

- Ⓛ Bedienungsanleitung
- Ⓛ Operating Instructions
- Ⓛ Instructions de service
- Ⓛ Gebruiksaanwijzing
- Ⓛ Instrucciones de uso



Invert 130/40
Invert 130/60



- | | | |
|---|-------------------|--|
| Ⓛ | Achtung! | Lesen Sie diese Anleitung vor der Installation und Inbetriebnahme aufmerksam durch. |
| Ⓛ | Attention! | Carefully read through these instructions prior to installation and commissioning. |
| Ⓛ | Attention! | Prière de lire attentivement la présente notice avant l'installation et la mise en service. |
| Ⓛ | Attentie! | Lees deze instructies voor de installatie en ingebruikname aandachtig door. |
| Ⓛ | ¡Atención! | Lea con detenimiento estas instrucciones antes de la instalación y de la puesta en servicio. |



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1 Technical Specifications

		Invert 130/40	Invert 130/60
Mains voltage:		1 ~ 230/240 V	1 ~ 230/240 V
Mains frequency:		50 - 60 Hz	50 - 60 Hz
Setting range:		100 V	100 V
Stromeinstellbereich:		5 - 130 A	5 - 130 A
Power input:	manual arc	4.5 kVA	4.85 kVA
	TIG	3.1 kVA	3.1 kVA
Operating voltage:	manual arc	20,2 - 25,2 V	20.2 - 25.2 V
	TIG	10,2 - 15,2 V	10.2 - 15.2 V
Max. current draw:		27 A	27 A
Mains fuse:		16 A time-lag	16 A time-lag
Duty cycle at max. output (25 °C/ 40 °C):	manual arc	130 A / 50 % / 35 %	130 A / 80 % / 55 %
	TIG	130 A / 40 % / 30 %	130 A / 60 % / 40 %
Operating modes:		manual arc/TIG	manual arc/TIG
Setting:		stepless	stepless
Suitable electrodes	manual arc	from 1.5 mm Ø	from 1.5 mm Ø
	TIG	for steel 0.3 mm and up	for steel 0.3 mm and up
Protection class:		IP 23 S	IP 23 S
Cooling:		F	F
Insulation class:		F	F
Temperature range:	operation	-10 °C - +40 °C	-10 °C - +40 °C
Dimensions (l x w x h):		255 x 110 x 210 mm	235 x 110 x 220 mm
Weight:		4.9 kg	4.9 kg
Operating conditions:		relative humidity 10-80 %	relative humidity 10-80 %

2 Scope of Application

The inverter welding machines are designed as a compact, easy to operate and field-safe unit. With it all metals (except aluminium) can be welded. Special consideration has been given to stick electrode welding capabilities, i.e. vertical-down welding. Due to its wide range of welding current setting the Invert 130 is very versatile, e.g. for sheet metal and steel welding. In addition there is the capability of TIG welding with scratch start. With this welding process steel, stainless steel and NF-metals (except aluminium) can be welded, e.g. thin plate welding or car body work.

Product Liability/Warranty




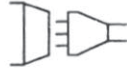

This product shall only be used as specified. Any other use requires the written consent of Metabo GmbH, Business Unit Elektra Beckum, P.O.Box 1352, D-49703 Meppen, Germany. Please contact your dealer for any warranty claims.

Warranty work will essentially be carried out by service centres authorised by us. Repairs beyond the warranty period may be carried out only by our authorised service centres.

Please preserve all repair invoices!

We reserve the right to make technical changes!

2.1 Information - Shown On Type Plate

a) Identification					
1) Manufacturer Address			Trademark		
2) Type			3) Serial number		
4) 			5) ISO / IEC 60974-1		
b) Welding output					
6) 		8) ~50 Hz		10) 15 A / 20,6 V to 160 A / 27 V	
7) 		9) $U_0 = 48 \text{ V}$		11) X	
		12) I_2		11a) 35 %	
		13) U_2		11b) 60 %	
				11c) 100 %	
				12a) 160 A	
				12b) 130 A	
				12c) 100 A	
				13a) 26 V	
				13b) 25 V	
				13c) 24 V	
c) Energy input					
14)  1 ~ 50 Hz		15) $U_1 = 230 \text{ V}$		16) $I_{1\text{max}} = 37 \text{ A}$	
				17) $I_{1\text{eff}} = 22 \text{ A}$	
22) IP23		23) 			

The following explanations refer to the numbered boxes shown in Figure 2.3 according to ISO/IEC 60974-1.

a) Identification

- Box 1 Name and address of the manufacturer or distributor or importer and, optionally, a trade mark and the country of origin, if required
- Box 2 Type (identification) as given by the manufacturer
- Box 3 Traceability of design and manufacturing data, e.g. serial number
- Box 4 Welding power source symbol (optional) e.g.



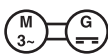
Single-phase transformer



Single- or three-phase transformer-rectifier



Single- or three-phase static frequency converter-transformer-rectifier

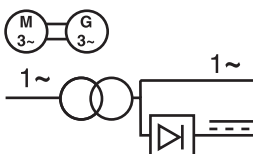


Three-phase motor-generator

Three-phase motor-generator-rectifier



Three-phase rotating frequency Converter



Single-phase combined a.c. and d.c. power source



Engine-a.c. generator



Engine-generator-rectifier

- Box 5 Reference to this Standard confirming that the welding power source complies with its requirements

b) Welding Output

Box 6 Welding process Symbol e.g.:



Manual metal arc welding with covered electrodes



Tungsten inert-gas welding



Metal inert and active gas welding including the use of flux cored wire



Selfshielded flux cored arc welding



Submerged arc welding



Symbol for plasma cutting



Symbol for plasma gouging

Box 7



Symbol for welding power sources which are suitable for supplying power to welding operations carried out in an environment with increased hazard of electric shock (if applicable).

Box 8

Welding current symbol e.g.:



Direct current



Alternating current, and additionally the rated frequency in hertz e.g.: ~50 Hz

Box 9

$U_0 \dots V$ Rated no-load voltage

a) Arithmetic mean value in case of direct current

b) RMS value in case of alternating current

c) $U_r \dots V$ Reduced rated no-load voltage in case of a voltage reducing device

d) $U_s \dots V$ Switched rated no-load voltage in case of an a.c. to d.c. switching device

Box 10

$\dots A / \dots V$ to $\dots A / \dots V$ Range of output, rated minimum and maximum welding current and their corresponding conventional load voltage.

Box 11

X Duty cycle (duty factor) symbol.

Box 12

I_2 Rated welding current symbol.

Box 13

U_2 Conventional load voltage symbol.

Boxes

11a, 11b, 11c ...% Values of the duty cycle (duty factor).

12a, 12b, 12c ... A Values of the rated welding current.

13a, 13b, 13c ... V Values of the conventional load voltage.

These boxes form a table with corresponding values of the three settings:

a) ... % duty cycle (duty factor) at the rated maximum welding current;

b) 60 % duty cycle (duty factor);

and

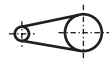
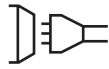
c) 100 % duty cycle (duty factor) as far as relevant.

Column a) need not be used if the duty cycle (duty factor) for the rated maximum welding current is 60 % or 100 %.

Column b) need not be used if the duty cycle (duty factor) at the rated maximum welding current is 100 %.

c) Energy input

Box 14 Energy input symbol e.g.:



Input supply, number of phases (e.g. 1 or 3), symbol for alternating current and the rated frequency (e.g. 50 Hz or 60 Hz)


Engine

Motor

Belt drive

Box	Electrically powered welding power sources	Box	Mechanically powered welding power sources
15	$U_1 \dots V$ Rated supply voltage	18	$n \dots \text{min}^{-1}$ Rated load speed
16	$I_{1\text{max}} \dots A$ Rated maximum supply current	19	$n_0 \dots \text{min}^{-1}$ Rated no-load speed
17	$I_{1\text{eff}} \dots A$ Maximum effective supply current	20	$n_i \dots \text{min}^{-1}$ Rated idle speed, if applicable
Boxes 15 to 17 form a Table with corresponding values.		21	$P_{1\text{max}} \dots \text{kW}$ Maximum power consumption, if applicable

Box 22 IP.. Degree of protection, e.g. IP21 or IP23.

Box 23  Symbol for protection class II, if applicable.

3 Commissioning

Caution:

This product is assembled with great care and thoroughly checked. All units undergo a computerised check before leaving the factory. Please check your machine for transport damage after unpacking. In case such damage is detected please notify your supplier immediately.

Ensure that mains voltage matches the machine's rated voltage as shown on its name plate. Connect to 230/240 V AC circuit. The supply circuit need to be protected by a 16 amp time-lag fuse. Operation of other electrical equipment on the same circuit while welding is limited.

Pure argon (of at least 99.998 % purity) is preferably used for TIG welding. Connection of the TIG torch to the gas cylinder must be by means of a suitable pressure reducing device (max. 10 bar). The earth cable must have a minimum lead cross section of 16 mm². After setting the main switch [1] to ON the machine is ready to operate.

4 Description

Controls

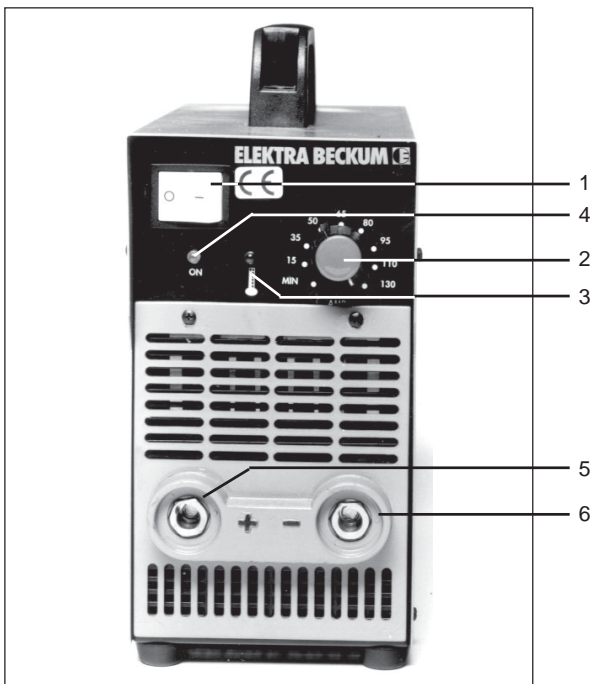


Figure 1: Front panel

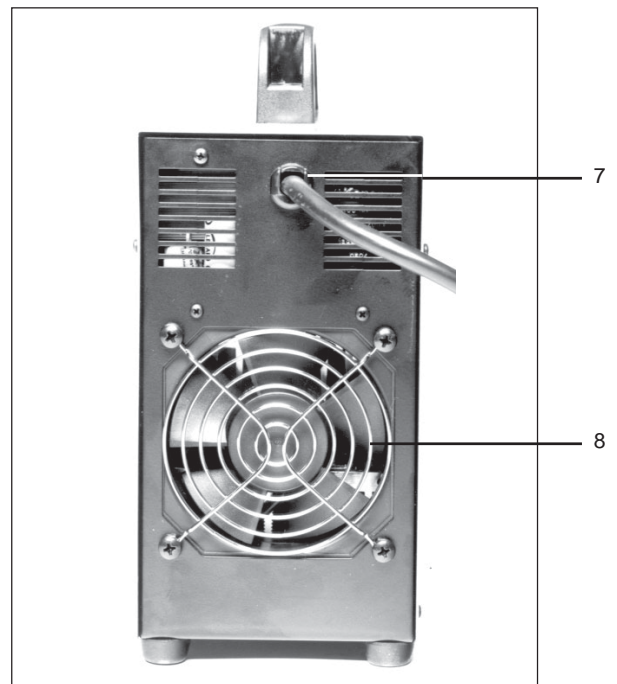


Figure 2: Rear view

- 1 Mains ON/OFF switch
- 2 Welding current setting 5 - 130 A; with integrated automatic hot start
- 3 Neon control light; indicates thermal overloads or short circuits
- 4 ON/OFF control light
- 5 Socket for positive (+) pole; electrode holder, TIG: earth cable
- 6 Socket for negative (-) pole; earth cable, TIG: torch
- 7 Power cable
- 8 Cooling fan

5 Operation

The welding machines Invert 130/40 and 130/60 are primary clocked inverters, suitable for manual arc welding with coated stick electrodes and for direct current TIG welding (optional).

The electrode diameter and the required welding current are selected according to the material to be welded.

Dust, dirt and metal chips will harm any welding machine. It is of particular importance that the air ventilation for cooling is not disabled.

Prior to welding the joints must be cleaned and dirt, rust, grease and paint removed. Also slag from previous welds must be completely removed.

Attach earth clamp firmly to work piece, assuring good metal to metal contact. Check that all cables and connectors are in proper operating condition to ensure proper current conduction.

Place the uncoated end of the electrode into a notch of the electrode holder. With the welding machine a welding accessory kit, consisting of welding visor and pick hammer, can be purchased. The tinted glass of the welding visor protects the eye from harmful rays (ultraviolet and infrared rays). The clear glass plate protects the dark glass from spatters and breakage. When removing slag it is strongly recommended to wear eye protection to prevent injury from sharp and hot slag particles. Depending on electrode type and eye sensitivity protective glasses are available in different shades. Normally protective glasses of shade DIN 9 are used for electrodes from 1.5 mm to 4 mm Ø.

Select the correct welding current as shown below:

Current (A)	Electrode Ø	Material Thickness
25 - 50	1.0 - 2.0 mm	1.0 - 2.0 mm
50 - 100	2.0 - 2.5 mm	2.0 - 4.0 mm
100 - 140	2.5 - 3.25 mm	4.0 - 8.0 mm
140 - 220	3.25 - 5.0 mm	8.0 - 12.0 mm

In principle do not use too thick an electrode.

As a general rule calculate **40 amps welding current per 1 mm of electrode core wire diameter**. Depending on electrode type, material thickness and weld position this calculated value may have to be adjusted plus or minus. The Invert 130/40 and 130/60 works perfectly with thin plate, which is the outstanding feature of this machine, aside from its extreme compact and robust design. It is characteristic of an inverter to generate a true direct current, which makes for a soft and smooth running arc with reduced spatter formation.

Overview Of Stick Electrodes And Their Correct Use

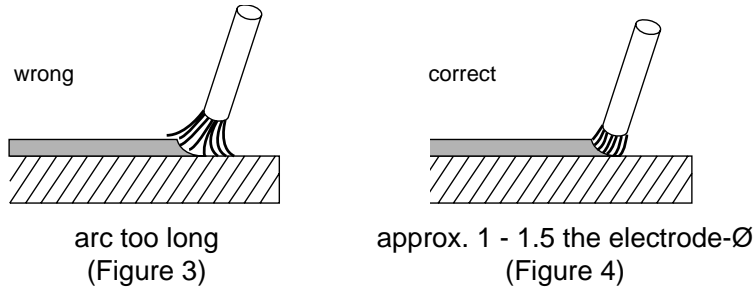
In order to achieve a good weld the electrode has to be dry, so storing in a dry place is essential. Should electrodes have become moist, dry in an oven at 200°C to 300°C for 1 - 2 hours.

Basic-coated electrodes **always** require pre-drying at 200°C to 300°C for 3 hours, unless they are vacuum-packed. Stick electrodes are coded according to EN 499 and other standards, such as B.S. 639, AWS-SFA 5.1 and ISO 2560. The codes are always shown on the electrode package. The electrode description is defined by the manufacturer according to the standards, the description is checked by an independent test institute for compliance. This information is shown on the packaging.

Welding Hints

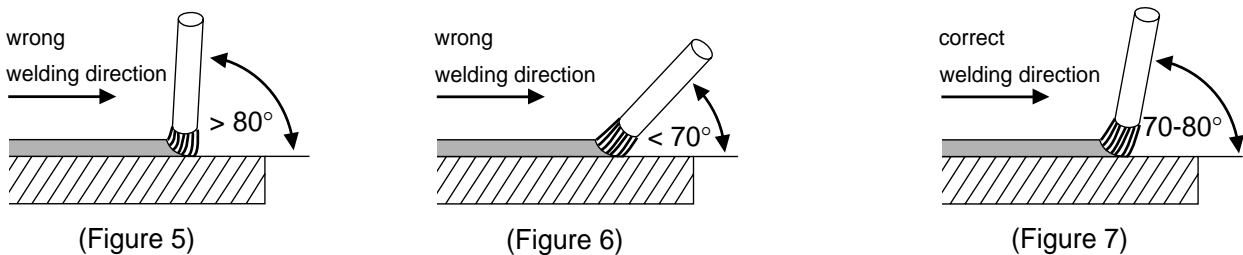
Because of the multitude of and great differences in the important points for welding only the very basic operations for the most common electrodes for low-carbon steels, the rutile or rutile cellulose electrode, are introduced here. In the case that other electrodes have to be used, the electrode manufacturers supply upon request all relevant information for the type of special electrode to be used.

Always make some trial welds on scrap material. Select electrode diameter and welding current as per Table 1. Attach earth clamp to work piece and place electrode into electrode holder as described earlier. Now hold the electrode tip approx. 2 cm above the starting point of your weld seam. Hold the welding visor in front of your face and draw the electrode with a short stroke along the groove. Through the welding shield you watch the arc, keeping it to a length of 1 to 1.5 times the electrode diameter.



The correct arc length is important for a good weld, because with too short or too long an arc both welding current and working voltage change. A low working voltage causes insufficient penetration. Too high or too low welding current gives a poor welding seam. Too long an arc does not sufficiently melt the parent material, resulting in high spatter losses. Also the air, with its detrimental substances like hydrogen and nitrogen, may get access to the weld pool.

For a good weld the work angle of the electrode (or electrode inclination angle) is of substantial importance. The inclination should be 70° - 80° to the welding direction. With the work angle too steep slag will run under the weld pool, too flat an work angle causes the arc to spatter, in both cases the result is a porous, weak welding seam (see figure 5 - 7).



The welder has to keep the arc at the same length, that is the electrode burn-off is compensated by feeding the electrode into the weld. At the same time the welder has to watch the weld pool for even penetration and width.

Welding is always done from left to right (backhand welding).

At the end of the welding seam the electrode can not simply be lifted or pulled from the weld, this creates porous end craters, which weaken the weld. To correctly terminate a weld the electrode is held for a short moment at the end of the weld seam, then lifted in an arc over the just laid weld.



Remove slag only after it has cooled down and is no longer glowing.

If an interrupted weld is to be continued, the slag at the end of the already finished weld must be removed. Then the arc can be started either in the groove or on the weld, as described earlier, and then moved to the end of the weld, which has to be thoroughly melted for good fusion. Welding is then continued normally.

6 TIG Welding (optional)

Due to the same welding characteristics as with manual arc welding, TIG welding is possible with models Invert 130/40 and 130/60.

For TIG welding a TIG torch model SR 17 V (see section 11) is used, which is always connected to the negative (-) pole. The arc is started by scratching with the tungsten electrode on the workpiece (causing a short-circuit). The shielding gas is supplied directly from the pressure reducing device of the gas cylinder to the torch. A gas flow rate of 6-7 l/min is recommended. Pure argon is required as shielding gas.

The earth lead is connected to socket [4]. The welding current is selected with the potentiometer [2], then the arc is ignited by a brief contact of the tungsten electrode with the workpiece (scratch start).

6.1 Practical Hints for Operation

To ensure good arc starting and good welding results the following should be adhered to:

- ① Electrode types
Only thoriated electrodes are recommended for use, e.g.
WT 20 1.8 - 2.2 % thorium oxide, colour code: red or grey
- ② Electrode diameter
The electrode diameter must correspond to the welding current.
Rule of thumb: less than 80 A Ø 1.0 mm
 70 to 140 A Ø 1.6 mm
- ③ Tungsten electrodes have to be ground in longitudinal direction. Use a fine grit grinding wheel and grind from tip to shaft.
- ④ Too much gas flow can reduced the arc starting ability (arc extinguished by blowing).

7 Overloads

The inverter welding machines are positively protected against overloads by several independent protection devices. If the permissible duty cycle is exceeded, the machine is shut down automatically. This is indicated by the control light [3]. After a short cooldown period the machine is operational again.

Important: Do not switch the machine off during the cooldown period, as this will cut the power to the fan, considerably extending the cooldown period.

8 Trouble Shooting

When welding the control light [3] comes on and the welding current goes off.	Thermal overload protection has engaged. Let machine run idle for several minutes to let cool down.
It is difficult to keep the arc burning.	If the electrode is not moist, damaged or has been stored too long, there may be a voltage drop (less than 190 V at full load), probably caused by too long and extension cord.
Machine switched on but no welding current.	<ul style="list-style-type: none">- check mains fuse- voltage too high (over 250 V), which triggers the corresponding protection device
Poor arc starting with TIG welding	<ul style="list-style-type: none">- insufficient or no gas supply- tungsten electrode wrongly ground- wrong electrode diameter- workpiece surface not clean (oil, grease)
Porous welding seam	<ul style="list-style-type: none">- wrong setting of shielding gas flow rate (too much or too little)- wrong shielding gas (pure argon only)- impurities in shielding gas- wrong position of TIG torch

9 Safety Precautions/Accident Prevention

- This Welding Machine should only be used for its intended application (TIG and manual arc welding).
- Operate machine only on power supply circuits having a fully operational protective bonding circuit (earth/ground lead).
- Know and adhere to all applicable local safety standards and codes.

9.1 Protection against the Risk of Electric Shock

The earth cable is to be firmly attached to the workpiece, ensuring good conduction. Protect welding cables and the power cable from damage. Replace damaged cables with genuine Elektra Beckum replacement parts. Place torch or electrode holder on insulated backing during short work breaks. For longer work breaks switch machine off. Wear dry and insulating gloves and shoes when welding. Always disconnect machine from power by pulling the power cable's plug from the outlet before servicing.

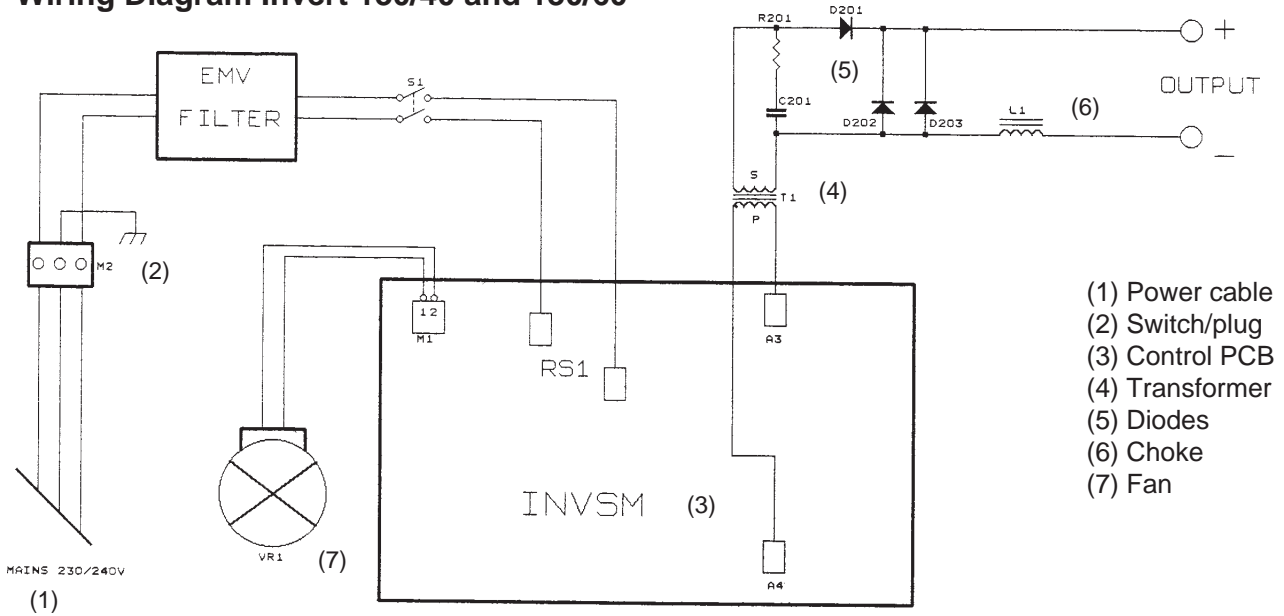
Protection against UV Rays, Burns and Fumes:

- Wear suitable protective clothing to prevent burns (sleeved gloves, welding apron etc.).
- Always use a welding visor.
- Screen off workplace to protect other persons working nearby against UV rays.
- Welding materials with contaminated surfaces may generate toxic fumes. Ensure surface is clean before welding.
- Zinc-plated or galvanized material should not be welded as zinc fumes are highly toxic.
- When welding under an increased electrical hazard it is important to wear undamaged, dry and insulating clothing.

Fire Prevention

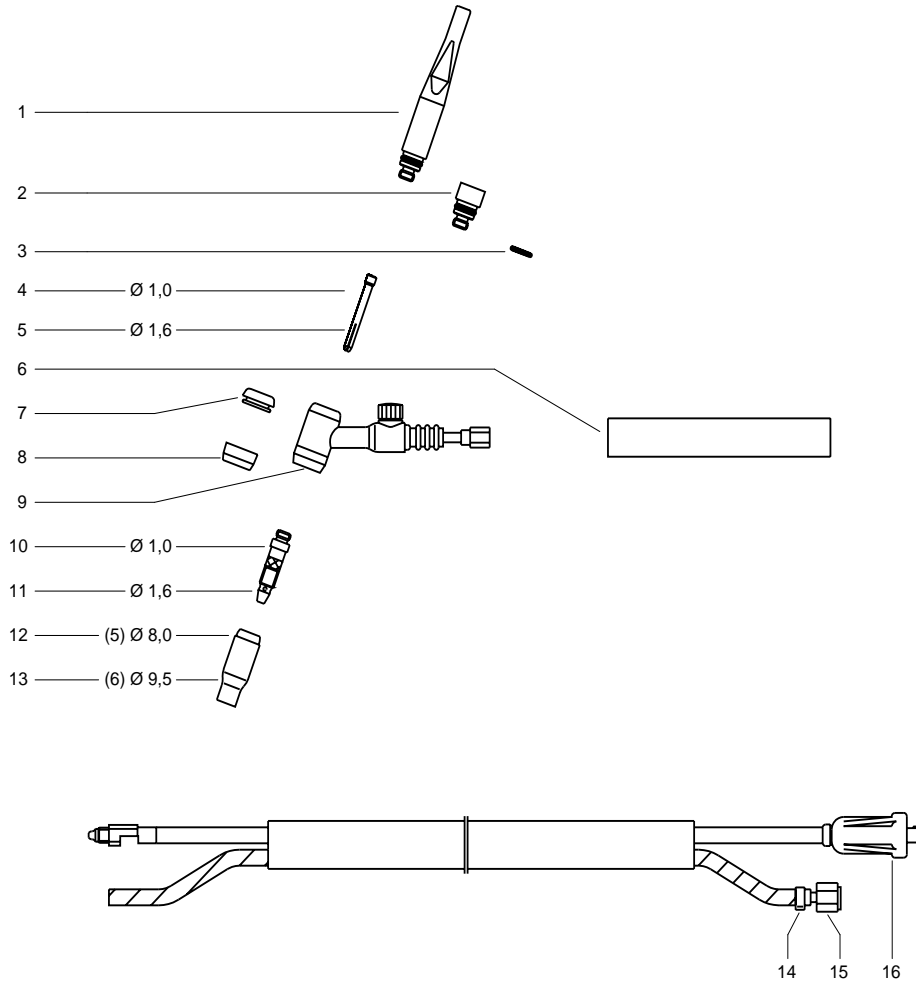
- Hot slag or sparks can cause fire when getting in contact with combustible solids, liquids and gases.
- Remove all combustible and inflammable material from the work area.
- Fuel, lubricant and solvent containers must not be welded, even when they are empty. The same applies to hollow spaces containing or having contained combustible materials.

10 Wiring Diagram Invert 130/40 and 130/60



- (1) Power cable
- (2) Switch/plug
- (3) Control PCB
- (4) Transformer
- (5) Diodes
- (6) Choke
- (7) Fan

11 Exploded View Drawing and Spare Parts List TIG-Torch SR 17 V



1	132 712 7230
2	132 712 7248
3	132 712 7892
4	132 712 7078
5	132 712 7086
6	132 766 9202
7	132 766 9199
8	132 712 7256
9	132 717 1174

10	132 712 7132
11	132 712 7140
12	132 712 7876
13	132 712 7175
14	132 766 9148
15	132 766 9180
16	821 503 7887

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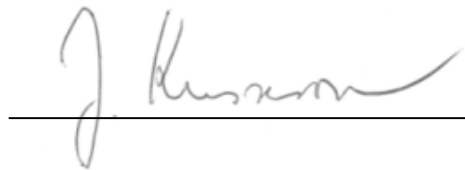
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INVERT 130/40

* EN 60974-1, EN 50199

** 89/ 336/ EWG, 72/ 23/ EWG, 93/68/ EWG



Jürgen Kusserow

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