WELDING TORCH

SP7

SAFETY INSTRUCTIONS FOR USE AND MAINTENANCE

DEVICE N°
W000274322 - W000315626 - W000315615

EDITION : EN
REVISION : K
DATE : 01-2023

Instructions for use

REF : **8695 5502**

Original instructions

LINCOLN ELECTRIC

Thank for the trust you have expressed by purchasing this equipment, which will give you full satisfaction if you follow its instructions for use and maintenance.

Its design, component specifications and workmanship comply with applicable European directives.

Please refer to the enclosed CE declaration to identify the directives applicable to it.

The manufacturer will not be held responsible where items not recommended by themselves are associated with this product.

For your safety,there follows a non-restrictive list of recommendations or requirements, many of which appear in the employment code.

Finally we would ask you kindly to inform your supplier of any error which you may find in this instruction manual.

CONTENTS

INFORMATIONS

DISPLAYS AND PRESSURE GAUGES

The measuring devices or displays for voltage, current, speed, pressure, etc., whether analog or digital, should be considered as indicators

For operating instructions, adjustments, troubleshooting and spare parts see safety instructions for use and maintenance

REVISIONS

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A - SAFETY INSTRUCTIONS

For general safety instructions, please refer to the specific manual supplied with the equipment.

Gas shielded electric arc welding equipment

Before starting any work on the torch, make sure that the power source is switched off.

FREEZCOOL DISCHARGE : (pink heat transfer liquid 285)

- **W000010167 (9,6L)**
- **W000010168 (19,3L)**

➢ **Freezcool should not be discharged in large quantities into the natural environment. You should observe local emission standards concerning COD(✶).**

➢ **Before any emission of this product, contact your local water Authority to inquire about the regulations applying to your region.**

You should inform them of:

- ❖ **The COD of the Freezcool (741000 mg/kg)**
- ❖ **The quantity in kg to be discharged**

➢ **The Water Authority will advise you of the approach to be followed and in particular :**

- ❖ **The location**
- ❖ **The quantity**
- ❖ **The timing..**

✶ The COD (Chemical Oxygen Demand) represents the portion of the product requiring oxygen, (e.g. oxidizable mineral salts and the major part of organic compounds)..

1 - AIRBORNE NOISE

Adjustment parameter	Acoustic pressure level at the nearest working stations $L_{aeq.1min}$	Peak acoustic pressure level at the nearest working stations L_{pc}	Acoustic pressure level L_{wa}
Welding: PLASMA/Smooth	68.4 to 72.3 dB(A)	101.8 dB(C)	**90 dB(A)**
Welding: PLASMA/Pulsed	69.0 to 72.5 dB(A)	106.5 dB(C)	**90 dB(A)**

The use of a helmet is MANDATORY during welding.

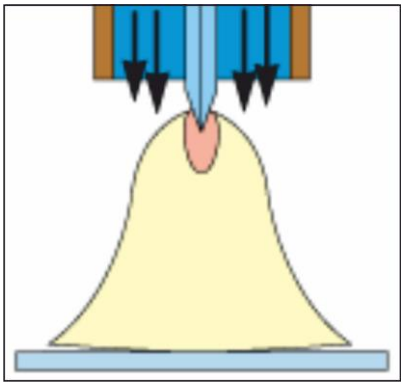
B - DESCRIPTION

1 - GENERAL INFORMATION

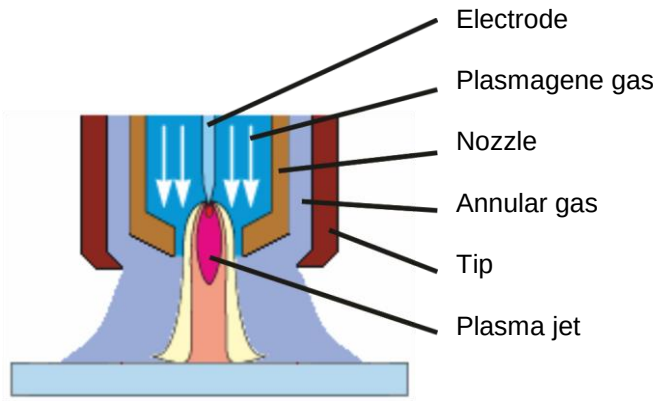
The **SP7** torch was designed for the automatic plasma and double-flow TIG welding processes. It has been especially designed to provide the operator with excellent quality work.

With the harness being out of line, compared with the axis of the torch body, work on the tungstene electrode is made particularly easy.

2 - PLASMA PROCESS



Standard TIG



PLASMA

The Plasma process is a development of the conventional TIG process, which improves performance.

Energy is greatly modified in the Plasma arc:

- High temperature, plasmagene gas at 30000°K
- Energy focused on a reduced area via the mechanical constriction of the arc.

First, a "**plasmagene**" gas, usually pure argon, combined with the electrical arc, constitutes the plasma which passes through a nozzle.

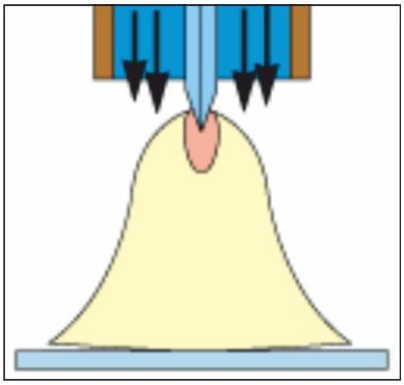
This generates high current density and very high temperature at the centre of the Plasma stream.

Secondly, an "**annular**" gas runs between the nozzle and the tip and mainly serves to protect the melted metal. Depending on the material to be welded, this gas could be pure argon, an argon-hydrogen mixture (max. 5%), an argon helium mixture, or even pure helium.

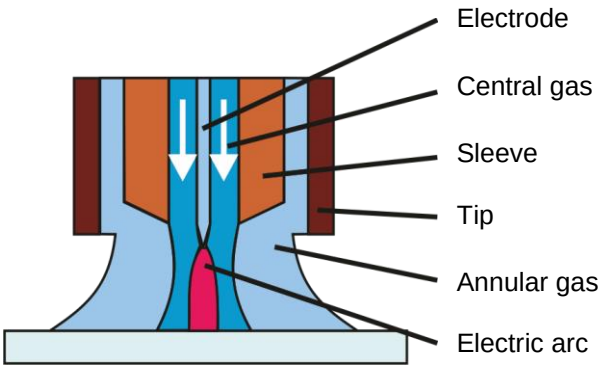
The electrode, protected by the nozzle, is highly resistant to erosion and pollution.

A permanent pilot arc can be established between the electrode and the nozzle, thus avoiding high frequency ignition at every welding run, and making it safe to work in an environment comprising electronic and computing equipment.

3 - DOUBLE-FLOW TIG PROCESS



Standard TIG



Double-flow TIG

The double-flow TIG process is an improvement of the conventional TIG process, which increases performance.

First, a "**central**" gas, usually pure argon, runs in the small gap between the electrode and the sleeve, thus confining the electrical arc pneumatically.

Secondly, an "**annular**" gas runs between the sleeve and the tip and mainly serves to protect the melted metal. Depending on the materials to be welded, this gas could be pure argon, an argon-hydrogen mixture (max. 5%), an argon helium mixture, or even pure helium.

The two gas flows are concentric with the electrode, thus protecting the latter very well and improving its resistance to erosion, in comparison to using a traditional single flow solution.

A permanent pilot arc can be established between the electrode and the sleeve, thus avoiding high frequency ignition at every welding run, and making it safe to work in an environment comprising electronic and computing equipment.

4 - SPECIFICATIONS OF THE SP7 TORCH

		Version with screw-on fittings	Quick Connector (QC) version
Reference	Straight	W000315615	W000274322
	Bent		W000315626
Maximum intensity		450A	
Power factor		100 %	
Weight of torch alone, ready to weld		7.5 Kg	
Length of bundle		2.1 m	
Cooling	Number of circuits	• 1 electrode circuit (out - return) • 1 nozzle/tip circuit (out - return)	
	Min. output	3 l/min	
	Min. pressure	5 bars	
	Max. pressure	6 bars	
	Cooling power	2,6 KW	
Ignition	Principle	By emission H.F. (7 KV)	
Plasmagene or central gas	Argon	0.4 to 10 l/min	
Annular gas	Argon Argon /H2 Argon / He	10 to 25 l/min	
Norm		CEI 60974-7	

5 - COOLING OF THE TORCH

To cool the **SP7** welding torch in a closed circuit, the following coolants may be used:

- That is liquid **LINCOLN ELECTRIC**
- or distilled water

- **SPECIAL LIQUID LINCOLN ELECTRIC**

NEVER ADD WATER

This product is ready for use:

- W000010167 drum of 9,6 L
- W000010168 drum of 19,3 L

This product is :

- antifreeze
- anti-algae
- anti-corrosive
- non toxic
- non-flammable

- **DISTILLED WATER**

It should have :

- high electical resistivity
- a PH of about 7

CAUTION with water: RISK OF FREEZING

If atmospheric temperature is below +5°C (installation off), the torch cooling installation should be protected against freezing during this period.

To avoid freezing, it is recommended to keep the cooling unit running (including at night and at the week-end) by adding a water electric heating system to the water circuit.

To that end, you can connect the cooling unit and the water warming system to a mains electricity supply that will not be interrupted overnight or on weekends.

CAUTION: NEVER ADD ANTIFREEZE

The water level of the tank must be checked at regular intervals.

6 - DESCRIPTION OF THE TORCH BODY

The torch body consists of three mechanically-assembled parts :

- Upper body
- Isolating spacer
- Lower body

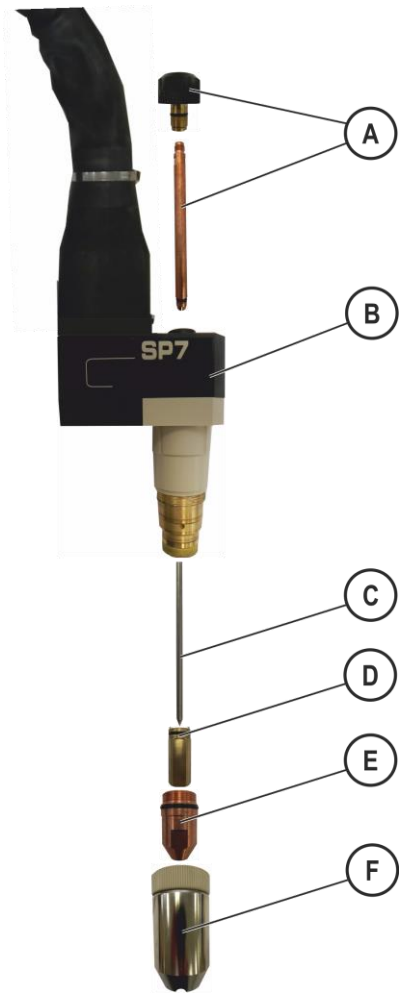
The lower body receives the nozzle or sleeve « **E** », which is a threaded and indexed part.

An isolating gun « **D** » placed in the nozzle or sleeve « **E** » ensures the centring of the electrode « **C** » at the extremity of the torch.

The lower body also receives the cooled down protective tip « **F** ».

The electrode outlet is at the top of the torch. It is cooled down by the upper body. It receives the tightening clamp of the tungstene electrode, length 150 mm Ø 2.4 - 3.2 - 4.0 or 4.8 mm.

A	Electrode clamp assembly
B	Torch body
C	Electrode
D	Centring isolating gun
E	Nozzle or sleeve
F	Cooled down tip



7 - CONDITION ON DELIVERY

The **SP7** torch is delivered in operating order for the plasma process:

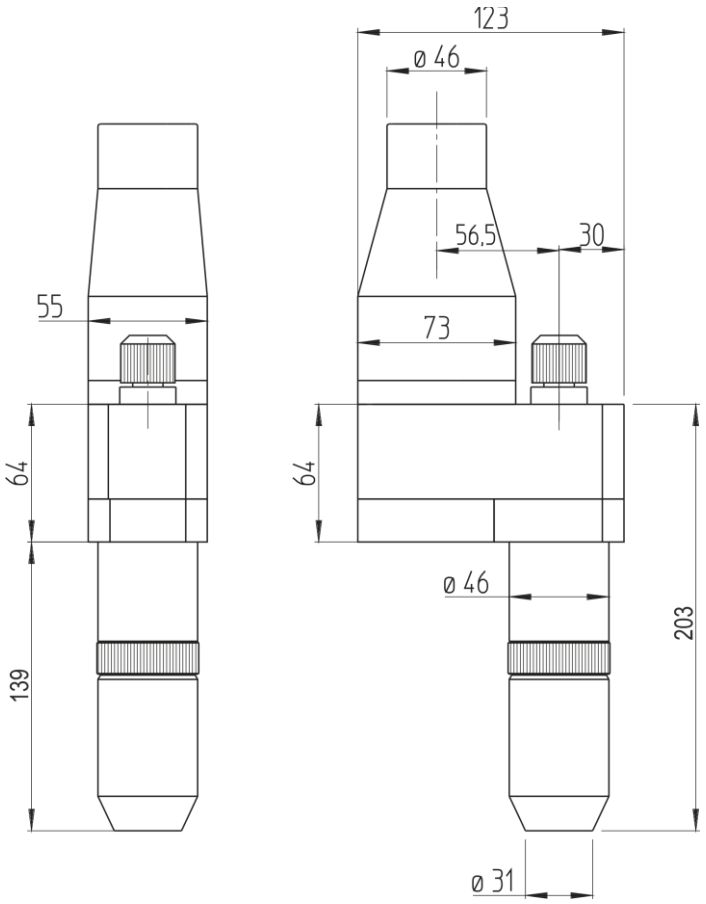
- An electrode Ø 3,2 mm
- A centering gun
- A nozzle Ø 2,5 mm

Additional parts:

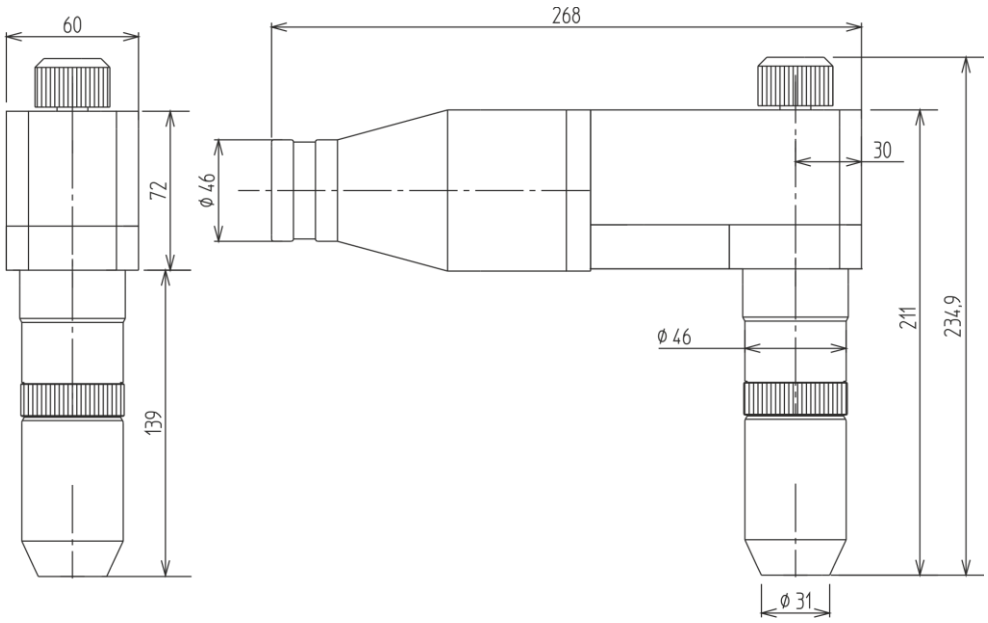
- A nozzle spanner
- A nozzle Ø 3 mm
- One nozzle adjusting gauge.

8 - DIMENSIONS AND FASTENING

DIMENSIONS EXCLUDING THE TORCH SUPPORT STRAIGHT VERSION



DIMENSIONS EXCLUDING THE TORCH SUPPORT ANGLED VERSION

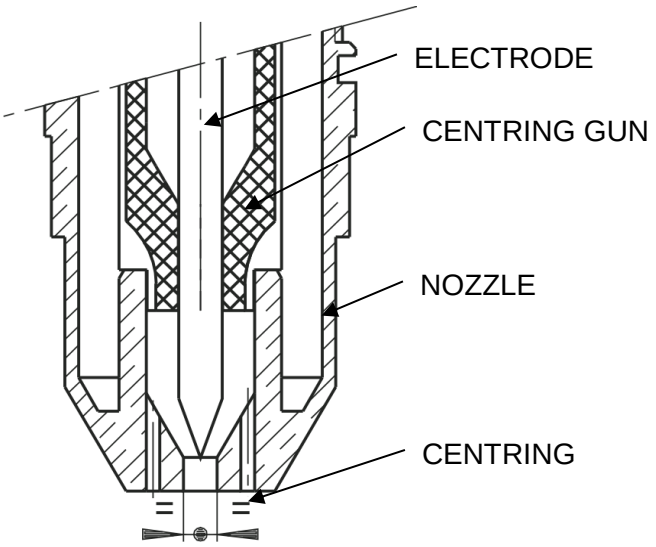


C - USING THE SP7 TORCH

1 - ELECTRODE SHARPENING

In Plasma, in order to get a symmetrical arc, avoid welding defaults (undercut at the edge of the molten area) and prevent the nozzle from deteriorating quickly, the tungsten electrode passes through an isolating gun which automatically centres the electrode.

It is recommended to grind this electrode using preferably an automatic machine in order to ensure that the electrode tip is properly centred inside the nozzle.



In TIG the electrode is centred by the same gun. It can be grinded using a grinder. It is recommended not to hold the electrode manually during this operation.

Also make sure that particles are swept along the grinding cone's generating lines; this reduces the erosion of the tungsten in operation.

Ensure that the grinder is exclusively used for this purpose, otherwise polluting particles would be left on the electrode.

When removing a deformed or polluted tip prior to grinding, avoid gripping the electrode in a clamp or a vice and hitting with a hammer or a sledge hammer.

This might create microcracks on grain boundaries or deform the structure, thus generating cracks at high temperature, which would reduce the electrode's lifespan. An electrode may be shortened by cutting with a grinder.

2 - GRINDING ANGLE

This angle is not absolute; it is characteric of the electron emission surface at the tip.

It is therefore recommended to ensure that this angle remains constant in order to obtain constant welding results. A 40° point angle is satisfactory.

Make sure that the end part of the tip, which is vulnerable during ignition, is eliminated before starting (using a fine grain abrasive).

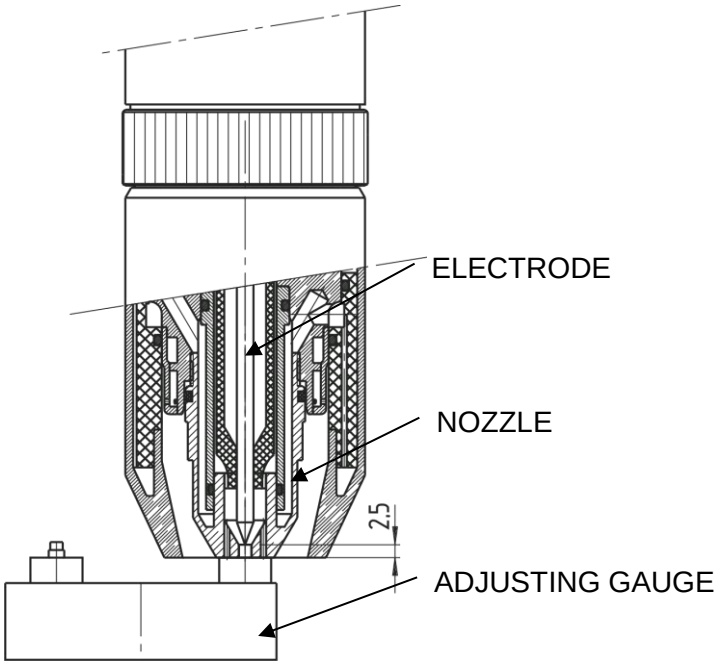
3 - ADJUSTING THE ELECTRODE INSIDE THE TORCH

In double-flow TIG mode:

The electrode projects out of the lower face of the sleeve by 1.5 to 2mm. Over 2mm, there exists a risk of damaging the electrode protective gas, thus reducing its lifespan.

In PLASMA mode:

The tool supplied with the **SP7** allows the extent to which the electrode enters the nozzle to be adjusted, from 1.5mm to 3mm, depending on the type of nozzle.

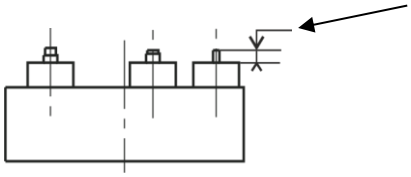


4 - ADJUSTING GAUGE

For each type of nozzle, there is a different setting range for the depth to which the electrode enters the nozzle.

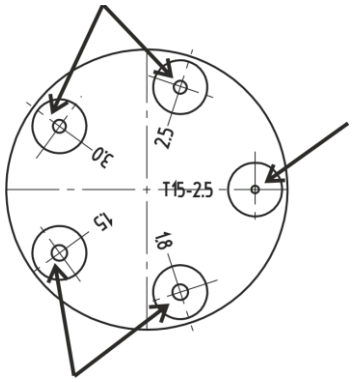
For a given nozzle, you should never go below the minimum value, as this would risk creating a short circuit between the electrode and the nozzle.

The electrode-nozzle depth characterizes the plasma arc: the greater it is, the more constricted the arc will be.



Calibrated pin for heights of 1.5-1.8-2.5 and 3 mm.

Pins for nozzle > 1.5 for operating with a cylindrical or a cylindrical/diverging nozzle.

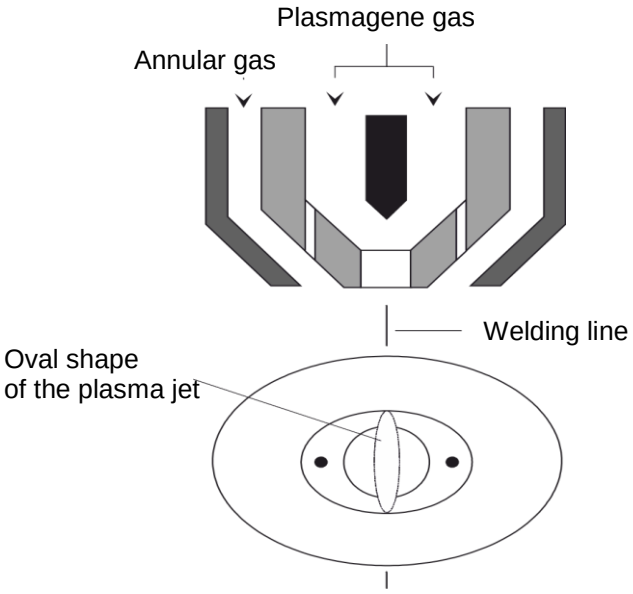


Pin of height 2.5 mm for cylindrical nozzle 1.5.

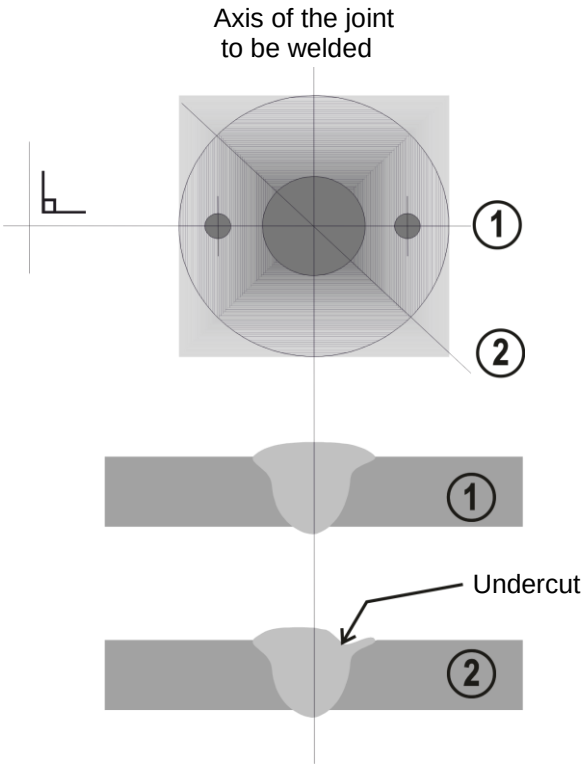
Pin for operating with a cylindrical/diverging nozzle.

5 - THE NOZZLE

There are two side holes on the nozzle. These holes inject cold gas, thus forcing the plasma jet to take an oval shape in line with the bead and making the action of the arc in the plan of the joints to be welded more efficient.



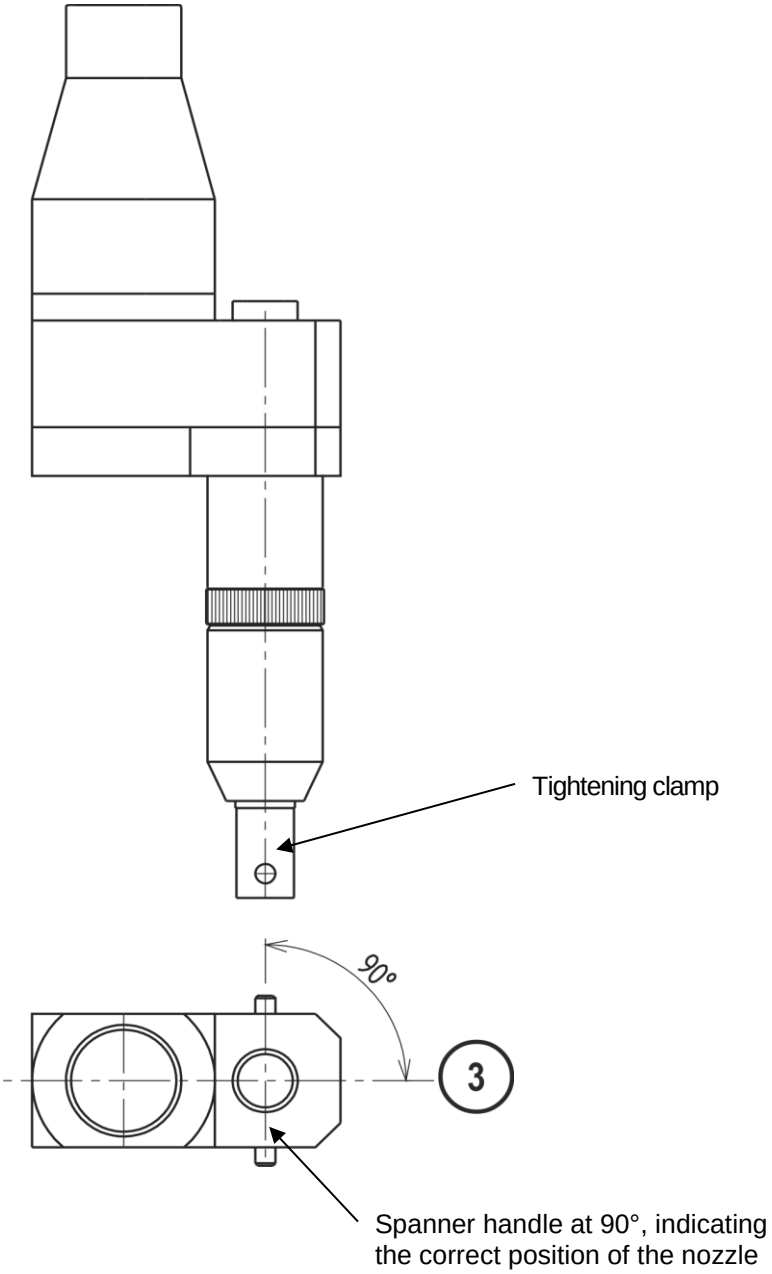
The axis of the nozzle's holes must be perpendicular to the axis of the joint to be welded.



①	Correct positioning of the nozzle
②	Offsetting of the nozzle

The automatic indexing of the nozzle ensures that the nozzle's holes are at right angle with the axis of the joint to be welded, thus avoiding ② defaults.

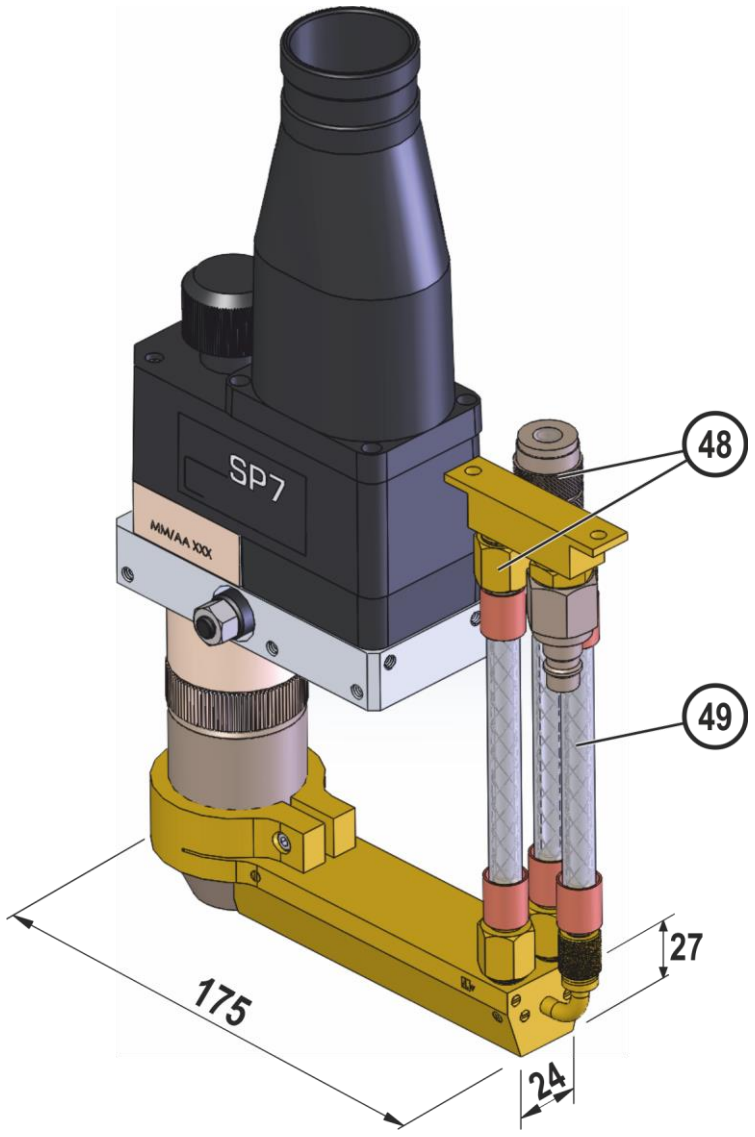
The nozzle must be tightened up to the stop, using the special spanner, with the handles making a 90° angle with the ③ axis of the torch. If it is not the case, slightly loosen the nozzle so as to obtain the right angle.



6 - TRAILING SHIELD OPTION SP7 « W000315616 »

The trailing shield **SP7** option extends gas shielding for materials that are liable to be oxidised or for achieving better quality with stainless steel.

It is cooled by an additional water circuit, which is connected directly to the torch interface.

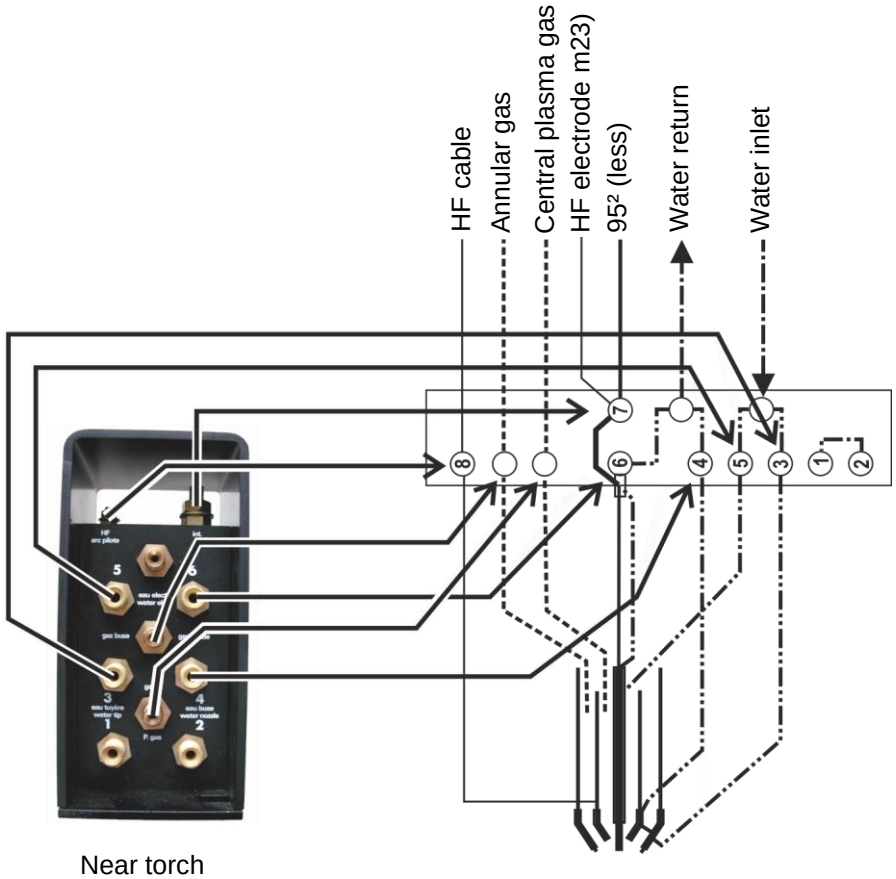


48	Cooling
49	Gas

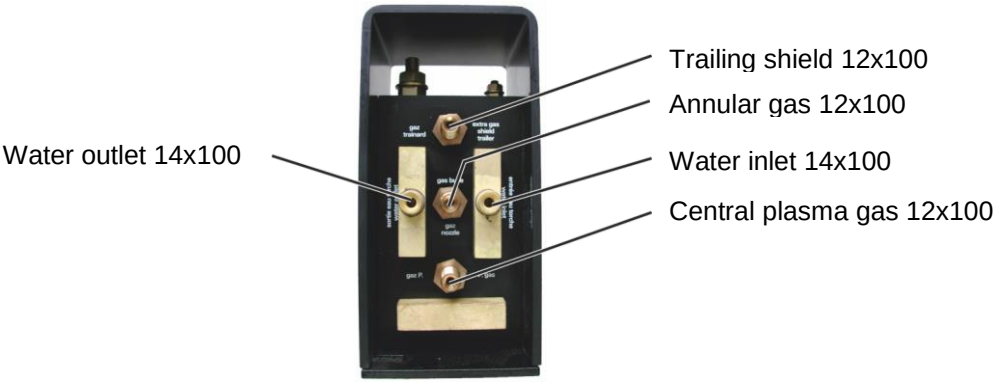
D - CONNECTION OF SP7

1 - CONNECTION OF SP7 W000315615

This connection is made through the unit, part number **S92576544** (for torch with screw-in connectors), which acts as the interface between the bundle of the torch and that of the equipment.



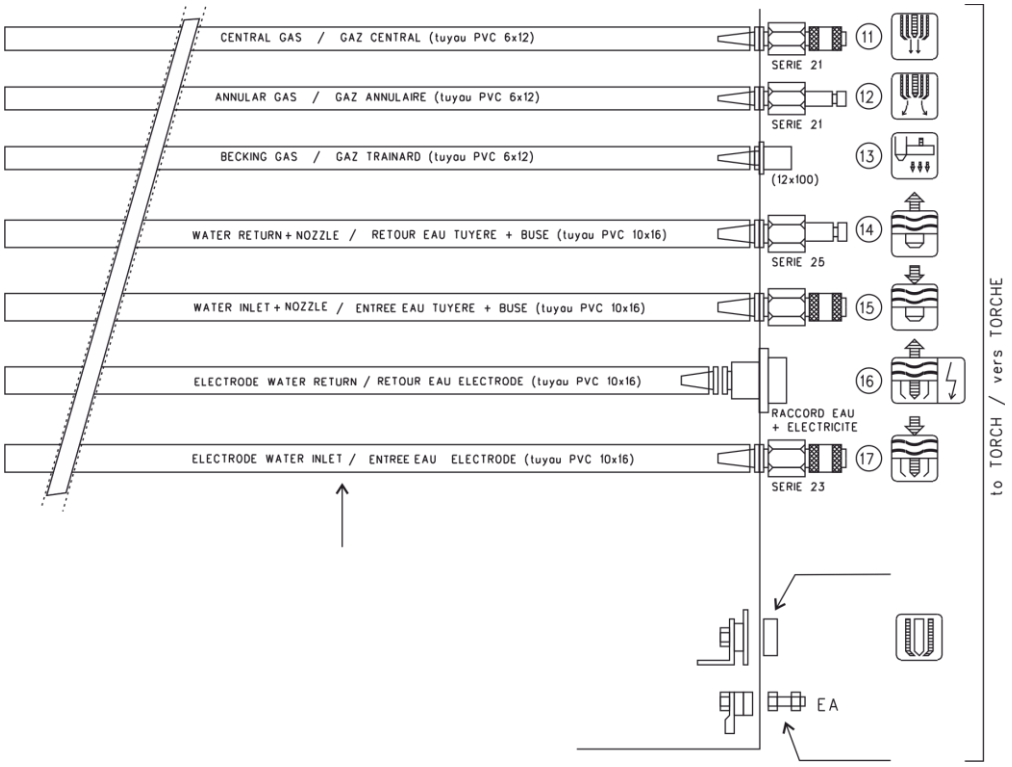
Near torch



Near bundle

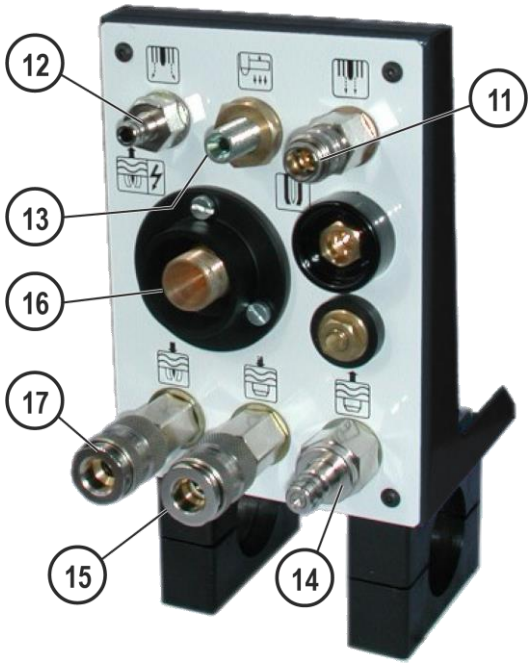
2 - CONNECTION OF SP7 W000274322 / W000315626

The connection is made directly onto the **BRT 450** or on the **Quick Connector** interface according to the following diagram:



Case of a Quick Connector (QC) interface

This connection is made through the unit with the part number **W000315574** for torches with **Quick Connectors**; it acts as the interface between the bundle of the torch and that of the equipment.



Case of BRT 450

BRT 450 is used as part of an **NERTAMATIC 450** installation or **LINC-MASTER** installation.

Connection near the torch

11	Plasma gas
12	Annular gas
13	Saddle gas
14	Nozzle + tip water return
15	Nozzle + tip water inlet
16	Electrode water outlet
17	Electrode water inlet
	Pilot arc connection

E - MAINTENANCE

Before any servicing operation, shut down the cutting installation.

1 - SERVICING

The **SP7** plasma or TIG double-flow welding torch is the seat of several phenomenons which create the electric arc To do this, they are supplied with:

- electric energy
- central or plasmagene gas
- annular gas
- cooling water

through means of a bundle of pipes and wires..

COMMENTS:

- The normal wear of the nozzle (in plasma) or of the sleeve (in TIG) and electrode limit the service life of these parts, making their replacement necessary.
- An error in assembly or leaving out a part can be detrimental to the service life of the torch.
- During disassembly or reassembly of parts equipping the torch, handle them carefully in order to avoid breaking, scratching or marking them.
- Always use original parts **LINCOLN ELECTRIC**.

BUNDLE:

- The bundle must be installed so that it is safe from mechanical, chemical and heat damage.
- Be careful of the condition of the bundle grouping sheath.
- If it is defective, check the condition of the various conduits which make up the bundle.
- Also check the wire leading to the part (ground wire)
- The upkeep and repair work on the envelopes, conduits and isolating sheaths must never be carried out haphazardly.
- Regularly check the tightening of all the connections and make sure that the electrical connections do not heat up.

ROUTINELY CHECK:

- The O-rings, if they are damaged, replace them, being careful to avoid scratching their housing.

ROUTINELY CLEAN:

- The accessible parts of the torch body with a dry cloth. In case of water flow, dry it before refitting.

NOTA : The nozzle or sleeve tightening nut must be screwed on and hand-tightened.

Every time the cap is fitted, clean the thread of the torch body.

2 - TROUBLESHOOTING

DEFECTS	SOLUTIONS
Pilot arcing difficult	- Check: ➜ Type of gas: argon ➜ Pressure : 3 bar ➜ Flowrate 3 to 6 litres/min - Check the gas pipes throughout the circuit using a gas test
The arc blows while striking.	- Check the flowrate of the welding gas
Difficult transfer	- Check the connection of the electric wire running to the part (ground wire). - Check the electrode circuit, especially the connections to the bundle connections. - Increase the pilot arc flowrate to ensure the arc is well off the torch
Destruction of the nozzle	The destruction of a nozzle can be caused by: ➜ direct contact with the part ➜ a lack of welding gas: check the flowrate or the gas circuit ➜ intensity too great for the type of the nozzle used ➜ poor cooling: check the flow on the water return circuit
Destruction or rapid wear of electrode	- Increase the flowrate of the welding gas - Check the cooling circuit. - The intensity is too high for the diameter of the electrode.

3 - SPARE PARTS

How to order

The photos or sketches identify nearly every part in a machine or an installation

The descriptive tables include 3 kinds of items:

- **those normally held in stock:** ✔
- **articles not held in stock:** ✘
- **those available on request: no marks**

(For these, we recommend that you send us a copy of the page with the list of parts duly completed. Please specify in the Order column the number of parts desired and indicate the type and the serial number of your equipment.)

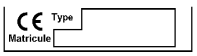
For items noted on the photos or sketches but not in the tables, send a copy of the page concerned, highlighting the particular mark.

For example:

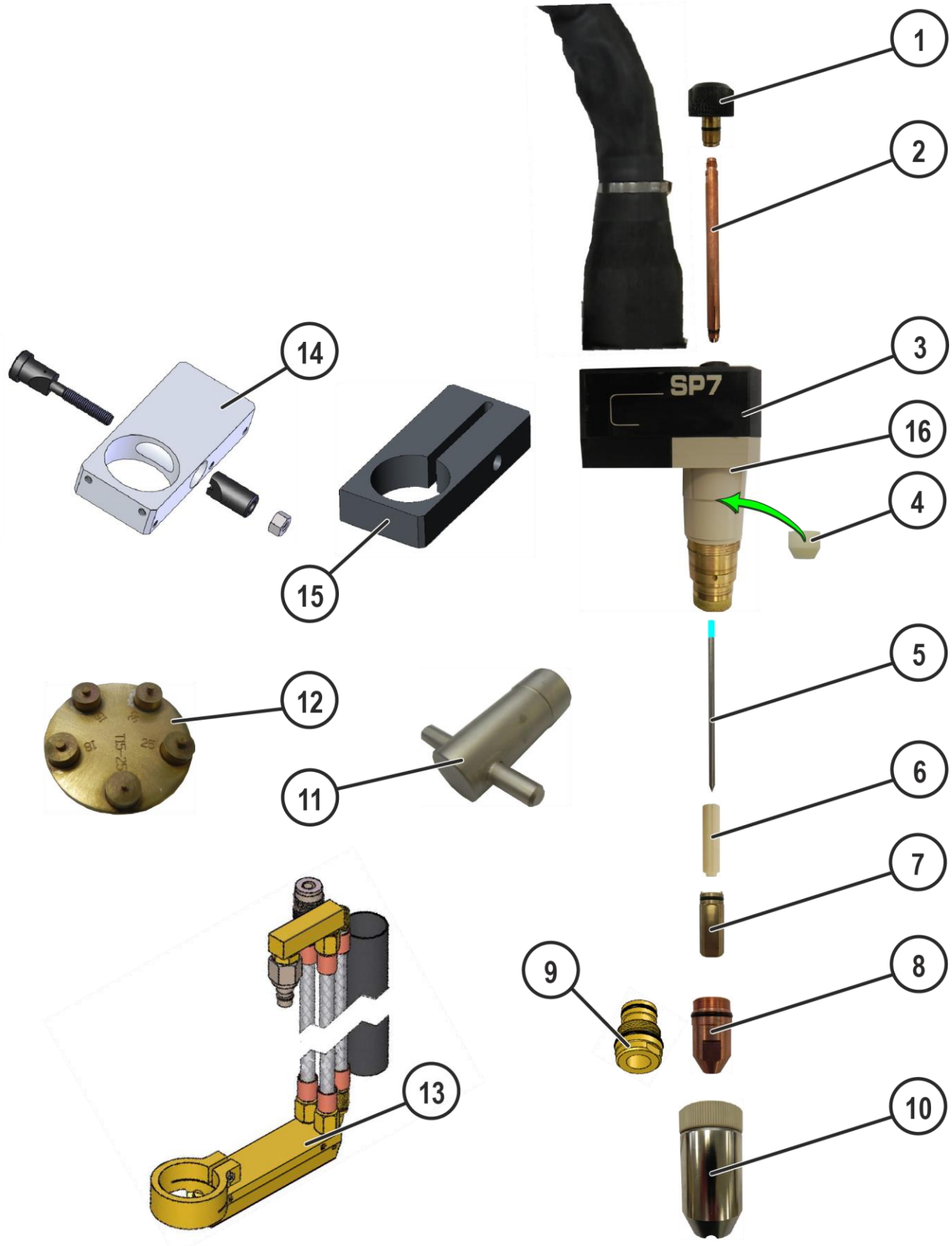
✔	normally in stock
✘	not in stock
	on request

Item	Ref.	Stock	Order	Designation
1	W000XXXXXX	✔		Machine interface board
2	W000XXXXXX	✘		Flowmeter
3	P9357XXXX			Silk-screen printed front panel

- For parts order, give the quantity required and put the number of your machine in the box below.



TYPE :
Number:


1
2
3
SP7
16
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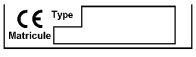
✔	normally in stock
✘	not in stock
	on request

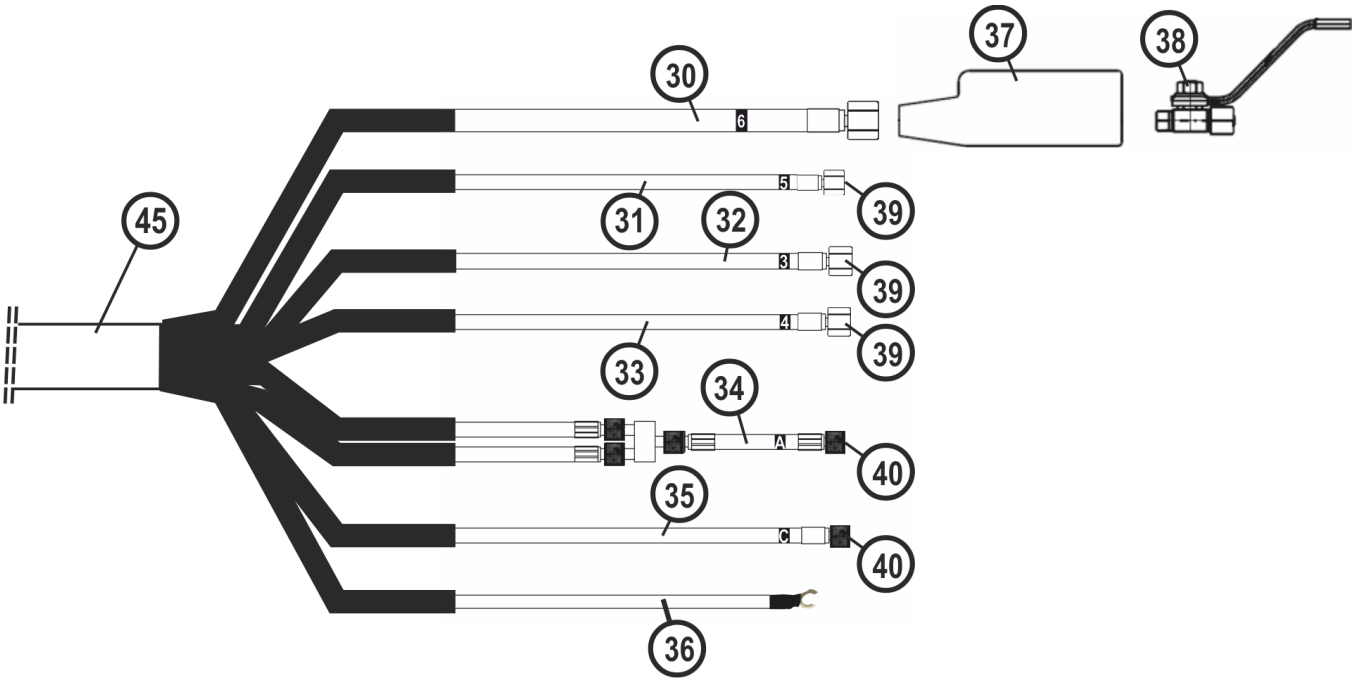
Item	Ref.	Stock	Order	Designation
	W000274322	✔		**SP7** straight torch (with quick connectors)
	W000315626	✔		**SP7** bent torch (with quick connectors)
	W000315615	✔		**SP7** straight torch (with screw-in connectors)
1	S93570070	✔		Electrode clamp cap
2	S93570026	✔		Clamp, Ø 3.2 mm
	S93570032	✔		Clamp, Ø 4.0 mm
	S93570027	✔		Clamp, Ø 4.8 mm
3	W000268287	✔		Straight torch body **SP7**
4	W000315787	✔		Electrode grommet
5	S03710655	✔		Electrode, Ø 3.2 mm, lanthanum 2 %
	S03710656	✔		Electrode, Ø 4.0 mm, lanthanum 2 %
	W000381291	✔		Electrode, Ø 4.8 mm, lanthanum 2 %
6	W000315789	✔		Centring bush, Ø 3.2 mm
	W000315797	✔		Centring bush, Ø 4.0 mm
	W000315798	✔		Centring bush, Ø 4.8 mm
7	S93570074	✔		**SP7** sleeve/nozzle holder
8	W000315791	✔		Cylindrical nozzle, Ø 1.5 mm
	W000373363	✔		Cylindrical nozzle, Ø 2.0 mm
	W000315792	✔		Cylindrical nozzle, Ø 2.5 mm
	W000273864	✔		Cylindrical nozzle, Ø 2.5 mm (3 diffusers)
	W000315793	✔		Cylindrical nozzle, Ø 3.0 mm
	W000315799	✔		Cylindrical nozzle, Ø 3.0 mm (3 diffusers)
	W000315794	✔		Cylindrical/divergent nozzle, Ø 3.0
	W000384165	✔		Cylindrical nozzle, Ø 3.4
	W000315795	✔		Cylindrical nozzle, Ø 4.0 mm
	W000265892	✔		Nozzle, Ø 5.0 mm sleeve, heel 2 mm
	W000315796	✔		Double flow TIG sleeve, Ø 6.0 mm
9	W000242140	✔		TIG **SP7** cap
10	W000376074	✔		Cooled nozzle
11	S93570028	✔		Nozzle/sleeve spanner.
12	W000241568	✔		**SP7** electrode/nozzle adjustment rod.
13	W000315616	✔		**SP7** QC shield gas assembly
14	W000315539	✔		**SP7** torch support ring (old)
15	W000375807	✔		**SP7** torch support ring (new)
	S91211143	✔		Set of seals for **SP7**
				2 x Ø11.1 x 1.78 for part no. 1
				10 x Ø6 x 2.2 for gas fitting ring
				4 x Ø4.48 x 1.78 pour part no. 3 ring
				2 x Ø31.47 x 1.78 pour part no. 10 internal
				2 x Ø36.27 x 1.78 pour part no. 10 internal
				2 x Ø37.4 x 1.78 pour part no. 10 internal
				4 x Ø20.35 x 1.78 for part no. 8
				12 x Ø5.5 x 1.3 for part no. 3 internal
				12 x Ø4.57 x 1 for part no. 3 internal
				1 x Ø21 x 1 for part no. 3 internal
	S91211144	✔		Set of **SP7** seals for part no. 7
				10 x Ø11.5 x 1.3 for part no. 7 internal
				2 x Ø14 x 1.78 for part no. 7 external
16	W000384864			**SP7** insulating part

➢ For parts order, give the quantity required and put the number of your machine in the box below.



TYPE :
Number:

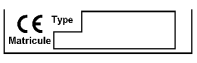
BUNDLE DETAILS FOR TORCH SP7
W000315615



✔	normally in stock
✘	not in stock
	on request

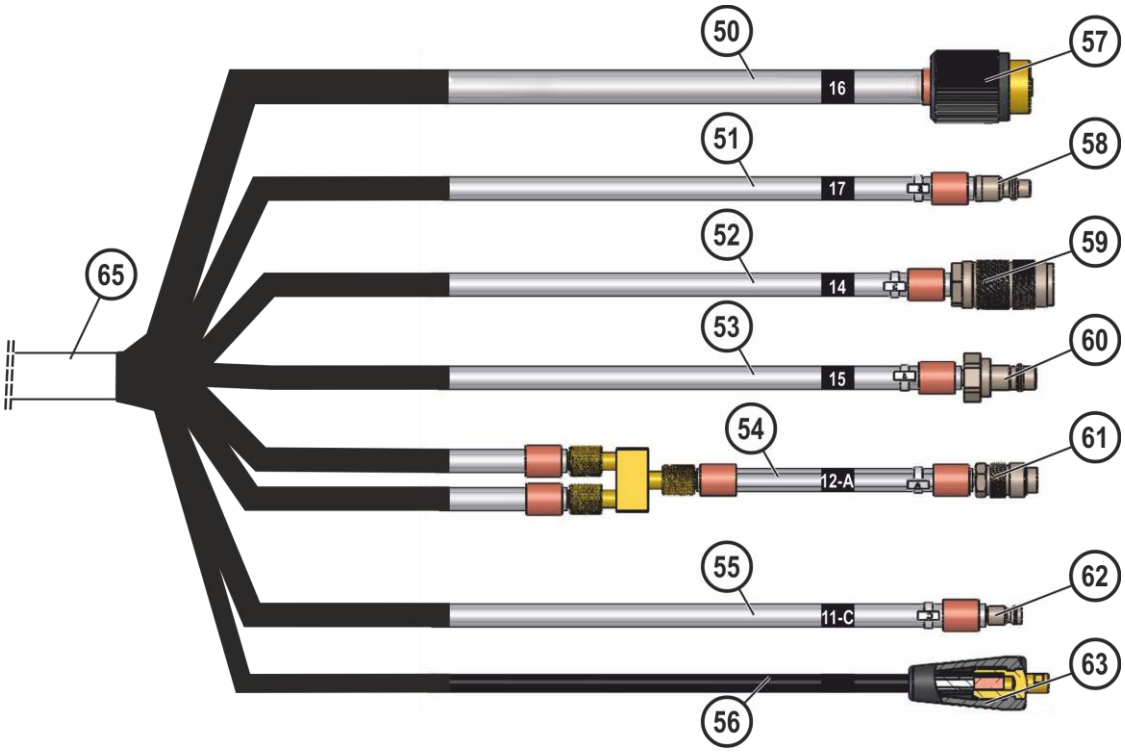
Item	Ref.	Stock	Order	Designation
30	S92579723	✔		Water/electricity return conduit
31				Electrode water inlet conduit
32				Nozzle + nozzle end water outlet conduit
33				Nozzle + nozzle end water inlet conduit
34				Annular gas inlet conduit
35				Plasma gas inlet conduit
36				HF cable
37	S04080936	✘		Water/electricity fitting protection
38				Water/electricity fitting
39	S07300001	✔		Ring
	S07301001	✔		Nut
40	W000352152	✔		Ring
	S33760211	✔		Nut
	W000147372	✔		Seal
45				**SP7** bundle assembly

➢ For parts order, give the quantity required and put the number of your machine in the box below.



TYPE :
Number:

BUNDLE DETAILS FOR TORCH SP7 QC W000274322 AND W000315626



✔	normally in stock
✘	not in stock
	on request

Item	Ref.	Stock	Order	Designation
50	W000235282	✔		Water/electricity return conduit
51				Electrode water inlet conduit
52				Nozzle + nozzle end water outlet conduit
53				Nozzle + nozzle end water inlet conduit
54				Annular gas inlet conduit
55				Plasma gas inlet conduit
56				Nozzle HF cable
57				Water/electricity return fitting
58				Water/electrode inlet fitting (reference SEFI : 90852306)
59				Nozzle + nozzle end water outlet fitting (reference SEFI : 92232506)
60				Nozzle + nozzle end water inlet fitting (reference SEFI : 90852506)
61				Annular gas inlet fitting (reference SEFI : 92232106)
62				Plasma gas inlet fitting (reference SEFI : 90852106)
63	W000384409	✔		Nozzle cable fitting
65				Bundle details for torch **SP7** QC

➢ For parts order, give the quantity required and put the number of your machine in the box below.

TYPE :
Number:

PERSONAL NOTES

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