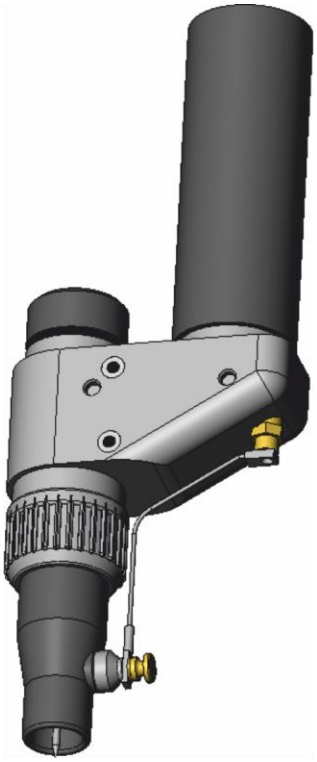
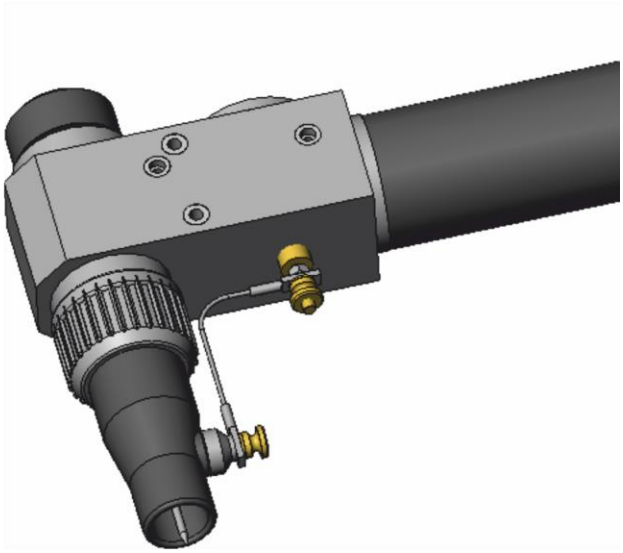
WELDING TORCH

MEC 4

SAFETY INSTRUCTIONS FOR USE AND MAINTENANCE

DEVICE No
W000315606 - W000315607 - W000315610 - W000315611 - W000315612





EDITION : EN
REVISION : G
DATE : 01-2023

Instructions for use

REF: **8695 9007**

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.

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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 285 cooling liquid)

- **W000010167 (9.6L)**
- **W000010168 (19.3L)**

➢ **Freezcool may not be discharged in large quantities in the natural environment. Please comply with local discharge regulations regarding COD (✶).**

➢ **Before any discharge, contact the water department for the rules applicable in your region.**

They will need to know:

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

➢ **The water department will let you know what you must do, particularly the following:**

- ❖ **place**
- ❖ **quantity**
- ❖ **time etc.**

✶ The COD (Chemical Oxygen Demand) represents the part of the product that demands oxygen,
e.g. oxidisable mineral salts and most 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: TIG/Alternating/Non-pulsed **300 A ; 50 Hz ;Nac 70%**	69.2 to 73.6 dB(A)	102.6 dB(C)	**90 dB(A)**
Welding: TIG/Alternating/Non-pulsed **300 A ; 80 Hz ;Nac 70%**	68.6 to 75.3 dB(A)	101.8 dB(C)	**97 dB(A)**
Welding: TIG/Alternating/Pulsed **300 A ; 50 Hz ;Nac 70% ;pulsé 5 Hz**	69.3 to 72.1 dB(A)	99.8 dB(C)	**95 dB(A)**
Welding: TIG/Direct/Non-pulsed **200 A**	68.7 to 71.4 dB(A)	103.7 dB(C)	**87 dB(A)**
Welding: TIG/Direct/Pulsed **200 A**	68.4 to 70.4 dB(A)	98.7 dB(C)	**85 dB(A)**

The use of a helmet is <u>MANDATORY</u> during welding.

B - DESCRIPTION

1 - PRESENTATION

The **MEC4** torch is specially designed for inert gas shielded automatic TIG welding using a tungsten electrode.

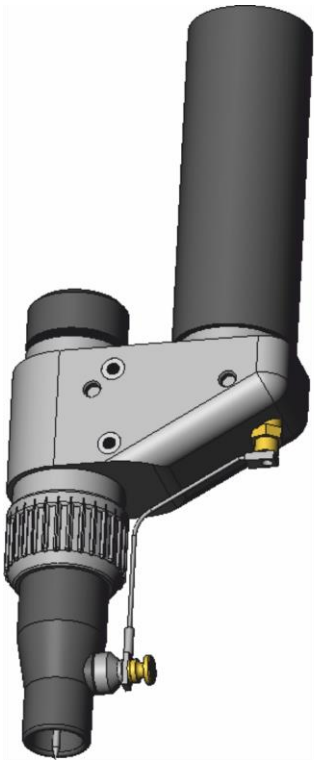
It addresses all the requirements for high welding quality and productivity, regardless of the welded metals:

- Carbon or low-alloy steels
- Stainless steels
- Light alloys
- Copper
- Titanium
- Zirconium, etc.

It comes in:

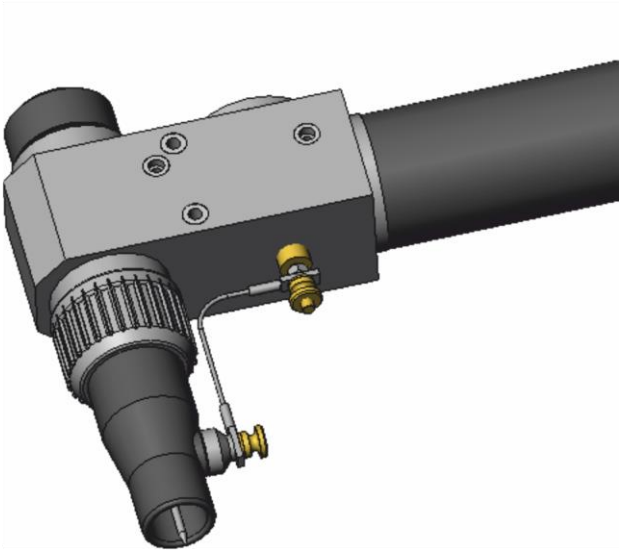
- **straight version**: bundle parallel to the torch body
- **bent version**: bundle perpendicular to the torch body

offering maximum accessibility to the assembly work to be carried out.



STRAIGHT VERSION

- W000315606: Version with screw-on fittings
- W000315611: Quick Connector (QC) version
- W000315610: Version for manual power source



BENT VERSION

- W000315607: Version with screw-on fittings
- W000315612: Quick Connector (QC) version

Both versions offer the following possibilities:

➢ Easy removal of the electrode holder from the top of the torch body, for more speed and no risk of upsetting the mechanical adjustment of the torch.

➢ Pre-adjustment (outside the torch) of the emerged length of the electrode in relation to the end of the protective nozzle. That pre-adjustment is carried out with an adjustable tool delivered with the torch.

➢ The parallelepiped shape of the outer body of the torch makes it easier to take a positioning reference.

➢ The **MEC4** torch is cooled by water circulation and can easily withstand the most stringent welding requirements up to 500A at 100% (except version W000315610, limited to 250A at 100%.

➢ As an option, straight and bent **MEC4** torches may be instantly fitted with the following additions:

- Nozzle with electromagnetic circuit for welding with arc oscillation or deviation
- Large diameter (6.0, 6.4 or 7 mm) electrode holder for high-intensity AC welding of light allows.
- Trailing shield additional to the nozzle for all applications requiring a high degree of gas shielding for the melted metal. That trailing shield option is compatible with arc oscillation.

2 - CHARACTERISTICS OF THE MEC4 TORCH

<table>
<tr><th colspan="2"></th><th>Version with screw-on fittings</th><th>Quick Connector (QC) version</th><th>Manual version</th></tr>
<tr><td rowspan="2">Part number</td><td>Straight</td><td>W000315606</td><td>W000315611</td><td>W000315610</td></tr>
<tr><td>Bent</td><td>W000315607</td><td>W000315612</td><td></td></tr>
<tr><td colspan="2">Maximum intensity</td><td colspan="2">500A / 100%</td><td>250A / 100%</td></tr>
<tr><td colspan="2">Weight of torch alone, ready to weld</td><td colspan="3">2.6 Kg</td></tr>
<tr><td colspan="2">Bundle length</td><td>1.1 m</td><td>2 m</td><td>8 m</td></tr>
<tr><td rowspan="2">Cooling</td><td>Number of circuits</td><td colspan="2">1 water circuit
(out and back)</td><td>1 hollow fitting
quarter turn
connector
for manual station</td></tr>
<tr><td>Min. output</td><td colspan="3">2.5 l/min at 3.5 bar</td></tr>
<tr><td>Striking</td><td>Principle</td><td colspan="3">Double HF emission</td></tr>
<tr><td>Annular gas</td><td>Argon
Argon/H2
Argon/He
Helium</td><td colspan="3">10 to 38 l/min</td></tr>
</table>

3 - TORCH COOLING

For cooling the **MEC4** torch in a closed circuit, the following may be used as cooling liquid:

- Either **LINCOLN ELECTRIC** liquid
- Or demineralised water

- **SPECIAL LINCOLN ELECTRIC LIQUID**

NEVER ADD WATER

It is ready for use:

- W000010167, 9.6 L drum
- W000010168, 19.3 L drum

This product is:

- Antifreeze
- Anti-algae
- Anti-corrosion
- Non toxic
- Non-inflammable

- **DEMINERALISED WATER**

It must have:

- high electrical resistivity
- pH close to 7

CAUTION while using water: RISK OF FREEZING

If the ambient temperature is below +5°C (with the equipment halted), the torch cooling system must be protected from freezing during that period.

To avoid freezing, the cooling unit should be made to run (including overnight and on weekends), by adding an electric water warming 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.

NEVER ADD ANTIFREEZE

The level in the cooling liquid tank must be verified at regular intervals.

Liquid can be lost during operation (change of parts on the torch) or through evaporation.

If any topping up is required, it should be done:

- either only with **LINCOLN ELECTRIC** liquid if that is the coolant being used
- or only with demineralised water if that is the coolant being used

4 - TORCH BODY DESCRIPTION

The bottom of the metal body of the torch **F** is threaded and has two seals **G** and **H**, and receives the shield gas metal nozzle **J**.

That nozzle is pressed on the two seals **G** and **H** thanks to the nozzle nut **K** fitted on the thread of the torch body **F**. The cooling water circulates between the two seals **G** and **H** and is in direct contact with the inner wall of the shielding nozzle.

The electrode holder is made up of a knurled fastening cap **A**, that rotates freely on the body of the electrode holder **B**.

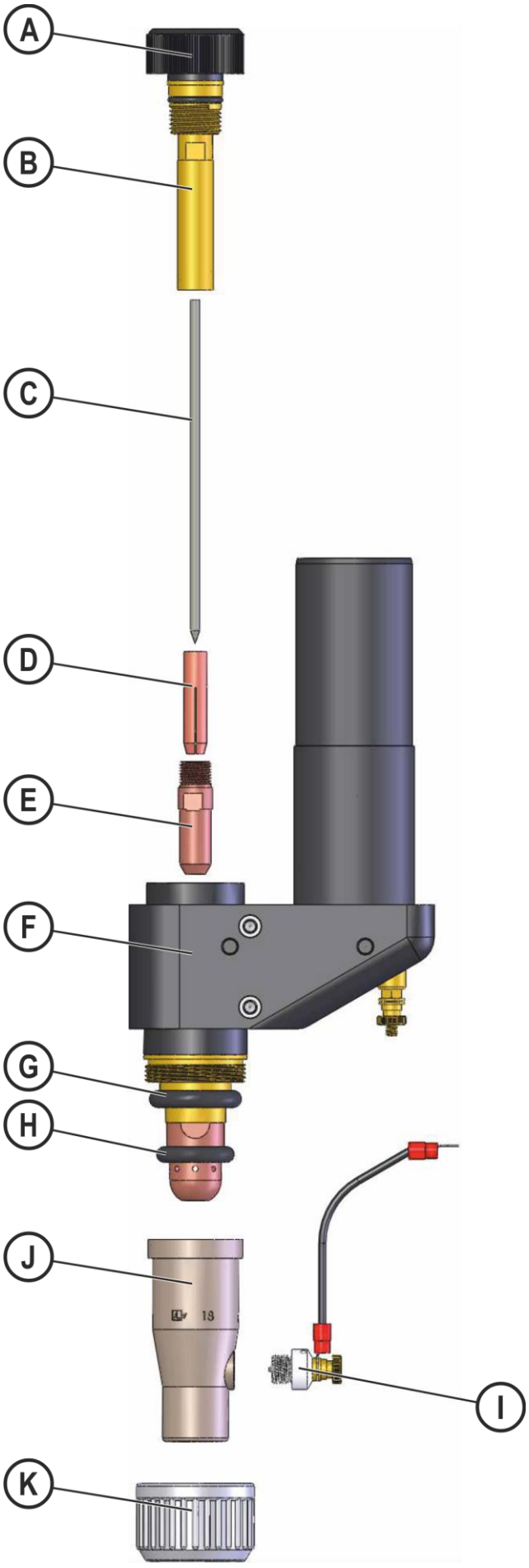
The electrode clamp **D** is fitted inside the opposite end of the electrode holder, and thanks to the thread, the clamp seat **E**.

As soon as the seat **E** is tightened onto the body **F**, the inner taper of the clamp seat **E** applies pressure on a split taper of the clamp **D**, which tightens around the electrode **C** and effectively immobilises it.

The electrode holder assembly inserted from the top into the torch body **F** is held pressed by the thrust due to the tightening of the cap **A**.

The HF strike circuit is provided for the main electrode and the auxiliary electrode.

A	Tightening cap
B	Electrode holder assembly
C	Electrode
D	Electrode clamp
E	Clamp seat
F	Torch body
G **H**	Seals
I	Auxiliary electrode
J	Shield gas nozzle
K	Nozzle nut


A
B
C
D
E
F
G
H
J
I
K

5 - DELIVERY CONDITION

- **Versions W000315606, W000315607, W000315611 and W000315612**

  The **MEC4** torch is supplied in operating condition along with:

  - 5 clamps for the electrode, 1.6 - 2.4 - 3.2 - 4.0 - 4.8 mm
  - 3 shield nozzles, diameter 11 - 13 - 18 mm
  - 1 auxiliary strike electrode
  - 3 NERTAL 2% lanthanated tungsten electrodes, 150 mm long, diameter 2.4 - 3.2 - 4.0 mm
  - 1 electrode pre-adjustment rod with 10 mm spanner.

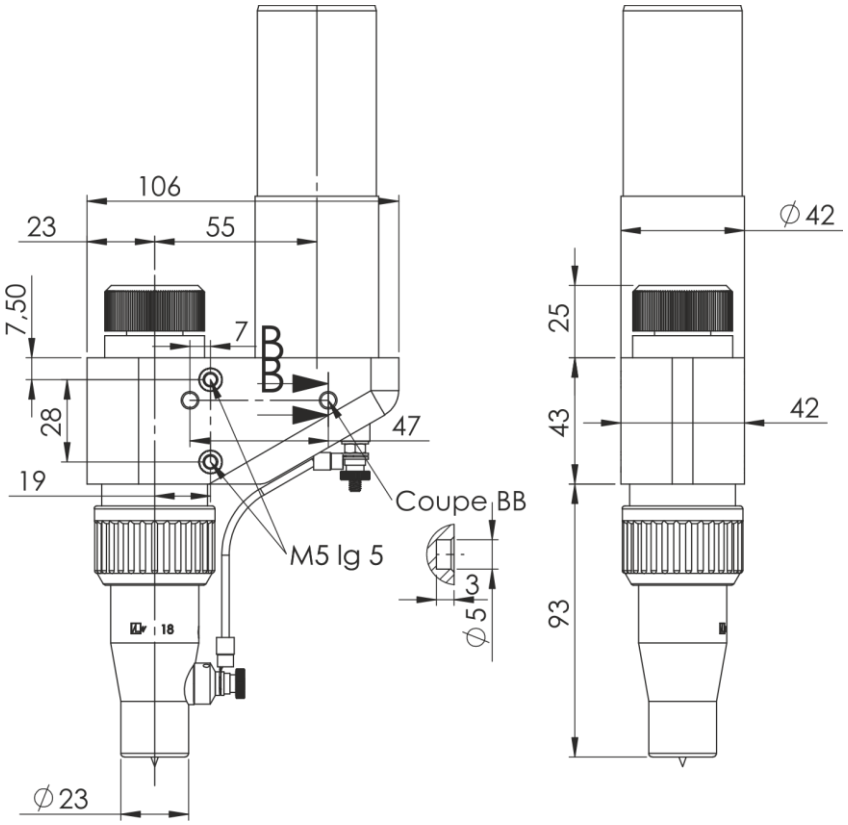
- **Version W000315610**

  The **MEC4** torch is supplied in operating condition only with:

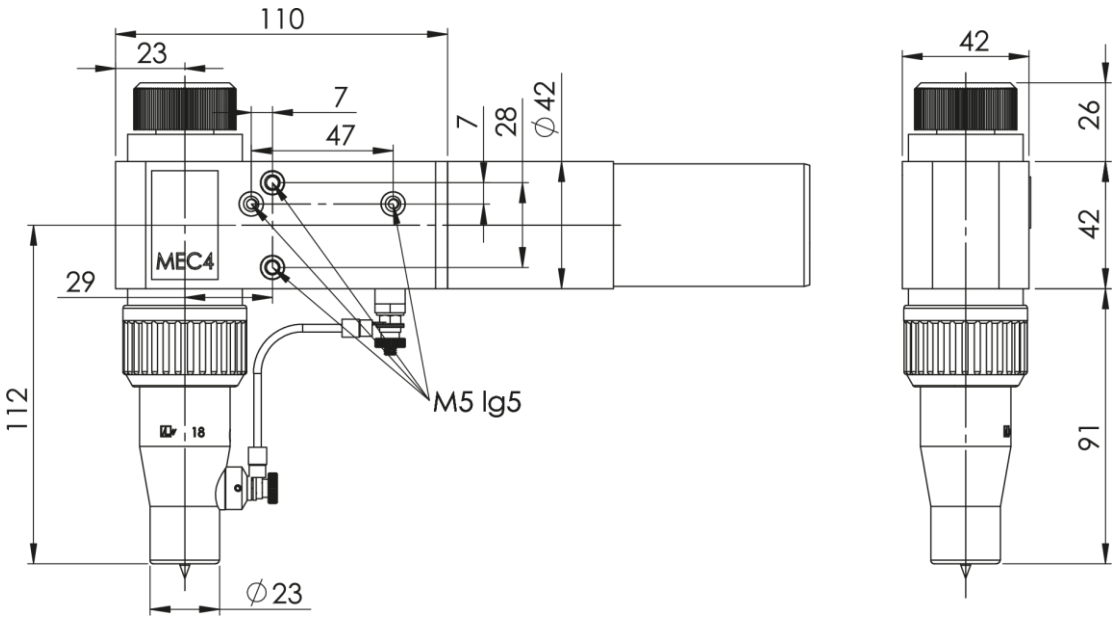
  - 1 clamp for the electrode, 3.2 mm
  - 1 shield nozzle, diameter 18 mm
  - 1 auxiliary strike electrode
  - 1 NERTAL 2% lanthanated tungsten electrode, 150 mm long, diameter 3.2 mm
  - 1 electrode pre-adjustment rod with 10 mm spanner.

6 - DIMENSIONS AND FASTENING

STRAIGHT TORCH



BENT TORCH



C - USE

1 - TUNGSTEN ELECTRODE

The **MEC4** torch is supplied with NERTAL 2% lanthanated tungsten torches. The permissible mean intensity values for each diameter are as follows, with direct polarity direct current:

- Ø 1.6: up to 150A
- Ø 2.4: up to 230A
- Ø 3.2: up to 320A
- Ø 4.0: up to 400A
- Ø 4.8: up to 450A

Optimum arc stability will be achieved with intensity close to the stated maximum. Tungsten is very oxidisable when hot, and so the electrodes must be kept shielded with neutral gas at all times, including during the cooling period after welding. Any blue or black colouring shows deficient shielding after welding

2 - SHARPENING OF ELECTRODES

Electrodes are sharpened with a grinding wheel.

The operation should be done with the electrode not being held manually.

Also, make sure that particles are removed along the surface line of the sharpening taper; that reduces tungsten wear during use.

Sharpening should also be finished with fine grain abrasive, because the resistance of the electrode during use is improved when the surface of the emissive part is carefully finished.

Make sure that the grinding wheel is not a multi-purpose one, which could deposit polluting particles on the electrode.

To eliminate a deformed or polluted tip before sharpening, the electrode should not be held in a clamp or vice, and should not be struck with a hammer.

That could lead to micro-cracks at the grain joints or simply deform the structure and lead to cracks at high temperatures, which would shorten the life of the electrode. To reduce the length of an electrode, a kerf should be made with the wheel.

3 - SHARPENING ANGLE

This angle is not an absolute parameter, but it characterises the electronic emission surface at the tip. That is why, for consistent welding results, care must be taken to reproduce the angle consistently. A 40° top angle ought to be satisfactory. Make sure that the extreme end of the tip, which is vulnerable from the time of striking, is removed before use (with fine grain abrasive).

4 - ADJUSTING THE ELECTRODE IN THE MEC4 TORCH

The erosion of the tip of the electrode during welding is significantly determined by the purity of its gas shield, and shielding is in principle ideal at a relatively small distance from the orifice of the torch nozzle.

The greater the emerged length of the electrode (the arc length must be added to that length), the greater the gas flow must be, and it can be disrupted by the flow of air in the neighbouring area:

- torch movement
- movement of tooling in the vicinity
- ventilation or aeration close to the welding equipment.

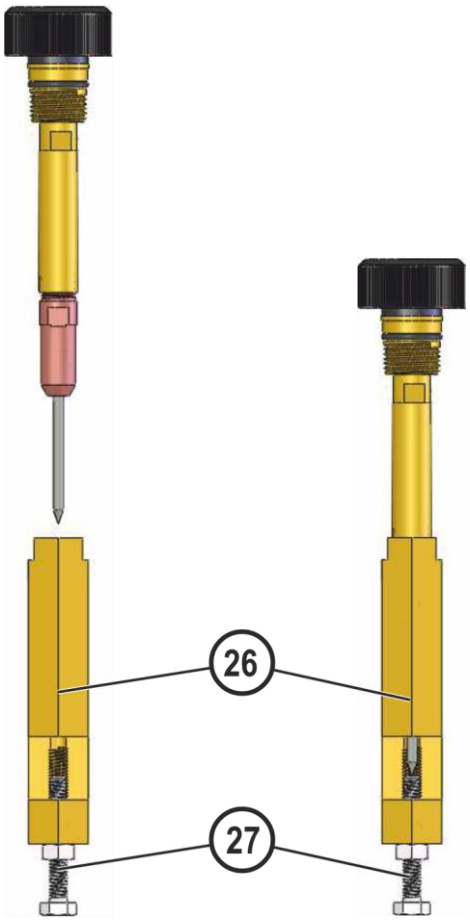
In practice, the tool supplied with the **MEC4** torch should be adjusted so that the electrode emerges out of the nozzle by 2 to 3 mm.

Once the tool is adjusted, electrode replacements can be made rapidly with no adjustment, with the certainty of finding the same position.

Proceed as follows:

- immobilise the electrode adjustment tool in a vice, for example
- position the electrode in the electrode holder without tightening the clamp seat too firmly, so that the electrode can still slide
- insert the electrode holder in the tool by engaging the two flats fully, then tighten the electrode holder with the 10mm spanner. The tip of the electrode must then stop against the adjusting screw.

The length of the electrode that emerges out of the nozzle is obtained for the first time by successively adjusting that screw immobilised by a lock nut.

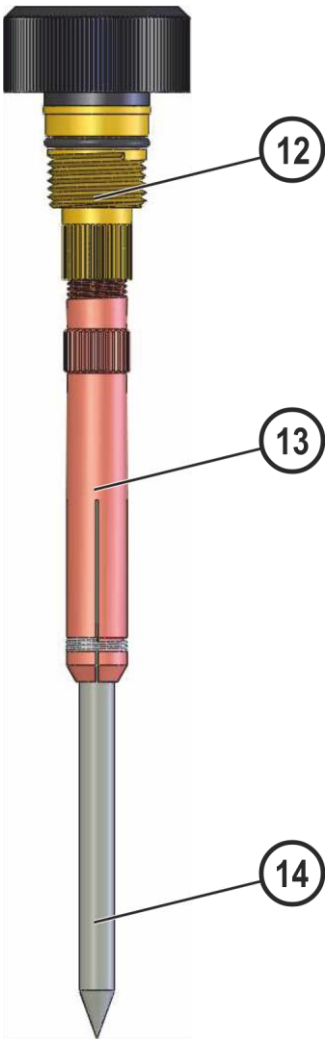


26	Electrode adjustment tool
27	Adjustment

5 - OPTION FOR TUNGSTEN 6 - 6.4 - 7 MM

Large diameter tungsten electrode holder for high-intensity AC welding of light allows.

With this system, the tungsten cannot be adjusted outside the torch. Adjustment and tightening is done directly in the body of the torch.



12	Clamp holder
13	Clamp, diameter 6 - 6.4 - 7
14	Electrode, diameter 6 - 6.4 - 7

6 - NOZZLES

The nozzles of the **MEC4** torch are of five types, characterised by the inner diameter of the shielding orifice:

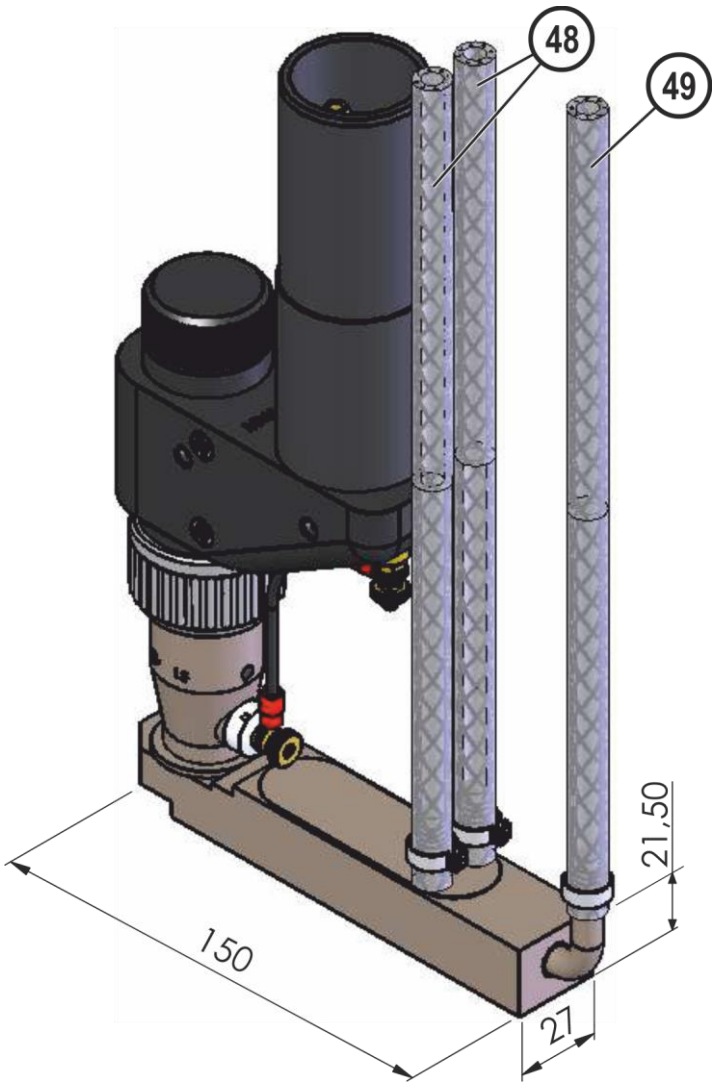
- Ø 11 must not be used at over 150A, to allow satisfactory shielding
- Ø 13 limited to 250A
- Ø 18 may be used up to 500A.

7 - MEC4 TRAILING SHIELD OPTION W000315603

The **MEC4** trailing shield option extends gas shielding, for materials that are liable to be oxidised or for achieving better quality with stainless steel.

Only the Ø18 nozzle allows the use of the additional trailing shield.

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



48	Cooling
49	Gas

8 - MAGNETIC POLES OPTION

This is a special Ø18 nozzle with integrated magnetic poles that allows work with arc oscillation or deviation.

TIG arc oscillation makes it possible to:

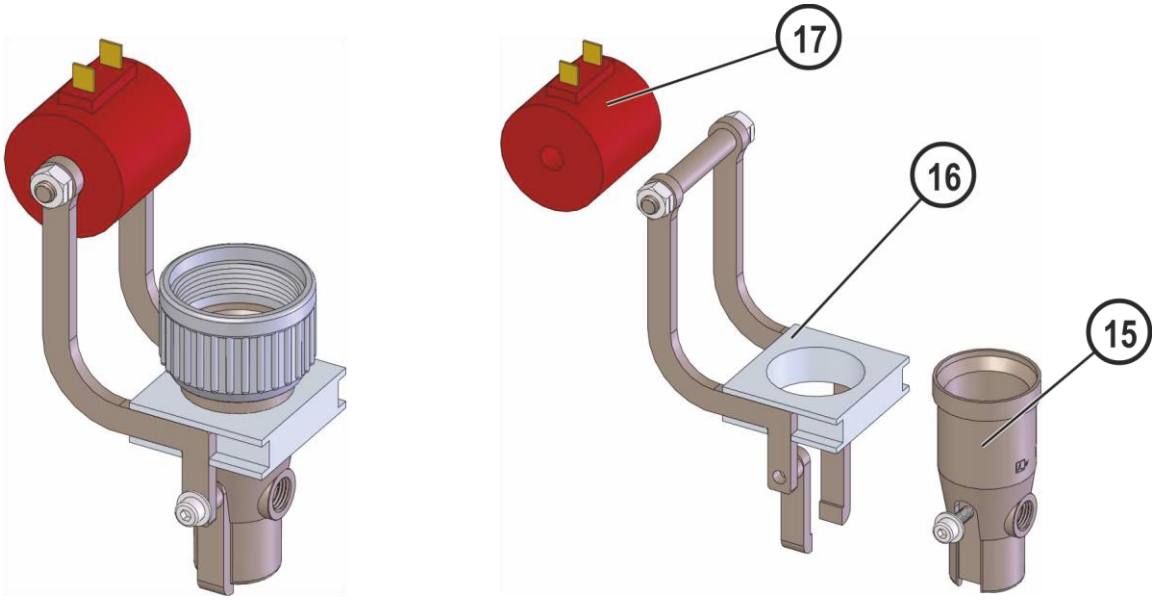
- improve control over the transfer of energy to the workpiece.
- move back the limit at which surface defects occur.
- weld imperfectly squeezed workpieces more easily.
- increase the surface of the workpiece subjected to the flow of heat from the TIG arc.

With equal power, penetration is reduced compared to stable TIG arcs; that can be of particular benefit when the aim is to deposit precious materials with low dilution or when multi-pass welding is needed or even only a second pass with a very fine finish is required on visible welds in rust-proof boilerwork.

The magnetic deviation of the TIG arc towards the front extends its impact and helps increase the electrical power used.

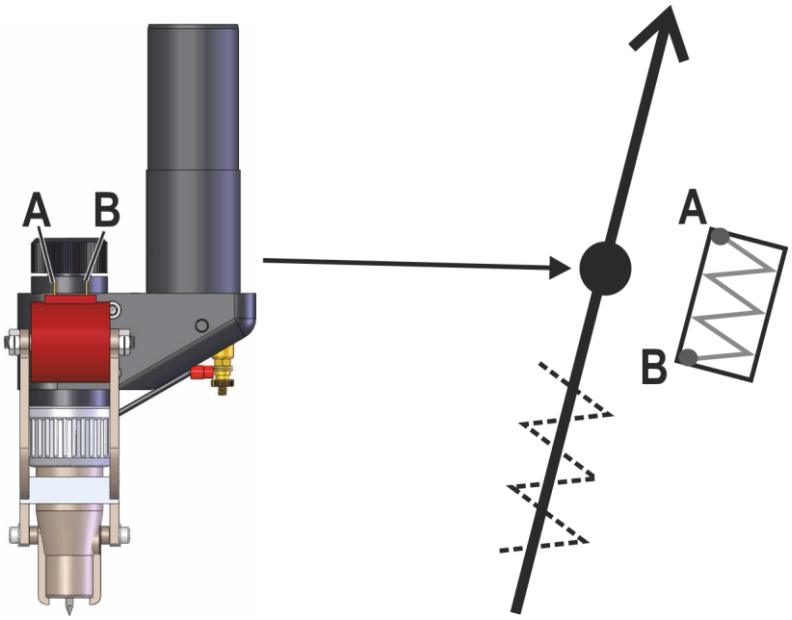
That can thus allow noticeably higher execution speeds. Further, an arc conditioned in this manner will be more stable, even when the tip of the electrode undergoes operating wear.

MAGNETIC NOZZLE ASSEMBLY

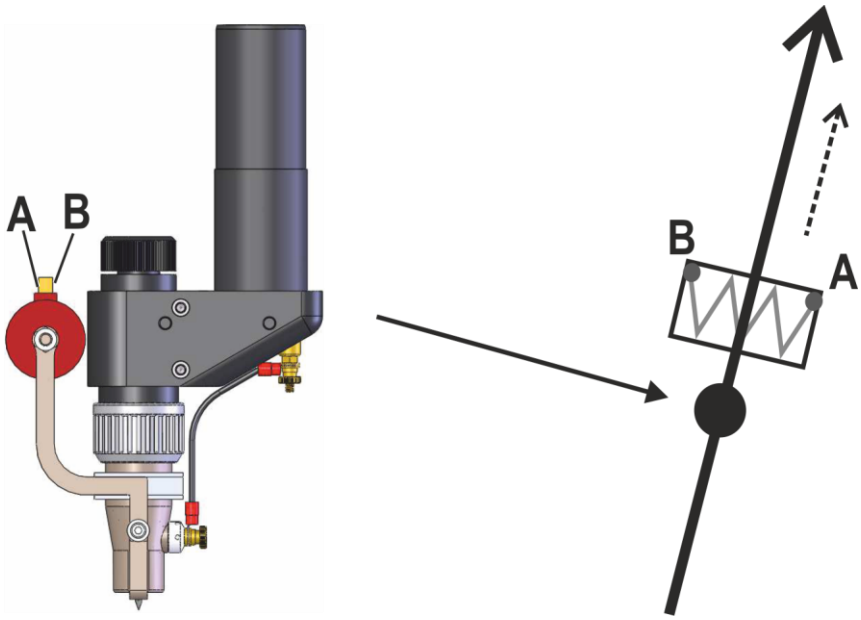


15	Nozzle with magnetic pole
16	Magnetic circuit
17	Coil

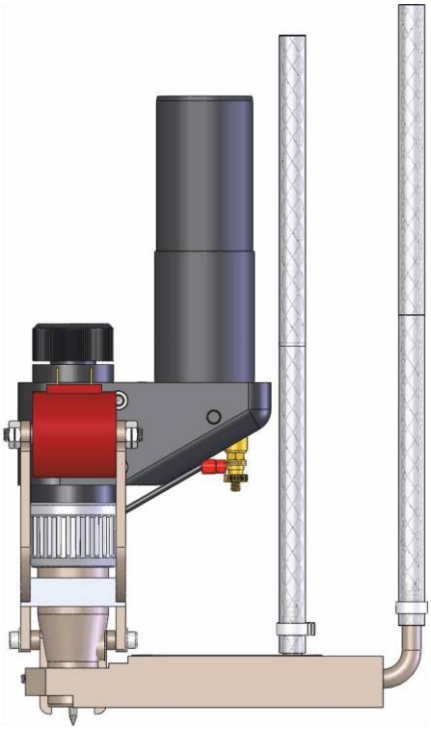
ASSEMBLY OF MAGNETIC CIRCUIT ON THE TORCH



Oscillation: The line of the poles is aligned with the line of the seam to weld.



Deviation: The line of the poles is perpendicular to the line of the seam to weld. Arc deviation must precede welding; otherwise, reverse the direction of flow of current in the inductor by reversing the two lugs **A** and **B**.

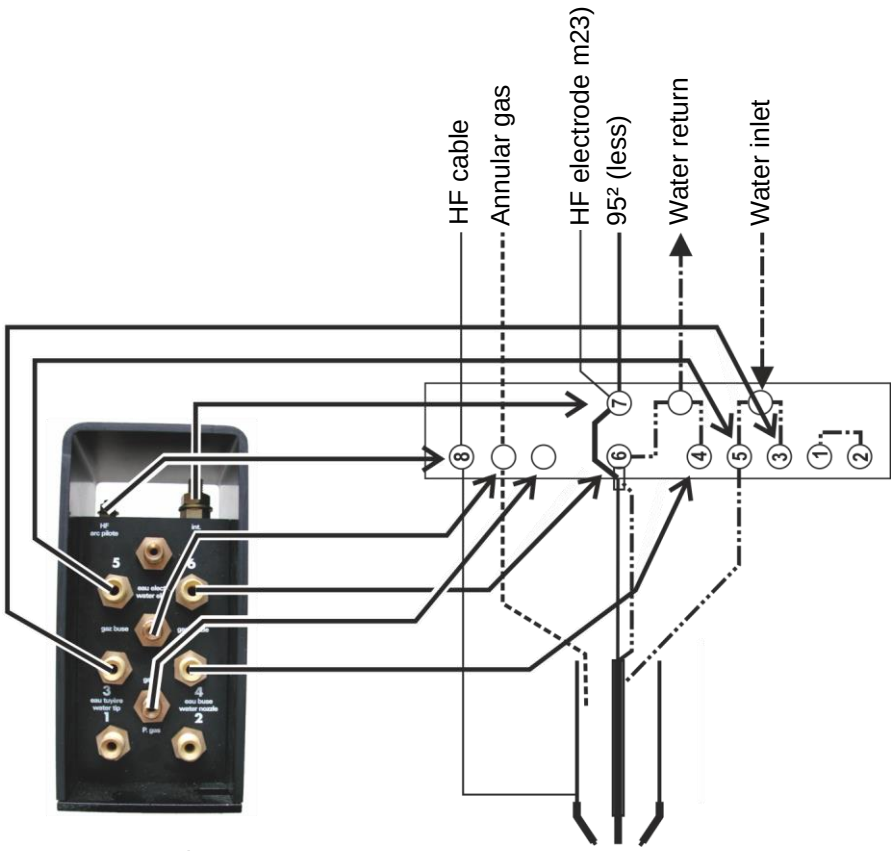


The poles integrated in the nozzle receive a magnetic circuit, which in turn receives the induction coil. This type of nozzle with poles is compatible with the optional trailing shield system. It only allows the magnetic oscillation position.

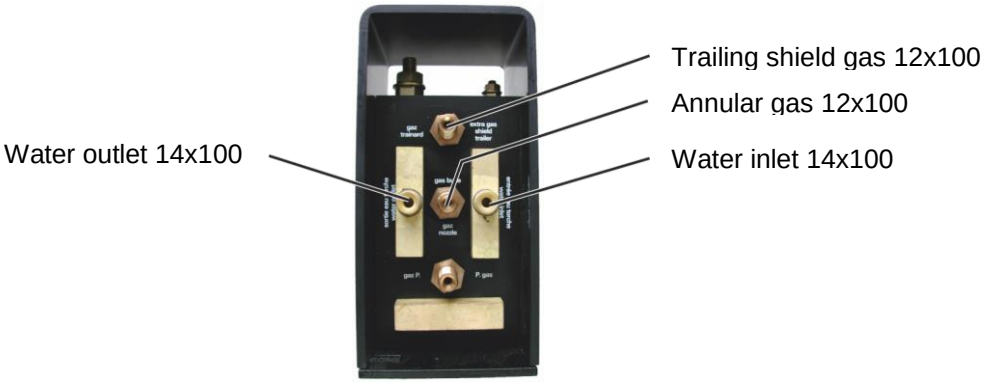
D - CONNECTION OF THE MEC4 TORCH

1 - CONNECTION OF MEC4 W000315606/W000315607

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



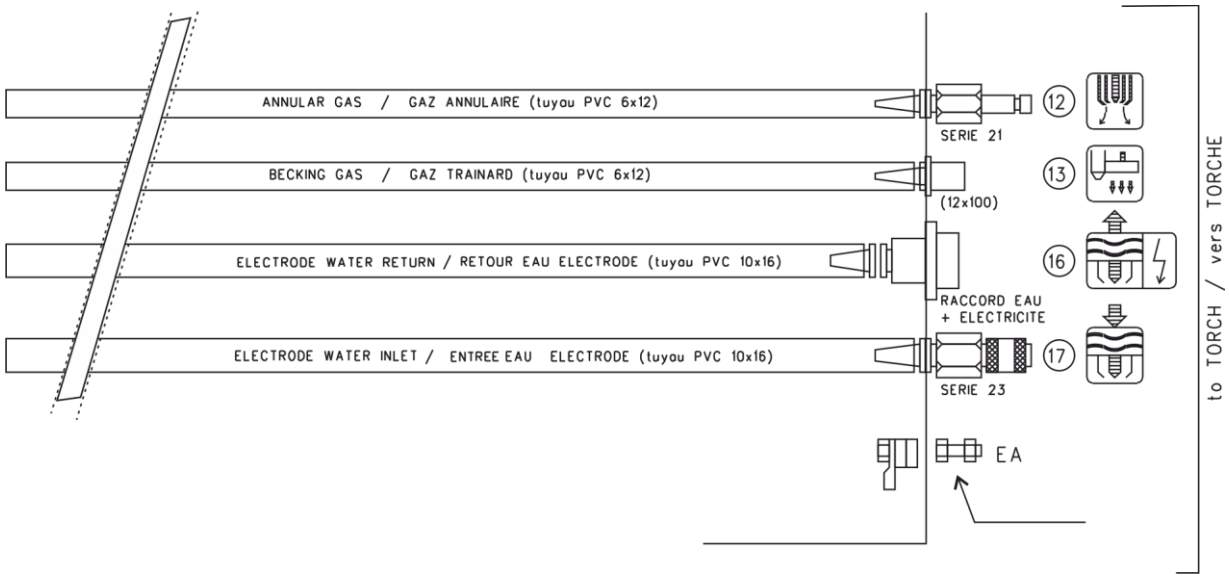
Near torch



Near bundle

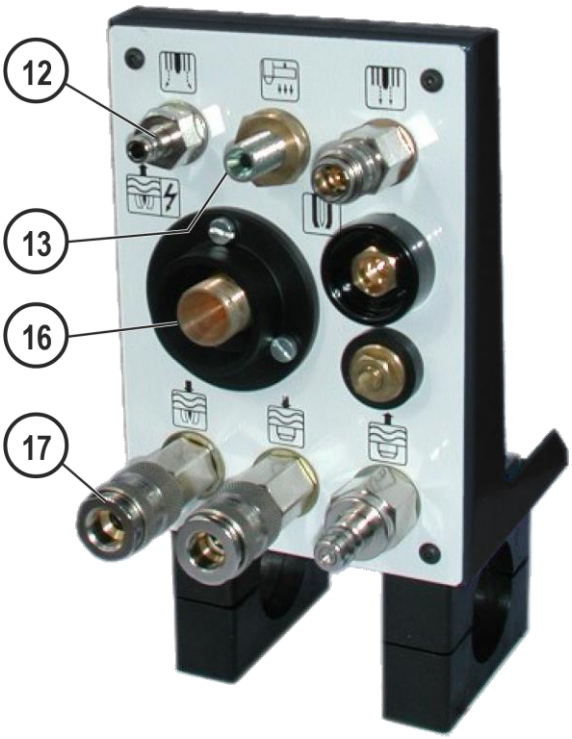
2 - CONNECTION OF MEC4 W000315611/W000315612

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



Case of a Quick Connector (QC) interface

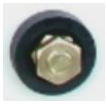
This connection is made through the unit **W000315574** for torches with **Quick Connectors**; it acts as the interface between the bundle of the torch and that of the equipment.



BRT 450

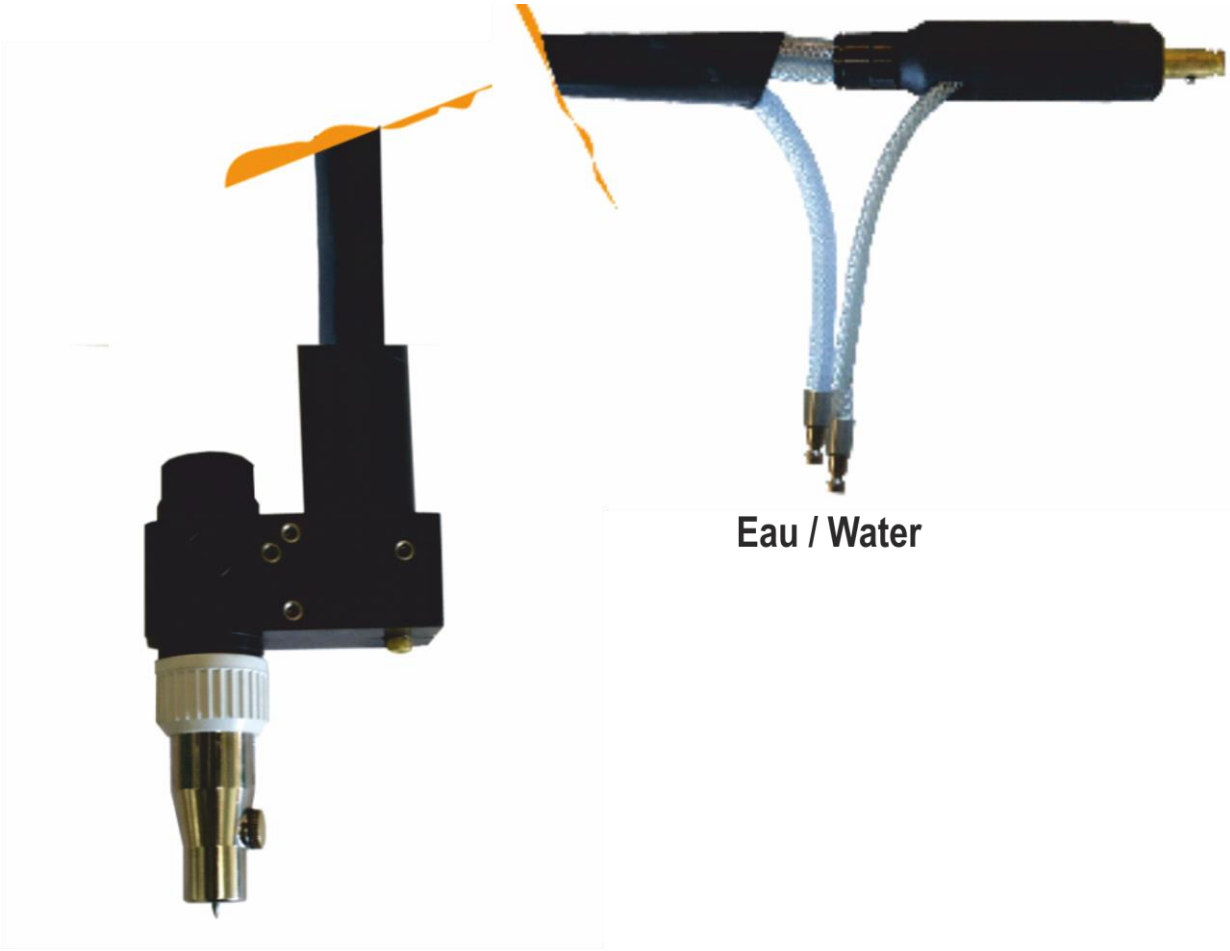
The **BRT 450** unit is used as part of a **NERTAMATIC 450** or **LINC-MASTER** installation.

Connection near the torch

12	Annular gas
13	Trailing shield gas
16	Electrode water outlet
17	Electrode water inlet
	HF connection

3 - CONNECTION OF MEC4 W000315610

This connection is made by a quarter-turn connection with annular gas. If the gas is separated near the power source, use the adapter **W000306140**.



E - MAINTENANCE

Before any work, stop the welding equipment

1 - SERVICING

The **MEC4** welding torch is the location of different phenomena that create the electric arc. For that, it is supplied with:

- electrical energy
- annular gas
- cooling water

through a bundle of pipes and cables.

COMMENTS:

- Assembly errors or the omission of parts would harm the life of the torch.
- While removing or assembling the parts making up the torch, handle the parts with care to avoid breaking, scratching or marking them.
- Always use original **LINCOLN ELECTRIC** parts.

BUNDLE:

- The bundle must be installed so that it is safe from mechanical, chemical and thermal damage.
- Monitor the condition of the sleeve covering the bundle.
- If it is defective, explore the condition of the various conduits that make up the bundle.
- Also check the cable to the piece (ground cable)
- Work for maintaining and repairing insulating sleeves, pipes and enclosures may not be carried out in a haphazard manner.
- Regularly check all the connections and make sure that the electrical connections are not heating.

REGULARLY CHECK:

- O-ring seals; if these are damaged, replace them, taking care not to scratch their housing.

REGULARLY CLEAN:

- the accessible parts of the torch body with a dry cloth. Any water drips must be dried before reassembly.

NB: The alumina cap must be screwed in and tightened by hand.

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

2 - TROUBLESHOOTING

FAULTS	REMEDIES
The arc blows while striking.	- Check the annular gas output - Check the level of current before and during welding
Strike difficulties	- Check the connection of the electrical cable to the piece (ground cable). - Check the electrode circuit - Check the auxiliary electrode circuit
The electrode is rapidly worn or destroyed.	- Increase the annular gas output - Check the post gas time - Check the cooling circuit. - Intensity too high for the electrode diameter.

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.)

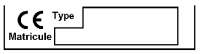
For items noted on the photos or sketches but not in the tables, send a copy of the page concerned, highlighting the particular mark.

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.



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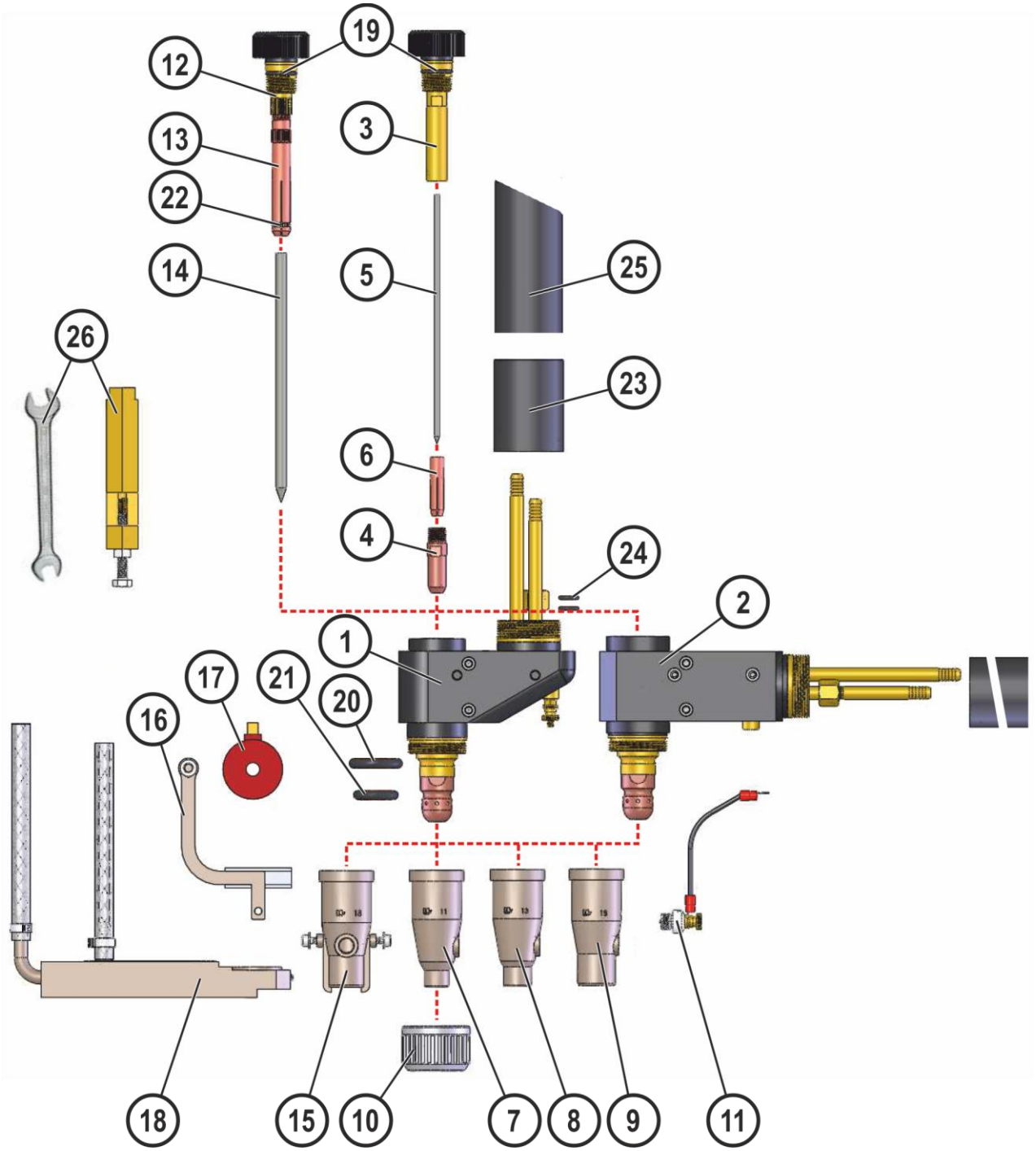
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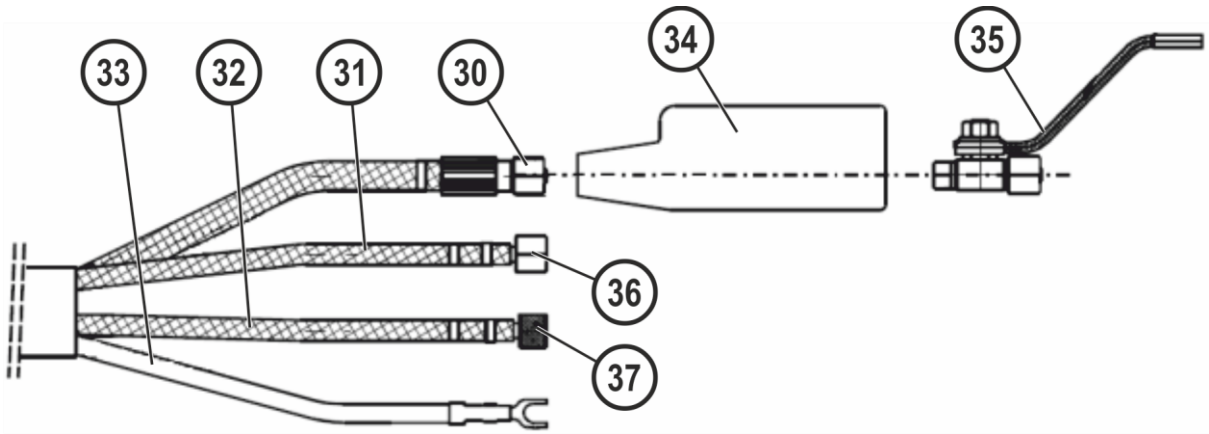
✔	normally in stock
✘	not in stock
	on request

Item	Ref.	Stock	Order	Designation
	W000315611	✔		**MEC4** 2m straight torch (quick connectors)
	W000315612	✔		**MEC4** 2m bent torch (quick connectors)
	W000315606	✔		**MEC4** 1m straight torch (screw-on connectors)
	W000315607	✔		**MEC4** 1m bent torch (screw-on connectors)
	W000315610	✔		**MEC4** 8m straight torch
1	S92579720	✔		**MEC4** straight torch body (+ 2 seals, 4.45 x 1.78)
2	S92579721	✘		**MEC4** bent torch body (+ 2 seals, 4.45 x 1.78)
3-4-19	S92579124	✔		Electrode clamp holder, Ø1.6 to 4.8mm
4	S91211125	✔		Electrode clamp seat
5	S03710651	✔		NERTAL 2% lanthanated electrode, Ø1.6mm
	S03710653	✔		NERTAL 2% lanthanated electrode, Ø2.4mm
	S03710655	✔		NERTAL 2% lanthanated electrode, Ø3.2mm
	S03710656	✔		NERTAL 2% lanthanated electrode, Ø4.0mm
	W000381291	✔		NERTAL 2% lanthanated electrode, Ø4.8mm
6	S91211124	✔		Electrode clamp, Ø1.6mm
	S91211115	✔		Electrode clamp, Ø2.4mm
	S91211116	✔		Electrode clamp, Ø3.2mm
	S91211117	✔		Electrode clamp, Ø4.0mm
	S91211118	✔		Electrode clamp, Ø4.8mm
7	S92579701	✔		**MEC4** nozzle, Ø11mm
8	S92579698	✔		**MEC4** nozzle, Ø13mm
9	S92579696	✔		**MEC4** nozzle, Ø18mm
10	S03710176	✔		**MEC4** nozzle clamping ring
11	W000315760	✔		Auxiliary strike electrode
12	S92579146	✔		Electrode clamp holder, Ø6.0 to 7.0mm
13	W000315631	✔		Electrode clamp, Ø6.0mm
	S92579144	✔		Electrode clamp, Ø6.4mm
	S92579145	✔		Electrode clamp, Ø7.0mm
14	S03710256	✔		Pure tungsten electrode, Ø6.0mm
15	W000315766	✔		**MEC4** nozzle, Ø18mm (magnetic poles)
16	W000315604	✔		**MEC4** magnetic circuit
17	S92572688	✔		Linear amp magnetic coil (**OSCILLARC**)
	S92572514	✔		Rotary transformer magnetic coil
18	W000315603	✔		**MEC4** trailing shield assembly (quick connectors)
	S91211128	✔		Set of seals and accessories for **MEC4**:
19				5 seals, 15.6x1.78, for part **3** and **12**
20				5 seals, 20x6, for part **1** and **2**
21	S92579747	✔		5 seals, 16x5.5, for part **1** and **2**
22				5 springs for part **13**
23	S92579711	✔		1 sleeve
24	S04081237	✔		5 seals for torch body 4.48x1.78
25	S92579628	✘		Plastic grouping sleeve
26	S92579350	✔		Electrode adjustment rod with 10 mm spanner

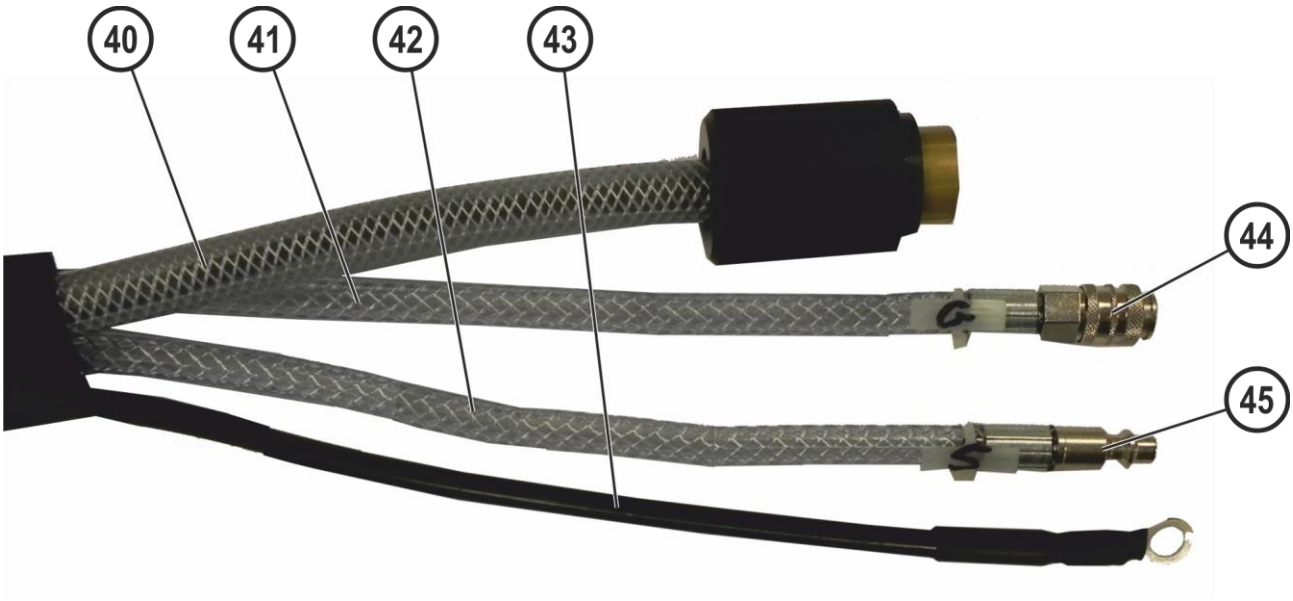
BUNDLE DETAILS FOR TORCH W000315606/W000315607/W000315610



✔	normally in stock
✘	not in stock
	on request

Item	Ref.	Stock	Order	Designation
30	S92579723	✔		Water/electricity conduit
31				Electrode water inlet conduit
32				Shield gas inlet conduit
33				HF cable
34	S04080936	✘		Water/electricity fitting protection
35				Water/electricity fitting
36	S07300001	✔		Olive
	S07301001	✔		Nut
37	W000352152	✔		Olive
	S33760211	✔		Nut
	W000147372	✔		Seal

BUNDLE DETAILS FOR TORCH W000315611/W000315612



✔	normally in stock
✘	not in stock
	on request

Item	Ref.	Stock	Order	Designation
40	W000235282	✔		Water/electricity conduit
41				Shield gas inlet conduit
42				Electrode water inlet conduit
43				HF cable
44				Serial coupler 21 9223 2106
45				Serial end piece 23 9085 2306

PERSONAL NOTES

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