductive paste |

12 Appendix

12.1 Searching for a dealer

Sales & service partners

www.ewm-group.com/en/specialist-dealers



"More than 400 EWM sales partners worldwide"