

# WALTER

WALTER 2000 SERIES

DC TIG PULSE

AC/DC TIG MIX  
AC/DC TIG CELL

**USER MANUAL**



Zavarivanje Ltd.  
Belgrade, Cara Nikolaja Drugog Street No. 22  
Serbia  
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This user manual applies to all the welders from Walter TIG 2000 Series: 200/220/250/280/300/350/450 Ampere DC TIG and AC/DC TIG welders.

#### IMPORTANT:

WALTER TIG 2000 AC/DC and DC welders operate in DCEN (Direct Current Electrode Negative) polarity. The correct way to connect TIG torch and earth clamp is as follows:

1. TIG torch is connected to the “-“ output of the welder;
2. cable with earth clamp is connected to the “+”output of the welder.

The protective shielding gas (argon, helium, or mix), is connected to the electro-valve input on the back plate of the welder. This valve does not control the quantity of flow of the gas, or its pressure, only its stopping and starting. Therefore, it is necessary to connect the gas that has a reduced pressure (5 to 7 bars).

If the welder is heated during operation, its over temperature protection will activate itself, which will be indicated on the welder LCD screen. During this time, the welding will be restricted, and the welder will measure the temperature continuously, allowing the operator to weld again, once the electronic components are cooled off.

Walter TIG welder enclosures are manufactured in two types of mechanical protection ratings:

- IP21 (meaning that hazardous parts are protected from objects the size greater than 12.5mm, such as fingers and similar, and dripping water, i.e. vertically falling drops, shall have no harmful effect). Therefore welders in IP21 enclosures are not suitable for operation in conditions of rain and splashing water.

- IP23 (meaning that hazardous parts are protected from objects the size greater than 12.5mm, such as fingers and similar, and water falling as a spray at any angle up to 60° from the vertical shall have no harmful effect) Therefore welders with IP23 enclosures can operate in rain conditions, where water drops at angles less than 60° from the vertical.

The manufacturer is not responsible for any damage caused by failure to earth the welder. The manufacturer declines all responsibility for damage to persons or things deriving from inobservance of the safety regulations.

**USER MANUAL FOR WALTER 2000 SERIES WELDERS**

photo 1. User interface panel of the Walter TIG AC/DC MIX SERIES

**WALTER 2000 COMAND BUTTONS AND TRIMMER:**

**TRIMMER:** Set the main working welding current. Works in every menu, and in all welding processes available. Set main welding current is always visible in the upper right corner of the screen.



**MAGIC WAND:** The most important button for operation – used to calculate all the parameters of welding, according to the set main current. Push button again, to change welding process (AC, DC or MMA) and calculate again the parameters, according to the new process set.



**SAVE:** Push-button to save the default welding parameters (to be loaded on turning-on of the welder), or to be used in menus »save program« and »load program«.



**MINUS:** Push-button for decreasing of the value in each menu. The value being set in a menu is visible in the upper left corner of the menu.



**PLUS:** Push-button for increasing of the value in each menu. The value being set in a menu is visible in the upper left corner of the menu.

**▲ SWITCH MENU BACKWARD:** Switch menu backward, and at the same time memorize the value of the previous menu.

**▼ SWITCH MENU FORWARD:** Switch menu forward, and at the same time memorize the value of the previous menu.

### **IGNITION OF THE WELDING ARC.**

The welder is equipped with HF (**high frequency**) **ignition**. While you keep pressed the push-button on the handle of TIG torch, the welder will periodically give off a high frequency spark, which can start a TIG welding arc. The welding arc will be started once you have the tungsten electrode near the work piece, if the work-piece is connected via earth clamp to the + of the welder. Generally, the tungsten electrode should be held at a distance from the work piece which is the same as the electrode diameter.

If the arc ignition is not successful, remove the tungsten electrode from the TIG torch and grind it clean.

If you are working with DC welding process, make the tip of the electrode into a point. If you are working with AC welding process, the tip of the electrode will naturally form a small ball, and there is no need to make the electrode pointy. If, during welding, you happen to dip the electrode into the weld pool, be sure to clean the electrode, again by grinding it.

The Walter TIG welder can ignite the welding arc through the so-called **LIFT** ignition, also. The procedure of the ignition is then executed as followed: without pressing the torch push-button, bring the tip of the tungsten electrode in contact with the work-piece, and then press the torch button, and slowly raise the electrode. The arc will be ignited. With software regulation of the lift ignition, there is no need to scratch the electrode against the work-piece to establish a welding arc.

The remote control of the output current via foot pedal is enabled when a 10kOhm foot pedal is inserted into XLR connector marked "remote". The foot pedal is used for current output control only, not for HF ignition, which is done via the connector marked "HF", and set up on the TIG torch by default.

**LIST OF USER MENUS:**

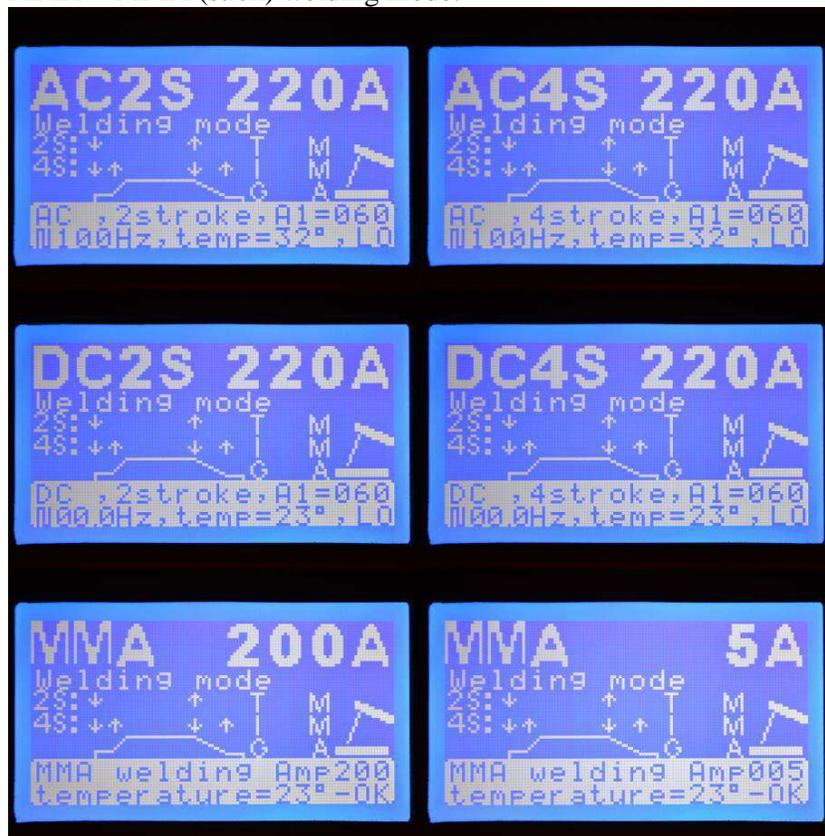
Listed below are all available menus, discussed at length on the following pages.

No	Description	DC	AC	MMA
1	welding process mode selection: MMA ⇔ DC 2 STROKE ⇔ DC 4 STROKE ⇔ AC 2 STROKE ⇔ AC 4 STROKE	✓	✓	✓
2	preflow time	✓	✓	-
3	start current	✓	✓	-
4	start current time	✓	✓	-
5	up-slope time	✓	✓	-
6	frequency	✓	✓	-
7	back current	✓	-	-
8	duty cycle	✓	-	-
9	AC balance/cleaning	-	✓	-
10	down slope time	✓	✓	-
11	stop current	✓	✓	-
12	stop current time	✓	✓	-
13	postflow time	✓	✓	-
14	precision setting	✓	-	-
15	extra menu on/off	✓	✓	-
16	extra menu AC double pulse ⇔ AC/DC PLUS MIX ⇔ AC/DC MINUS MIX	-	✓	-
17	extra menu main current time	-	✓	-
18	extra menu back current amperage	-	✓	-
19	extra menu back current time	-	✓	-
20	extra menu AC welding, added cleaning	-	✓	-
21	extra menu spot weld time	✓	✓	-
22	extra menu micro-spot weld time	✓	✓	-
23	extra menu tungsten electrode ball preparation	-	✓	-
24	load program	✓	✓	-
25	save program	✓	✓	-
26	MMA AC frequency	-	-	✓

✓ **SET THE WELDING PROCESS - DC-AC-MMA AND 2/4-STROKE (menu 1).**

The welding process can be changed by using the magic wand button  , or in the user menu for welding mode selection. The magic wand switches the mode from AC-2-Stroke to DC-2-Stroke to MMA and back to AC-2-Stroke. Using the buttons **-** and **+** , the user can switch the whole range of welding modes:

- AC-2S – AC TIG welding mode with 2-stroke welding current control;
- AC-4S - AC TIG welding mode with 4-stroke welding current control;
- DC-2S - DC TIG welding mode with 2-stroke welding current control;
- DC-4S - DC TIG welding mode with 4-stroke welding current control;
- MMA - MMA (stick) welding mode.



## 2 STROKE TIG WELDING:

### Press and hold push-button on the handle of TIG torch:

The gas valve releases flow. The gas flows for the pre-set time of the *pre/post flow* (menu 2). HF ignition is started, and lasts in repeated cycles until the welding arc is established, or the torch button is no longer pressed. When the arc is ignited, the welding current starts from the set value of the *start current* (menu 3) and lasts for the *start current time* (menu 4), then is increased to the main current (always visible in the upper right corner of the welder LCD screen, and set by the

encoder), in the time period defined as *up-slope time* (menu 5). The *main welding current* is at the output of the welder for as long as the torch push-button is held pressed.

**Release the push-button on the handle of TIG torch:**

The welding current on the output of the welder lowers in the time period defined as *down-slope time* (menu10), to the value of *stop current* (menu 11), and lasts for the time period of *stop current time* (menu12). **If the user presses the TIG torch button again at any time during the down-slope or stop-current, the welding current raises again to main current, and it is withheld at the welder output until the torch push-button is released.**

## 4 STROKE TIG WELDING:

**Press and hold push-button on the handle of TIG torch:**

The gas valve releases flow. The gas flows for the pre-set time of the *pre/post flow* (menu 2). HF ignition is started, and lasts in repeated cycles until the welding arc is established, or the torch button is no longer pressed. When the arc is ignited, the welding current starts from the set value of the *start current* (menu 3) and lasts as long as the torch button is pressed.

**Release the push-button on the handle of TIG torch:**

The *start current* (menu 3) lasts for the *start current time* (menu 4), then is increased to the main current (always visible in the upper right corner of the welder screen, and set by the trimmer), in the time period defined as *up-slope time* (menu 5). The *main welding current* is at the output of the welder for as long as the torch push-button is not pressed.

**Press and hold push-button on the handle of TIG torch:**

The welding current on the output of the welder lowers in the time period defined as *down-slope time* (menu10), to the value of *stop current* (menu 11), and lasts for as long as the torch push-button is pressed. When the torch button is released, the welder output raises again to the main welding current.

**Quickly press push-button on the handle of TIG torch:**

The welding current on the output of the welder lowers in the time period defined as *down-slope time* (menu10), to the value of *stop current* (menu 11), and lasts for the time period of *stop current time* (menu12). If the user quickly presses the TIG torch button again at any time during the down-slope or stop-current, the welding current raises again to main current, and it is withheld at the welder output until the torch push-button is pushed again.

The selected welding mode is always visible in the status line, at the bottom of the welder LCD screen.

✓ **SET PRE -FLOW OF THE GAS (menu 2).**

By pressing the **-** or **+** buttons, the user can set the time for pre-flow of the shielding gas (0.1 second up to 20 seconds, steps of 0.1seconds).



✓ **SET POST -FLOW OF THE GAS (menu 13).**

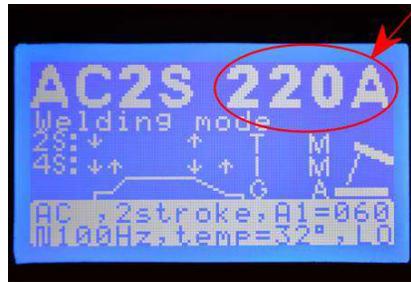
By pressing the **-** or **+** buttons, the user can set the time for post-flow of the shielding gas (0.1 second up to 20 seconds, steps of 0.1seconds).



## SET WELDING CURRENTS AND THEIR TIMES.

### ✓ **The main welding current (A3):**

Always visible in the upper right corner of the welder LCD screen, and set by the trimmer. in Amperes (1A – 400A, steps of 1 Ampere up to 200Amps, above that setps of 2Amp on 300Amp machines, or steps of 5Amp on 400Amp machines)



### ✓ **Istart (A1 – start current) – menu 3:**

By pressing the **-** or **+** buttons, the user can set the start current in Amperes (1A – 400A)



### ✓ **Imin (A<sub>L</sub> back current for DC pulsed welding) – menu 7:**

By pressing the **-** or **+** buttons, the user can set the back current for DC pulsed welding. in Amperes (1A – 400A)



✓ **Istop (A5 – stop current) – menu 11:**

By pressing the **-** or **+** buttons, the user can set the stop current in Amperes (1A – 400A)



✓ **S1 (start current time) – menu 4:** By pressing the **-** or **+** buttons, the user can set the start current time in seconds (0.1sec up to 20sec. – steps of 0.1 seconds).



✓ **S2 (up-slope time) – menu 5:** By pressing the **-** or **+** buttons, the user can set the up-slope time in seconds (0.1sec up to 20sec. – steps of 0.1 seconds).



✓ **S3 (down-slope time) – menu 10:** By pressing the **-** or **+** buttons, the user can set the down-slope time in seconds (0.1sec up to 20sec. – steps of 0.1 seconds).



- ✓ **S4 (stop current time) – menu 12:** By pressing the **-** or **+** buttons, the user can set the stop current time in seconds (0.1sec up to 20sec. – steps of 0.1 seconds).



### SET FREQUENCY OF MMA AC WELDING.

- ✓ **Freq:** By pressing the **-** or **+** buttons, the user can set the frequency of MMA pulsed or AC welding (set one of the following values: 25Hz, 50Hz, 100Hz, 200Hz).

#### MMA direct current DC WELDING:

##### Freq=000Hz:

Frequency set is 0Hz. The welding current output is a constant direct current DC current, no pulsing.



#### MMA alternating current AC WELDING:

##### Freq € {25 Hz, 50 Hz, 100 Hz, 200 Hz }:

At any frequency other than 0Hz, and if the welder is in the MMA AC Frequency menu (menu 26), mode is set to AC MMA, the welding output will be switched to *pulsed AC MMA welding*. The duty cycle of the output pulsed current is set by default to 50%.



## SET FREQUENCY AND DUTY CYCLE OF DC PULSED AND AC WELDING.

- ✓ **Freq:** By pressing the **-** or **+** buttons, the user can set the frequency of DC pulsed or AC welding (0.1Hz up to 500Hz).

### DC WELDING:

#### Freq=000Hz:

Frequency set is 0Hz. The welding current output is a constant DC current, no pulsing.



### DC-PULSED WELDING:

#### Freq=00.1Hz up to 990Hz:

At any frequency other than 0Hz, and if the welding mode is set to DC, the welding output will be switched to *pulsed DC welding*. The user has to set the other parameters of the pulsed DC welding – back current (Imin – menu 7) and Duty Cycle (menu 8).



**AC-WELDING:****Freq=20Hz do 990Hz:**

If the welding mode is set to AC, the frequency will be set to 100 Hz by default. The user can, by pressing the buttons **-** or **+** set AC frequency from 20Hz up to 990Hz.



\* AC TIG welding frequencies greater than 250Hz are mainly used for robotic welding at high speeds (up to 30 m/min), such as robot pipe welding. Although it is possible to weld with these high frequencies at large currents, the manufacturer advises to use them only with currents up to 200Ampere, due to increased heating of the AC bridge caused by high frequency switching of output current.

✓ **Duty Cycle (10% - 90%) – menu 8:**

**DC PULSED WELDING** – Defines the percentage of time period the welding current output would be equal to main current, in relation to the time the output would be background current ( $I_{min}$ ). One period of DC pulsed current is equal to  $1/Freq$ .

Example: Duty Cycle=30% means that during one period of DC pulsed welding, for 30% of the time the welding output would be the main welding current, and 70% of the time period, the output would be back current  $I_{min}$ . For the set frequency of 10Hz, the time period would be  $1/10s$ , i.e. 0.1 seconds. In this example, the main current would last 0.03 seconds, and back current would last 0.07 seconds.



✓ **AC Balance: (10% - 90%) – menu 9:**

**AC Balance** – Defines the percentage of time period the welding current output would be the **DC+ cleaning current** (as opposed to **DC- welding current**). The switching between **DC- welding** and **DC+ cleaning** current is called **AC or alternating current**, which is used to weld materials such as aluminium, magnesium and its alloys. One period of AC current is equal to  $1/\text{Freq}$ . Smaller AC balance gives a narrower welding arc, and bigger AC balance results in a wider welding arc.

Example: AC Balance=30% means that during one whole period of AC current, the DC+ cleaning current would be at the welder output for 30% of the time. The remaining 70% of the AC welding time period would be the DC- welding current (i.e. the main welding current -  $I_{max}$ ). For the set frequency of 100Hz, the time period of AC welding is  $1/100\text{s} = 0.01\text{seconds}$ . In this example the cleaning current would be at the welder output for 0.003seconds, and the welding current would be at the output for the remaining 0.007seconds of the AC time period.



✓ **Hi/Low Precision setting – menu 14 – DC welding only:**

The Walter welder has possibility for setting the precision range in DC welding to: **HI** or **LOW**, by pressing the buttons **-** or **+**.

**LO:** This mode is recommended for welding in the range of currents **greater than 30 Ampere on single phase machines, or 60 Ampere on three phase models**. The user can weld with currents smaller than 30 / 60 Ampere even when this value is set to LO, but the welding arc will not be completely stable, which is why we recommend this setting.

**HI:** This mode is recommended for welding in the range of currents **smaller than 30 Ampere on single phase machines, or 60 Ampere on three phase models**. This welding mode does not support currents greater than 30 / 60 Ampere.

The precision mode is always visible in the lower right corner of the status line of the welder LCD screen.



**SAVING AND LOADING WELDING PROGRAMS.**

- ✓ **LOAD program – menu 24** – Load welding program from memory. Set the number of the program (1 to 30) you want to load, by pressing **-** or **+** buttons, and then press button **SAVE** (  ) to load the program.

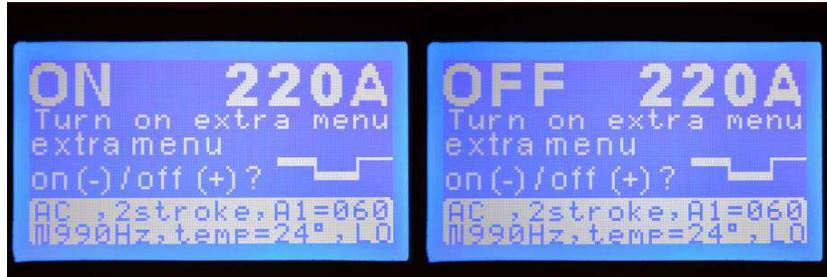


- ✓ **SAVE program – menu 25** – Save welding program to memory. Set the number of the program (1 to 30) you want to save, by pressing **-** or **+** buttons, and then press button **SAVE** (  ) to save the program. All welding parameters, excluding those from extra menus, will be saved to the memory. The user can write over an existing program, therefore be cautious not to lose important programs by writing them over.



✓ **Extra Menu on/off (menu 15):**

Use **-** or **+** buttons to turn extra menus on or off.



**EXTRA MENUS AVAILABLE IN DC AND AC WELDING MODES:**

✓ **Spot Welding (menu 21):**

**SPOT WELDING TIME:** User sets spot weld time by pressing buttons **-** or **+**. The spot welding current is the main welding current (upper right corner of the welder LCD screen). It can be set from 0.1 up to 10 seconds. The welder works in spot welding mode only while the welder is in the spot welding menu. By pressing the push-button on the handle of TIG torch, the welding arc will be ignited by HF, and the main welding current will be at the output of the welder for the time set in this menu.



✓ **Micro-Spot Welding (menu 22):**

**MICRO SPOT WELDING** (known also as Micro-Tack): used for spot welding of extremely thin materials. User sets micro-spot weld time by pressing buttons **-** or **+**. The spot welding current is the main welding current (upper right corner of the welder LCD screen). It can be set from 1 millisecond up to 200 milliseconds. The welder works in micro-spot welding mode only while the welder is in the micro-spot welding menu. By pressing the push-button on the handle of TIG torch, the welding arc will be ignited by HF, and the main welding current will be at the output of the welder for the time set in this menu.



**EXTRA MENUS AVAILABLE IN AC WELDING MODE ONLY:**✓ **Set AC Double Pulse or AC/DC MIX (menu 16):**

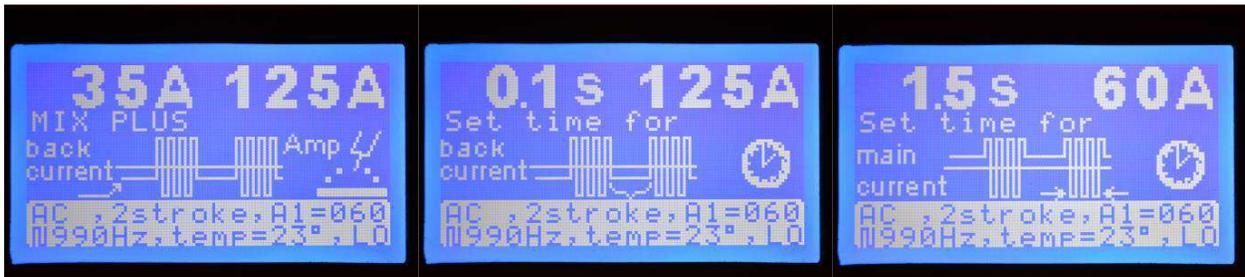
Use **-** or **+** buttons to choose AC Double Pulse or AC/DC+ MIX or AC/DC- MIX. For each of these welding options, the user can set the following welding parameters: **main AC welding current time** from 0.1 to 5 seconds (**menu 17**), **back AC current amperage** from 1 to 250A (**menu 18**) and **back current time** (**menu 19**).



1. **AC DOUBLE PULSE:** The welding output will be pulsed AC current, switching from main AC current and back AC current.



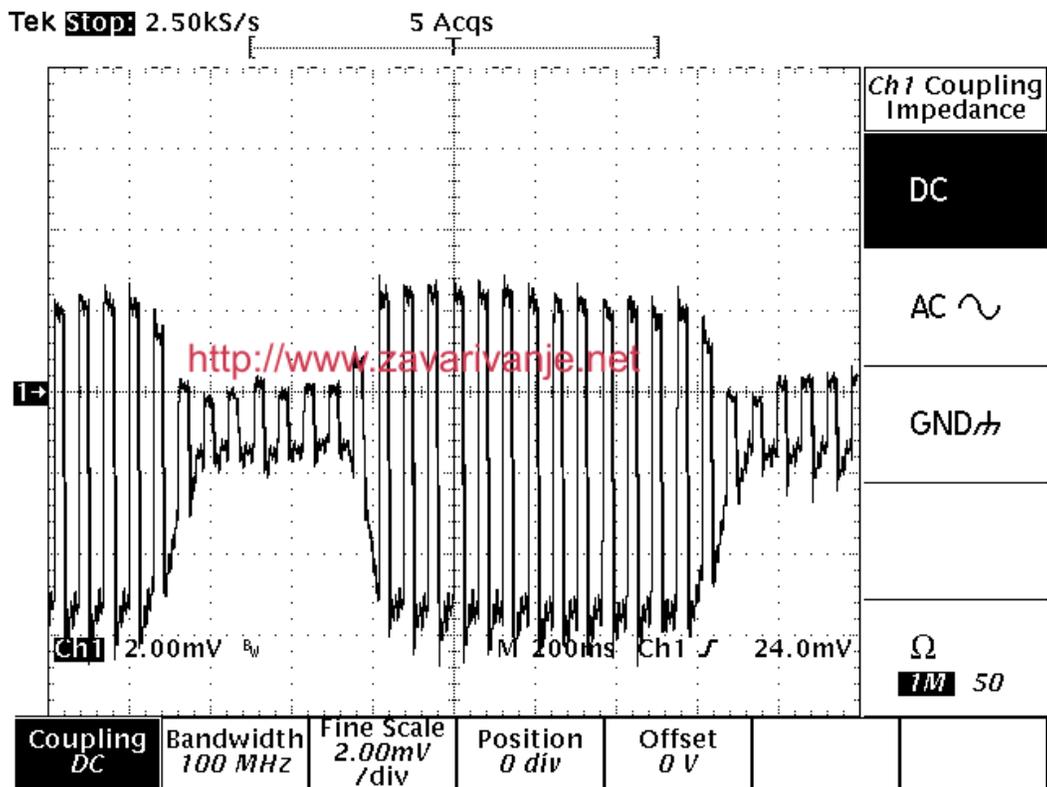
2. **AC/DC+ MIX** (mix main AC welding current and DC PLUS cleaning current): This mode is used to **increase cleaning** of the weld, and **decrease the heat input** into the weld pool.



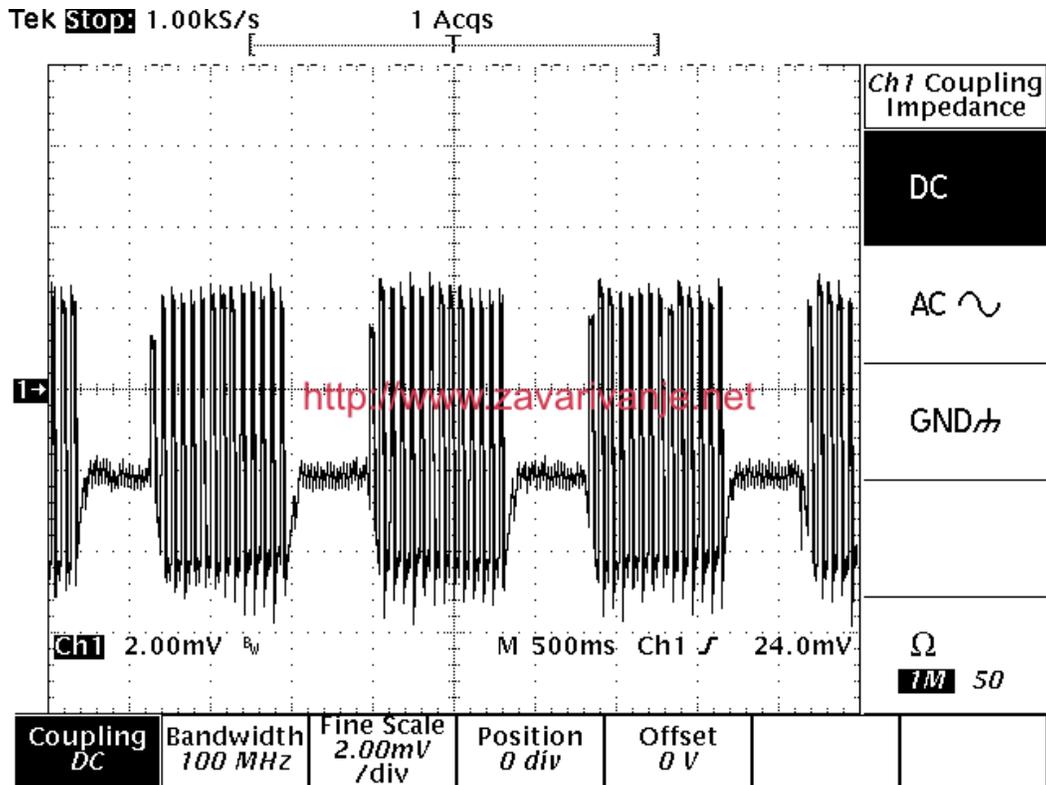
**3. AC/DC MIX** – (mix main AC welding current and DC MINUS welding current): This mode is used to **increase weld penetration**.



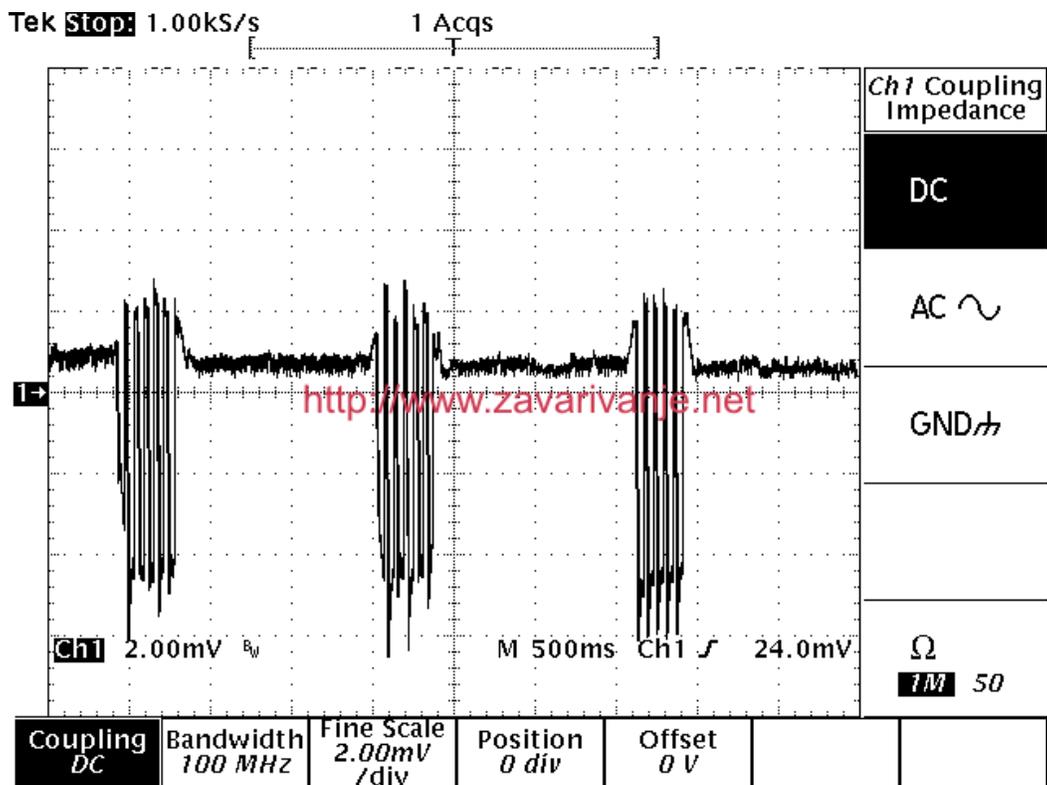
For better explanation, please find below the welding current waveforms, to illustrate these three processes.



Waveform of AC double pulse.



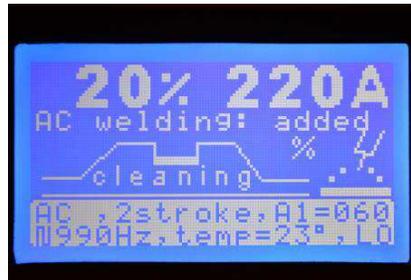
Waveform of AC/DC+ MIX welding current.



Waveform of AC/DC- MIX welding current.

✓ **AC Welding, Added Cleaning (menu 20):**

In addition to weld cleaning set by AC balance, the user can increase the cleaning of the weld pool, by adding cleaning power in this menu. The added cleaning is expressed in percentage (1-100%), where bigger percentage means greater cleaning effect. Use **-** or **+** buttons to set this value.



✓ **Tungsten Electrode Ball Preparation (menu 23):**

Use **-** or **+** buttons to set time for tungsten electrode ball preparation (50-250ms). Whereas in DC welding, most desirable shape of the tungsten electrode is pointy, AC welding requires a rounded ball at the tip of the electrode. Achieve the desired shape by applying the controlled AC current to the new electrode.



## **Safety Regulations and Precautions**

Before starting the welder, it is indispensable for the staff responsible to read and understand all the WARNINGS and all the CAUTION and DANGER indications listed in this manual. Nevertheless, the manufacturer cannot foresee all the possible circumstances which may lead to potential risks in the effective conditions of use of the welder. Any operations and/or procedures for maintenance not expressly recommended or indicated in the user manuals must always be notified to and approved by the Manufacturer. In the event that a procedure not specifically recommended needs to be applied, the user is responsible for assuring that such procedure is safe and does not cause harm to persons or things. The manufacturer declines all responsibility for damage to persons or things deriving from inobservance of the safety regulations.

### **SAFETY**

- Do not permit incompetent persons or without adequate training to use the welding set.
- Do not permit children or animals to approach the welding set when it is in operation.
- Do not access the welding set with wet hands, since it is a potential source of electric shock if improperly used.
- Any inspections of the welding set must be carried out with the engine off. Inspections with the engine on are to be carried out by specialized personnel only.
- Welding gases may contain noxious residues. Never operate the welding set in inadequately ventilated places.
- Do not operate the welding set near places with a danger of explosion or fire.
- Do not allow access to persons wearing a pacemaker because of possible electromagnetic interference with the device.
- In the event of fire, use a homologated fire extinguisher and never use water.
- Use protective gloves and head-mask at all times.
- Never leave inflammable liquids or cloths soaked in inflammable liquids on or in proximity of the work-piece being welded.
- Take the necessary precautions to prevent the danger of electrocution.
- Check that the earthing system has been installed and constructed in accordance with regulations.
- Never use worn-out or threadbare welding cables.

- Do not weld containers under pressure.
- Remove all easily flammable materials (paper, wood, etc), from the proximity of the work-piece being welded.
- Place welder on a steady horizontal surface to avoid its tumbling or turning-over.

## INSTALLATIONS

### **Room:**

The work room must have proper ventilation exhausts. It is recommended for the work room to have a climate control. It is recommended to make sure that the metal particles and sawdust, corrosive gases and humidity do not enter the enclosure of the welder.

### **Connecting to the mains supply:**

Before connecting the welder, make sure that the technical requirements (stated in the table on the side of the welder) match voltage and mains fuse in the work room. The mains installations must be protected by fuses.

### **Welding:**

The welding cables and torches must be firmly and completely connected to the front panel connectors of the welders, to ensure a good electrical contact. The loss of contact can lead to overheating in the place where the contact is loose, decrease welder productivity and ultimately can cause damage on the welder.

Always make sure to have good contact of the earth clamp and the work-piece. Clamping them on a metal that is covered with paint or powder-coat can reduce the quality of contact, or negate it completely.

When using flux-coated MMA electrodes, check the manufacturer recommended polarity and amperage, which is always indicated on their package. Always protect flux-coated electrodes from humidity and mechanical damage.

### **In the event of welder mal-function:**

The welder enclosing may be opened by trained personnel in an authorized service shop only.

## Safety Precautions for TIG and MMA Welding

The use of a welder may put you or others in danger. Therefore, we ask you to consider these safety precautions carefully, and to adhere to safety recommendations:

1. Use protective gloves and head-mask at all times. Make sure your skin is protected from direct and reflected UV lights produced by the welding arc.
2. Wear appropriate overalls. Avoid synthetic overalls, and replace wet clothes as soon as possible.
3. Wear appropriate protective shoes, with soles made of insulation material.
4. Make sure that the work room is properly ventilated, to avoid accumulation of harmful gases.

5. Avoid welding in proximity of flammable materials, in spaces with explosive potential, and with limited freedom of movement.
6. Do not weld in humid conditions.
7. Welders in IP21 enclosing are not to be used in the rain. Welders with IP23 enclosures can be used in conditions of rain dropping at an angle of less than 60° from the vertical
8. Do not put earth clamp or electrode holder in contact with the metal enclosure of the welder.
9. Welding cables that are thread-bare or not properly insulated, must be replaced immediately.
10. When not in use, it is recommended to remove the welder from the mains.

## **SAFETY PRECAURIONS FOR COMPRESSED ARGON**

When welding in TIG mode, argon is the most commonly used protection gas. Read and adhere to these safety precautions and recommendations.

### **FIRST AID**

**Breathing:** Argon does not have a toxic effect on human. Higher concentrations can cause asphyxiation, due to lack of oxygen. Symptoms of high concentration are loss of movement and consciousness. The victim can not sense the asphyxiation. The victim must be transferred to fresh air. Cover them with blanket, and make them lay still. Call the doctor. If the victim stops breathing, give the victim CPR (a combination of rescue breathing and chest compressions) or use an automated oxygen resuscitator.

### **IN THE EVENT OF FIRE OR EXPLOSION**

**Danger:** fire may easily cause the fracture or explosion of the gas cylinder. Argon is not flammable, or combustible.

**Combustion products:** None.

**Extinguishing:** Cool cylinders with water, spray from a protected place. Do not approach cylinders that may be hot. Evacuate if cylinders cannot be cooled.

**Suitable extinguishing media:** Water fog or fine water spray.

### **ACCIDENTAL RELEASE MEASURES**

**Personnel:** Evacuate area. Before dealing with spillage take the necessary protective measures, inform others to keep at a safe distance and shut off all possible sources of ignition. Contact supplier for specific assistance. Allow gas to escape to atmosphere, preferably in an open remote location. When accessing the spillage area provide breathing equipment, independent from surrounding air. If it is not possible, first prove that the atmosphere is not contaminated.

**Environment:** Try to stop further gas spillage. Prevent vented gas from re-entering ventilation intakes, low-lying spaces, cellars, drains, sewers or similar. Argon does not contaminate the environment.

**Cleaning Method:** Allow gas to escape to atmosphere.

### **Handling and Storage**

**Storage:** Store cylinders upright in an enclosure, preferably outside of buildings, protected from direct sunlight. Secure cylinders by chains or similar device to prevent falling over. Store cylinders below 45°C. Keep away from flammable or combustible materials. Keep away from vehicular traffic and other thoroughfares. Protect from physical damage. Protect regulators and other fittings from impact.

**Transport:** When possible, do not transport in a vehicle that does not have a transport space separated from the driver's cabin. The driver must be informed about the safety precautions of the load. The gas cylinders must be secured before transport. The valve must be sealed and protected by a safety cap.

### **Hazards identification**

**Respiratory protection:** Use only in well ventilated areas. In case of insufficient ventilation, wear suitable respiratory equipment.

**Hands protection:** Wear suitable protection gloves and shoes.

**Additional warnings:** Because argon is heavier than air, it can accumulate close to ground level, particularly in depressions. Do not breathe the gas. Avoid nitrogen-rich atmosphere.

### **Risk Phrase:**

R44 - Risk of explosion if heated under confinement

### **Safety Phrase:**

S15 - Keep away from heat

S23 - Do not breathe gas/fumes/vapour/spray

S37 - Wear suitable gloves

S38 - In case of insufficient ventilation, wear suitable respiratory equipment

S39 - Wear eye/face protection

S51 - Use only in well ventilated areas