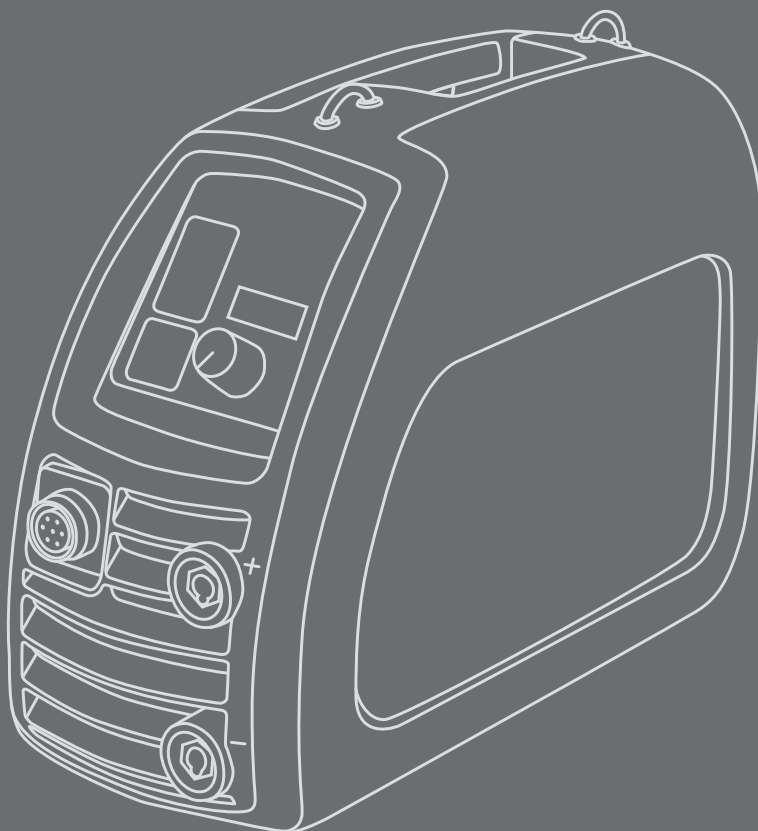


Minarc

Evo 180



OPERATING MANUAL

English

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1. PREFACE

1.1 General

Congratulations on choosing Minarc Evo welding equipment. Used correctly, Kemppi products can significantly increase the productivity of your welding, and provide years of economical service.

This operating manual contains important information on the use, maintenance and safety of your Kemppi product. The technical specifications of the equipment can be found at the end of the manual.

Please read the manual carefully before using the equipment for the first time. For your own safety and that of your working environment, pay particular attention to the safety instructions in the manual.

Read also the separate Kemppi Safety Instructions booklet delivered in the product package. Pay particular attention to the risks associated with fire and explosion.

For more information on Kemppi products, contact Kemppi Oy, consult an authorised Kemppi dealer, or visit the Kemppi web site at www.kemppi.com.

For Kemppi's standard safety instructions and warranty terms and conditions, please visit our web site at www.kemppi.com.

The specifications presented in this manual are subject to change without prior notice.

NOTE! Items in the manual that require particular attention in order to minimise damage and personal harm are indicated with this symbol. Read these sections carefully and follow their instructions.

Disclaimer

While every effort has been made to ensure that the information contained in this guide is accurate and complete, no liability can be accepted for any errors or omissions. Kemppi reserves the right to change the specification of the product described at any time without prior notice. Do not copy, record, reproduce or transmit the contents of this guide without prior permission from Kemppi.

1.2 Product introduction

Minarc Evo 180 is an easy-to-use welding machine for MMA (stick welding). It is suitable for professional use in metal industry, work sites and repair welding. Before use or doing any maintenance work on the machine, read the operating manual and keep it for further reference.

A separate voltage reduction device (VRD) model is also available. Minarc Evo 180VRD includes VRD for maintaining the open-circuit voltage (OCD) at 30 volts. With AU models (Australia, New Zealand) VRD for maintaining the open-circuit voltage at 12 volts is always included.

Minarc Evo 180 tolerates fluctuations in input voltage, and it is suitable for on-site work using power generators and long power cables. The power source utilises PFC technology to ensure optimum usage on a single phase power supplies. IGBT inverter design delivers reliable arc ignition and welding performance with all electrode types.

Welding and earth return cables are supplied in the delivery package, including electrode holder, earth clamps and connections.

Minarc Evo can also be used for basic TIG welding, where the TIG arc is started by the lift arc ignition technique. Order numbers for the additional equipment required for TIG welding and for the remote current control devices can be found in section 5 "Ordering codes".

2. BEFORE YOU START USING THE UNIT

NOTE! Please read the separate safety instruction booklet provided before you commence welding. Pay particular attention to the risks associated with fire and explosion.

2.1 Unpacking

Always before using the equipment, make sure it was not damaged during transportation. Also check that you have received what you ordered and that instructions are included. The packaging material of the products is suitable for recycling.

Transportation

The machine should be transported in an upright position.

NOTE! Always move the welding machine by lifting it from the handle. Never pull it from the welding cable or other cables.

Environment

The machine is suitable for both indoor and outdoor use, but it should be protected from rain and sunshine. Store the machine in a dry and clean environment and protect it from sand and dust during use and storage. The recommended operating temperature range is $-20 \dots +40$ °C. Place the machine in such a way that it does not come in contact with hot surfaces, sparks and spatters. Make sure the air flow in the machine is unrestricted.

2.2 Positioning and location of the machine

Place the machine on a firm, dry and level surface. Where possible, do not allow dust or other impurities to enter the machines cooling air flow. Preferably site the machine above floor level.

Notes for positioning the machine

- The surface inclination should not exceed 15 degrees.
- Ensure the free circulation of the cooling air. There must be at least 20 cm of free space around the machine for cooling air to circulate.
- Protect the machine against heavy rain and direct sunshine.

NOTE! Do not operate the machine in rain. The protection class of the machine is IP23S, which allows for outside preserving and storage only.

NOTE! Never use a wet welding machine.

NOTE! Never aim metallic grinding spray or sparks towards the equipment.

2.3 Distribution network

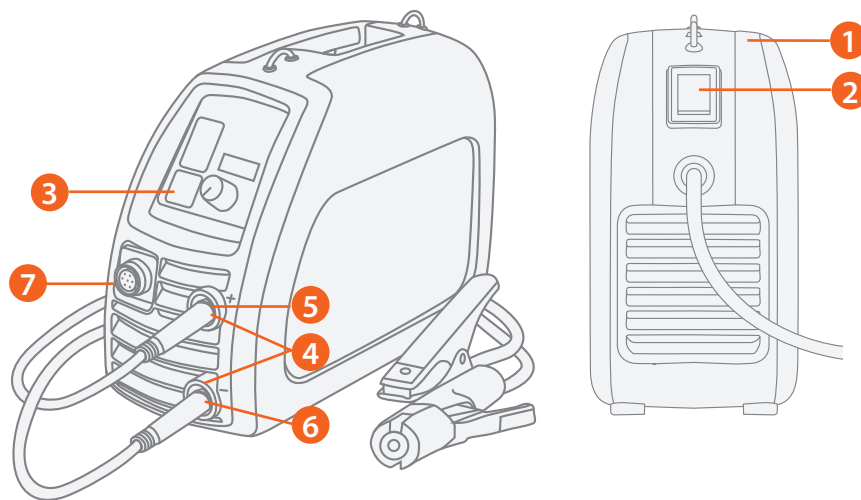
All regular electrical devices without special circuits generate harmonic currents into distribution network. High rates of harmonic current may cause losses and disturbance to some equipment.

Minarc Evo 180 comply with IEC 61000-3-12.

2.4 Serial number

The serial number of the unit is marked on the rating plate. The serial number makes it possible to trace product manufacturing series. You might need the serial number when placing spare parts orders or when planning maintenance.

2.5 General view of the machine



1. Machine case
2. ON/OFF power switch
3. Welding current display
4. Positive and negative welding circuit connection sockets
5. Electrode holder and welding cable
6. Earth return cable and clamp
7. Connection socket for remote control of welding current

2.6 Cable connections

Connection to the mains

The machine is equipped with a 3 m long supply voltage cable and plug. Connect the supply voltage cable to the mains. The mains supply cable and electrical plug are already installed to the machine. Should you need to fit an alternative plug type, ensure installation is completed by an authorised electrician.

If you use an extension cable, its cross-sectional area should be at least as large as the machines supply cable ($3 \times 1.5 \text{ mm}^2$). It is recommended to use $3 \times 2.5 \text{ mm}^2$ extension cable. The maximum length for the extension cable is 100 meters.

The machine can also be used with a generator. The minimum power for the generator is 5.5 kVA, and the recommended power 8.5 kVA in order for the machine to be used at maximum capacity.

Electrode holder

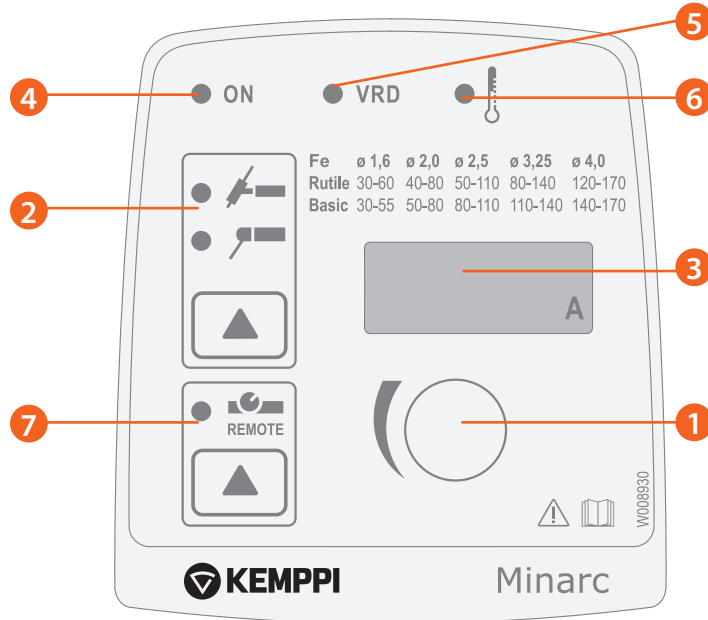
Connect the welding cable to the power source. Normally, the welding cable with electrode holder is connected to the positive terminal (electrode +).

Earth return

Connect the earth return cable to the power source. Normally, the earth return cable and clamp is connected to the negative terminal (-). Clean the workpiece surface and fix the earth return cable clamp to the work piece in order to create a welding circuit.

2.7 Operating functions

1. Welding current adjustment knob
2. Welding process selection button
3. Welding current meter display
4. Machine 'ON' green light
5. VRD SAFE light. Solid green VRD safe 'ON'. Solid red if VRD failure.
6. Overheating indicator
7. Remote control ON/OFF button



Main switch and 'ON' indicator

When you turn the main switch to position I, the machine 'ON' indicator light (item 4) is illuminated and the unit is ready for welding. The indicator light is always on when the unit is connected to the mains and the main switch is in position I. In normal conditions the machine panel 'ON' lights status is solid green. But if the machine is locked down, the light status is flashing and the machine will not weld. The machine should be reset via the main switch. If the light continues to flash, contact your KempPpi service shop.

NOTE! Always start and stop the machine from the main switch, never use the plug as a switch!

Indicator 'VRD safe ON'

Minarc Evo VRD models reduce the open circuit voltage (OCV) at a low level. At switch on, the VRD indicator light (item 5) is solid green, indicating normal VRD safe limits. If VRD limits are exceeded the machine switches to 'LOCK DOWN' state and the VRD safe light changes colour to solid 'RED'. Welding is prevented and the main 'ON' panel light is also flashing. The machine should be reset via the main switch. If the machine locked status continues, contact your KempPpi service shop.

Welding process selector, MMA/TIG

This switch is used for selecting either MMA or TIG welding mode, depending on the welding process chosen.

Regulating welding current

The welding current level is regulated via a stepless adjustment knob. Set the welding current level according to the target weld piece, position and electrode type and size.

Overheating indicator

The thermostatic temperature switch may become active during heavy welding or high ambient temperatures. This is indicated by a yellow indicator light. The power source fan will cool the unit and after the indicator goes off, the unit is again ready for welding.

Local and remote control

The welding machine can be controlled with a remote control device. Select remote control by pressing the Remote control ON/OFF button.

Details of available remote current control devices can be found in the Ordering codes section later in this manual.

3. USE

***NOTE!** Welding fumes may be dangerous to your health. Ensure that there is ample ventilation during welding! Never look at the arc without a face shield specifically designed for arc welding! Protect yourself and your surrounding area from the arc and hot welding spatter!*

3.1 Prepare to weld

***NOTE!** Always wear protective clothing, gloves, face and eye shields suitable for welding. It is recommended that you make practice welds before you commence welding your main work piece. If when igniting the arc or during welding, the electrode sticks or freezes to the work piece, note that it will quickly heat up, and may start to glow red hot. To release the electrode, twist the electrode holder away from the work piece and start again. If this fails, switch off the machine at the main switch and then release the electrode after it has cooled down. Note: the electrode and work piece will be very hot.*

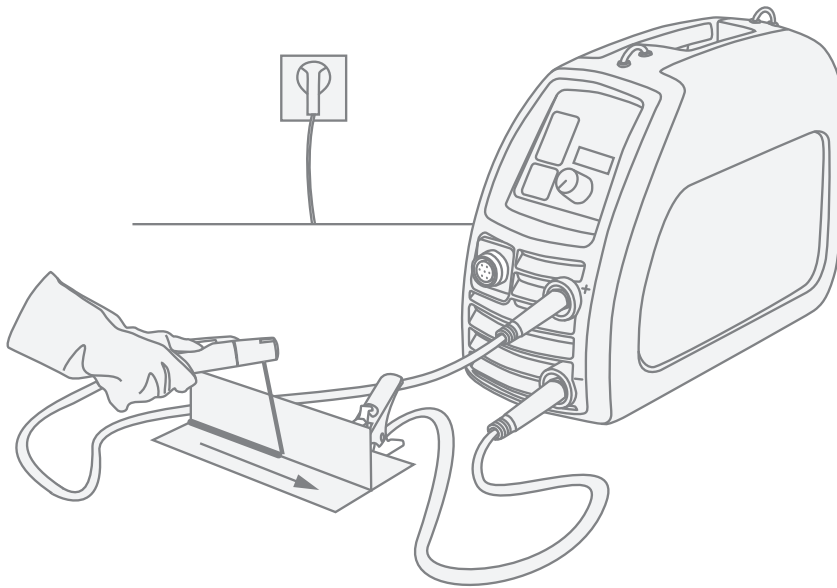
You can start welding after you have made the necessary preparation described throughout these instructions.

In addition to the welding machine, welding outcome is influenced by the work piece type, welding position and the welding environment. Therefore, recommendations in this manual must be followed.

During welding, an electric current is flowing through the cable, clamp and electrode to the workpiece.

The earth return cable attached to the workpiece guides the current back to the machine, forming the closed welding circuit. Unrestricted current flow is only possible when the earth return clamp is properly attached to the workpiece and the fixing point of the clamp is clean, free from paint and rust.

3.2 MMA welding



In manual metal arc (MMA) welding, the filler material is melted from the electrode to the weld pool. The rate of welding current is selected on the basis of the electrode size and welding position. The arc forms between the electrode tip and work piece. The melting electrode coating forms a gas and slag shield, which protects the molten metal in transfer to the weld pool and during solidification. As the slag solidifies over the hot weld metal, it prevents weld metal oxidation. This slag coating is removed after welding e.g. with a chipping hammer. When removing the slag coating, ensure you protect your eyes and face with suitable equipment.

For more info, visit www.kemppi.com > Welding ABC.

3.2.1 Filler materials and equipment

Minarc Evo 180 can be used with all electrode types suitable for DC welding. Electrode sizes for the unit are listed in Technical data section later in this manual.

1. Follow the welding specifications given on the electrode package.
2. Before you start welding, check that you have selected the correct welding process.
3. Check that the welding cable and earth cable connections are hand tight. If a cable connection is loose, it will result in a decrease of welding performance, overheating of the connection, and it may affect your product warranty cover.
4. Select and mount the correct electrode type firmly in holder.

3.2.2 Earth return cable and clamp

If possible, always fix the earth return cable and clamp directly to the welding work piece.

1. Clean the connection surface of earth clamp from paint, dirt and rust.
2. Connect the clamp carefully so that contact surface is as large as possible.
3. Finally check that the clamp remains fastened.

3.2.3 Manual metal arc welding (MMA)

Select your required welding parameters according to the manufacturer's filler material recommendations and the joint to be welded.

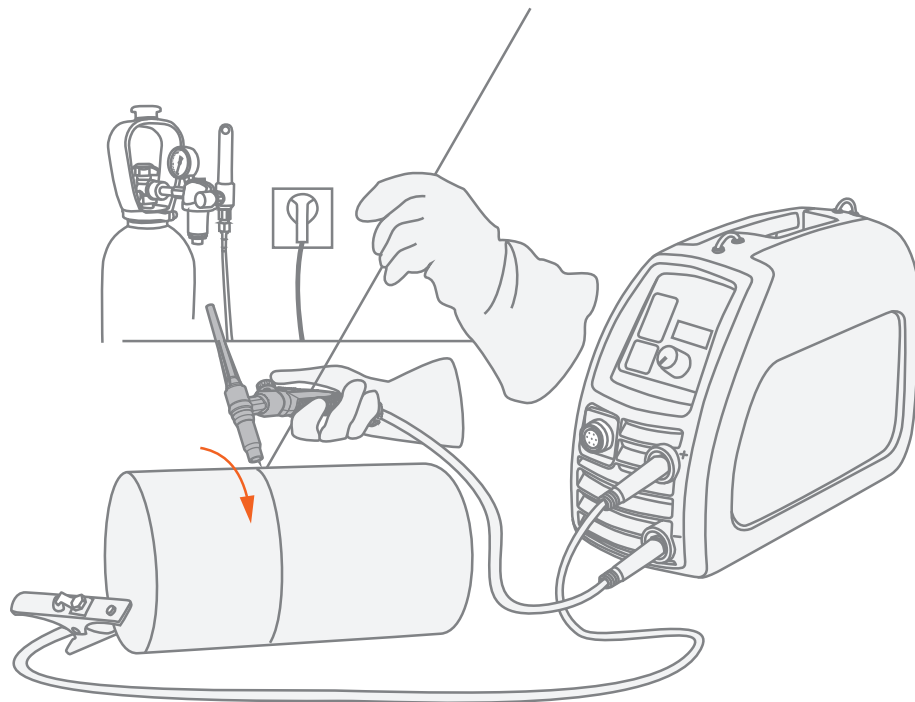
1. Select the required polarity (+ or -) of welding current cable (normally +) and return current cable (normally -) according to the filler material manufacturers recommendations.
2. Select MMA welding mode by pressing the process selection button on the control panel.
3. Select a suitable welding current by adjusting the current adjustment knob.
4. Make a small test weld to check the selections made.

Site your equipment in a suitable location, ensuring there is adequate cable length to complete the weld pass. Before you start welding, ensure you are comfortably positioned in front of the work piece, and that you are well balanced with your weight equally distributed. Ensure that the power source current setting is correct for the electrode size selected. Draw the welding face shield over your eyes. (Electronic welding face shields like Kemppi BETA 90X, allow you to see the welding start point more accurately and better concentrate on the welding process. This reduces the possibility of arc flash). Ensure others in the welding area are aware that you're going to weld. To establish the arc, scratch the electrode on the surface of the work piece.

As the arc starts to burn you will see a bright molten material form, this is molten slag, formed from the electrode coating and the darker coloured material is the molten weld metal itself, formed from the melting core wire. Hold the electrode at an angle of approximately 75–85 degrees from the horizontal, leaning away from the weld itself. Hold this position, maintaining a 3 mm distance from electrode tip to work surface. As the electrode burns, this arc length distance needs constant maintenance throughout the welding cycle. Slowly travel the electrode away from the deposited weld pool material, maintaining a constant travel speed. Your completed weld bead should be straight and of even width and bead height, consistent in its appearance. Travel too slowly and the weld pool will get too big and may burn through the weld piece, too fast and the resulting weld will be too small and may have slag entrapments and/or poor strength. After welding, the solidified slag on the weld surface should easily remove with a chipping hammer. Ensure you wear eye and face protection when removing the slag from the weld surface.

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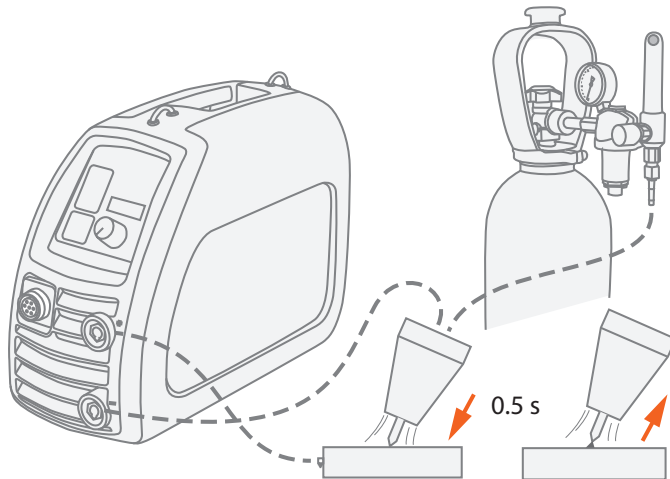
3.3 TIG welding



Minarc Evo 180 can also be used for basic TIG welding and remote current control. The TIG arc is started by the touch and lift ignition technique. Order numbers for the additional equipment required for TIG welding and/or remote current control devices can be found in Ordering codes section later in this manual. Ensure you select TIG process on the Minarc Evo 180 control panel before you commence welding.

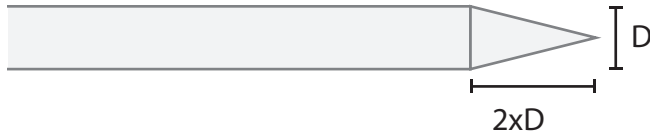
The TIG process forms an arc between the tungsten electrode and the work piece. The arc melts the work piece forming a molten weld pool. The arc and tungsten electrode mounted in the TIG torch are shielded by an inert shielding gas that is connected to, and flows through, the nozzle of the TIG torch. The gas required is argon and the flow rate is approximately 8 to 10 litres per minute. If necessary, suitable filler material is added to the weld pool to complete the

weld joint. Filler wire is fed into the weld pool from the outside of the arc and gas shield. The filler wire and the welding current level are decided according to the base material type and thickness, joint form and welding position.



NOTE! Ensure you protect your eyes and face with suitable equipment.

NOTE! The tungsten electrode tip should be sharpened as described.



3.3.1 DC TIG welding

Select your required welding parameters according to the joint to be welded.

1. Connect TIG torch to the negative (-) pole of the power source, and earth cable to positive (+) pole.
2. Select TIG welding mode by pressing the process selection button on the control panel.
3. Select a suitable welding current by adjusting the current adjustment knob.
4. Ensure your argon shielding gas supply is switched on and the flow rate is approximately 8 to 10 litres per minute.
5. Make a small test weld to check the selections made.

3.3.2 Earth return cable and clamp

If possible, always fix the earth return cable and clamp directly to the work piece.

1. Clean the connection surface of earth clamp from paint, dirt and rust.
2. Connect the clamp carefully so that contact surface is as large as possible.
3. Finally check that the clamp remains fastened.

3.3.3 Tungsten inert gas welding (TIG)

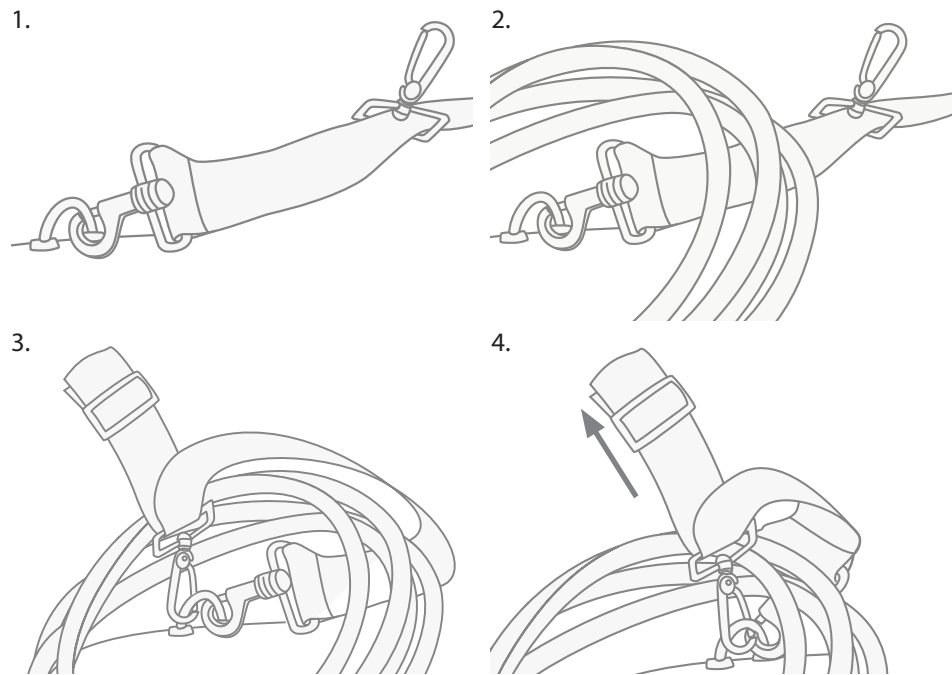
Argon shielding gas is used in DC TIG welding. Your dealer will give you advice on choosing the correct gas, supplier, and supporting equipment. Open the gas valve on the Kemppi TTM 15V TIG torch. When the gas starts to flow, ignite the arc. The arc is activated by lightly touching the work piece with the tungsten electrode and lifting away. A reliable technique to practice is, lightly and briefly touch the tungsten electrode to the work piece surface and then rock backwards onto the ceramic nozzle of the TIG welding torch, so the tungsten is no longer in contact with the work piece surface. This action makes and breaks a momentary contact of the tungsten electrode in a controlled manner, first making the electrical circuit and secondly establishing the TIG welding arc the moment the tungsten leaves contact to the work piece surface.

The length of arc is regulated by holding the tungsten electrode tip at a suitable distance from work piece. A suitable arc length is usually about the diameter of the tungsten electrode. When the arc is burning, move the electrode slowly forwards to the start of the weld, tilting the torch to approximately 10–15° pulling angle. If necessary, adjust power source current value so that a constant weld pool size is maintained for the forward travel speed. If necessary to complete the weld, add compatible filler wire to the weld pool.

Stop welding by lifting the torch away from the work piece and by closing the gas valve on the torch.

NOTE! Always secure the gas cylinder in an upright position with either a specially made wall rack or cylinder trolley. Always close the cylinder valve after welding.

3.4 Using the shoulder strap



Using and fixing the shoulder strap

The machine is delivered with a fabric shoulder strap and metal clip set. The shoulder strap can be used as a convenient and comfortable way to transport both the machine and cables set. There are two identical metal clips. Fix one clip to each of the metal lifting eyes, located at the top of the machine. Adjust the shoulder strap to a comfortable length. The machine can now be carried.

Should you also wish to transport and secure the cables set, place the cable bundle over the strap as shown, bring the strap and remaining free clip over the top of the cable bundle and secure to the already fastened rear clip. As you take the weight of the machine with the strap, the cable set is clamped securely into position ready for transport.

NOTE! The machine should not be used when hanging from the shoulder strap.

4. MAINTENANCE

NOTE! Be careful when handling electrical cables!

In maintaining the unit, take into consideration the rate of use and the environment it is used in. When the unit is used properly and serviced regularly, you will avoid unnecessary disturbances in use and production.

4.1 Daily maintenance

Perform the following maintenance daily:

- Clean the electrode holder and TIG torch's gas nozzle. Replace damaged or worn parts.
- Check TIG torch's electrode. Replace or sharpen, if necessary.
- Check the tightness of welding cable and earth return cable connections.
- Check the condition of mains lead and welding cables, and replace damaged cables.
- See that there is enough space around the unit for ventilation.

4.2 Troubleshooting

Problem	Cause
The machine 'ON' indicator light will not light up.	<ul style="list-style-type: none">• No electricity connected to the machine• Check the mains supply fuses.• Check the mains cable and plug.
The machine will not weld.	<ul style="list-style-type: none">• Check power supply status and connections.• VRD 'Lock down' state is active. OCV level has exceeded the set limit and welding is prevented.• VRD light is solid RED, and GREEN main power light is flashing.• Establish cause of VRD lock down. Reset the machine via the main on/off switch.• If the machine will not re-set, contact your Kemppi service agent
Poor welding results.	Several factors affect the welding quality. <ul style="list-style-type: none">• Ensure that the welding current selected is adequate for the selected electrode type and size.• Ensure the cable connections are correct and secure.• Ensure the process selection is correct.• Check that the earth return clamp connection area is clean and that the cable and clamp are not damaged.• For TIG welding, check that the shielding gas flow is switched on and set correctly. Poor ignition and arc quality in TIG welding may be a result of a poorly prepared tungsten electrode. Always maintain and grind a point on the TIG torch electrode tip before welding.
Overheating indicator is illuminated.	Normally, this indicates that the device has reached its maximum designed operating temperature. The thermostat has become active, switching the welding power off. Allow the unit to cool and the machine will soon automatically reset and allow welding to restart. <ul style="list-style-type: none">• Ensure that cooling air has unrestricted flow.• If the machine's duty cycle has been exceeded, wait for indicator to turn off. In certain circumstances, this light may also indicate irregularity in the supply voltage. Too low or high supply voltage.

If the machine's malfunction is not eliminated with the above measures, contact Kemppi service.

4.3 Storage

Store the unit in a clean and dry place. Shield it from rain, and in temperatures exceeding +25 °C from direct exposure to sun.

4.4 Disposal of the machine



Do not dispose of electrical equipment with normal waste!

In observance of European Directive 2002/96/EC on waste electrical and electronic equipment, and its implementation in accordance with national law, electrical equipment that has reached the end of its life must be collected separately and taken to an appropriate environmentally responsible recycling facility.

The owner of the equipment is obliged to deliver a decommissioned unit to a regional collection centre, per the instructions of local authorities or a Kemppi representative. By applying this European directive you will improve the environment and human health.

5. ORDERING CODES

Minarc Evo 180 welding machine	includes earth return and welding cables	61002180
Minarc Evo 180 welding machine (Denmark)	includes earth return and welding cables	61002180DK
Minarc Evo 180VRD welding machine	includes earth return and welding cables	61002180VRD
Minarc Evo 180AU welding machine (Australia, New Zealand)	includes earth return and welding cables	61002180AU
Minarc Evo 140AU welding machine (Australia, New Zealand)	includes earth return and welding cables	61002140AU
Minarc Evo 180NP welding machine	includes earth return and welding cables (does not include mains plug)	61002180NP
Earth return cable and clamp		6184015
Welding cable and electrode holder		6184005
Carrying strap		9592163
Optional: TIG torch	4 m	TX163GVD94
R10 hand held remote control	5 m	6185409
R10 hand held remote control	10 m	618540901

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6. TECHNICAL DATA

Minarc Evo 180		
Connection voltage	1 ~ 50/60 Hz	230 V ± 15 %
Connection voltage (AU)	1 ~ 50/60 Hz	240 V ± 15 %
Rated power at max. current	30 % ED MMA	170 A / 5.7 kVA
	35 % ED TIG	180 A / 4.0 kVA
Supply current	30 % ED I_{1max}	24 A
	100 % ED I_{1eff}	15 A
Supply current (140 AU)	100 % ED I_{1eff}	10.0 A
Connection cable	H07RN-F	3G1.5 (1.5 mm ² , 3 m)
Fuse	type C	16 A: 170 A ED 30% 10 A: 140 A ED 28%
Output 40 °C	30 % ED MMA	170 A / 26.8 V
	100 % ED MMA	115 A / 24.6 V
	35 % ED TIG	180 A / 17.2 V
	100 % ED TIG	130 A / 15.2 V
Output 40 °C (140 AU)	28 % ED MMA	140 A / 25.6 V
	100 % ED MMA	80 A / 23.2 V
Welding range	MMA	10 A/15 V – 170 A/32 V
	TIG	10 A/10 V – 180 A/30 V
Open circuit voltage	average	90 V; VRD 30 V; AU VRD 12 V
No-load power		30 W
Voltage steps		stepless
Power factor at 100 % ED		0.99
Efficiency at 100 % ED	MMA	84 %
Stick electrodes	∅	1.5 – 4.0 mm
External dimensions LxWxH	height with handle	361x139x267 mm
Weight	without connection cable	5.4 kg
	with connection cable	5.85 kg
Temperature class		F (155 °C)
EMC class		A
Degree of protection		IP23S
Operating temperature range		-20...+40 °C
Storage temperature range		-40...+60 °C
Standards IEC 60974-1 IEC 60974-10 IEC 61000-3-12		

