

Operation instruction • english  
Gebrauchsanweisung • deutsch  
Gebruiksaanwijzing • nederlands  
Manuel d'utilisation • français

1916200E  
0701

# MASTERTIG

AC/DC 2000, 2500, 2500W, 3500W



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# 1. PREFACE

## 1.1. INTRODUCTION

Congratulations on having purchased this product. Properly installed Kemppi products should prove to be productive machines requiring maintenance at only regular intervals. This manual is arranged to give you a good understanding of the equipment and its safe operation. It also contains maintenance information and technical specifications. Read this manual from front to back before installing, operating or maintaining the equipment for the first time. For further information on Kemppi products please contact us or your nearest Kemppi distributor.

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

In this document, for danger to life or injury the following symbol is used:



Read the warning texts carefully and follow the instructions. Please also study the Operation safety instructions and respect them when installing, operating and servicing the machine.

## 1.2. PRODUCT INTRODUCTION

Mastertig AC/DC is a power source for TIG /MMA welding suitable for AC and DC welding and designed for demanding professional use. The power source is an inverter, which is formed with IGB transistors. The power source is available in three sizes, 200 A, 250 A and 350 A. The 250 A power source comes in two separate versions for gas-cooled torches and for water-cooled torches. Three different exchangeable panel versions are available for the power source: a basic panel, a minilog panel and a pulse panel.



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## 1.3. OPERATION SAFETY

Please study these Operation safety instructions and respect them when installing, operating and servicing the machine.

### ***Welding arc and spatters***

Welding arc hurts unprotected eyes. Be careful also with reflecting arc flash. Welding arc and spatter burn unprotected skin. Use safety gloves and protective clothing.

### ***Danger for fire or explosion***

Pay attention to fire safety regulations. Remove flammable or explosive materials from welding place. Always ensure that you have sufficient fire fighting equipment available where you are welding. Be prepared for hazards in special welding jobs, eg. for the danger of fire or explosion when welding container type work pieces. Note! Fire can break out from sparks even several hours after the welding work has been finished!

### ***Mains voltage***

Never take welding machine inside a work piece (eg. container or truck). Do not place welding machine on a wet surface. Always check cables before operating the machine. Change damaged cables without delay. Damaged cables may cause an injury or set out a fire. Connection cable must not be crushed, it must not touch sharp edges or hot work pieces.

### ***Welding power circuit***

Isolate yourself by using proper protective clothing, do not wear wet clothing. Never work on a wet surface or use defect cables. Do not put the TIG torch or welding cables on welding machine or on other electric equipment. Do not press the TIG torch switch, if the torch is not directed towards a work piece.

### ***Welding fumes***

Take care that there is sufficient ventilation during welding. Take special safety precautions when welding metals which contain lead, cadmium, zinc, mercury or beryllium.

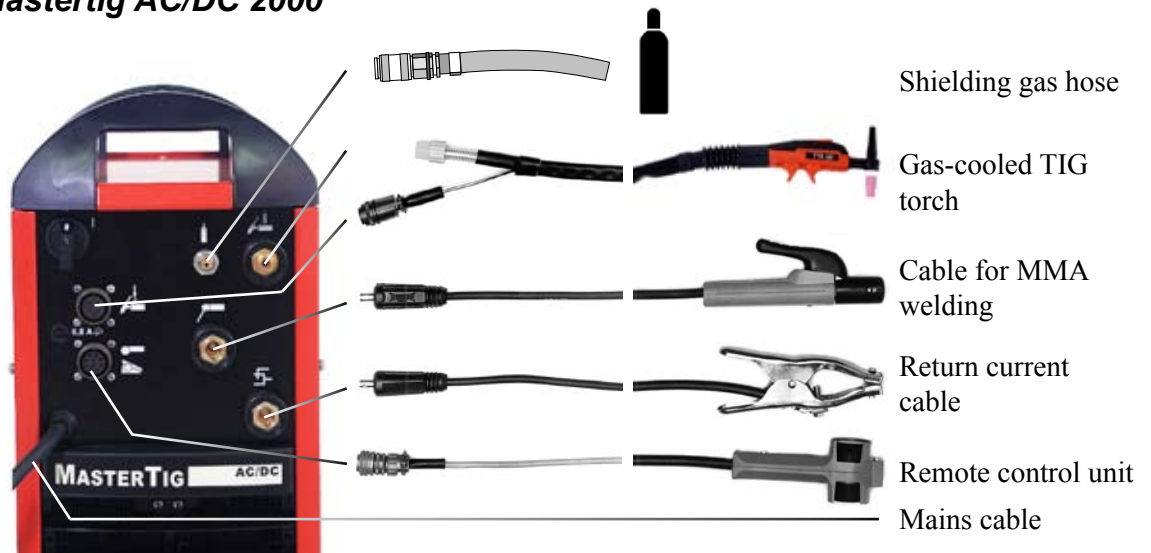


**This equipment's electromagnetic compatibility (EMC) is designed for use in an industrial environment. Class A equipment is not intended for use in residential location where the electrical power is provided by the public low-voltage supply system.**

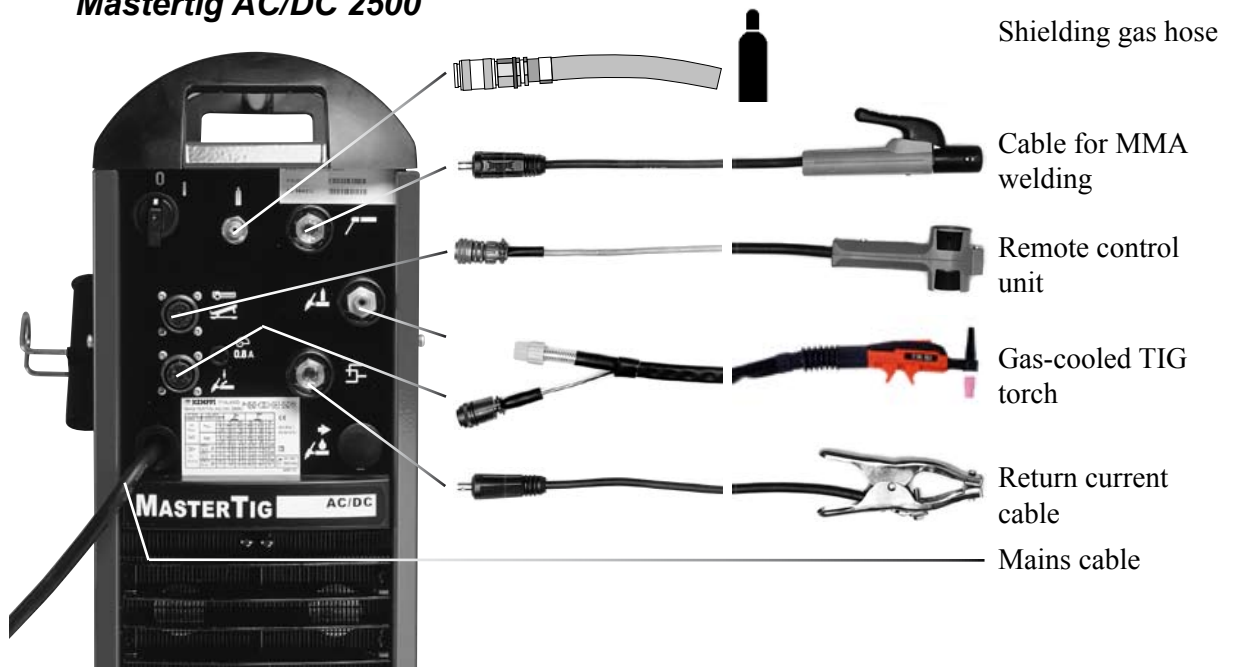
## 2. INSTALLATION

### 2.1. CABLING THE MACHINE

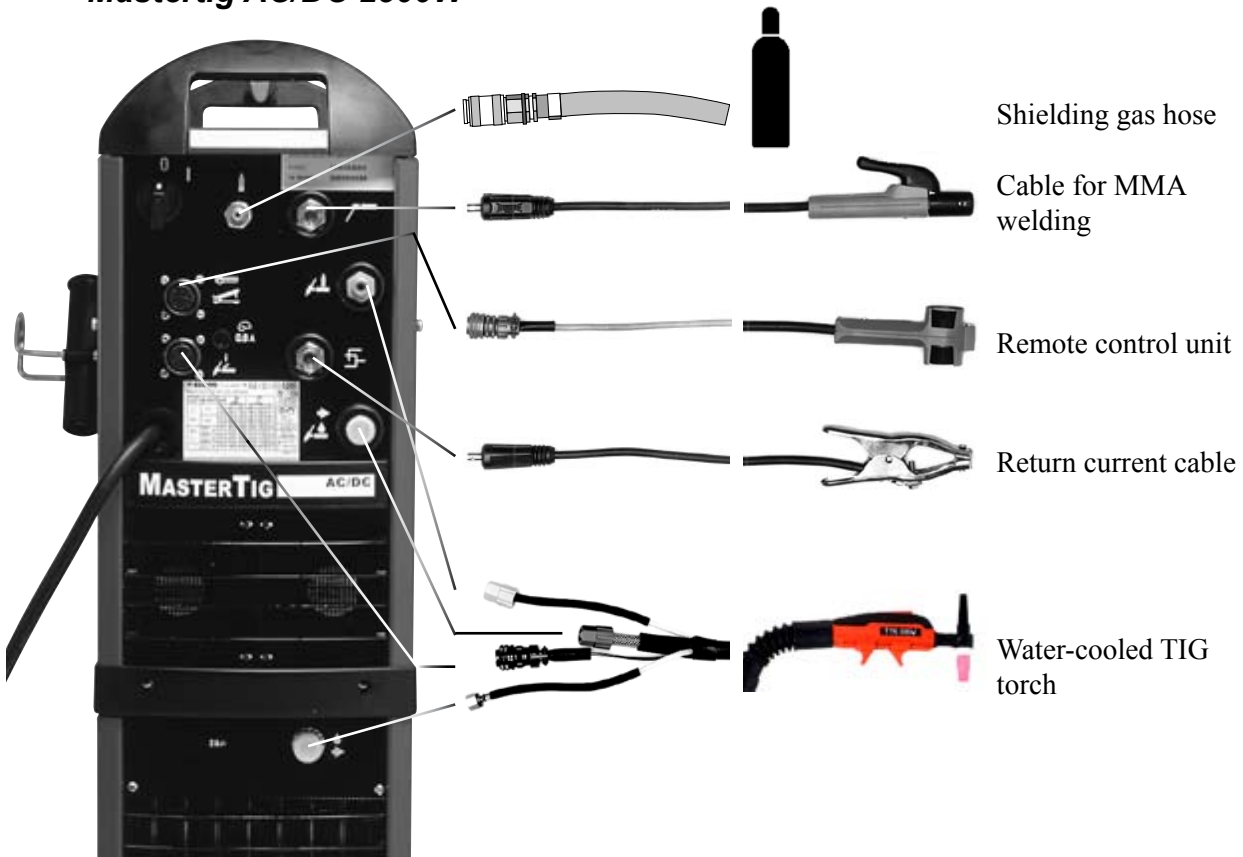
#### *Mastertig AC/DC 2000*



#### *Mastertig AC/DC 2500*



**Mastertig AC/DC 2500W**



Shielding gas hose

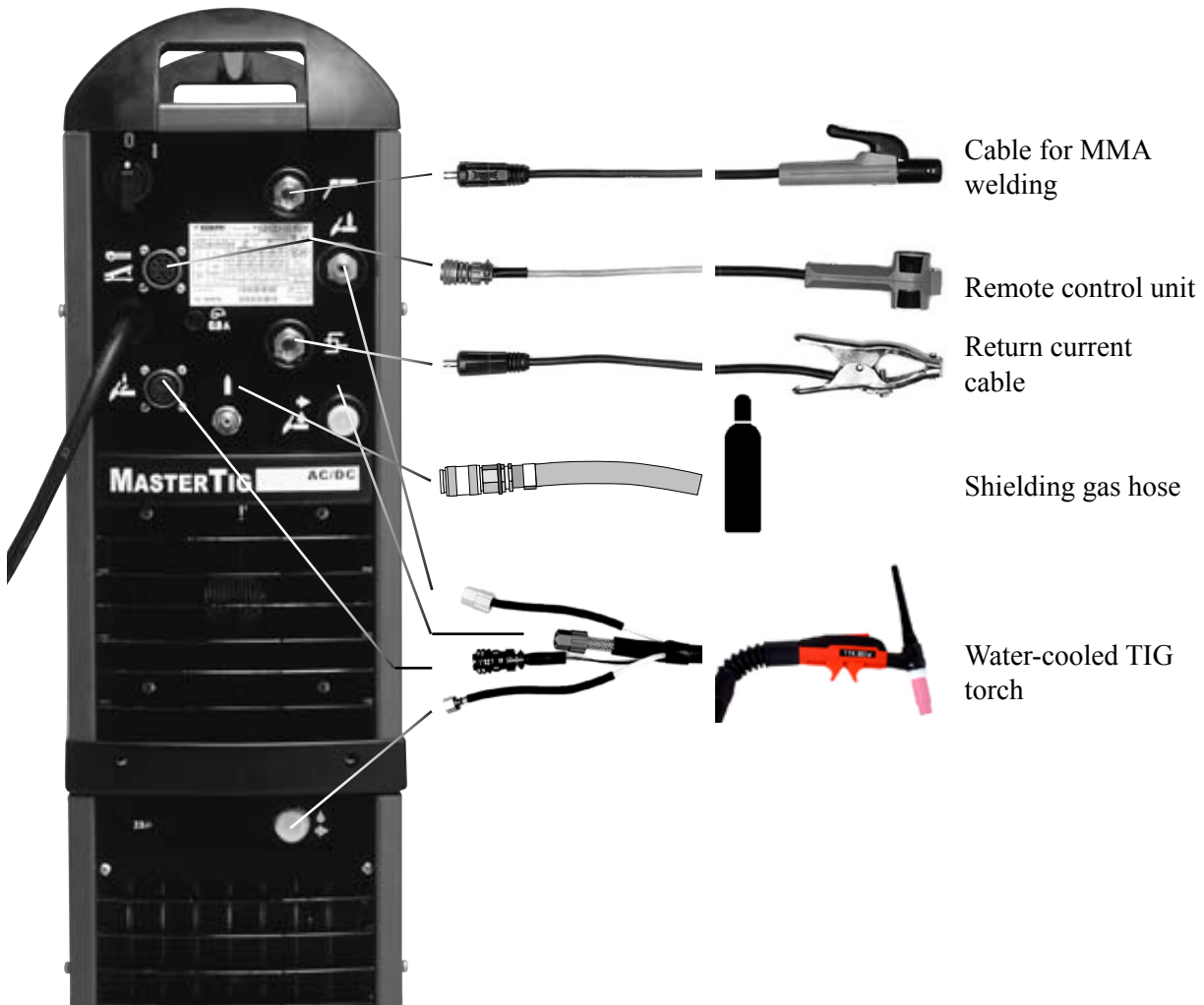
Cable for MMA welding

Remote control unit

Return current cable

Water-cooled TIG torch

**Mastertig AC/DC 3500W**



Cable for MMA welding

Remote control unit

Return current cable

Shielding gas hose

Water-cooled TIG torch

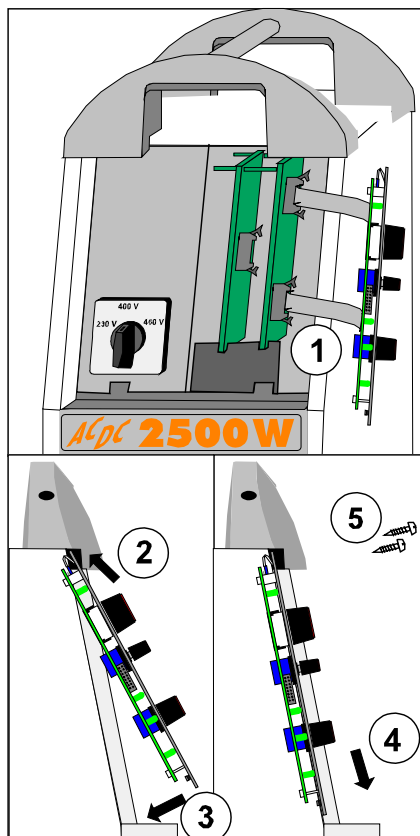
## 2.2. SITING THE MACHINE

**When siting the machine, the following have to be considered:**

Site the machine on a fixed dry base, which does not cause dust etc. into the suction air of cooling.

- Make sure that the machine is placed away from the line of particle spray from grinding tools.
- Ensure free circulation of the cooling air. Make sure that there is at least a 20 cm free distance both in front of and at the rear of the machine for the circulation of the cooling air.
- Protect the machine against heavy rain and in hot circumstances against direct sunshine.

## 2.3. START OF INSTALLATION



Mastertig AC/DC 2500 and -2500W: Check first that the mains voltage change-over switch is in right position.

If it is necessary to change mains cable, do it before mounting to the wheel barrow T 120. Otherwise you possibly have to dismount the machine.

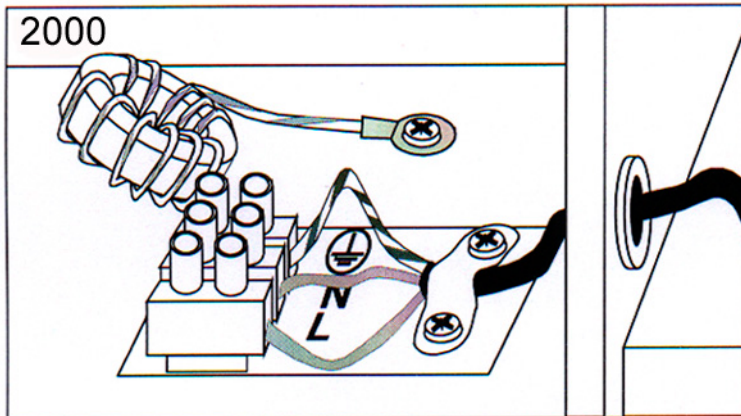
Before connecting the machine to the mains supply, one of the three panels, the ACDC panel, the ACDC minilog or the ACDC pulse panel, has to be installed. Installation instructions 4283280 are in the package of the panel.

## 2.4. CONNECTING THE MACHINE TO THE MAINS SUPPLY



The installation or replacement of the mains cable and the plug may be carried out only by an authorized electric shop or electrician.

### *Mastertig AC/DC 2000*

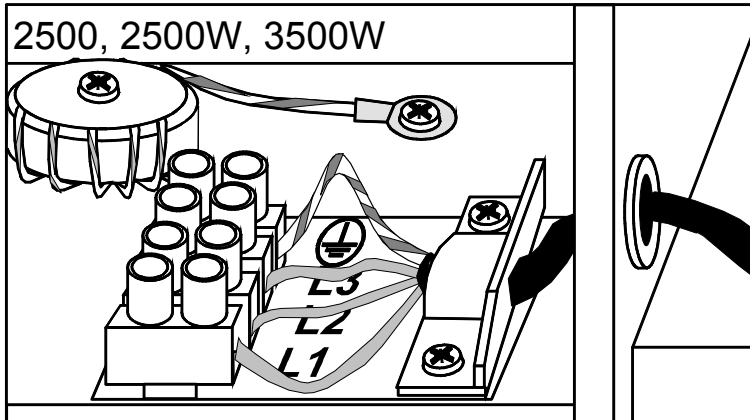


The machine is delivered with a mains cable with an earthed plug for connection to a mains supply of 230 V.

#### **To be noted when replacing the mains cable:**

The lifting handles, cover and the right-hand-side plate have to be opened. The cable is brought to the machine through the inlet ring on the rear panel and fastened with a cable clamp. The phase lead of the cable are coupled to connector L, the blue to the connector of the N lead and the yellow-green to the connector of the protective grounding lead (⊕).

### *Mastertig AC/DC 2500, -2500W and -3500W*



The machine is delivered with a 5 m mains cable (4×2.5 mm<sup>2</sup>) without a plug. Mains cable is suitable for all mains voltages with recommended fuse size (please look at Technical data table). 4×6 mm<sup>2</sup> cable can be connected to the machine, if local regulations are requiring it.



If you use greater fuse size than recommended big short circuit current can cause extra damage in case of failure.

### *Mastertig AC/DC 2500, -2500W*

Before connecting the machine to the mains supply, make sure that the voltage change-over switch of the machine is turned to the position corresponding to the mains supply voltage (230 / 400 / 460 V).

#### **When replacing the mains cable, note the following:**

The lifting handles, cover and right-hand-side plate of the machine have to be opened. The cable is brought to the machine through the inlet right on the rear panel and fastened with a cable clamp. The phase leads of the cable are coupled to connectors L1, L2 and L3; the yellow-green is coupled to the connector of the protective grounding lead (⊕).



## 2.5. CABLE FOR MMA WELDING AND RETURN CURRENT CABLE

The welding cables have to be at least 16 mm<sup>2</sup> copper cables for Mastertig AC/DC 2000 and 25 mm<sup>2</sup> copper cables for Mastertig AC/DC 2500, Mastertig AC/DC 2500W and 50 mm<sup>2</sup> copper cables for Mastertig AC/DC 3500W. Thinner cables will cause voltage losses and heating.

Connect the grounding clamp of the return cable carefully, preferably directly to the piece to be welded. Use as short welding cables as possible. Unnecessarily long cables will lower the maximum output voltage of the machine. Coiling of the excess cable lowers the output voltage of the machine especially in AC welding and decreases the ignition spark.

**Clean the fastening surface of any paint and rust!**

## 2.6. THE WELDING TORCH

In Mastertig AC/DC 2000 and Mastertig AC/DC 2500, only an gas-cooled torch can be used. In Mastertig AC/DC 2500 W and -3500W, you can use either an gas-cooled or a water-cooled torch. Make sure that the torch you are using is designed for the maximum welding current that you need.



**Never use a damaged torch!**

## 2.7. ELECTRODES TO BE WELDED

With the Mastertig AC/DC power sources you can use all electrodes designed for DC or AC welding within the current limits of the machine in question.

Mastertig AC/DC 2500, -2500W and -3500W power sources are suitable for carbon arc gouging and cutting according to their maximum power.

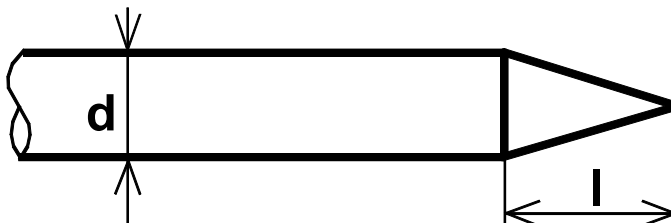
Reference max electrode diameters and yield				
electrode type	yield	2000	2500, 2500W	3500W
Fe-rutile	95 %	ø 4	ø 5	ø 6
Fe-base	100 %	ø 4	ø 5	ø 6
Fe-high-yield	180 %	ø 2,5	ø 4	ø 5
	250-270 %	---	ø 4	ø 5
Ss-rutile	---	ø 4	ø 6	ø 6
Ss-base	---	ø 4	ø 6	ø 6
Ss-high-yield	150 %	ø 3,25	ø 5	ø 6
Hard facing by welding	100 %	ø 3,25	ø 5	ø 6

## 2.8. TIG DC WELDING

DC- current is used typically when welding different kind of steel. We recommend for DC-welding a WC20 (grey) electrode.


### 2.8.1. Sharpening of the electrode

The tip of the electrode is sharpened into a cone, so that the arc becomes steady and the thermal energy is concentrated on the spot being welded. The length of the sharpening to the diameter of the electrode:



with small current sharp  $l = 3 \times d$   
with large current blunt  $l = 1 \times d$

Choice of the electrode for DC welding. The table is only given as a guide.

Welding current range		Electrode	Gas nozzle		Gas flow rate
DC-		WC20			Argon
A		ø mm	number	ø mm	l / min
5...80		1,0	4/5	6,5/8,0	5...6
70...140		1,6	4/5/6	6,5/8,0/9,5	6...7
140...230		2,4	6/7	9,5/11,0	7...8
225...350		3,2	7/8	11,0/12,5	8...10
330...350		4	10	16	10...12

## 2.9. TIG AC WELDING

AC-current is typically used when welding aluminium. We recommend for AC-welding a WC20 (grey) or a clean wolfram electrode (green).

### 2.9.1. Balance

In AC-welding the ratio between the positive and negative half-cycle is called balance. With the balance you can control heat between the electrode and work piece. When balance is positive, it means that the positive half-cycle is longer than the negative, more heat is coming to the electrode than to the work piece. Correspondingly when balance is negative, negative half-cycles are longer, the work piece is hotter and the electrode is colder. Mastertig AC/DC-machines have build-in BALANCE-automatism, which chooses automatically right balance value. User adjusts the BALANCE-knob according to the electrode, and the machine takes care of the balance control in different currents.

**BALANCE automatics offers two benefits as compared to a constant balance:**

- In AC welding, you can use both a sharpened and a rounded (cut) electrode. When welding starts, the machine will round the cut tip so that its is suitable.
- The current-range of the electrode is extended: the current of the lower end is lowered and the current of the maximum end is increased.


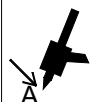
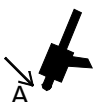


With BALANCE automatics, you can use the position for a sharpened electrode with a narrower arc to obtain a narrower seam and to a deeper penetration than with a rounded electrode. A narrow seam is useful especially in fillet welding.



When using a rounded electrode, the arc is broad and the cleaning area of the arc is also wider, so it can be used for end-to-end seams and outer corners.

The table is only given as a guide.

Welding current range			Electrode	Gas nozzle		Gas flow rate
min.	min.	max.	WC20	number		Argon
 A	 A	A				
15	25	90	1,6	4/5/6	6,5/8,0/9,5	6...7
20	30	150	2,4	6/7	9,5/11,0	7...8
30	45	200	3,2	7/8/10	11,0/12,5/16	8...10
40	60	350	4,0	10/11	16/17,5	10...12

The table and the panel scale are based on the use of WC20 (grey). When using pure wolfram electrode (green) the tip rounds off slightly.

## 2.10. SHIELD GAS



**Handle gas bottle with care. There is a risk of injury if gas bottle or bottle valve is damaged!**

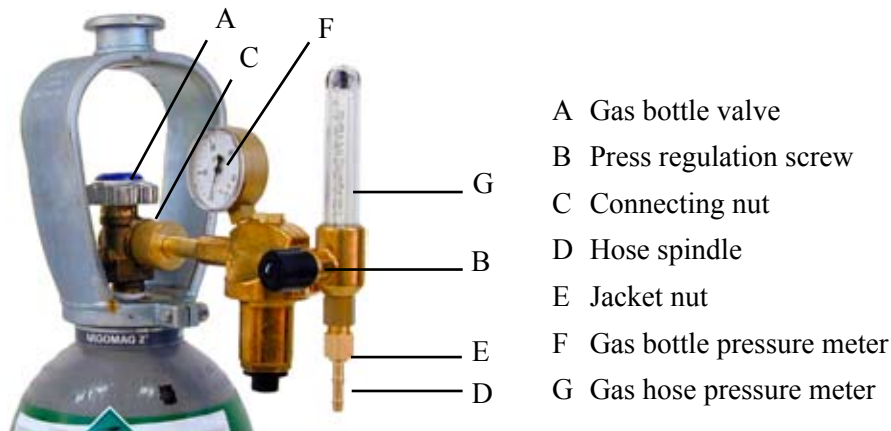
Argon, argon-helium or helium gases are normally used as shield gas. Check that the gas bottle valve is suitable for the gas. The flow rate is set according to the welding power used in the job. A suitable flow rate is normally 8 - 10 l/min. If the gas flow is not suitable, the welded joint will be sporous. Contact your local Kemppi-dealer for choosing gas and equipment.

### 2.10.1. Installing gas bottle



**Always fasten gas bottle properly in vertical position in a special holder on the wall or on a carriage. Remember to close gas bottle valve after having finished welding.**

#### Parts of gas flow regulator



The following installing instructions are valid for most of the gas flow regulator types:

1. Step aside and open the bottle valve (A) for a while to blow out possible impurities from the bottle valve.
2. Turn the press regulation screw (B) of the regulator until no spring pressure can be felt.
3. Close needle valve, if there is one in the regulator.
4. Install the regulator on bottle valve and tighten connecting nut (C) with a wrench.
5. Install hose spindle (D) and jacket nut (E) into gas hose and tighten with hose clamp.
6. Connect the hose with the regulator and the other end with the wire feed unit. Tighten the jacket nut.
7. Open bottle valve slowly. Gas bottle pressure meter (F) shows the bottle pressure. Note! Do not use the whole contents of the bottle. The bottle should be filled when the bottle pressure is 2 bar.
8. Open needle valve if there is one in the regulator.
9. Turn regulation screw (B) until hose pressure meter (G) shows the required flow (or pressure). When regulating flow amount, the power source should be switched on and the gun switch pressed simultaneously.

Close bottle valve after having finished welding. If the machine will be out of use for a long time, unscrew the pressure regulation screw.

### 3. OPERATING PANELS

#### BASIC



#### MINILOG

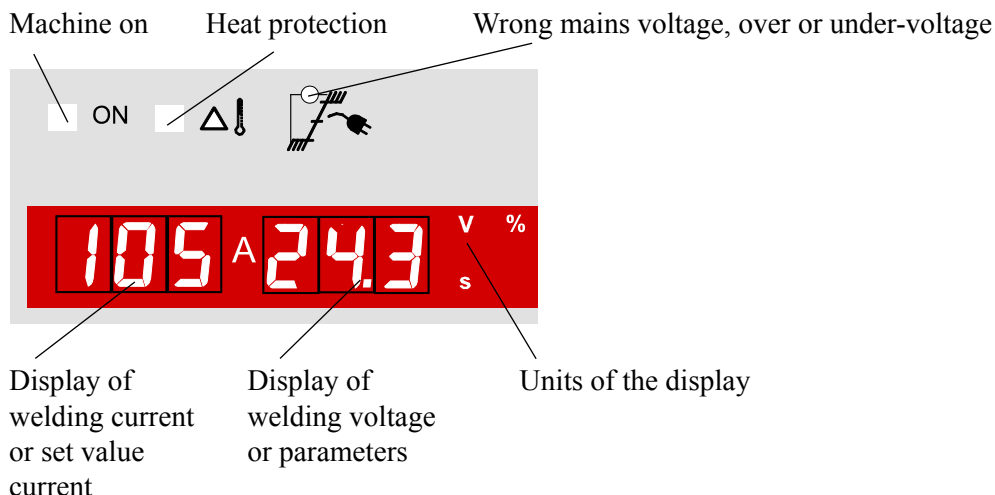


## PULSE



1. Selection switches for TIG welding: TIG HF = spark TIG and TIG CONTACT = contact TIG
2. Frequency of AC welding, FREQUENCY 50 ... 200 Hz
3. Adjustment of post-gas time 0 ... 100 s
4. Adjustment potentiometer of the down-slope time of the welding current 0 ... 15 s
5. Current adjustment knob I2, used also to adjust the values of the parameters with keys.
6. Selection of local / remote control REMOTE and at the same time the key for code locking CODE LOCK/ENTER
7. Adjustment of the pulse current of Pulse TIG PULSE 3 ... 200A, 250A, 350A and the adjustment of the pulse ratio RATIO 10 ... 75 %
8. Selection key of Pulse TIG
9. Adjustment of the background current of Pulse TIG BACK 20 ... 40 % and adjustment of the frequency FREQUENCY 0.1 ... 300 Hz
10. Adjustment of the start current, starting with a current lower than the welding current SOFT START, or with a current higher than the welding current HOT START -70 ... +50 %
11. Selection of Minilog operations and adjustment of the current level MINILOG -80 ... +20 %
12. Adjustment of the pre-gas time, and at the same time the key for code locking CODE LOCK.
13. Adjustment of the up-slope time of the welding current 0 ... 5 s
14. Selection of fusion spot welding and adjustment of time, SPOT WELD 0 ... 10 s
15. Selection of the operation mode of the torch switch 2T / 4T.
16. Calling the welding parameters from the memory or from the panel MEM. / PANEL.
17. Saving the welding values in the memory SAVE.
18. Selection key of the memory channel CHANNEL 1 ... 9
19. Selection key for broken-arc method BROKEN ARC.
20. Adjustment of the dynamics (arc force) of MMA welding DYNAMICS -9 ... 9
21. Selection key of MMA welding MMA
22. Adjustment potentiometer of the form of the AC TIG arc BALANCE -70 ... +70 %

## 3.1. NUMERICAL DISPLAYS AND SIGNAL LIGHTS OF THE PANEL

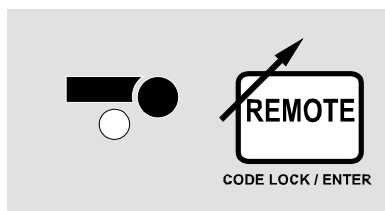


The signal light of thermal protection is on when the machine has over-heated. Let the machine on so that the fan will cool the machine. Wait until the light goes off, and you can continue welding.

The light for the wrong voltage turns on if the mains voltage is too high or too low. Check the voltage setting of the machine and/or the mains voltage. The wrong voltage light will also turn on if there is a momentaneous over-voltage in the mains supply.

The current is displayed with a tolerance of  $3\% \pm 2\text{ A}$ ; the voltage with a tolerance of  $3\% \pm 0.2\text{ V}$ .

## 3.2 USE OF THE REMOTE CONTROL

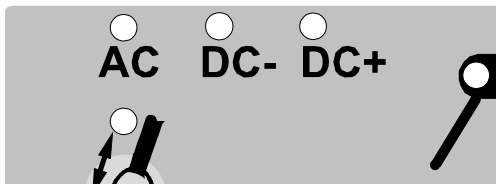


The remote control is selected from the key REMOTE. With the remote control you can adjust the welding current of MMA and TIG welding. The values of the parameters (up-slope and down-slope times, gas flow times etc.) are adjusted from the current knob.

With remote control unit C 100AC you can also change the welding method (MMA / TIG). The machine selects the polarity (type of current) in accordance with an advance selection on the panel.

## 3.3. MMA WELDING

### 3.3.1. Selection of type of current



Select MMA welding by pressing the selection key of MMA welding. The signal light of the type of current indicates the current type selected: AC, DC-, DC+.

Change the current type by pressing the MMA selection key again and the current type will change and the signal light will show the current type selected.

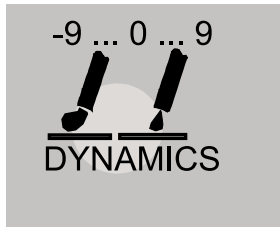
### 3.3.2. Broken arc method

Press the BROKEN ARC key and the signal light for broken arc method turns on.

A broken arc method has to be used if the seam to be welded cannot tolerate the heat of a continuous arc. The heat of the welding is controlled by breaking the arc. Usually the reason is thin material or various fittings. In the broken arc method position, the arc breaks faster and the ignition pulse is smaller than in ordinary MMA welding.

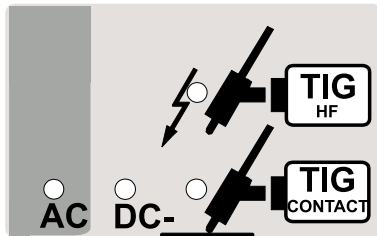
### 3.3.3. Control of MMA welding dynamics (only with minilog and pulse panels)

Press the DYNAMICS key and you will see the numerical value corresponding to the dynamics in the display. You can change the value by turning the current knob. Numerical value zero is the normal setting for all MMA electrodes. When the value is adjusted negative (-1... 9), the arc is softened. The amount of spatter decreases when welding at the upper end of the recommended current range of the electrode. On the positive side (1...9) the arc is rough. It is suitable e.g. for thin stainless steel rods when welding near the lower end of the recommended current range.



## 3.4. TIG WELDING

### 3.4.1. Selection of TIG welding and type of current



Press the selection key next to the selected TIG method, spark TIG (TIG HF) or contact TIG (TIG CONTACT), and the signal light next to the key will show the method. You can change the type of current by pressing the selection key again. (If you want to select DC+ as the current type for TIG, press both TIG keys at the same time.)

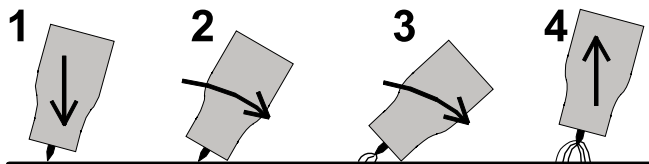
### 3.4.2. Spark ignition



**Use contact ignition when you are welding in an environment where there are sensitive electronic equipments. The ignition spark can cause interferences in equipment near the welding machine.**

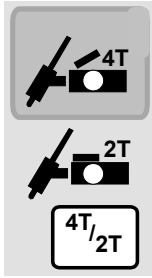
The arc is ignited with a high-frequency, high-voltage spark without touching the work piece. If the arc is not ignited in spite of the spark within one second, you will have to try the ignition again by pressing the torch switch. In some cases the spark ignition works better if you touch the work piece with the gas nozzle lightly before the ignition.

### 3.4.3. Contact ignition



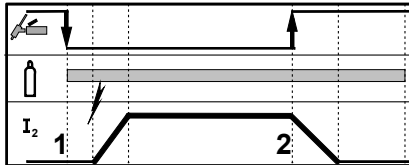
Press the electrode lightly against the work piece (1). Press the switch and the shielding gas will start to flow and a small current will pass through the electrode. Lift the electrode away from the work piece by turning it so that gas nozzle rests against the work piece (2 ja 3), and the arc will ignite and the current will rise to the welding level within the up-slope time (4).

### 3.4.4. Use and selection of operation of the torch switch



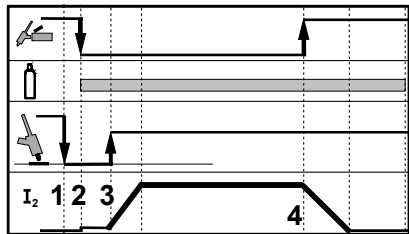
The operation of the torch switch is selected by pressing the 2T/4T key.

#### 2-function (2T) / spark ignition

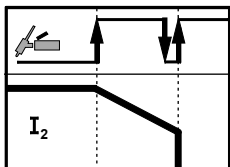


1. Press the torch switch. The gas starts to flow and after the pre-gas time selected, the arc is ignited and the current rises to the welding level within the selected up-slope time.
2. Release the torch switch, and the welding current will drop in accordance with the selected down-slope time. After the arc is turned off, the gas will continue to flow for the post-gas time.

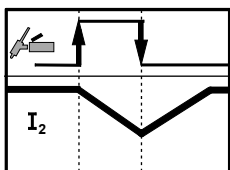
#### 2-function (2T) / contact ignition



1. Press the tip of the torch lightly against the work piece.
2. Press down the torch switch.
3. Lift the electrode slowly away from the work piece. The arc will ignite and the welding current will rise to the welding level within the selected up-slope time.
4. Release the torch switch, and the welding current will drop in accordance with the selected down-slope time. After the arc is turned off, the shielding gas will continue to flow for the post-gas time.

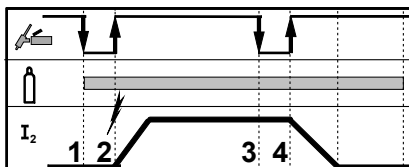


The down-slope time of the welding current can be interrupted by quickly pressing the torch switch.



You can go back to the welding current from the down-slope current by pressing the torch switch down. After that, the current will rise at a rate corresponding to the down-slope time.

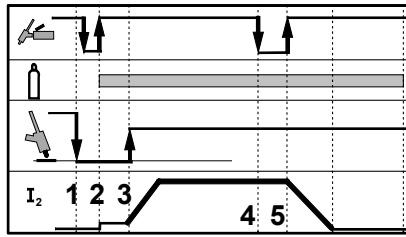
#### 4-function (4T) / spark ignition



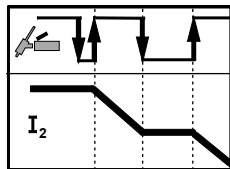
1. Press the torch switch down. The shielding gas starts to flow.
2. Release the torch switch. The ignition spark ignites the arc and the current will rise to the welding level within the up-slope time.
3. Press the torch switch down. The welding continues.
4. Release the torch switch, and the current starts to drop and after the selected down-slope time the arc is broken. After this, the shielding gas will flow for the time selected.



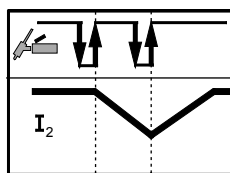
#### 4-function (4T) / contact ignition



1. Press the electrode lightly against the work piece.
2. Press the torch switch down for a moment.
3. Lift the electrode slowly away from the work piece. The arc will ignite and the welding current will rise to the welding level within the up-slope time.
4. Press the torch switch down. The welding continues.
5. Release the torch switch, and the welding current will drop and stop after the selected down-slope time. After the arc is turned off, the shielding gas will continue to flow for the post-gas time.

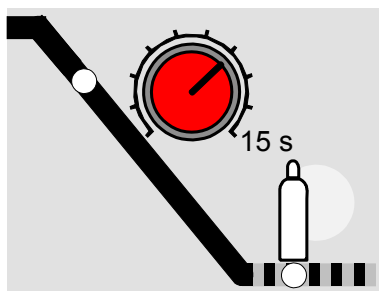


By pressing the torch switch during the down-slope time of the current, the current will remain at that level as long as the switch is pressed down. After the release of the switch, the current will drop further.



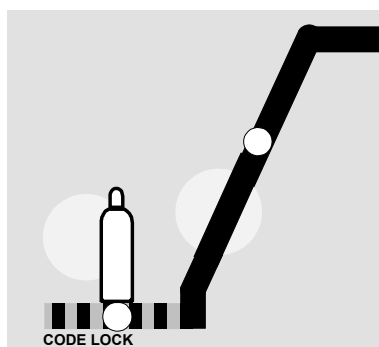
By pressing the switch down for a moment, you can raise the welding current back to the welding level.

#### 3.4.5. Adjustment of the down-slope time of the welding current



The adjustment of the down-slope time is done from the potentiometer. The time can be adjusted between 0 - 15 s. When you adjust the down-slope time, you can see the time in seconds in the right-hand numerical display. After 5 seconds, the display will return to the start status.

#### 3.4.6. Adjustment of the up-slope time of the welding current



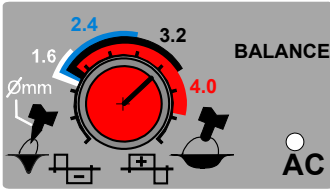
1. Press the key next to the up-slope of the current pattern. The right-hand numerical display will show the up-slope time in seconds.
2. Select the desired value by turning the current knob (0 - 5 s). 5 seconds after the adjustment, the displays will return to show the set value of the current.

#### 3.4.7. Adjustment of the pre-gas and post-gas times

1. Press the switch in the panel next to the gas bottle of the current model of either the pre-gas or the post-gas.
2. Turn the current knob until the value that you want is shown in the right-hand display. (Pre-gas 0 - 5 s, post-gas 3 - 100 s)

#### 3.4.8. Adjustment of the form of the arc, BALANCE

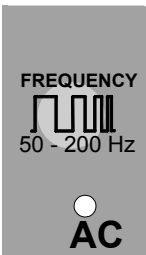
The BALANCE function will adjust the balance so that it is suitable for the selected electrode and current. At the same time, it adjusts the pre-heating of the tip of the electrode at the start in accordance with the tip form selected.



- 1a. When welding with a sharpened electrode, turn the control knob to the left edge of the range of the electrode that you have selected. (Narrow arc, deep penetration, range: small seams)
- 1b. When welding with a rounded electrode, turn the control knob to the right edge of the range of the electrode that you have selected.
2. If you want more heat to the electrode, turn the knob to the right, or if you want less heat, turn it to the left.

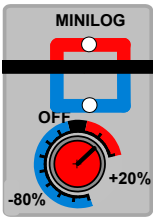
### 3.4.9. Frequency adjustment of TIG AC welding (only with minilog and pulse panel)

The frequency of AC welding can be adjusted by means of the MINILOG and PULSE PANEL. Raising the frequency will make the arc slightly more stable and narrow, but it will increase the noise caused by arc.



1. Press the FREQUENCY key in the AC square.
2. Adjust the frequency with the current knob. The adjustment range of the frequency is 50 ... 200 Hz. When leaving the factory, the frequency of the machine is 60 Hz.

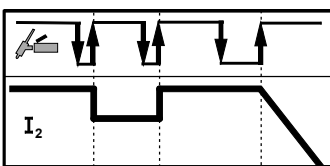
### 3.4.10. Minilog operation (only with minilog and pulse panel)



With the Minilog operation you can select two current levels, the welding current and the base current, and you can move from one to the other by quickly pressing the torch. The Minilog operation can be used only with a 4-function torch switch operation.

The selection and adjustment of the Minilog operation is done by means of the potentiometer. When the potentiometer is in the OFF position, the operation is not in use. The welding current is selected from the current knob like usually. The Minilog knob is used to select a basic current, the minimum of which is 80 %

below the welding current and the maximum is 20 % above the current level. During the adjustment, you can see the set value of current in amperes in the current display.



You can move from the welding current to the basic current by quickly pressing the torch.

By quickly pressing it again, you move back to the welding current. The signal lights on the panel show you the current level you are on.

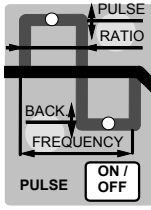
You can stop the welding by a longer pressing of the torch switch (> 0.7 s).

The Minilog operation can be used to adjust the heat, if the work piece is overheated or if you need more heat for a moment.

With the Minilog operation you can go to a lower current level for example when you change the position or the grip of the filler material wire without having to stop the welding to do that.

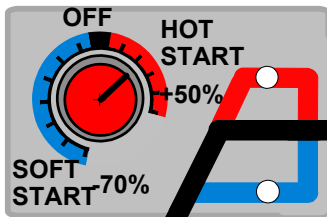
A lower current can also be used as the crater filling current if you do not want to use the down-slope time for that.

### 3.4.11. Pulse welding (only with the pulse panel)



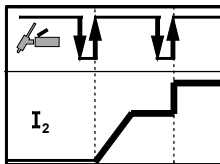
1. Switch the pulse welding on by means of the pulse-section key ON/OFF.
2. Adjust the average current that you want from the current adjustment knob. The current display will show you the average current.
3. Press the key BACK. FREQUENCY once. The text bAc of the right-hand display shows you that now you can adjust the background current from the current knob. The background current is proportional to the average current, but it is shown in the current display in amperes.
4. Press the key BACK. FREQUENCY again. The text FrE of the current display shows that now you can adjust the pulse frequency. The pulse frequency is shown in Hz.
5. Press the key PULSE RATIO once. You will see the pulse current in the current display. The right-hand display reads PUL. You can also adjust the pulse current, but please note that this will change the average current.
6. When you press the key PULSE RATIO again, you can adjust the pulse ratio, rAt. The pulse ratio is shown as a percentage of the total length of the cycle.
7. When you press either of the parameter keys a third time, the adjustment goes back to the average current AvE.

### 3.4.12. Control of the start current (only with the pulse panel)



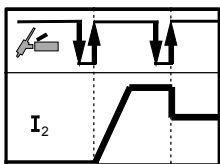
By means of the control potentiometer of the start current you can select either a soft, normal or hot start. The start current is available only with a 4-function torch switch operation.

By turning the potentiometer to OFF, you have a normal start (see the use of the torch switch / 4-function)



By turning the potentiometer to the left, you get a soft start (SOFT START). When you raise the torch switch, the current rises in accordance with the up-slope of the start current to the start current, which is smaller than the welding current.

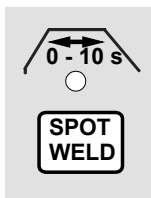
From the start current, you can move to the welding current by pressing the torch switch for a short moment.



The start current is proportional to the welding current. You can see the value of the start current in the numerical display during the control.

When you turn the potentiometer to the right, the start current is higher than the welding current (HOT START). Otherwise the start is made in the same way as with a soft start.

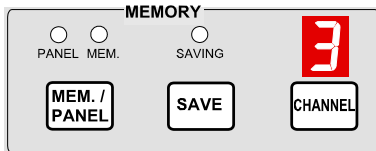
### 3.4.13. Fusion spot welding (only with a pulse panel)



Select fusion spot welding by pressing the special operation key SPOT WELD. To show that you have selected fusion spot welding, the signal light next to the key goes on. You can select the spot time that you want with the current knob. The time selected is shown in the numerical display during the adjustment. Five seconds after the adjustment, the display returns to the set value of the current and you can adjust the welding current.

The time shown in the display means the time you have the welding current. The down-slope and the up-slope times are increasing the burning time of the arc.

## 3.5. MEMORY FUNCTIONS (ONLY WITH THE PULSE PANEL)



By means of the memory functions you can save 9 panel settings in the permanent memory. All adjustable or chosen values are saved in the memory. When the memory function is not in use, the numerical display of the memory section is black.

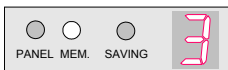
With the CHANNEL key you can select the channel to be read and used for the saving of a setting.

The MEM / PANEL key is used to select whether to use the values in the memory or values controlled from the panel.

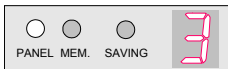
The function of the SAVE key is two-phased. When you press it once, you select the values to be saved. In this case the light SAVING is blinking to show that you are performing a saving operation. When the light is blinking, you can find the channel into which you want to save the values. When you press the key again, the information is saved in the memory.

### 3.5.1. Calling the values from the memory

1. Press the CHANNEL key so many times that the numerical channel display shows the number of the channel that you want. At the same time, the signal lights of the panel show you the selections of the selected channel and the current display shows you the set value



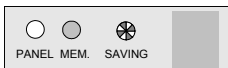
of the current. You can see the other values of the welding parameters by pressing the parameter key or by turning the potentiometer. All the values are locked, which means that you cannot change them while the MEM signal light is on.



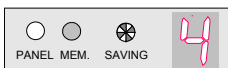
2. If you want to change the values found, press the MEM / PANEL key and the PANEL signal light comes on and you can change the values.

### 3.5.2. Saving a welding situation (parameters) in the memory

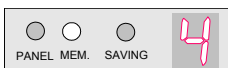
You have good welding values, which you want to save in the memory.



1. Press the SAVE key once and the SAVING light starts to blink.



2. Press the CHANNEL key so many times that the number of the channel in which you want to save the values is shown in the numerical display.



3. Now press the SAVE key again and the values are saved in the memory.

Note! When you are saving (= the SAVING light is blinking) and you have rolled the number of the channel that you want by using the CHANNEL key, you can see the previous values of that channel by pressing the MEM / PANEL key to bring the panel to the MEM status, so that you can check the present values of that channel. In this case the values to be saved will not change. After the check, press the MEM / PANEL key again and you can again see the values to be saved and you can save them by pressing SAVE.

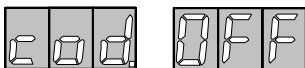
## 3.6. CODE LOCKING

The welding machine has a theft protection. You can install a three-digit machine-specific code into the machine, which the user must know in order to turn the machine on. The code is saved in the panel. If you change the panel the code follows the panel.

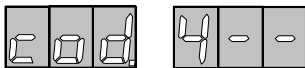
When the machine leaves the factory, the code locking operation is not on.

### 3.6.1. Installing the code locking

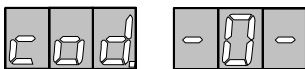
1. Press the pre-gas key (CODE LOCK) and the key of the remote control (REMOTE / CODE LOCK/ENTER) at the same time.



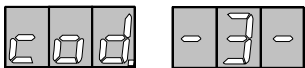
2. Select the first digit from the current adjustment knob (e.g. 4).



3. Press the accept key (REMOTE / CODE LOCK/ENTER).

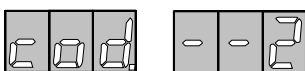


4. Select the second digit from the knob (e.g. 3) and again accept it by pressing the key (REMOTE / CODE LOCK/ENTER).



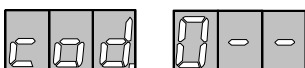
5. Select the third digit in the same way (e.g. 2).

Now the code locking is on with the number that you have chosen (e.g. 432).

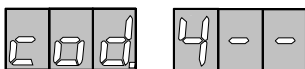


### 3.6.2. Turning the machine on when the code locking is on

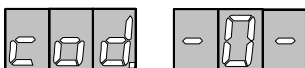
When you turn on a machine in which the code locking is on, you must always feed in the opening code that you have installed in order to be able to use the machine.



1. Feed in the first digit from the current adjustment knob.



2. Accept the digit by pressing (REMOTE / CODE LOCK/ENTER).



3. Feed in the second and third digits in the same way.

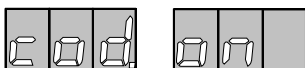
The machine is ready for use.



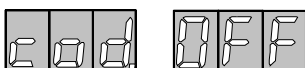
**If you enter wrong code, you can try again by turning the machine off and on.  
If you can not open the machine, you do not remember the right code, contact  
an authorized service agent.**

### 3.6.3. Removal of code locking

1. Press the key for pre-gas (CODE LOCK) and the key for remote control (REMOTE / CODE LOCK/ENTER) at the same time.



2. Feed in the digits of the code in the same way as when opening the machine. The code locking will be removed after you have fed in the last digit.



3. Turn the machine off. The machine is now ready for use.

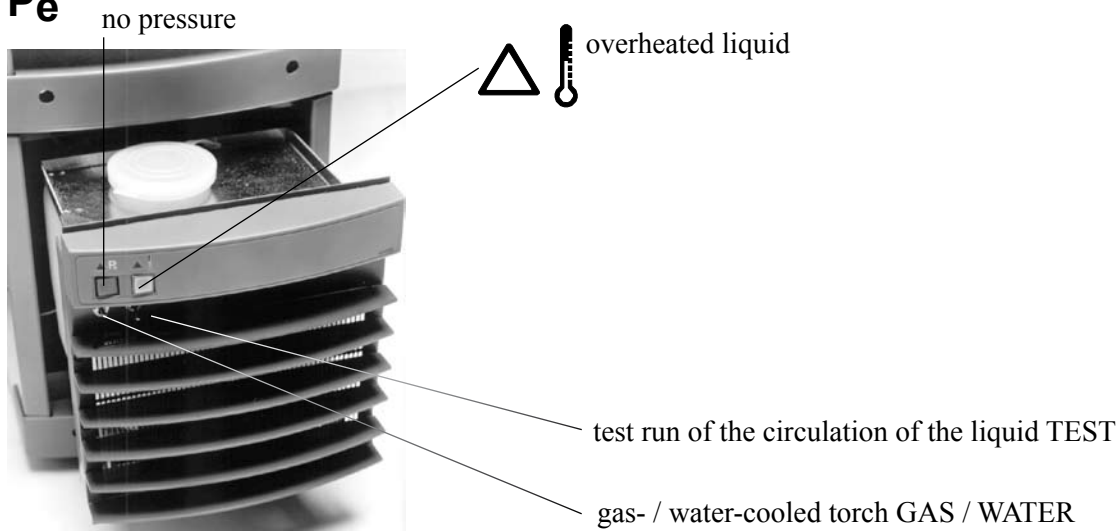
### 3.6.4. Changing the code

1. Remove the code locking in accordance with the above instruction.
2. Install the code locking again.

## 4. COOLING UNIT

(only Mastertig AC/DC 2500W, -3500W)

Pe



Filling in the liquid and checking the liquid level is done by pulling open the hatch in the lower part of the machine so that you can see the filling hole for the liquid. The cooling units tank is filled with 20 – 40 % glycol / water mixture according to antifreeze requirements. Instead of glycol / water mixture you can also use another liquid according to your experience.

The circulation of the liquid is operation-controlled, which means that the liquid is circulating only during welding and for a while after the welding.

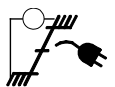
## 5. INTERNAL PROTECTIONS OF THE MACHINE

### 5.1. OVERHEATING PROTECTION



The yellow signal light of the overheating protection comes on and the machine stops when the machine has overheated. The machine may overheat if the machine is loaded for a long time with a current higher than 100 % of the duty cycle or when the circulation of the cooling air is prevented.

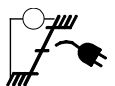
### 5.2. OVER-VOLTAGE PROTECTION OF THE MAINS SUPPLY VOLTAGE



If the over-voltages in the mains supply are so high that they can endanger the machine, the supply of the machine is immediately turned off. If the over-voltages are short in duration, this may be seen as short breaks in the current. The signal light of the panel showing an over / under-voltage comes on during a long period of over-voltage.

### 5.3. THE WRONG VOLTAGE SELECTION

*Mastertig ACDC 2500, Mastertig ACDC 2500W*



If a multi-voltage machine is connected to the wrong voltage, the machine will not start and the signal light in the front panel comes on to indicate this. The machine will not be damaged if it is connected to the wrong voltage for a short time. Unplug the machine from the mains supply and select the correct voltage from the switch under the front panel.

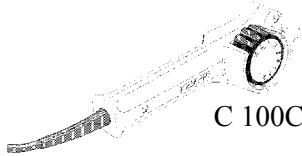
### 5.4. PROTECTION OF A WATER-COOLED TORCH

*Mastertig ACDC 2500W and -3500W*

If the switch of the cooling unit is in the position for an gas-cooled torch and you start welding with a water-cooled torch and a current is over 60 A, the welding is broken.

## 6. ACCESSORIES

### 6.1. REMOTE CONTROL UNITS



C 100C

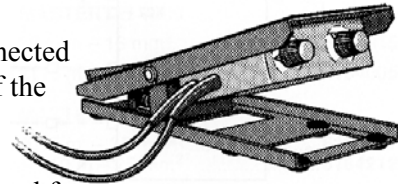


C 100D  
C 100AC

- C 100C** Control of MMA / TIG welding current, memory scale 1 - 10.
- C 100D** Control and fine-tuning of MMA / TIG welding current, memory scale 1 - 10.
- C 100AC** Control of MMA / TIG welding current, memory scale 1 - 10 and MMA / TIG selection.
- C 100F** Foot pedal control unit for TIG welding
- start function
  - adjustment of the welding current with pedal movements
  - limitation of the welding-current range with min and max potentiometers

#### 6.1.1. Connecting the foot pedal unit:

The foot pedal unit has two connections, which are connected to the remote control and start connections in the rear of the power source. When using the foot pedal unit, the maximum current output of the machine is ca. 30 % below its maximum output unless the machine is calibrated for the foot pedal unit.



#### 6.1.2. Calibration of the machine for the foot pedal unit:

1. Turn the machine off.
2. Press the REMOTE key and at the same time turn the machine on; the display will show the text rEn 01.
3. Turn the current adjustment knob so that the display will show rEn 02. (01=C 100C, 02=C 100F)
4. Press the REMOTE key so that the setting is saved in the memory.

### 6.2. WHEEL BARROWS AND TRANSPORT CHASSISES

#### T 120 (transport unit)

Mastertig AC/DC 2000, 2500, 2500W, 3500W



lifting ear



**Do not lift the welding machine and the transport unit with a gas bottle.**

#### T 22 (transport unit)

Mastertig AC/DC  
2500, 2500W, 3500W

lifting ears  
on both sides  
(total 4 pcs)



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## 7. EXTRA FUNCTIONS

There are extra functions and selections in the machine, which are not seen in the panel. The welder needs these functions not in normal welding, but they may be a solution in some special cases. These functions are called jumper functions, because they are behind jumper numbers. Functions can be On/Off-type or adjustable parameter.

### ***Jumper functions***

1. Turn off the machine.
2. Press the [POST GAS] button and at the same time turn the machine on. You can see text (J01 OFF) or (J01 ON) on the panel.
3. Choose jumper number you need by pressing the [REMOTE] button.
4. Change jumper setting with the pulse potentiometer.
5. When you have done the changes needed press the [POST GAS] button. All jumper settings are then saved in the memory.

Factory settings are underlined.

- J01: [On] = slope of up slope is constant, time depends on set value of current.  
[Off] = up slope time is independent of set value of current.
- J02: [On] = slope of down slope is constant, time depends on set value of current.  
[Off] = down slope time is independent of set value of current.
- J03: [On] = TIG antifreeze is on.  
[Off] = TIG antifreeze is not in use.
- J04: [On] = manual AC balance control.  
[Off] = balance function in use.
- J05: [On] = tag welding automatics is not in use.  
[Off] = tag welding automatics on.
- J06: [On] = down slope of TIG is minimum end level current.  
[Off] = end level current is 20 % of the welding current
- J07: [Off] = open-circuit voltage is 70 V  
[On] = open-circuit voltage is 12 V without VRD card, 22 V with VRD card
- J08: [On] = when stopping welding with 4T function the down slope starts by pressing torch connector. Slope continues as long as you press the connector. Current stays at end level in case you press longer than down slope's normal time (look J06).  
[Off] = normal 4T function.
- J09: [Off] = primary frequency is 18 kHz / 36 kHz (depending on the set value)  
[On] = primary frequency is 18 kHz in the whole current range.
- J10: [Off] = hot/soft - start function is not in use on 2T function.  
[On] = hot/soft - start function is in use on 2T function.
- J11: hot/soft - start time adjustment on 2T function (0.0 ... 9.9 s). J10 has to be in position [On]
- J12: [Off] = on 2T function the down slope is cut off by a short press of the switch  
[On] = on 2T function the down slope does not cut off by a short press of the switch
- J13: [Off] = on TIG AC the level of positive half-cycle changes when the balance and set value change (both with auto and manual balance)  
[On] = on TIG AC the level of positive half-cycle is always the same as the level of the negative half-cycle



- J14: [Off] = limit of short press of the TIG switch is 0.7 s  
[On] = limit of short press of the TIG switch is 0.3 s
- J15: [Off] = AC TIG welding is started in the positive half-cycle  
[On] = AC TIG welding is started in the negative half-cycle
- J16: 0 -> 2.0 = ratio for the start length of DC in AC TIG  
factory setting is 1.0
- J17: 0 -> 2.0 = ratio for MMA ignition pulse  
factory setting is 1.0
- J18: ----- vacant
- J19: ----- vacant

## 8. MAINTENANCE

The amount of use and an unusual working environment have a special effect on the need for maintenance. Proper use and preventive maintenance will help to ensure trouble-free operation of the machine without unexpected interruptions.

### 8.1. THE WELDING TORCH

Due to high temperatures and wear, the welding end of the TIG torch requires maintenance most, but also the condition of the other parts should be checked regularly.

#### 8.1.1. *The welding end*

Check that...

- all insulations of the welding end are undamaged and in place.
- the gas nozzle is undamaged and suitable for the work.
- the flow of the shielding gas is free and even.
- the electrode is undamaged. Use an electrode size and tip sharpening which are suitable for the welding job. Sharpen the electrode lengthwise.
- the fastening parts of the electrode are undamaged and that the electrode is tightly fastened in its place.

#### 8.1.2. *The torch cable*

Check that...

- the insulation of the handle and the torch cable are undamaged.
- the torch cable has no sharp bends.

**Always replace any damaged parts immediately!**

Follow the instructions of the torch manufacturer in all maintenance and repair measures.

### 8.2. CABLES

Check the condition of the welding and connection cables daily.



**Do not use damaged cables!**



**Check also that the mains connection cables that you use are in good condition and that they comply with all the regulations!**

Mains connection cables may be repaired and installed only by an authorized electric shop or electrician.

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### 8.3. THE POWER SOURCE

NOTE! Disconnect the plug of the machine from the mains socket and wait for ca. 2 minutes (capacitor charge) before removing the casing plate.

**Check at least very six months:**

- The electric connections of the machine– clean any oxidized parts and tighten any loose ones.

NOTE! You must know the correct tension torques before you start to repair the connections.

- Clean the inner parts of the machine from dust and dirt e.g. with a soft brush and a vacuum-cleaner.

Do not use pressurized air, because there is the danger that the dirt is packed even more tightly in the gaps of the cooling profiles. Do not use a pressure washing device.

Only an authorized electric shop or electrician may repair the machine.

### 8.4. REGULAR MAINTENANCE

**KEMPPI Service Repair Shops handle regular maintenance by agreement.**

**Regular maintenance includes e.g. the following:**

- Cleaning of the machine.
- Checking and maintenance of the welding tools.
- Checking the clamps, switches and potentiometers.
- Checking the electric connections.
- Checking the mains cable and plug.
- Replacement of any parts that are damaged or in poor condition.
- Maintenance testing. The operation and performance values of the machine are checked and, where necessary, adjusted by means of test equipment.

## 9. OPERATION DISTURBANCES

In the case of operation disturbances, contact an authorized KEMPPI Service Repair Shop.

Check the maintenance parts before sending the machine to the service shop.

## 10. DISPOSAL OF THE MACHINE



Do not dispose of electrical equipment together 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 returned to an environmentally compatible recycling facility. As the owner of the equipment, you should get information on approved collection systems from our local representative.

By applying this European Directive you will improve the environment and human health!

## 11. ORDERING NUMBERS

Mastertig AC/DC 2000	6162000
Mastertig AC/DC 2500	6162500
Mastertig AC/DC 2500W	6162505
Mastertig AC/DC 3500W	6163505
ACDC panel	6162801
ACDC minilog	6162802
ACDC pulse	6162803

### **Accessories**

T 120 transport unit	6185252
T 22 transport unit	6185256
GH 20 (gun holder)	6256020

### **Remote control units**

C 100C	6185410
C 100D	6185413
C 100AC	6185417
C 100F	6185405

### **Cables**

Extension cable for remote control	10 m	6185456
Start extension cable C 100F	10 m	6185310

### **Welding cables**

Cable for MMA welding	25 mm <sup>2</sup>	5 m	6184201
	25 mm <sup>2</sup>	10 m	6184202
Cable for MMA welding	50 mm <sup>2</sup>	5 m	6184501
	50 mm <sup>2</sup>	10 m	6184502
Return current cable	25 mm <sup>2</sup>	5 m	6184211
	25 mm <sup>2</sup>	10 m	6184212
Return current cable	50 mm <sup>2</sup>	5 m	6184511
	50 mm <sup>2</sup>	10 m	6184512

### **TIG torches, gas-cooled**

TTK 130	4 m	627063004
TTK 130	8 m	627063008
TTK 130	16 m	627063016
TTK 130F	4 m	627063104
TTK 130F	8 m	627063108
TTK 130F	16 m	627063116
TTK 160	4 m	627066004
TTK 160	8 m	627066008
TTK 160	16 m	627066016
TTK 160S	4 m	627066204
TTK 160S	8 m	627066208
TTK 160S	16 m	627066216
TTK 220	4 m	627072004
TTK 220	8 m	627072008
TTK 220	16 m	627072016
TTK 220S	4 m	627072304

TTK 220S	8 m	627072308
TTK 220S	16 m	627072316
<b><i>TIG torches, water-cooled</i></b>		
TTK 250WS	4 m	627075704
TTK 250WS	8 m	627075708
TTK 250WS	16 m	627075716
TTK 300W	4 m	627080504
TTK 300W	8 m	627080508
TTK 300W	16 m	627080516
TTK 350W	4 m	627085504
TTK 350W	8 m	627085508
TTK 350W	16 m	627085516

## 12. TECHNICAL DATA

### **Mastertig AC/DC 2000**

Mains voltage	1~ 50 / 60 Hz	230 V ± 10 %
Rated power	TIG	max. 200 A / 6,8 kVA
	TIG	100 % 150 A / 4,5 kVA
	MMA	max. 160 A / 7,3 kVA
	MMA	100 % 100 A / 4,2 kVA
Welding current range	TIG DC	3 A / 10 V ... 200 A / 18 V
	AC	10 A / 10 V ... 200 A / 18 V
	MMA DC	10 A / 10 V ... 160 A / 26,4 V
	AC	11 A / 10 V ... 160 A / 26,4 V
Connection cable		3 x 2,5 mm <sup>2</sup> S- 3
Fuse		16 A delayed
Maximum load**)	TIG AC	30 % ED (T = 40 °C) 200 A / 18 V
	TIG AC	100 % ED (T = 40 °C) 150 A / 16 V
	MMA	20 % ED (T = 40 °C) 160 A / 26,4 V
	MMA	100 % ED (T = 40 °C) 100 A / 23,6 V
Fuse		20 A delayed
Maximum load***)	TIG AC	50 % ED (T = 40 °C) 200 A / 18 V
	TIG AC	100 % ED (T = 40 °C) 150 A / 16 V
	MMA	60 % ED (T = 40 °C) 160 A / 26,4 V
	MMA	100 % ED (T = 40 °C) 140 A / 23,6 V
Open circuit voltage	(AC and DC)	70 V DC
Frequency of AC*)	fixed / adjustable	60 Hz / 50 ... 200 Hz
Efficiency		75 % (160 A / 26,4 V)
Power factor		0,8 (160 A / 26,4 V)
Cos fii		0,96 (160 A / 26,4 V)
Open circuit power		18 W
Storage temperature range		-40 ... +60 °C
Operating temperature range		-20 ... +40 °C
Temperature class / Degree of protection		B (130 °C), H (180 °C) / IP 23C
External dimensions	length	540 mm
	width	260 mm
	height	510 mm
Weight		30 kg

\*) Adjustable with MINILOG- and PULSE panels.

\*\* ) Fuse reduces maximum load.

\*\*\* ) Use of 20 A fuse requires changing of connection cable.

The products meet conformity requirements for CE marking.

**Mastertig AC/DC****2500****2500W**

Mains voltage	3~ 50 / 60 Hz	230 V ± 10 % 400 V ± 10 % 460 V ± 10 %	
Rated power (U1=400V)	TIG 70 % ED	250 A / 7,5 kVA	
	TIG 100 % ED	200 A / 6,7 kVA	
	MMA 40 % ED	250 A / 10,3 kVA	
	MMA 100 % ED	200 A / 7,9 kVA	
Connection cable		4 x 2,5 mm <sup>2</sup> S - 5 m	
Fuse	230 V	20 A delayed	
	400 V	16 A delayed	
	460 V	16 A delayed	
Welding current range	TIG DC	3 A / 10 V ... 250 A / 20 V	
	AC	10 A / 10 V ... 250 A / 20 V	
	MMA	10 A / 20 V ... 250 A / 30 V	
Maximum load (T=40 °C)	TIG AC 60 % ED	--	
	70 % ED	250 A / 20 V	
	100 % ED	220 A / 18,8 V	
	MMA DC 40 % ED	250 A / 30 V	
Maximum load (T=20 °C)	100 % ED	200 A / 28 V	
	TIG AC 100 % ED	250 A / 20 V	
	MMA DC 80 % ED	250 A / 30 V	
	100 % ED	240 A / 29,6 V	
Open circuit voltage	(AC and DC)	70 V DC	
Frequency of AC	fixed / adjustable*)	60 Hz / 50 ... 200 Hz	
Efficiency		80 % (250 A / 30 V)	
Power factor		0,9 (250 A / 30 V)	
Open circuit power		18 W	
Storage temperature range		-40 ... +60 °C	
Operating temperature range		-20 ... +40 °C	
Temperature class / Degree of protection		B (130 °C), H (180 °C) / IP 23C	
External dimensions	length	690 mm	690 mm
	width	260 mm	260 mm
	height	550 mm	830 mm
Weight		39 kg	65 kg
Max liquid pressure of cooling unit		-----	350 kPa
Rated power of cooling unit		-----	1300 W

\*) Adjustable with MINILOG- and PULSE panels.

\*\*) Fuse can reduce maximum load.

The products meet conformity requirements for CE marking.

**Mastertig AC/DC****3500W**

Mains voltage	3~ 50 / 60 Hz	----- 400 V ± 10 % -----
Rated power (U1=400V)	TIG 60 % ED	350 A / 11,7 kVA
	TIG 100 % ED	280 A / 8,2 kVA
	MMA 60 % ED	350 A / 15,7 kVA
	MMA 100 % ED	280 A / 11,2 kVA
Connection cable		4 x 2,5 mm <sup>2</sup> S - 5 m
Fuse	400 V	20 A delayed
Welding current range	TIG DC	3 A / 10 V...350 A / 24 V
	AC	10 A / 10 V...350 A / 24 V
	MMA	10 A / 20 V...350 A / 34 V
Maximum load (T=40 °C)	TIG AC 60 % ED	350 A / 24 V
	100 % ED	280 A / 21,2 V
	MMA DC 60 % ED	350 A / 34 V
	100 % ED	280 A / 31,2 V
Maximum load (T=20 °C)	TIG AC 100 % ED	310 A / 22,4 V
	MMA DC 80 % ED	350 A / 34 V
	100 % ED	300 A / 32 V
Open circuit voltage	(AC ja DC)	70 V DC
Frequency of AC	fixed / adjustable*)	60 Hz / 50 ... 200 Hz
Efficiency		80 % (350 A / 34 V)
Power factor		0,9 (350 A / 34 V)
Open circuit power		18 W
Storage temperature range		-40 ... +60 °C
Operating temperature range		-20 ... +40 °C
Temperature class / Degree of protection		B (130 °C), H (180 °C) / IP 23C
External dimensions	length	690 mm
	width	260 mm
	height	870 mm
Weight		74 kg
Max liquid pressure of cooling unit		350 kPa
Rated power of cooling unit		1300 W

\*) Adjustable with MINILOG- and PULSE panels.

\*\*) Fuse can reduce maximum load.

The products meet conformity requirements for CE marking.

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## 13. TERMS OF GUARANTEE

Kemppi Oy provides a guarantee for products manufactured and sold by them if defects in manufacture and materials occur. Guarantee repairs must be carried out only by an Authorised Kemppi Service Agent. Packing, freight and insurance costs to be paid by orderer. The guarantee is effected on the date of purchase. Verbal promises which do not comply with the terms of guarantee are not binding on guarantor.

### ***Limitations on guarantee***

The following conditions are not covered under the terms of guarantee: defects due to natural wear and tear, non-compliance with operating and maintenance instructions, connection to incorrect or faulty supply voltage (including voltage surges outside equipment spec.), incorrect gas pressure, overloading, transport or storage damage, fire or damage due to natural causes i.e. lightning or flooding.

This guarantee does not cover direct or indirect travelling costs, daily allowances or accommodation.

Note: Under the terms of guarantee, welding torches and their consumables, feeder drive rolls and feeder guide tubes are not covered. Direct or indirect damage due to a defective product is not covered under the guarantee. The guarantee is void if changes are made to the product without approval of the manufacturer, or if repairs are carried out using non-approved spare parts.

The guarantee is also void if repairs are carried out by non-authorized agents.

### ***Undertaking guarantee repairs***

Guarantee defects must be informed to Kemppi or authorised Kemppi Service Agents within the guarantee period. Before any guarantee work is undertaken, the customer must provide proof of guarantee or proof of purchase, and serial number of the equipment in order to validate the guarantee.

The parts replaced under the terms of guarantee remain the property of Kemppi.

Following the guarantee repair, the guarantee of the machine or equipment, repaired or replaced, will be continued to the end of the original guarantee period.



KEMPPI OY  
PL 13  
FIN – 15801 LAHTI  
FINLAND  
Tel (03) 899 11  
Telefax (03) 899 428  
www.kemppi.com

KEMPPIKONEET OY  
PL 13  
FIN – 15801 LAHTI  
FINLAND  
Tel (03) 899 11  
Telefax (03) 7348 398  
e-mail: myynti.fi@kemppi.com

KEMPPI SVERIGE AB  
Box 717  
S – 194 27 UPPLANDS VÄSBY  
SVERIGE  
Tel (08) 590 783 00  
Telefax (08) 590 823 94  
e-mail: sales.se@kemppi.com

KEMPPI NORGE A/S  
Postboks 2151, Postterminalen  
N – 3103 TØNSBERG  
NORGE  
Tel 33 34 60 00  
Telefax 33 34 60 10  
e-mail: sales.no@kemppi.com

KEMPPI DANMARK A/S  
Literbuen 11  
DK – 2740 SKOVLUNDE  
DANMARK  
Tel 44 941 677  
Telefax 44 941 536  
e-mail:sales.dk@kemppi.com

KEMPPI BENELUX B.V.  
Postbus 5603  
NL – 4801 EA BREDA  
NEDERLAND  
Tel +31 (0)76-5717750  
Telefax +31 (0)76-5716345  
e-mail: sales.nl@kemppi.com

KEMPPI (UK) Ltd  
Martti Kemppi Building  
Fraser Road  
Priory Business Park  
BEDFORD, MK443WH  
ENGLAND  
Tel 0845 6444201  
Fax 0845 6444202  
e-mail: sales.uk@kemppi.com

KEMPPI FRANCE S.A.  
65 Avenue de la Couronne des Prés  
78681 EPONE CEDEX  
FRANCE  
Tel (01) 30 90 04 40  
Telefax (01) 30 90 04 45  
e-mail: sales.fr@kemppi.com

KEMPPI GmbH  
Otto – Hahn – Straße 14  
D – 35510 BUTZBACH  
DEUTSCHLAND  
Tel (06033) 88 020  
Telefax (06033) 72 528  
e-mail:sales.de@kemppi.com

KEMPPI SP. z o.o.  
Ul. Piłsudskiego 2  
05-091 ZĄBKI  
Poland  
Tel +48 22 781 6162  
Telefax +48 22 781 6505  
e-mail: info.pl@kemppi.com

KEMPPI WELDING  
MACHINES AUSTRALIA PTY LTD  
P.O. Box 404 (2/58 Lancaster Street)  
Ingleburn NSW 2565, Australia  
Tel. +61-2-9605 9500  
Telefax +61-2-9605 5999  
e-mail: info.au@kemppi.com

ООО КЕМППИ  
127018 Moscow, Polkovaya str. 1,  
Building 6  
e-mail: info.ru@kemppi.com

ООО КЕМППИ  
127018 Москва, ул. Полковоя 1,  
строение 6