



**EN**

welding torch

PHW 20

099-003872-EW501

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27.02.2020

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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](http://www.ewm-group.com/en/specialist-dealers).**

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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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## 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
			Switch
	Incorrect / Invalid		Turn
	Correct / Valid		Numerical value – adjustable
	Input		Signal light lights up in green
	Navigation		Signal light flashes green
	Output		Signal light lights up in red
	Time representation (e.g.: wait 4 s / actuate)		Signal light flashes red
	Interruption in the menu display (other setting options possible)		
	Tool not required/do not use		
	Tool required/use		

## 2.3 Part of the complete documentation

These operating instructions are 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.

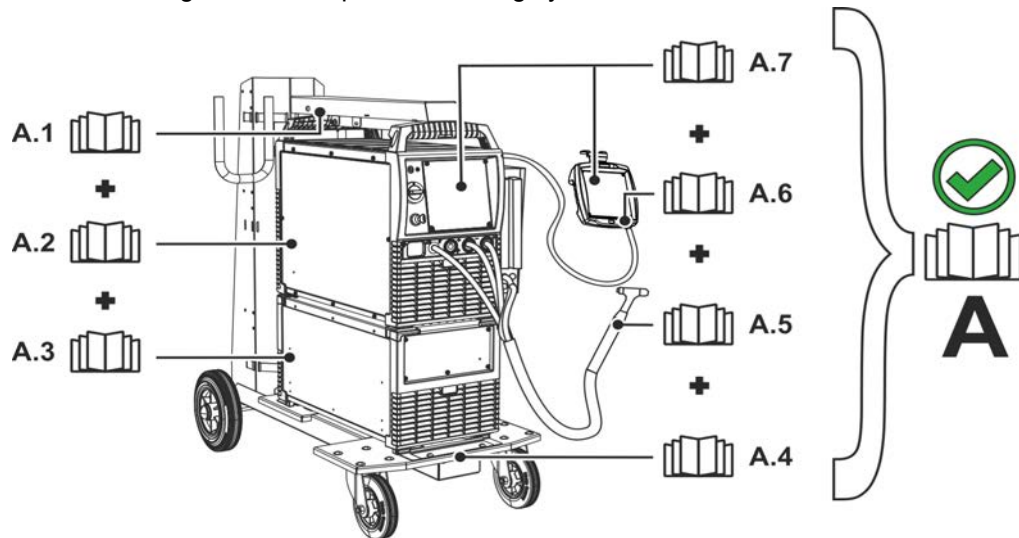


Figure 2-1

Item	Documentation
A.1	Options conversion instructions
A.2	Power source
A.3	Cooling unit, voltage converter, tool box etc.
A.4	Transport cart
A.5	Welding torch
A.6	Remote control
A.7	Controller
A	Complete documentation

## 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](http://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**



#### **Do not carry out any unauthorised repairs or modifications!**

To avoid injury and equipment damage, the unit must only be repaired or modified by specialist, skilled persons!

**The warranty becomes null and void in the event of unauthorised interference.**

- Appoint only skilled persons for repair work (trained service personnel)!

Spare parts can be obtained from the relevant authorised dealer.



## 4 Machine description – quick overview

### 4.1 PHW 20

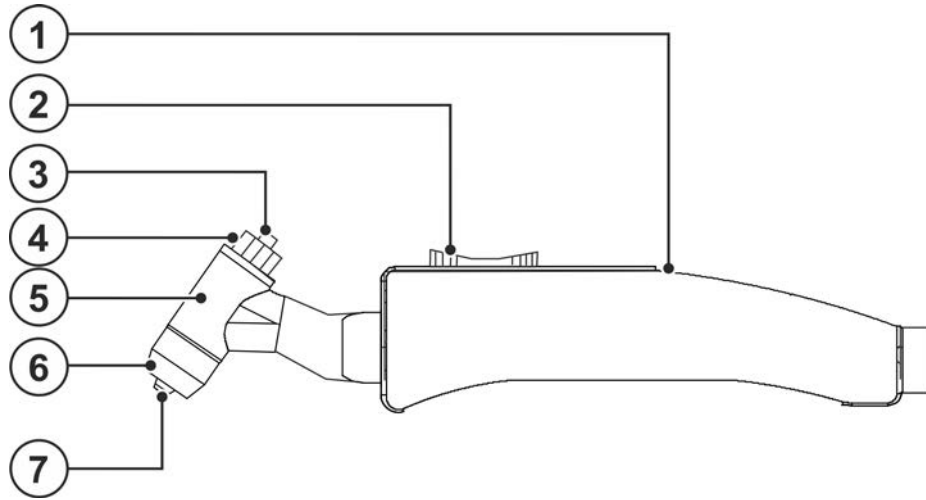


Figure 4-1

Item	Symbol	Description
1		Grip plate
2		Torch trigger
3		Cap
4		Electrode holder
5		Torch body
6		Gas nozzle
7		Plasma nozzle

## 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 6.2 chapter).**

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

#### 5.2.1.1 In operation

**Temperature range of the ambient air:**

- -10 °C to +40 °C (-13 F to 104 F)<sup>[1]</sup>

**Relative humidity:**

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

#### 5.2.1.2 Transport and storage

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

- -25 °C to +55 °C (-13 F to 131 F)<sup>[1]</sup>

**Relative humidity**

- up to 90 % at 20 °C (68 F)

<sup>[1]</sup> 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.

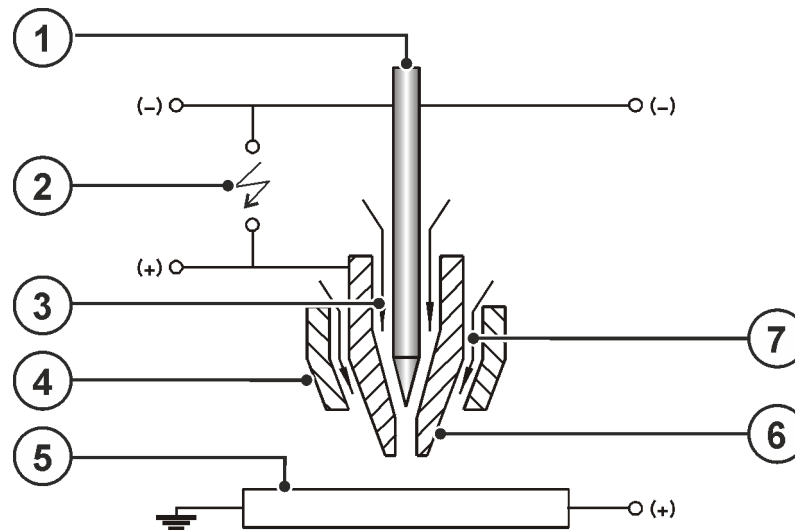


Figure 5-1

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

## 5.4 Welding torch cooling system



### Coolant mixtures!

**Mixtures with other liquids or the use of unsuitable coolants result in material damage and renders the manufacturer's warranty void!**

- Only use the coolant described in this manual (overview of coolants).
- Do not mix different coolants.
- When changing the coolant, the entire volume of liquid must be changed.

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

## 5.4.1 Permitted torch coolant

Coolant	Temperature range
KF 23E	-10 °C to +40 °C

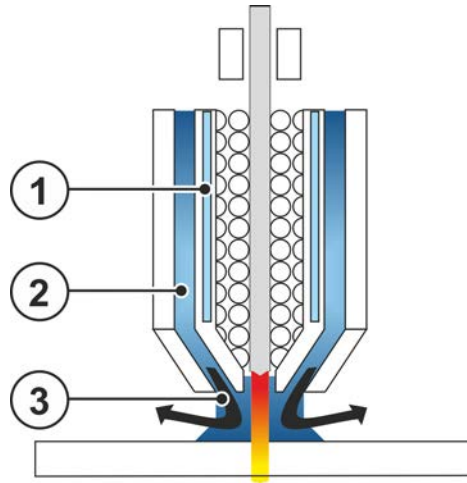


Figure 5-2

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.

## 5.4.2 Plasma torch - cooling circuit

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

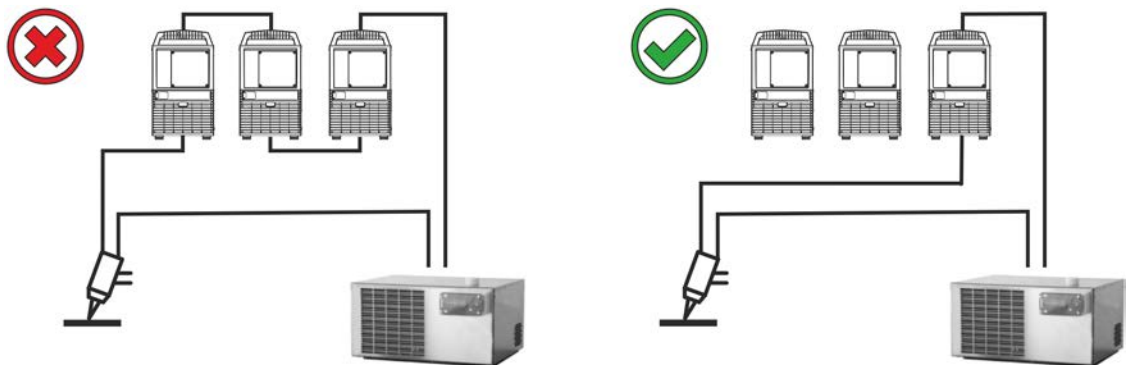


Figure 5-3

## 5.4.3 Welding torch connection

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

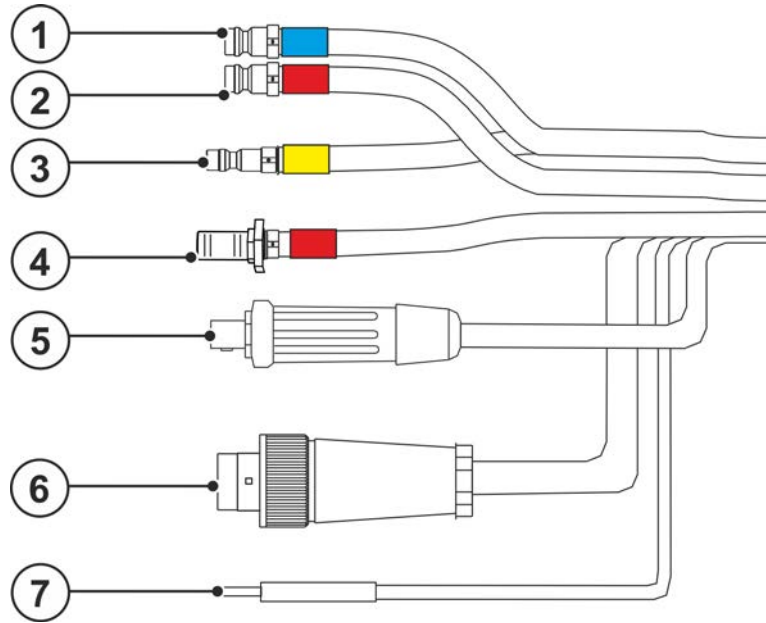


Figure 5-4

Item	Symbol	Description
1		<b>Quick connect nipple (9 mm / 0.35 inch)</b> Coolant feed (blue)
2		<b>Quick connect nipple (9 mm / 0.35 inch)</b> Coolant return (red)
3		<b>Quick connect nipple (5 mm / 0.2 inch)</b> Shielding gas (yellow)
4		<b>Quick connect coupling (5 mm / 0.2 inch)</b> Plasma gas (red)
5		<b>Connector plug (9 mm / 0.35 inch)</b> Welding current connection
6		<b>Connector plug (5-pole)</b> Control cable assembly
7		<b>Connector plug (4 mm / 0.16 inch)</b> 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 gas to flow through the welding torch for a few minutes to blow out any moisture. This prevents ignition problems.**

**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

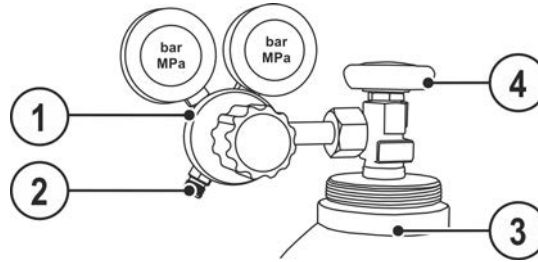


Figure 5-5

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 the arc-forming 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.



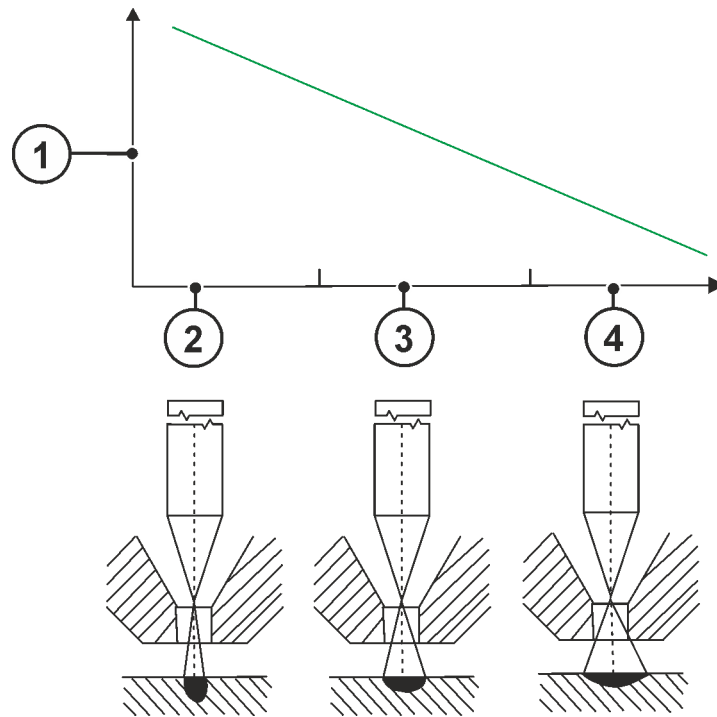


Figure 5-6

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 (pos. 2 to 4) results in a softer arc characteristic and a shallow penetration. A reduced quantity of plasma gas (pos. 4 to 2) results in a shallow penetration.

### 5.6.3 Shielding gas

Argon is usually used as shielding gas. To fully achieve the desired constriction effect, up to 10%, in special cases up to 30%, hydrogen must 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/H<sub>2</sub>
- N<sub>2</sub>/H<sub>2</sub>

## 5.7 Load capacity of plasma nozzles

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
Ignition current	0.7-3 A
Gas pre-flow	0.4 sec
Gas post-flow	4.0 sec



*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.*

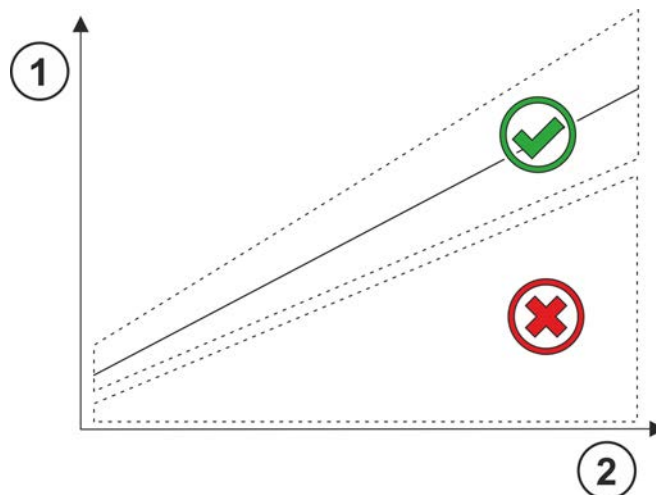


Figure 5-7

Item	Symbol	Description
1		Plasma gas quantity
2		Plasma nozzle size

### 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

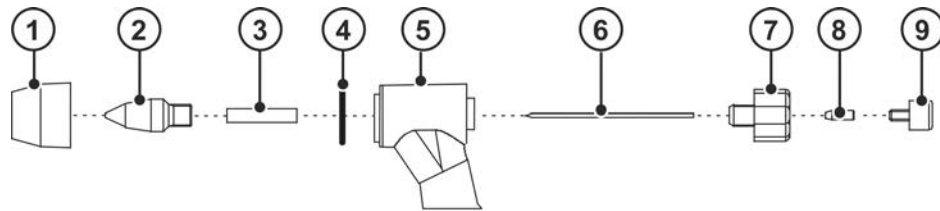


Figure 5-8

Item	Symbol	Description
1		Gas nozzle
2		Plasma nozzle
3		Centring sleeve
4		Sealing ring of the gas nozzle
5		Torch body
6		Electrode
7		Electrode holder
8		Collet chuck
9		Clamping screw

## 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.

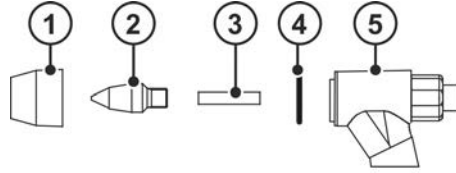


Figure 5-9

Item	Symbol	Description
1		Gas nozzle
2		Plasma nozzle
3		Centring sleeve
4		Sealing ring of the gas nozzle
5		Torch body

- Unscrew the gas nozzle (1) from the torch body (5).
- Unscrew the plasma nozzle (2) with the centring piece (3) from the torch body.
- Rub the contact surface of the plasma nozzle towards the torch body lightly with thermally conductive paste <sup>[1]</sup> and push the centring piece into the plasma nozzle.
- Screw the plasma nozzle hand-tight into the torch body.
- Remove the sealing ring of the gas nozzle (4) from the torch body and rub it sparingly with lubricant VR 500 <sup>[1]</sup>. Then put the sealing ring of the gas nozzle back into the torch body.

Screw the gas nozzle hand-tight into the torch body.

<sup>[1]</sup> > see 9 chapter

## 5.8.3 Electrode change



**To prevent damage to the machine and incorrect welding results, the electrode gap must be adjusted each time the electrode is changed. The setting can either be made using an electrode setting gauge > see 9 chapter or a commercially available calliper. Plasma nozzle and electrode (normal or dental) must be used in the appropriate combination.**

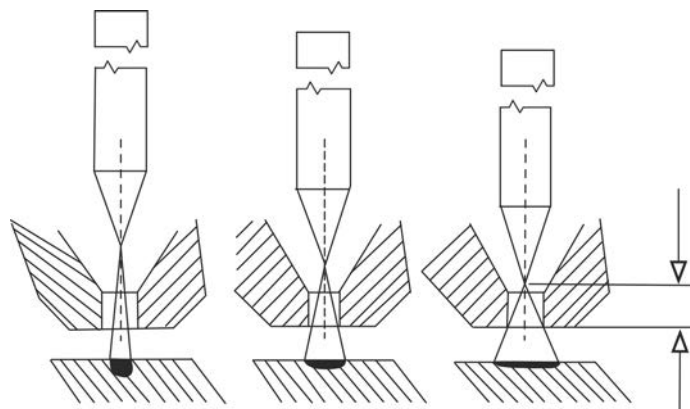


Figure 5-10

### 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  $30^\circ$ .

**Note the grinding direction**

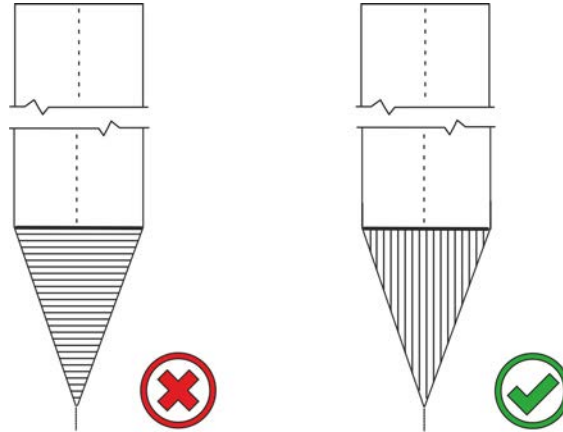


Figure 5-11

**Regrinding electrodes centrally**

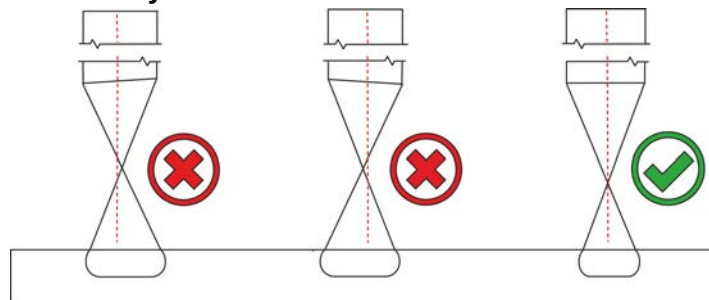


Figure 5-12

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**

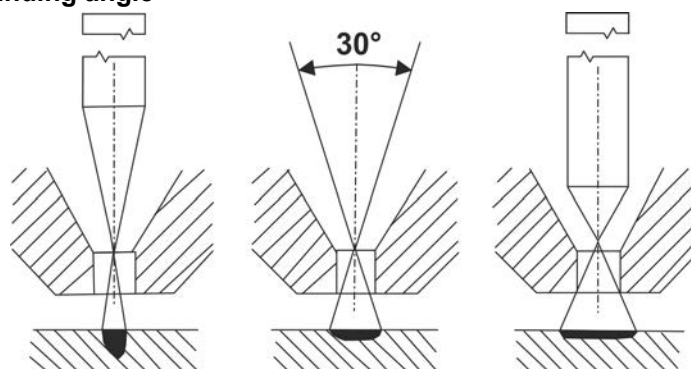


Figure 5-13



**The more pointed the grinding cone, the deeper the penetration. The wider the grinding cone, the shallower the penetration.**

## 5.8.3.2 Setting the electrode gap (electrode setting gauge)

The choice of setting gauge depends on the current version of the plasma nozzle / electrode combination (normal or dental) > see 9 chapter.

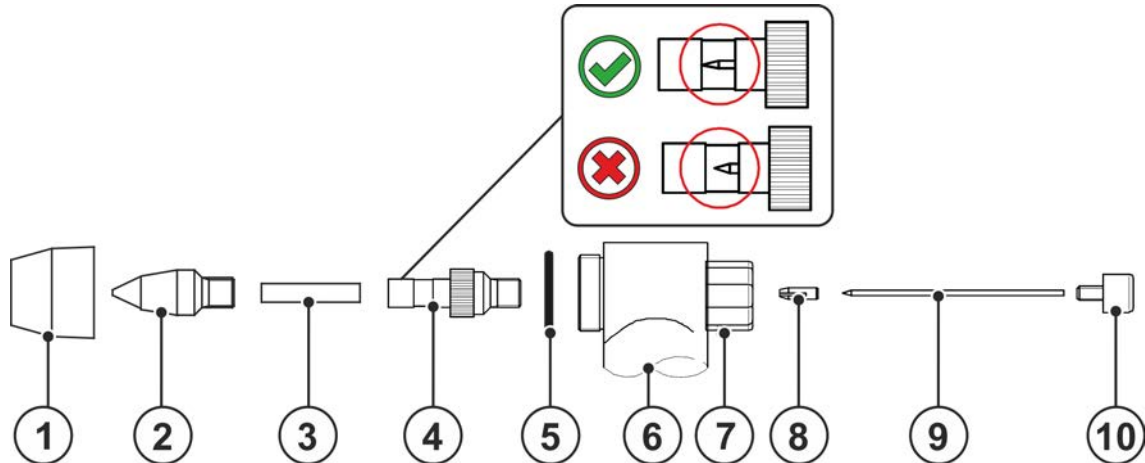


Figure 5-14

Item	Symbol	Description
1		Gas nozzle
2		Plasma nozzle
3		Centring piece
4		Electrode setting gauge
5		Sealing ring of the gas nozzle
6		Torch body
7		Electrode holder
8		Collet chuck
9		Electrode
10		Clamping screw

- Unscrew the gas nozzle (1) from the torch body (6).
- Unscrew the plasma nozzle (2) with the centring piece (3) from the torch body.
- Unscrew clamping screw (10) and remove electrode (9) with collet chuck (8).
- Screw the electrode setting gauge (4) into the torch body up to the stop.
- Insert a new or a reground electrode with the tip first through the collet chuck and push it forward until it rests against the stop of the electrode setting gauge.

Insert the clamping screw back into the electrode holder (7) and tighten.

Unscrew the electrode setting gauge from the torch body.

- Remove the sealing ring of the gas nozzle (5) from the torch body and rub it sparingly with lubricant VR 500 <sup>[1]</sup>. Then put the sealing ring of the gas nozzle back into the torch body.
- Rub the contact surface of the plasma nozzle towards the torch body lightly with thermally conductive paste <sup>[1]</sup> and push the centring piece into the plasma nozzle.
- Screw the plasma nozzle hand-tight into the torch body.

Screw the gas nozzle hand-tight into the torch body.

<sup>[1]</sup> see accessories > see 9 chapter

### 5.8.3.3 Setting the electrode gap (calliper)

Note the different gaps for different electrodes. Standard electrode 35.8 mm and dental electrode 40.8 mm.

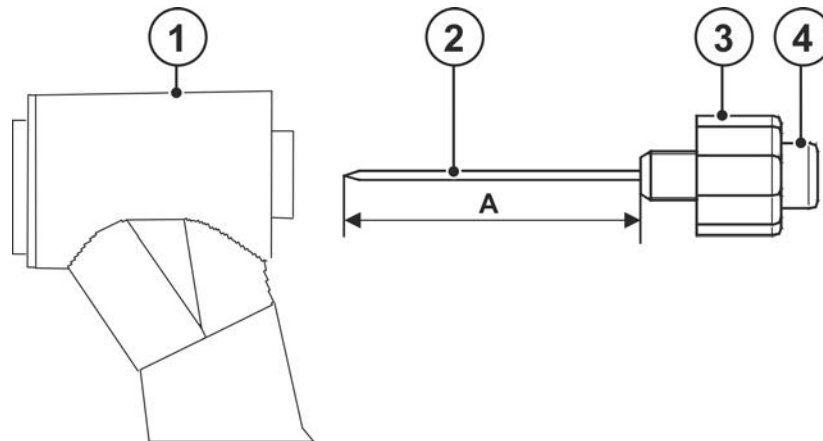


Figure 5-15

Item	Symbol	Description
1		<b>Torch body</b>
2		<b>Electrode</b> Standard version 35.8 mm, 1.41 inch Dental version 40.8 mm, 1.61 inch
3		<b>Electrode holder</b>
4		<b>Clamping screw</b>

- Unscrew the electrode (2) with the electrode holder (3) from the torch body (1).
- Measure the electrode gap (A) from the start of the thread of the electrode holder to the electrode tip with the calliper (standard version 35.8 mm / dental version 40.8 mm).
- Adjust the electrode gap to the required value by loosening the clamping screw (4).
- Secure the electrode with the clamping screw.
- Screw the electrode complete with electrode holder back into the torch body and tighten by hand.

### 5.9 Commissioning

#### 5.9.1 Start of welding

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

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

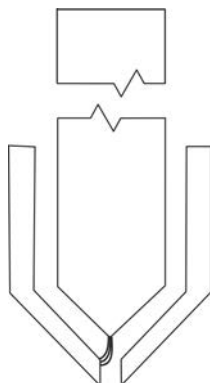


Figure 5-16

#### 5.9.2 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.

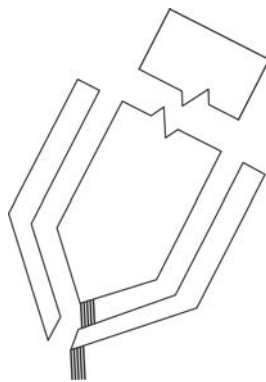


Figure 5-17



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



## 6 Maintenance, care and disposal

### 6.1 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



**Incorrect maintenance, testing and repair!**

**Maintenance, testing and repair of the machine may only be carried out by skilled and qualified personnel. A qualified person is one who, because of his or her training, knowledge and experience, is able to recognise the dangers that can occur while testing welding power sources as well as possible subsequent damage, and who is able to implement the required safety procedures.**

Observe the maintenance instructions > see 6.2 chapter.

- In the event that the provisions of one of the below-stated tests are not met, the machine must not be operated again until it has been repaired and a new test has been carried out!

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.

## 6.2 Maintenance work, intervals

### 6.2.1 Daily maintenance tasks

- Check welding torch, hose package and power connections for external damage and replace 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 cold wire feed nozzle and clamping nut on the cold wire feed tube.

## 6.2.2 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.

## 6.2.3 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](http://www.ewm-group.com)!

## 6.3 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 electric 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.
- Information about returning used equipment or about collections can be obtained from the respective municipal administration office.
- In addition to this, returns are also possible throughout Europe via EWM sales partners.

## 7 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.

### 7.1 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 7.2 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

#### 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 changeover switch for ignition types or the **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
  - ✘ Insufficient plasma gas quantity
  - ✘ 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)
- ✓ Unsuitable or worn welding torch equipment
  - ✗ Check size of gas nozzle and replace if necessary
- ✓ Condensation (hydrogen) in the gas tube
  - ✗ Purge hose package with gas or replace

## Increased wear

- ✓ Increased electrode wear
  - ✗ Plasma gas purity too low
  - ✗ Electrode distance too high
  - ✗ Insufficient water cooling
  - ✗ Gas supply leak
  - ✗ Shielding gas (argon) pre-/post-flow period too low
- ✓ Increased nozzle wear
  - ✗ Electrode distance too high
  - ✗ Insufficient water cooling
  - ✗ Insufficient plasma gas quantity
  - ✗ Current limit exceeded

## 7.2 Vent coolant circuit

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)!

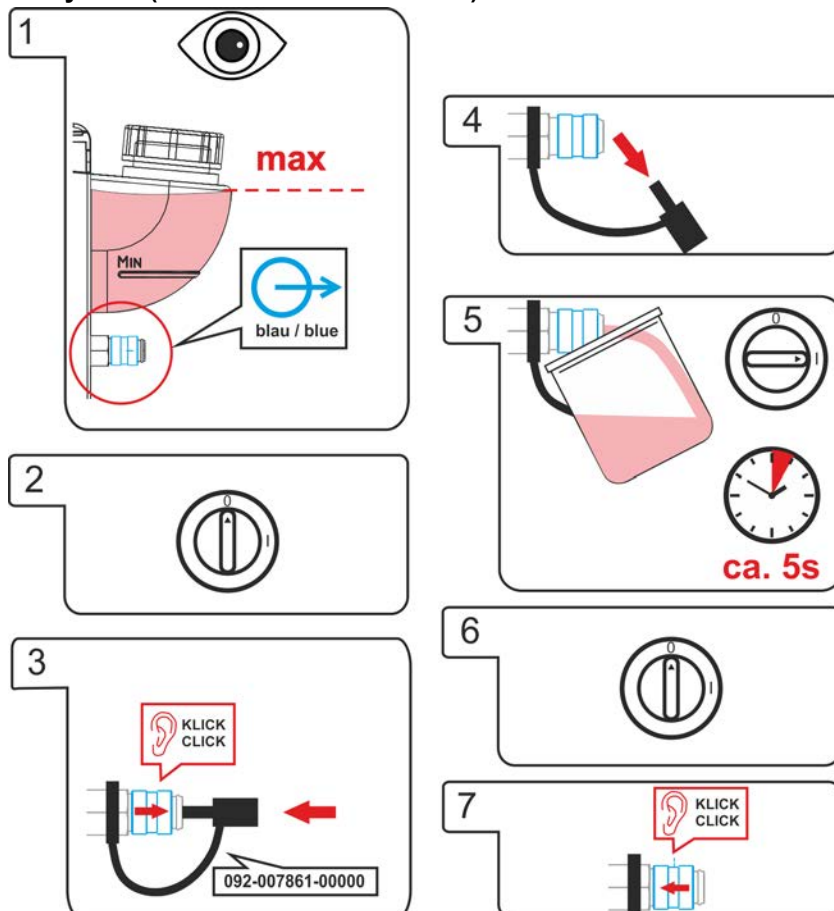


Figure 7-1

## 8 Technical data

### 8.1 PHW 20

Duty cycle DC at 40° C	20 A (100 %)
Machine cooling	indirect water cooling
Coolant requirement	1 l/min (2-3 bar) 0,26 gal./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) 0,13 gal./min (Coolant return)
Coolant feed	15 °C 59 °F
max. Rücklauftemperatur	25 °C 77 °F
Hose package length	3 m 118 inch
Weight without hose package	0,13 kg 0,29 lb.
Standards used	See declaration of conformity (appliance documents)
Safety marking	CE

#### 8.1.1 Dimensions

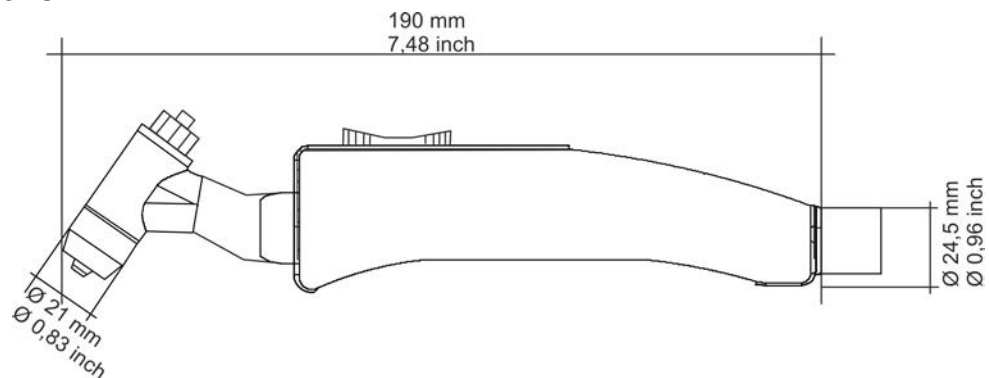


Figure 8-1

## 9 Accessories

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

### 9.1 Welding torch cooling system

Type	Designation	Item no.
TYP 1	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

### 9.2 General

Type	Designation	Item no.
EAG PHW 20	Electrode setting gauge	394-001119-00000
EAG PHW 20 Dental	Electrode setting gauge	394-002701-00000

## 10 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.

### 10.1 PHW 20

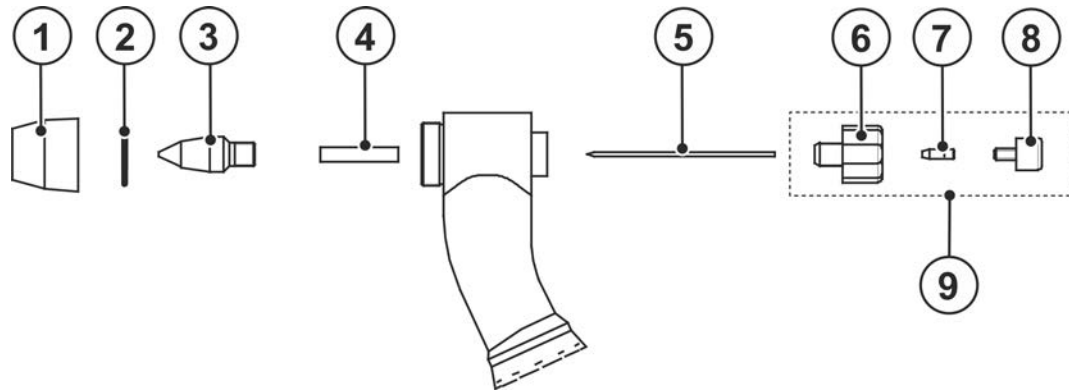


Figure 10-1

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
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	394-002697-00000	0.8 x 29.2 Dental	Plasma nozzle (dental)
4	394-001118-00000	CP PHW 20	Centring piece
5	094-019147-00000	1.0X47MM WL10	Plasma electrode
5	394-002695-00000	1,0x52 Dental	Plasma electrode (dental)
6	394-002694-00000	EH	Electrode holder
7	394-002238-00000	C PHW 20	Collet chuck
8	394-002693-00000	CP PHW 20	Clamping screw
9	394-002692-00000	BC PHW 20	Electrode holder, complete (clamping screw, collet chuck and electrode holder)
	094-025515-00000	PHW/PMW 20	Spare parts box
	094-019445-00000	VR 500	Lubricant
	094-025527-00000	WLP 35 g	Thermally conductive paste

## 11 Appendix

### 11.1 Searching for a dealer

Sales & service partners

[www.ewm-group.com/en/specialist-dealers](http://www.ewm-group.com/en/specialist-dealers)



"More than 400 EWM sales partners worldwide"