



ENel Sp. z o. o. - WROCLAW
DESIGN AND MANUFACTURE OF POWER
ELECTRONIC DEVICES

INVERTER WELDING MACHINE **ENEL250A**

USER MANUAL



DEALER:

1. INTRODUCTION

This manual contains information that will allow to take full advantage of ENEL250A welding machine operation values and enable its safe use. Before operating the product, be sure to read this manual.

2. APPLICATION

ENEL250A welding machine is a modern direct current source designed mainly for welding with coated electrodes (MMA) of all types (ER-, EA-, EB-, ES-, ...) with diameters from $\varnothing 1.6$ to $\varnothing 5.0$. Due to the high open circuit voltage (90V) and very good welding properties, the device also allows welding with cellulose coated electrodes which are used, among others, for pipelines welding.

When equipped with additional TIG welding torch with gas valve placed in the torch grip, it is possible to weld steel and its alloys and copper and its alloys using TIG welding (welding with a non-consumable electrode - mostly tungsten electrode in an inert gas shield, such as argon). The ignition of the arc is done by scratch.

Due to the small dimensions and weight, and resistance to large voltage fluctuations, the ENEL250A welder is particularly useful for operation in difficult field conditions when installing any type of welded structures, pipelines, tanks, etc.

The device is designed for operation at ambient temperature from -10°C up to $+40^{\circ}\text{C}$ and relative humidity up to 90% at temperature of $+20^{\circ}\text{C}$. You can not operate the welder in the rain without an additional protection against water entering the inside of the device.

3. DESCRIPTION

ENEL250AC welding machine is an inverter direct current source operating in the frequency range above the audio frequency. This current source is characterised by good dynamics and a smooth and stable arc. It is lightweight, of small dimensions, resistant to large fluctuations of the mains voltage. The connecting, control and indicating elements are located on the front panel. On the rear panel there are: power switch, power cord, fan and rating plate. Control elements of the welder are shown in Fig. 1. The welding machine has smooth adjustment of the welding current (knob (1) (Fig. 1)) within the range from 10 to 250A.

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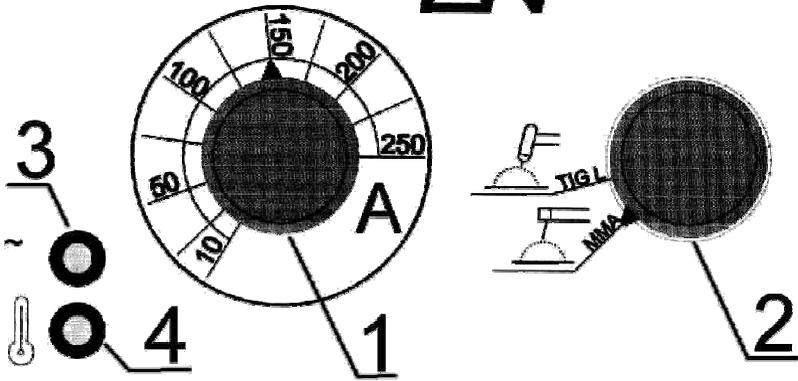


Figure 1

There are two operation modes available to select with switch (2) (Fig. 1):

- 1) **welding with coated electrodes (MMA)** - the switch (2) should indicate the icon



The rectifier is provided with the features:

- **HOTSTART** - for facilitating the launch of the welding process (at the moment of arc ignition there occurs a momentary increase of the current value of about 30% compared to welding current set).
- **ANTISTICK** - for facilitating electrode unsticking when it adheres to the works being welded (when the electrode adheres to elements being welded longer than 3 seconds, the welding current is automatically switched off, so electrode detaching is not difficult).

- 2) **TIG welding** - the switch (2) should indicate the icon



HOTSTART and ANTYSTICK functions are off, the arc ignition occurs at the moment of lifting an electrode (after having touched at the welding start point).

The main switch of welding machine (green) is located on the rear panel - backlight of the key indicates that the power cord is connected to the 3 phase mains. After the welding machine is turned on, the green indicator (3) (Fig. 1) lights up. The welder has a protection against loss of one of supply phases - in the case of phase loss the indicator (3) (Fig. 1) goes out and the power module is turned off.

A welder has a thermal protection to protect certain components against excessive overheating. Activation of this protection is indicated by the lamp (4) (Fig. 1) shining yellow.

4. TECHNICAL SPECIFICATIONS

Table 1

Item	Parameter	Unit	Value
1	2	3	4
1.	Power supply (3-phase)	V	3x400V
2.	Frequency	Hz	50/60
3.	Welding current: P60%	A	250
	P100%	A	210
4.	Current adjustment range	A	10-250
5.	Input current: P60%	A	13.0
	P100%	A	11.0
6.	Output Power: P60%	kVA	8.5
	P100%	kVA	7.0
7.	Power factor (250A)		0.95
8.	Open Circuit Voltage	V	90
9.	Power cable cross-section	mm ²	5x1.5
10.	Case Enclosure Class		IP22
11.	Insulation class		C
12.	Dimensions: Length	mm	352
	Width	mm	222
	Height	mm	262
13.	Weight	kg	10.5
14.	Compliance with Standard		EN60974-1
15.	Electrical Efficiency		0.92

5. OPTIONAL ACCESSORY

(Can be supplied with rectifier for an extra fee)

1. 3m welding cable 1x35mm² terminated with an electrode holder K-260.¹⁾
2. 3m welding cable 1x35mm² terminated with an electric clamp ZBK35.¹⁾
3. Shoulder strap for carrying the rectifier.
4. Welding cable with SR26V welding torch of TRAFIMET.
5. Remote Control module

6. OPERATING INSTRUCTIONS

6.1 CONNECTION TO POWER MAINS

1. ENEL250A welder is manufactured as a protection class I device and because of users safety should be connected only to the 5-wire electrical socket provided with the protective (earth) conductor. Electrical supply circuit should be protected with a time-delayed fuse rated at 10A or automatic circuit breaker, e.g. S391B10 of FAEL production.
2. After connecting the electrical plug to a power socket, the welding machine switch located on the rear panel should be lit.
3. The rectifier should be placed in a dry place, so that free inflow and outflow of cooling air is allowed. It is not permitted to cover the ventilation openings.
4. Select the operation mode with button (2) (Fig. 1)
5. Preparation the rectifier for MMA welding (with coated electrodes): connect the welding cable with electrode holder and the cable terminated with electric clamp to (+) and (-) terminals maintaining polarity in accordance with the instructions given on the electrode packaging. For most of the electrodes being used, the welding cable with electrode holder is connected to the (+) terminal, and the cable with a clamp is connected to the (-) terminal.
5. Preparation the rectifier for TIG welding:
 - a) connect the cable with electric clamp to the (+) terminal and TIG welding torch to the (-) terminal.
 - b) connect the connector of the welding torch gas hose to the output of rotameter connected to a gas cylinder.

6.2 OPERATION OF THE RECTIFIER

Prior to welding, ensure that all safety precautions and instructions specified in section 7.1 have been observed.

¹⁾ Other length cables are available on request.

MMA WELDING (WITH COATED ELECTRODES)

- 1) Connect the welding cable with the electric clamp to the work to be welded.
- 2) Turn on the power switch at position ON (ZAL). Then the indicator (3) (Fig. 1) should illuminate indicating that the rectifier is ready for operation. The cooling fan should turn on immediately.
- 3) Set the switch (2) in the position marked with MMA welding icon.



- 4) Fit an electrode in the electrode holder and set welding current suitable for a specific electrode using the potentiometer (1) (Fig. 1).
- 5) After the welding is completed, the rectifier should be left connected to the mains for some time (approx. 3 minutes). This is recommended for cooling down the heated components.
- 6) If during welding, the rectifier has been overloaded by exceeding the permitted duty cycle of 60% at currents given in Table 1, the temperature limiter can operate. This cuts-off the welding current and lights up the indicator (4) (Fig. 1). In such case wait until this indicator turns off, and then you can continue the welding.
- 7) When the electrode adheres to elements being welded longer than 2-3 seconds, the welding current is automatically switched off, so electrode detaching is not difficult.

TIG WELDING

- 1) Connect the welding cable with the electric clamp (connected to the (+) terminal) to the work to be welded.
- 2) Fit an appropriate tungsten electrode in the TIG welding torch (connected to the (-) terminal).
- 3) Set the power switch in the position ON (ZAL).
- 4) Set the switch (2) (Fig. 1) in the position marked with TIG welding icon.



- 5) Set the proper gas flow using a rotameter on the gas cylinder.
- 6) The ignition of the arc is done by scratch. Touch the workpiece to be welded with an electrode (the current doesn't flow while touching, so no sparking should take place) and lift it immediately - this should initiate ignition of the arc.

- 7) After the welding is completed, the rectifier should be left connected to the mains for some time (approx. 3 minutes). This is recommended for cooling down the heated components.
- 8) If during welding, the rectifier has been overloaded by exceeding the permitted duty cycle of 60% at currents given in Table 1, the temperature limiter can operate. This cuts-off the welding current and lights up the indicator (4) (Fig. 1). In such case wait until this indicator turns off, and then you can continue the welding.

7. MAINTENANCE

CAUTION: Before performing any inspection and maintenance unplug the power cord from the mains.

7.1 ONGOING MAINTENANCE

- 1) Check the condition of the power cord and insulation of welding cables. Any damages should be fixed immediately.
- 2) Ensure that welding cables connections, the electric clamp and isolated jaws of the welding holder are operational. Any worn or damaged parts should be replaced.

7.2 PERIODIC MAINTENANCE

Depending on the operating conditions of rectifier but not less frequently than once every three months, proceed with the following:

- 1) remove any dust from the internal and external parts using a soft brush and a vacuum cleaner or compressed air under pressure of ca. 3bar.
- 2) check the condition and electrical connections, including cables connected to the protective terminal. All connections should be correct.
- 3) check if all bolts are firmly tightened.

8. REPAIRS

Any repairs may be performed ONLY by persons authorized and trained by the manufacturer.

9. DANGERS DURING WELDING

Prior to welding, authorized persons should thoroughly read this manual and strictly observe all given instructions. Non-compliance with these instructions may result in, among others, following dangerous consequences.

9.1 FIRE, EXPLOSION

Observe fire regulations in force at the welding stand. Remove any flammable materials in the vicinity of the welding stand. Prepare the appropriate fire-fighting equipment. Keep in mind that due to sparks and welding arc high temperature, there is a fire hazard even after a certain period after welding has been completed. Be especially careful when welding tanks used to store flammable or combustible materials. If improperly cleaned before welding, may result in explosion.

Argon used for TIG welding is an inert gas and it can remove oxygen from the atmosphere resulting in suffocation.

Often inspect gas cylinder, pressure regulator and gas hose. All joints should be tight. Do not connect the gas cylinder directly to the gas hose without a pressure regulator designed for argon.

Do not use gas cylinders of which content is uncertain. The gas cylinder should always be secured in an upright position to a wall or a specially designed cylinder rack. After welding always turn off the cylinder valve. Handling of gas cylinders must always be done in accordance with the manufacturer's instructions.

WARNING: Gas cylinder may explode if dropped or fallen over.

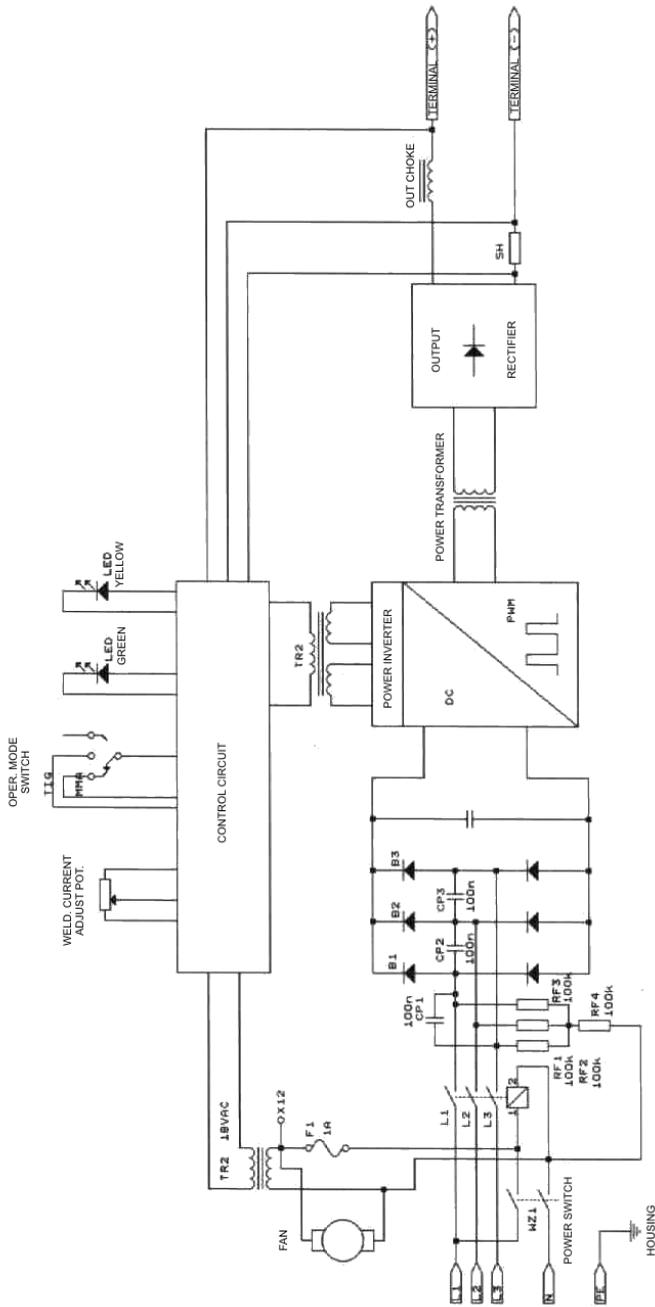


Figure 2 General electric diagram

9.2 BURNS

A welder must be fitted with a suitable non-flammable clothing, welding gloves, suitable footwear and welding mask. High temperature of the arc, welding splatter and ultraviolet radiation can cause dangerous injuries.

9.3 HARMFUL FACTORS

Welding process causes emission of vapours harmful to your health.

Welding stand should be provided with efficiently operating ventilation. If the ventilation is not sufficient, use appropriate protective masks.

Without appropriate gas masks do not weld metals containing lithium, cadmium, zinc, and beryllium.

9.4 ELECTRIC SHOCK

Do not touch live electrical parts. Do not work in damp places and do not place the power supply on wet surfaces. Keep your clothing and body dry. Do not operate the rectifier without housing covers. Inspect the power cords, plugs and sockets, and the condition of the insulation of all current conducting wires and welding holders.

Any repairs and inspections must be carried out by qualified and authorized persons.

10.SPARE PARTS LIST

Specification of main components is given in the following table:

Item	Description	Quantity
1.	Handle	1
2.	Strap catch	2
3.	Thermal switch 80 °C	1
4.	Bridge Rectifier	3
5.	Power transformer	1
6.	AC transformer 230/2x9V	1
7.	Operating Mode Switch	1
8.	IGBT transistor	6
9.	Control circuit	1
10.	Output socket	2
11.	Output choke	1
12.	Fan protective grille	1
13.	Potentiometer	1
14.	Knob	2
15.	Circuit breaker	1
16.	Power cord	1
17.	Cord strain relief	1
18.	Fan	1