



MODEL

# NOVATIG 203 PULSE PFC

## **INSTRUCTION MANUAL**

for installation,  
use and maintenance  
of welding  
machines.

Original instructions in Italian.  
Please keep for future use.

1.995.226 EN - Rev. 1.1



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## 1. PREFACE

### 1.1. PURPOSE OF THE INSTRUCTION MANUAL FOR USE AND MAINTENANCE

This manual has been designed to provide the user with general knowledge of the machine and to allow it to be used safely.

This instruction manual is an integral part of the machine and has the purpose of providing all the information necessary to ensure:

1. safe handling of the machine, either packaged and unpackaged;
2. correct machine installation;
3. knowledge of the technical specifications of the machine;
4. thorough understanding of machine operations and limitations;
5. indication of the qualifications and specific training required of those operating and carrying out maintenance work on the machine
6. in-depth knowledge of its intended, unforeseen and prohibited uses;
7. its proper and safe use;
8. how to carry out correct and safe maintenance and repair operations;
9. technical assistance and management of spare parts;
10. disposal of waste produced by the machine;
11. the safe dismantling of the machine in accordance with applicable regulations to protect workers' health and the environment.

This document assumes that the applicable occupational health & safety and hygiene regulations are complied with at the site where the machine will be used.

**IMPORTANT: Those in charge have the responsibility, in accordance with current legislation, to carefully read the contents of this Instruction Manual and ensure that operators and maintenance personnel read the parts relevant to them.**

The customer has the responsibility to make sure that, if this document is modified by the Manufacturer, only the updated versions of the manual are actually present at the workplace.

The instructions, documentation and drawings found in this Manual are of a confidential technical nature and strictly the property of the Manufacturer, therefore, aside from the purpose for which it was produced, any reproduction in whole or in part of the contents and/or format must have the prior consent of the Manufacturer.

THE OFFICIAL LANGUAGE CHOSEN BY THE MANUFACTURER IS ITALIAN. The manufacturer cannot be held liable for translations in other languages that do not conform to the original meaning (ORIGINAL INSTRUCTIONS).

### 1.2. RECIPIENTS

This Instruction Manual is intended for the installer, the operator/user, the system manager, the system safety manager and the qualified or qualified and authorised technician authorised to maintain the machine.

**INSTALLER:** Technician authorised by the manufacturer and expert in handling, installation, connection and adjustment of the machine.

**OPERATOR/USER:** This is the person in charge of using the machine and cleaning it.

**PLANT MANAGER:** The individual who makes the adjustments and the programming.

**PLANT SAFETY MANAGER:** Person responsible for verifying that all applicable safety regulations and the provisions set out in this manual are observed.

**QUALIFIED TECHNICIAN:** Qualified person who, by virtue of an accurate technical knowledge of the machine and all the safety procedures, performs ordinary maintenance and minor repairs.

**QUALIFIED AND AUTHORISED TECHNICIAN:** Highly qualified person, trained and authorised by the manufacturer to make significant adjustments and extraordinary maintenance or repairs during the warranty period.

**EXPOSED PERSON:** Any person who is wholly or partly in a dangerous area (near the machine and exposed to risk due to his or her safety).

The machine is intended for industrial use, so its use is strictly for qualified, skilled technical personnel, in particular those:

- over 18 years of age;
- physically and psychologically capable of performing particularly difficult technical work;
- sufficiently trained to use the machine and carry out maintenance work on it;
- deemed suitable for carrying out the task entrusted to them by their employer;

- capable of comprehending and interpreting the operator manual and the safety instructions;
- familiar with the emergency procedures and how to implement them;
- have understood the operational procedures established by the machine's Manufacturer.

### 1.3. STORAGE OF THE INSTRUCTION MANUAL

The Instruction Manual must be carefully stored and must accompany the machine each time it changes hands throughout its life cycle.

It should be kept in good condition by handling it with care, with clean hands, and not placing it on dirty surfaces.

Parts of the manual must not be removed, torn or changed.

The Manual should be kept close to the machine to which it refers in an environment free from humidity and heat.

### 1.4. UPDATING THE INSTRUCTION MANUAL

The Manufacturer is only liable for the Instructions issued and validated by itself (Original Instructions); any translations **MUST** always be accompanied by the Original Instructions to verify the correctness of the translation. In any case, the Manufacturer is not liable for translations that have not been approved by the Manufacturer himself, thus if an inconsistency is detected, attention must be paid to the original language and, if necessary, the manufacturer's sales office should be contacted, which will make the changes deemed appropriate.

The Manufacturer reserves the right to make changes to the project, changes/improvements to the machine and updates to the Instruction Manual without previously informing Customers. However, should changes be made to the machine installed at the Customer's site, in agreement with the Manufacturer and involving the adaptation of one or more chapters of the Instruction Manual, the Manufacturer shall provide the Customer with the parts of the Instruction Manual that concern the change, with the new global revision model. The Customer shall be responsible, following the instructions that accompany the updated documentation, for replacing any parts that are no longer valid with the new ones.

### 1.5. HOW TO READ THE INSTRUCTION MANUAL

The Manual is split into chapters, each one dedicated to a specific category of information addressed to the personnel for whom the relevant qualifications have been defined.

To facilitate immediate comprehension of the text, terms, abbreviations and pictograms are used, the meanings of which can be found in Paragraph 1.6.

### 1.6. TERMS, SYMBOLS AND PICTOGRAMS

To highlight parts of text of significant importance the following symbols were adopted:

**ATTENTION:** Indicates the need to adopt appropriate behaviours so as not to put people's health and safety at risk and not to cause damage to the machine or the environment.

**HAZARD:** Indicates situations of serious danger that can seriously endanger the health and safety of people.

**IMPORTANT:** Indicates technical information of particular importance which should not be neglected.

The following pictogram stickers are affixed to the machine, depending on the version:



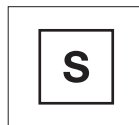
The product complies with the safety requirements provided by the applicable EU directives or regulations.



Carefully read the instructions listed in the manual.



Machine subjected to general danger (see instruction manual).



Machine used in environments with a high risk of electric shock.



**WARNING!**  
Moving mechanical parts.  
(For MIG generators only)

## 2. GENERAL INFORMATION

### 2.1. MANUFACTURER IDENTIFICATION DATA

MANUFACTURER: SINCOSALD S.r.l

HEADQUARTERS - OFFICES

via della Fisica, 26/28

20864 Agrate Brianza (MB) Italy

Tel: +39 039 641171

Fax: +39 039 6057122

CONTACTS:















export@sincosald.it www.sincosald.it

### 2.2. MACHINE IDENTIFICATION DATA AND PLATES

Each machine is identified by a CE plate on which its reference data is indelibly marked. For any communication with the manufacturer or service centre always quote these references.

**IMPORTANT: The plate must not be removed for any reason, under penalty of forfeiture of the guarantee and the unavailability of spare parts due to failure to be identified. The position of the nameplate on the Machine can vary from machine to machine.**

NOVATIG 203 PULSE PFC

SINCOSALD S.r.l Via della Fisica 26/28 Agrate B.za - MB - Italy			
NOVATIG 203 PULSE PFC		SERIAL NUMBER	
		EN 60974-1	
6a 	8	5A / 10.2V - 200A / 18V <sup>10</sup>	
7 	9	U <sub>0</sub> = 66V	
		X <sup>11</sup>	50% <sup>11b</sup> 60% <sup>11c</sup> 100% <sup>11e</sup>
		I <sub>2</sub> <sup>12</sup>	200A <sup>12b</sup> 180A <sup>12c</sup> 145A <sup>12e</sup>
		U <sub>2</sub> <sup>13</sup>	18V <sup>13b</sup> 17.2V <sup>13c</sup> 15.8V <sup>13e</sup>
6b 	8	5A / 20.2V - 200A / 28V <sup>10</sup>	
7 	9	U <sub>0</sub> = 66V	
		X <sup>11</sup>	30% <sup>11a</sup> 60% <sup>11c</sup> 100% <sup>11e</sup>
		I <sub>2</sub> <sup>12</sup>	200A <sup>12a</sup> 145A <sup>12c</sup> 135A <sup>12e</sup>
		U <sub>2</sub> <sup>13</sup>	28V <sup>13a</sup> 25.8V <sup>13c</sup> 25.4V <sup>13e</sup>
14 	50/60 Hz.		
15 U <sub>1</sub> = 230V	AF <sup>20</sup>		
	IP23 <sup>21</sup>		
	CE <sup>22</sup>		
			
6a 	8	5A / 10.2V - 130A / 15.2V <sup>10</sup>	
7 	9	U <sub>0</sub> = 66V	
		X <sup>11</sup>	90% <sup>11d</sup> 100% <sup>11e</sup>
		I <sub>2</sub> <sup>12</sup>	130A <sup>12d</sup> 105A <sup>12e</sup>
		U <sub>2</sub> <sup>13</sup>	15.2V <sup>13d</sup> 14.2V <sup>13e</sup>
6b 	8	5A / 20.2V - 130A / 25.2V <sup>10</sup>	
7 	9	U <sub>0</sub> = 66V	
		X <sup>11</sup>	60% <sup>11c</sup> 100% <sup>11e</sup>
		I <sub>2</sub> <sup>12</sup>	130A <sup>12c</sup> 95A <sup>12e</sup>
		U <sub>2</sub> <sup>13</sup>	25.2V <sup>13c</sup> 23.8V <sup>13e</sup>
14 	50/60 Hz.		
15 U <sub>1</sub> = 110V	AF <sup>20</sup>		
	IP23 <sup>21</sup>		
	CE <sup>22</sup>		
			

**NOVATIG 203 PULSE PFC plate explanation**

- Pos. 1** Name and address of the manufacturer and trademark
- Pos. 2** Identification of the welding machine model
- Pos. 3** Welding machine serial number
- Pos. 4** Welding machine type symbol: Transformer - Rectifier for arch welding
- Pos. 5** Reference to the legislation followed for welding machine construction: EN 60974-1
- Pos. 6a** Welding with TIG procedure
- Pos. 6b** Welding with MMA procedure
- Pos. 7** Symbol indicating that the welding machine can be used in environments with an increased risk of electric shock
- Pos. 8** Welding current symbol: Direct/Alternating Current
- Pos. 9** Rated no-load voltage  $U_0$  in V
- Pos. 10** Electric adjustment range of the welding machine: minimum and maximum rated welding current, with the relevant charged voltages
- Pos. 11** Welding machine service factor (X): this figure indicates the welding machine service factor as a percentage of a 10-minute work cycle. Example  $X = 60\%$  - I<sub>2</sub> 350 A, these data indicate that the welding machine on a work cycle can weld with a current  $I_2 = 350$  A for a time of 6 minutes out of 10, that is 60%.
- Pos. 11a** Service factor: 30 %
- Pos. 11b** Service factor: 50 %
- Pos. 11c** Service factor: 60 %
- Pos. 11d** Service factor: 90 %
- Pos. 11e** Service factor: 100 %
- Pos. 12** Rated welding current (I<sub>2</sub>)
- Pos. 12a** Value of the rated welding current at 30 %
- Pos. 12b** Value of rated welding current at 50 %
- Pos. 12c** Value of rated welding current at 60 %
- Pos. 12d** Value of rated welding current at 90 %
- Pos. 12e** Value of rated welding current at 100 %
- Pos. 13** Conventional load voltage (U<sub>2</sub>)
- Pos. 13a** Voltage at 30 % load
- Pos. 13b** Voltage at 35 % load
- Pos. 13c** Voltage at 60 % load
- Pos. 13d** Voltage at 90 % load
- Pos. 13e** Voltage at 100 % load
- Pos. 14** Symbol for the welding machine power supply and number of phases (3) followed by the direct/alternating current symbol
- Pos. 15** Rated power voltage
- Pos. 16** Maximum current in MMA welding
- Pos. 17** Actual current in MMA welding
- Pos. 18** Maximum current in TIG welding

- Pos. 19** Actual current in TIG welding
- Pos. 20** Air forced
- Pos. 21** Indicates the degree of welding machine protection: IP 23
- Pos. 22** Product complies with the safety requirements established by the applicable EU directives or regulations
- Pos. 23** See chapter 9. ADDITIONAL INSTRUCTIONS

**2.3. DECLARATIONS OF CONFORMITY**

The machine is constructed in compliance with the relevant EU Directives, applicable at the time of its entering onto the market.

**2.4. SAFETY STANDARDS**

The machine was built in accordance with the following standards and directives:

**Harmonised standards**

IEC 60974-1 - IEC 60974-5 - IEC 60974-10

**Directives**

EN 60204-1 - 2014-35-EV - 9231 EEC - 9368 EEC

**Standards**

EN/IEC 61000-3-12 - EN/IEC 61000-3-11 - EN/IEC 61000-3-3

**2.5. INFORMATION ON TECHNICAL ASSISTANCE**

The machines are covered by a warranty, as provided for in the general conditions of sale.

If during the warranty period you experience a malfunction or failure of the machine parts, which fall under the cases covered by the warranty, the manufacturer, after the necessary machine checks, will repair or replace defective parts.

The goods travel at the customer's risk; product damage caused by transportation or unloading is not covered by the warranty. All equipment and consumables supplied with the product are also excluded from the warranty.

It is reminded that any modifications carried out by the user, without the express written consent of the manufacturer, will void the warranty and free the manufacturer from any liability for damage caused by a defective product.

This applies in particular to alterations made to safety



devices that reduce their effectiveness.

The same considerations apply when using non-original spare parts or those different to the ones explicitly specified by the manufacturer.

For these reasons, we recommend our customers to always contact our Customer Service.

## 2.6. PREPARATION BY THE CUSTOMER

Unless otherwise agreed in the contract, the following are normally the Customer's responsibility:

- Room preparations, including any building work and/or ducting systems required;
- Electrical supply of the equipment, in compliance with the standards in force in the country of use. Particular care must be given to the protective conductor commonly known as "earthing" and to the efficiency of the circuit breaker installed to protect the power outlet. It is the purchaser's responsibility to keep the above system adequately efficient, in compliance with current accident prevention regulations.
- Consumables or material normally subject to wear;
- Equipment unloading at delivery and the consequent liabilities.

## 3. SAFETY

### 3.1. GENERAL SAFETY WARNINGS

**WARNING: your safety depends on you!!!**

- *Follow all safety rules carefully.*
- *It is your duty to protect yourself and others from the risks of welding operations.*
- *The operator is responsible for his own safety and that of those in the work area. He must therefore know all the safety rules and observe them.*

**Nothing can replace common sense!!!**

**IMPORTANT: Before operating the machine, carefully read the instructions contained in this manual and follow them thoroughly.**

The manufacturer has made every effort to design this machine and to make it as **INTRINSICALLY SAFE** as possible.

The manufacturer has also equipped the machine with all the protective and safety devices considered necessary. Finally, it has provided enough information for it to be used safely and correctly.

**IMPORTANT: This information must be scrupulously followed.**

The user may choose to appropriately add to the information provided by the manufacturer with additional processing instructions, which, obviously, do not contradict that contained in this Instruction Manual, in order to contribute to safe machine use.

For example, you must pay close attention to the clothing that anyone working on the machine is wearing:

- Avoid using clothes with hooks that can remain attached to parts of the machine;
- Avoid using ties or other fluttering clothing parts;
- Avoid wearing bulky rings or bracelets that may get caught in parts of the machine.

Whenever necessary, further recommendations for use will be provided in the Manual for the user related to preventive measures, personal protective equipment, information to prevent human error and any reasonably foreseeable prohibited behaviour.

It is, however, essential to diligently follow the following indications:

- It is absolutely forbidden to operate the machine automatically with the fixed and/or mobile guards removed;
- It is strictly prohibited to disable the safety mech-



anisms installed on the machine;

- Operations at reduced safety levels must be carried out in strict accordance with the instructions given in the relevant descriptions;
- After any operation with reduced safety levels, guards/safety devices should be replaced on the machine as soon as possible;
- Any cleaning must be carried out with the electrical and pneumatic separation devices sectioned.
- Do not alter parts of the machine for any reason; in the event of malfunction, due to non-compliance with the above, the manufacturer cannot be held liable for the consequences. We recommend that you request any changes to be made directly to the manufacturer;
- Clean the casing of the machines, the panels and the controls with soft cloths that are dry or have been lightly soaked in a mild detergent solution; do not use any type of solvent, such as alcohol or petrol, as the surfaces may be damaged;
- Position the machines as determined at the time of order according to the diagrams provided by the manufacturer, otherwise it cannot be held liable for any problems.

#### **ATTENTION:**

**The Manufacturer cannot be held liable for damage caused by the machine to persons, animals or property in the event of:**

- **use of the machine by personnel who are not adequately trained;**
- **improper use of the machine;**
- **electrical, hydraulic or pneumatic power supply faults;**
- **incorrect installation;**
- **failure to perform scheduled maintenance;**
- **unauthorised modifications or operations;**
- **the use of spare parts that are not original or not specific to the model;**
- **total or partial failure to follow the instructions;**
- **use contrary to the specific national regulations;**
- **calamities and exceptional events.**

#### **General requirements**

The moving parts must always be used according to the manufacturer's instructions, as indicated in this manual, which must always be available at the workplace.

All safety features placed on moving parts to prevent accidents and safeguard safety can not be modified or removed, but must be adequately safeguarded.

The user must promptly inform the employer or his

direct superior of any defects or anomalies presented on the mobile parts.

#### **A) Electric shock**

##### **ELECTRIC SHOCK CAN BE FATAL!!!**

- All electric shocks are potentially fatal.
- Do not touch live parts.
- Insulate yourself from the piece to be welded and from the earth, wearing insulating gloves and clothes.
- Keep clothing (gloves, shoes, headgear, clothes) and body dry.
- Do not work in damp or wet environments. Do not lean on the piece to be welded.
- If you have to work near or in an area at risk, use all possible precautions.
- If you also feel a little electric shock, stop welding immediately; do not use the device until the problem is identified and resolved.
- Provide an automatic wall switch, of adequate capacity and possibly in the vicinity of the machine, to immediately cut off the device in the event of an emergency situation.
- Frequently inspect the power cord.
- Disconnect the power cord from the mains before working on the cables or before opening the machine.
- Do not use the machine without the protective bulkheads.
- Always replace any damaged parts of the machine with original materials.
- Never bypass machine safety devices.
- Make sure that the power supply line is equipped with an efficient earth socket.
- Make sure that the work bench and the work piece are connected to an efficient earth socket.
- Never electrically and simultaneously touch "hot" parts of pliers connected to two welders because the voltage between the two can be the total of the no-load voltage of both welding machines.
- Any maintenance must be performed only by expert personnel, aware of the risks due to the voltages necessary for the operation of the equipment.

#### **B) Radiation**

Ultraviolet radiation, emitted from the electric arc, can damage the eyes and burn the skin.

Follow the instructions below:

- Wear appropriate clothing and protective masks.
- **DO NOT** use CONTACT LENSES!!! The intense heat emanating from the electric arc could stick them

to the cornea.

- Use masks with lenses, with a minimum DIN 10 or DIN 11 protection grade.
- Protect people near the welding area.
- **REMEMBER:** The arc can blind or damage your eyes. The arc is dangerous up to a distance of 15 metres. Never look at the arc with the naked eye!
- Prepare the welding area so as to reduce reflection and transmission of ultraviolet radiation: paint walls and exposed surfaces black to reduce reflection, installing protective screens or curtains, to reduce ultraviolet transmissions.
- Replace the mask lenses when they are damaged or broken.

### C) Welding wire

**Attention: the welding wire can cause perforated wounds.**

- Do not press the button on the welding torch before carefully reading the instructions for use.
- Do not point the torch towards parts of the body, other people or metals, when mounting the welding wire on the welding machine.

### D) Explosions

- Do not weld above or near pressurised containers.
- Do not weld in an atmosphere containing explosive powders, gases or vapours.

This welder uses inert gases such as CO<sub>2</sub>, ARGON, or ARGON + CO<sub>2</sub> mixtures to protect the arc, therefore it is necessary to pay the utmost attention to:

#### 1) Cylinders:

- Handle or use pressurised cylinders in accordance with the regulations in force.
- Do not connect the cylinder directly to the machine's gas pipe, without using a pressure regulator.
- Do not use cylinders that leak or are physically damaged.
- Do not use cylinders that are not well secured to the welding machine or to suitable supports.
- Do not transport cylinders without the valve protection fitted.
- Do not use cylinders whose contents have not been clearly identified.
- Do not put the cylinder in electrical contact with the arc.
- Do not expose cylinders to excessive heat, sparks, molten slag or flames.
- Do not tamper with the cylinder valves.
- Do not attempt to unlock blocked valves with hammers, keys, tools or other systems.
- Never delete or alter the name, number or other markings on the cylinders. It is illegal and dangerous.

- Do not lift the cylinders from the ground by holding them by the valve or by the cap, or by using chains, slings or magnets.
- Do not attempt to mix any gas inside the cylinders.
- Never refill the cylinders, but have them refilled by specialised companies.
- Do not modify or exchange the cylinder fittings.

#### 2) Pressure regulators:

- Keep pressure regulators in good condition. Damaged regulators can cause damage or serious accidents; they must be repaired only by qualified personnel.
- Do not use regulators for gases other than those for which they were manufactured.
- Never use a regulator that leaks or appears physically damaged.
- Never lubricate a regulator with oil or grease.

#### 3) Hoses:

- Replace hoses that appear damaged.
- Keep hoses taut to avoid accidental creases.
- Keep the excess hose collected and keep it out of the work area to prevent damage.

### E) Fire

- Avoid igniting fire due to sparks and hot slag or incandescent parts.
- Ensure that appropriate fire protection devices are available near the welding area.
- Remove flammable and combustible materials from the welding area and the surrounding area (minimum 10 metres).
- Do not weld on fuel and lubricant containers, even if empty; these must be carefully cleaned before being welded.
- Allow the welded piece to cool before touching it or putting it in contact with combustible or flammable materials.
- Do not weld on parts with cavities containing flammable materials.
- Do not operate in atmospheres with high concentrations of combustible vapours, flammable gases or dust.
- Always check the work area thirty minutes after the end of welding operations to ensure that there are no fires.
- Do not keep combustible materials such as lighters or matches in your pocket.

### F) Burns

Protect the skin against burns caused by ultraviolet radiation emitted by the electric arc, by sparks and slag from molten metal, using fireproof clothing,

which covers all exposed surfaces of the body.

Wear protective clothing and welder gloves, head-gear and high shoes with safety tip. Button the shirt collars and pocket flaps and wear trousers without cuff to avoid the entry of sparks and slag.

Wear a mask with protective glass on the outside and adiacinic glass filter inside. This is MANDATORY for welding operations, in order to protect the eyes from radiant energy and volatile metals. Replace the protective glass if it is broken, pitted or spotted. Avoid oily or greasy clothes; a spark could ignite them. Incandescent metal parts, such as work pieces, should always be handled with gloves.

First aid equipment and a qualified person should be available for each shift, unless there are health facilities nearby for immediate treatment of eye and skin burns.

### G) Fumes

Welding operations produce harmful fumes and metal dust, which can damage health:

- Do not work in spaces without adequate ventilation. Keep your head out of the fumes.
- In closed environments, use suitable exhaust fans. If ventilation is not adequate, use suitable respirators.
- Clean the material to be welded if there are solvents or halogen degreasers, which give rise to toxic gases. During welding, some chlorinated solvents can decompose in the presence of radiation emitted by the electric arc and produce phosgene gas.
- Do not weld coated metals or those containing lead, graphite, cadmium, zinc, chromium, mercury or beryllium, unless a suitable respirator is available.

The electric arc generates ozone. Prolonged exposure, in environments with high concentrations of ozone, can cause headaches, irritation of the nose, throat and eyes and severe congestion and chest pain.

### IMPORTANT: DO NOT USE OXYGEN FOR VENTILATION!!!

Gas leaks must be avoided in small spaces. Large gas leaks can dangerously change the oxygen concentration.

Do not place cylinders in small spaces.

DO NOT WELD or cut where solvent vapours can be drawn into the welding atmosphere or if radiant energy can penetrate into atmospheres containing even tiny amounts of trichloroethylene and perchlorethylene.

### H) Moving parts can cause damage

Moving parts, such as the fan, can cut fingers and hands and catch clothes.

Keep all doors, covers and guards closed and securely in place.

Protections and coverings can be removed, for possible maintenance and checks, only by qualified personnel.

Keep hands, hair, loose clothing and tools away from moving parts.

Refit the covers and guards and close the doors when the operation is completed and before restarting the machine.

### I) Noise

These welders do not in themselves produce any noise exceeding 70 dB. Arc welding processes can produce noise levels above this limit. Therefore, users must implement the precautions required by law.

Ear plugs should be used when working overhead or in a small space.

A rigid helmet should be used when others work in the area above.

Welders should not use flammable hair products.

### WARNINGS ABOUT ELECTROMAGNETIC COMPATIBILITY

Although these welding machines have been built according to the regulations, they can generate electromagnetic disturbances, that is disturbances to the telecommunication systems (telephone, radio, television) or to the control and safety systems. Read the instructions carefully to eliminate or minimise interference.

**ATTENTION: the welding machine has been designed to work in an industrial environment, therefore, to operate in domestic environments it may be necessary to observe special precautions in order to avoid possible electromagnetic interference.**

You must install and use the welding machine according to the manufacturer's instructions. If electromagnetic interference is detected, countermeasures must be taken to eliminate the problem, possibly using the manufacturer's technical assistance. In any case, do not modify the welding machine without the manufacturer's approval.

### Work area control to prevent E.M. interference

Before installing the welding machine it is necessary to check the work area to detect the existence of services that could malfunction in the event of electromagnetic disturbances.

Below is a list of services to consider:

- a) Power cables, control cables, transmission system and telephone cables that pass near the welding machine.
- b) Radio or television transmitters and receivers.
- c) Computer or control equipment.
- d) Safety and industrial process control equipment.
- e) Calibration and measurement instruments.
- f) Check the level of electromagnetic immunity of the equipment operating in the work area.
- g) The health of people in the vicinity, for example people who use pacemakers and earphones for hearing.
- h) The daily duration of welding operations or other activities.

The other devices must be electromagnetically compatible. This operation may require additional protective measures.

The dimensions of the area to be considered depend on the structure of the building and the type of activity in progress.

### **PACEMAKERS AND HEARING AIDS**

Magnetic fields deriving from high currents can affect the correct functioning of pacemakers and hearing aids. Wearers of electronic equipment should consult a physician before approaching arc welding operations.

### **METHODS FOR REDUCING EMISSIONS**

#### **A) Power supply**

The welding or cutting device must be connected to the power supply following the manufacturer's recommendations.

When interference problems arise, it may be necessary to take measures to solve the problem, such as the addition of filters on the power supply.

In the case of permanent installation of the equipment, the metal shielding of the power cables can be taken into consideration. The shielding must be connected to the welding machine so that there is good electrical contact between it and the mantle of the welding machine itself.

#### **B) Welding machine maintenance**

The welding machine must be periodically subjected to maintenance, according to the manufacturer's instructions.

Remove dust or foreign materials every 6 months, which may have been deposited on the transformer or on the diodes of the rectifier unit; to do this use a jet of dry, clean air.

The mantle and all the possible accesses inside the welding machine must be correctly closed during the welding and cutting operations. The welding ma-

chine must never be modified in any part except for modifications planned and authorised by the manufacturer and carried out by persons authorised by the manufacturer.

In particular, the distance of the arc from the work piece and the stabilisation devices must be adjusted and maintained according to the manufacturer's recommendations.

#### **C) Welding cables**

Welding cables must be kept as short as possible and must be placed close to each other and passed on the floor or as low as possible.

#### **D) Work piece earthing**

The earth connection of the work piece can reduce electromagnetic emissions in some cases.

The operator must pay attention to avoid that the earthing of the piece is not a source of danger for people and damage to the equipment. Where necessary, earthing must be carried out with a direct connection between the work piece and the ground, while in countries where this is not permitted, the connection must be made using a capacitor in accordance with the regulations of the country.

#### **E) Shielding**

Cable and equipment shielding in the work area can reduce interference. Shielding of the entire welding or cutting installation can be considered for special applications.

#### **F) Equipotential connections**

The equipotential connections of all metal components in and near welding installations should be considered.

In any case the metal components connected to the piece to be welded will increase the risk for the operator to receive an electric shock from the simultaneous contact with these metal components and the electrode. The operator should be isolated from all these metal components rendered equipotential.

#### **Checks and inspections**

Checks must be carried out by a qualified technician or a qualified and authorised technician; they must be visual and functional, with the aim of guaranteeing the safety of the machine.

They include:

- inspection of all supporting structures, which must not show any signs of cracking, breakage, damage, deformation, corrosion, wear or alteration to the original characteristics;
- checking all mechanical parts;

- inspection of all the safety devices installed on the machine;
- ll connections with pins and screws;
- inspection of the machine operations;
- inspection of the machine status;
- verification of the correct operation and efficiency of the electrical system;
- checking the seal and efficiency of the pneumatic and/or hydraulic system.

The results of these checks must be reported on a specific sheet.

**ATTENTION: If worn or faulty parts are not promptly replaced, the manufacturer cannot be held in any way liable for the damage caused by accidents that may result.**

**If faults or anomalies are detected, they must be eliminated before the machine is put into operation, and the expert carrying out the inspection will have to certify that the repair has been made, thus allowing the machine to be used.**

If the person performing the inspection detects hazardous faults, they must promptly inform the machine manufacturer.

Place the machine out of service if operating faults are found while performing the appropriate checks/inspections and/or repairs. Check that no objects are left between the moving parts after any maintenance work.

In order to guarantee maximum safety of the machine it is, nonetheless, PROHIBITED to:

- Tamper with any part of the machine;
- Leave moving parts unattended;
- Use the machine when not operating at full efficiency;
- Modify the machine to change the originally established use, without explicit authorisation from the Manufacturer;
- Run moving parts with manual operations in case of power failure.

### 3.2. INTENDED USE

The welding system should only be used for the purpose for which it was manufactured meaning to generate an electrical arch for MIG/MAG, TIG, MMA welding accordingly.

**ATTENTION: It cannot therefore be used as a device for thaw pipes; any improper use automatically voids the warranty and excludes the manufacturer from any liability in case of damage to persons and property.**

### 3.3. CONTRAINDICATIONS FOR USE

The machine must not be used:

- For uses other than those specified by the manufacturer, for different uses or not mentioned in this manual;
- In explosive, corrosive atmospheres or with a high concentration of dust or oily substances suspended in the air;
- In atmospheres with high fire risks;
- Exposed to adverse weather conditions;
- With safety devices bypassed or out of order;
- With electrical bridges and/or other means that exclude power/parts of the machine.

### 3.4. HAZARDOUS AREAS

The work area pertaining to the operator which is substantially the entire perimeter of the machine is considered hazardous.

It is the responsibility of the operator to keep the work area clear of persons or objects while using the machine and to avoid damage to persons, things or animals.

The use of the machine near other equipment or machines introduces additional risks. The operator is asked to evaluate these risks in order to prevent accidents.

### 3.5. SAFETY DEVICES

Welding machines are equipped with safety devices designed to prevent damage to the operator or to the welding machine itself. A safety device is any object or system that can reduce the risk of such damage.

Do not tamper with active safety devices or their connections.

Do not operate with the welding machine without the metal covers or with non-insulated connections. If necessary, during installation and connection, they must be integrated with others in order to guarantee compliance with the laws in force.

**IMPORTANT: Daily check that the safety devices are functioning properly and efficient.**



### 3.6. SIGNS

The safety signs must always be clearly visible and it is absolutely forbidden to remove or hide them. Generally there are signals or signs on the machine or in the work environment that indicate dangerous situations, prohibitions or instructions during use or operations connected to it, as in the following examples:



**Emission of optical radiation:**

The risk of optical radiation exists where the sign is affixed. Cat. 2 (EN 12198).



**Fire hazard:**

Fire hazards exist where the sign is affixed.



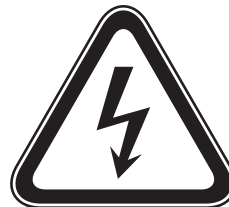
**General warning:**

This symbol indicates a hazard of any nature that may cause personal and property damages.



**Explosion hazard:**

This symbol indicates the presence of explosive substances or explosion hazard.



**Warning:**

Contact injuries may occur in this point (i.e. Electrical shock).



**Blinding:**

Protection goggles or mask must be worn near this symbol.

**Fatal hazard:**

Pay the utmost attention near this indication!!! Never touch the area indicated by this symbol since it indicates a fatal hazard.

**Noise:**

Protection goggles or mask near this symbol.

### 3.7. RESIDUAL RISKS

Careful use of the machine minimises the probability of accidents; however, during the use of the machine it is necessary to strictly observe the safety rules described in this manual.

## 4. INSTALLATION

### 4.1. SHIPPING

The shipment, also depending on the destination, can be carried out by different means.

The packed machine must be properly anchored to the means of transport in order to avoid uncontrolled movements.

The shipment is always carried out under the responsibility of the purchaser who assumes all charges for accidents and thefts that could occur during the transport itself.

### 4.2. PACKAGING

The machine is shipped packed in a special container and, if necessary, it is suitably stabilised with shock-proof material to ensure its integrity.

The packaging is made, with containment of the overall dimensions, also depending on the type of transport adopted.

To facilitate transport, the shipment can be performed with some components disassembled and properly protected and packaged.

**THE PACKAGING CONTAINS:**

No. 1 **NOVATIG 203 PULSE PFC** welding machine  
 No. 1 Instruction manual

**OPTIONAL ACCESSORIES:**

No. 1 Earth cable  
 No. 1 Clamp cable  
 No. 1 Welding torch

### 4.3. MACHINE RECEIPT

Upon receipt of the machine, check that the information in the shipping document actually corresponds to the material received and check that the packaging is perfectly intact.

**IMPORTANT: in case of damage or absence of some parts, immediately report the anomaly to the carrier, making any descriptive notes of the damage on the transport document before signing.**

**Do not use the machine, but contact the seller to agree on the procedure to be adopted.**

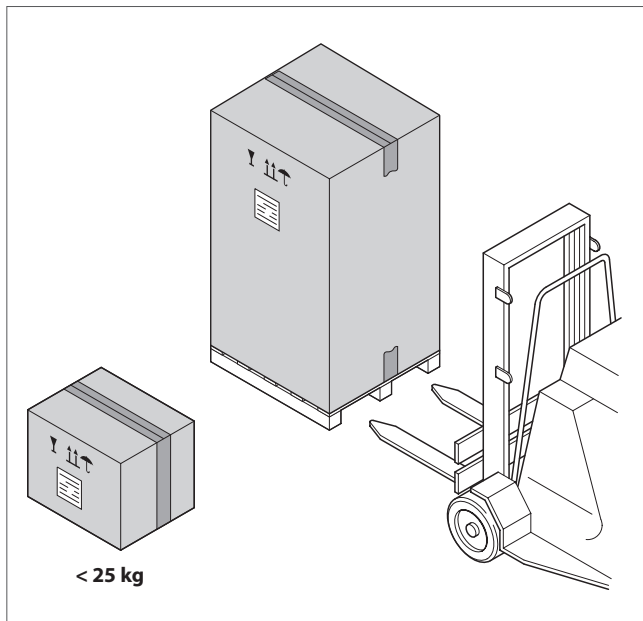
**To this end, it is advisable to carry out a check of the packaging during the unloading phase and, in suspicious cases, open the packaging and to verify the safety of the machine and any loose units.**

## 4.4. HANDLING AND LIFTING

**ATTENTION:** handling and lifting must be carried out by trained and qualified operators, using appropriate means and methods, to avoid risks to personal health and damage to the machine. Before carrying out handling and lifting, check the position of the centre of gravity of the load; always check the correct weight balance of the machine when it is transported, so as to prevent unexpected machine movements or falls. It is recommended to always use vehicles capable of supporting the weight and dimensions of the machine ("TECHNICAL SPECIFICATIONS" paragraph of this manual), so as to avoid damage to the machine or to persons or things around it.

**IMPORTANT:** the customer is always exclusively liable during the equipment loading and unloading phases.

For transport to the final installation site, it is preferable to use a forklift or pallet truck, taking care that the lifting forks support the entire crate.



For movements within the plant, the machine may be transported with a crane by properly harnessing it using cables with the appropriate resistance characteristics, depending on the weight of the machine itself. If the supply includes only the welding machine, generally weighing less than 25 kg, the packaging consists of a cardboard box without lifting pallets. It can be easily lifted by two operators and taken to the place of use.

**ATTENTION:** The machine must remain packed during unloading from the means of transport and until it is transferred to its destination.

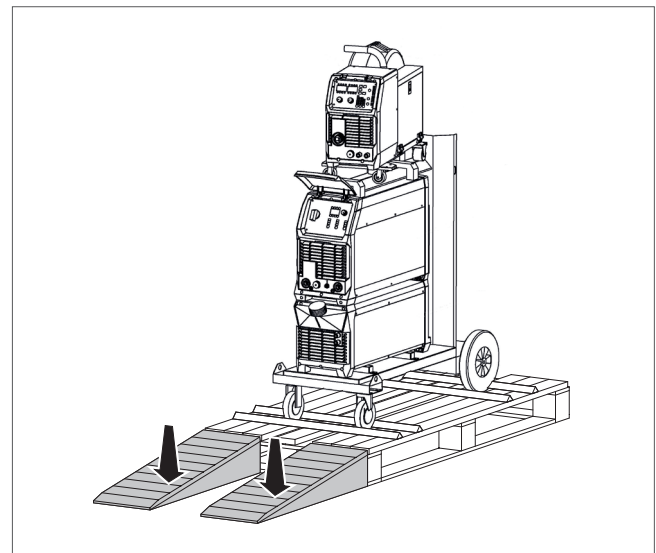
**IMPORTANT:** The Manufacturer cannot be held liable for damage caused to persons or property due to utilising lifting systems other than those described above.

## 4.5. UNPACKING

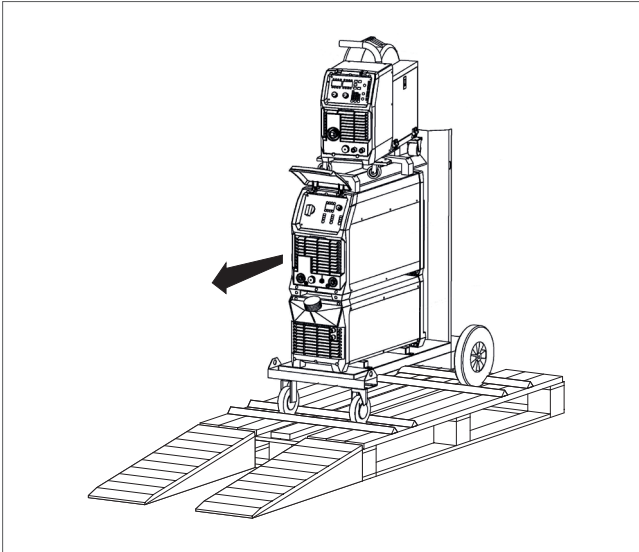
**IMPORTANT:** Consult the "Handling and lifting" paragraph to correctly handle the machine.

**ATTENTION:** To remove the machine from the packaging, use appropriate means and methods to avoid risks to human health. The packaging material must be properly disposed of in compliance with the laws in force.

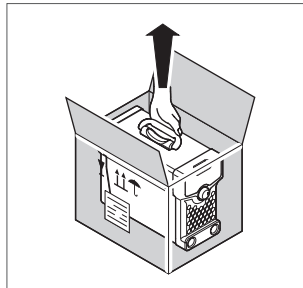
- Remove the protective covers such as straps, boxes, etc. using appropriate tools so as not to ruin the content.
- Remove the protective covers such as straps, boxes, etc. using appropriate tools so as not to ruin the content.
- Position appropriate descent ramps from the pallet verifying that the slides are well hooked to the pallet.



- Complete the unloading operations by carefully lowering the machine from the pallet.



If only the welding machine is present, this must be handled using the convenient handle on the upper part of the welding machine itself.

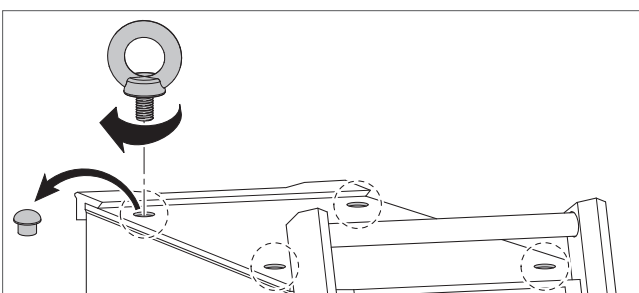


**ATTENTION:** risk of overturning when unloading the machine from the pallet equipped with descent ramps.

**ATTENTION:** when carrying out unpacking operations, it may be necessary to have two persons equipped with suitable personal protective equipment.

**IMPORTANT:** in addition to handling the machine using the special trolley, it can be lifted from the ground after having wrapped it with lifting straps, by slinging it from the bottom in a stable and safe way. If provided, the machine must be lifted only and exclusively by using M10 eye-bolts which are not supplied.

Remove the protective caps from the threaded holes and tighten up the lifting eye-bolts.



**Do not lift the machine by the FEEDER or generator handles.**

The welder has a sturdy handle integrated in the frame for handling.

**N.B.** These lifting and handling devices comply with the provisions prescribed by European standards. Do not use other devices such as lifting and handling equipment.

## 4.6. STORAGE

In the case of inactivity, the machine must be stored in compliance with the following precautions:

- Store the machine in an enclosed area accessible only to employees; the storage area must have a stable support surface with an adequate load coefficient and must be free of fire and/or explosion risk; it must have adequate humidity and temperature and sufficient lighting.
- Protect the machine from any impact and stresses;
- Protect the machine from humidity and high temperatures;
- Ensure the machine does not come into contact with corrosive substances;
- In the event of prolonged storage, periodically check that there are no variations in the condition of the packages.

## 4.7. PREPARATIONS

### Installation preparations

For the installation, it is necessary to prepare a manoeuvring area suited to the machine dimensions and selected lifting means. The machine must be positioned so that it is ideally ergonomic and provides maximum safety in the work place: leave an area around it large enough to allow easy operations and handling of the material to be processed and for maintenance and adjustment operations to be carried out.

Before installing the machine, check that the selected area is suitable and has the necessary authorisations to carry out the activity, sufficiently ventilated and illuminated, with a stable and levelled support surface. For installations on a raised floor, check that the slab can withstand the load.

### Electrical system preparation

Connection to the electrical system which powers and combines the synchronisation with other machines should be done by specialised and qualified staff following the wiring diagram and arrangements set out in Laws and/or Technical Standards currently in force for safety in workplaces and electrical installations.

Appropriate safety devices must be provided for its operation in line with those required in the area of safety in the workplace.

**IMPORTANT: The manufacturer cannot held liable for any damage to property, persons and/or animals caused by non-compliance with this provision.**

To achieve an adequate level of safety, the electrical system to which the machine is connected must provide, at the user's full charge, an earthing system according to the provisions of the user's country, a circuit breaker to protect the power supply socket with value  $\Delta I$  (current variation) not less than 30mA and anything else for a correct execution in a workmanlike manner, according to Laws and/or Technical standards in matters of safety in the workplace and electrical systems. Prepare connections for earthing the machine casing.

**ATTENTION: These preparations are always the sole liability of the user and nothing can be attributed to the manufacturer for damage to property, persons and/or animals due to poor electrical connections.**

## 4.8. ASSEMBLY/POSITIONING

**WARNING: the assembly of any detached units and the installation of the machine must be carried out exclusively by technicians authorised by the manufacturer.**

To allow for correct operations, the machine must always be positioned in places that comply with the environmental conditions described in this manual.

The machine must always be positioned in a perfectly levelled area; levelling can also be carried out using any adjustment systems present on the machine.

**ATTENTION: The machine must be positioned so as not to obstruct the entry and exit of the air from the cooling slots. REDUCED FLOW OF AIR causes overheating and possible damage to internal parts. Keep at least 500 mm of free space around the device.**

**IMPORTANT: Do not place any filtering device on the air intake passages of this welding machine. The warranty is void if any type of filtering device is used.**

## 4.9. CONNECTIONS

### Electrical connections

The machine's internal connections are carried out by qualified personnel sent by the manufacturer. The electrical connection between the machine panel and the customer's power distribution supply line must be carried out by qualified personnel from the Customer.

**IMPORTANT: The personnel qualified to carry out the electrical connection must make sure of the perfect efficiency of the earthing of the electrical system and must check that the line voltage and the frequency correspond to the data shown on the identification plate. Incorrect supply voltages can cause serious damage to the system.**

If the system is set to operate at single-phase 230 V at 50-60 Hz, wire the end of the power cable to an EEC plug with the same capacity as the socket on the line switch as per the following diagram:

### SINGLE-PHASE connections

Wire colour	Connection
Brown	"S" phase
Blue	"T" phase
Yellow/Green	Earth

If the system is set to operate at three-phase 400 V at 50-60 Hz, wire the end of the power cable to an EEC plug with the same capacity as the socket on the line switch as per the following diagram:

### THREE-PHASE connections

Wire colour	Connection
Black	"R" phase
Brown	"S" phase
Blue	"T" phase
Yellow/Green	Earth

**ATTENTION: Make sure the system line switch is in the "0" position before connecting the power cable.**

**ATTENTION: It is mandatory to install a circuit breaker with interlocked CEE socket, of adequate capacity and verifying that the earth socket is ef-**

efficient and separate from the rest of the electrical system of the working environment.

**ATTENTION:** the yellow-green wire of the welding machine power cable must always be connected to the protection conductor (system earth). The yellow-green wire should **NEVER** be combined with another phase wire for a voltage withdrawal. Do not touch live parts.

#### Gas hose connection

**ATTENTION: Cylinders can explode if damaged!!!**

- Keep the cylinders upright and chained to the appropriate support.
- Keep the cylinders in a place where they cannot be damaged accidentally.
- Do not lift the machine with the cylinder attached.
- Never touch the cylinder with the welding wire.
- Keep the cylinder away from the welding area or from non-insulated electrical circuits.

The inert gas cylinder must be equipped with a pressure reducer and possibly also a flow meter. Only after having correctly positioned the cylinder, connect the gas hose, exiting from the rear of the machine, to the pressure reducer. Next you can open the cylinder and adjust the pressure reducer.

#### 4.10. PRELIMINARY CHECKS

It is necessary to carry out the following operations before each machine start-up:

- Check all the safety systems;
- Check protection and signs.

Before putting the machine into operation, a number of checks and controls must be carried out in order to prevent errors or accidents during the Start-up phase:

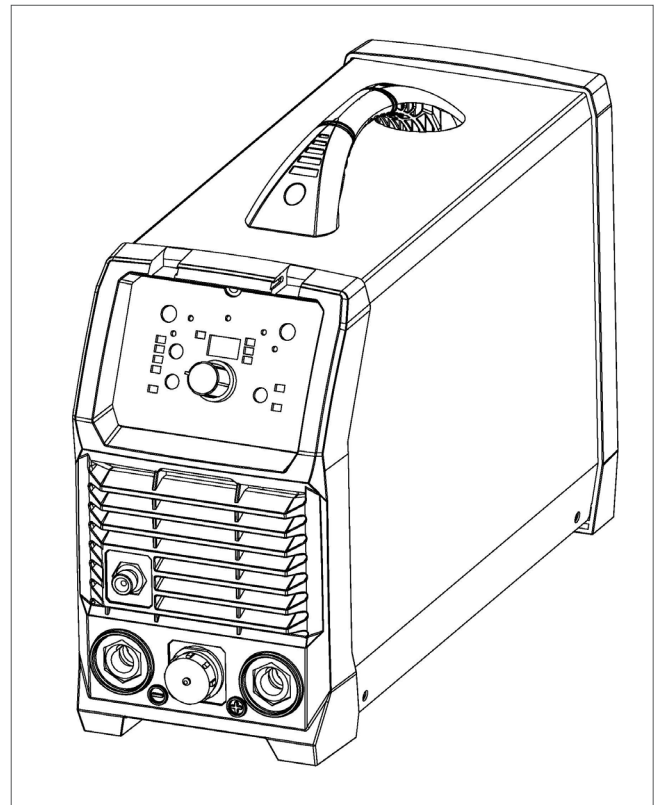
- Check that the machine has not been damaged during assembly;
- Verify, with particular care, the integrity of the electrical panels, control panels, electrical wiring and tubing;
- Check the exact connection of all external power sources;
- Check the free movement and free rotation of all moving parts;
- Check that hydraulic and pneumatic connections are tight so that they do not cause dangerous leakage.

## 5. MACHINE DESCRIPTION

### 5.1. OPERATING PRINCIPLE

The **NOVATIG** series welding systems were designed for TIG welding.

The **NOVATIG**.series welding system composition is shown below.



### 5.2. FEATURES AND MAIN COMPONENTS

- Lift TIG and HF Start Modes for versatility when welding around sensitive electronic equipment.
- Adjustable arc force, hot start & anti stick control for greater control and ease of use when MMA welding.
- High performance on ultra thin surfaces with no deformation.
- 2T/4T trigger control.
- Digital display meter for accurate setting & feedback of welding output.
- Equipped with temperature/phase loss protection; voltage and current sensors for high protection.
- Designed to work with diesel generators and to avoid failures due to its voltage spikes.
- Up/ Down Button Remote Control torch.
- Roller wheel amps control on torch.
- Wireless Remote Control. (optional)
- Wire Foot Pedal. (optional)



### 5.3. ENVIRONMENTAL CONDITIONS

The machine does not require particular environmental conditions. The machine must be installed indoors in a well-lit, ventilated industrial building with solid and level flooring.

The machine is suitable for operating in environments that:

- have an altitude not exceeding 2000 m a.s.l.;
- temperature between + 5 ° and + 35 ° C;
- relative humidity not higher than 80%.

It is forbidden to use the machine in environments that are:

- dusty;
- in corrosive atmosphere;
- at fire risk;
- in an explosive atmosphere.

**ATTENTION: The welding machine has an IP 23 protection grade, therefore its use is precluded in certain environmental situations, such as rain, excessive presence of metallic dust, presence of acids and corrosive atmospheres.**

### 5.4. LIGHTING

The lighting of the area of installation must comply with the laws in force in the country where the machine is installed and must, however, ensure good visibility at all points, not create hazardous reflections and allow clear reading of the control panels as well as identification of emergency buttons.

As the machine does not have its own light, it is necessary for the working environment to be equipped with general lighting to guarantee the machine has a value of 200 and 300 lux at all points of the machine.

### 5.5. VIBRATIONS

Under operating conditions that comply with the indications for proper use, the vibrations are not such as to cause hazardous situations. If this happens, you must request technical assistance and suspend the use of the equipment until the fault is resolved.

### 5.6. NOISE

The equivalent continuous A-weighted sound pressure level, emitted by the machine at the workplace in full operating conditions, is less than 70 dB (A). These emissions comply with the limits of the regulations in force and are not such as to generate danger for operators.

Arc welding processes can, however, produce noise levels above this limit. Therefore, users must implement the precautions required by law.

### 5.7. TECHNICAL SPECIFICATIONS

The following table shows the main technical specifications relating to the machine:

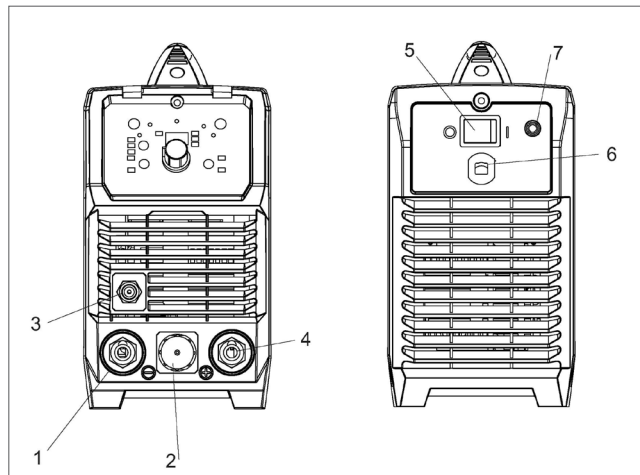


Parameters	NOVATIG 203 PULSE PFC	
	230V - 50/60 Hz	110V - 50/60 Hz
Power supply, single phase		
MAX current	32 A	39 A
Fuse	40 A	40 A
Noise emissions	< 70 dB	< 70 dB
MAX power	4.6 KW	4,1 KVA
Duty cycle 100%	145 A	105 A
Duty cycle 60%	180 A	130 A (90%)
Duty cycle 50%	200 A	-
Open circuit voltage	66 V	66 V
Welding range	5 - 200 A	5 - 130 A
Efficiency (%)	85	85
Max energy consumption value in the inactive state (W)	68	68
Compliant with standards	EN 60974 / 1 - 10	EN 60974 / 1 - 10
Application class	S	S
Weldable electrodes diameters	1.6 - 5 mm	1.6 - 5 mm
Dimensions, mm (L x B x H)	475 x 146 x 278	475 x 146 x 278
Weight, kg	9	9
Insulation class	F	F
Protection class	IP23	IP23
Cooling system	AF	AF
Operating temperature	- 10 + 40 °C	- 10 + 40 °C

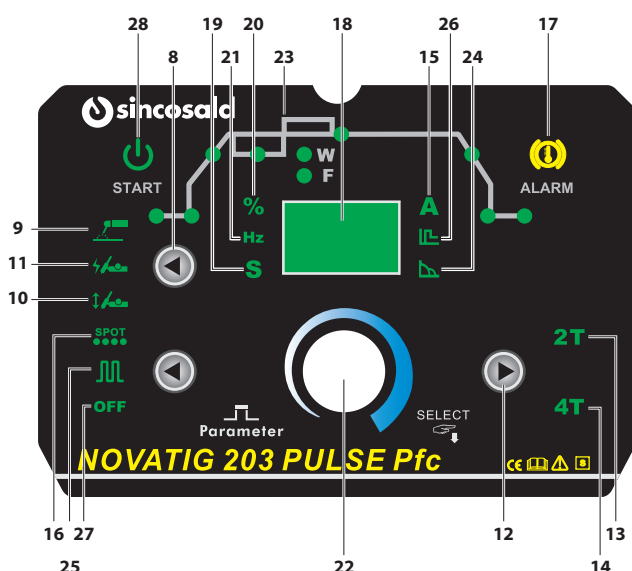
## 6. MACHINE USE

### 6.1. MACHINE LAYOUT DESCRIPTION

#### 6.1.1. Layout for the front and rear panel



1. "-" Output terminal.
2. TIG torch remote connection socket.
3. TIG torch gas connector.
4. "+" Output terminal.
5. Power switch
6. Input power cable.
7. Inlet gas connector.



#### Control Panel

8. Welding output mode button.
9. MMA mode indicator.
10. Lift TIG mode indicator\*.
11. Hf TIG mode indicator\*.
12. Trigger control mode button\*.

13. 2T trigger indicator.
14. 4T trigger indicator.
15. Digital display value current indicator.
16. Spot welding.
17. Alarm indicator\*.
18. Digital multifunction display\*.
19. Digital display value time indicator.
20. Digital display value percentage indicator.
21. Digital display value frequency indicator.
22. Parameter select/ adjust Knob\*.
23. TIG parameter setting indicator\*.
24. MMA arc force setting Indicator\*.
25. Pulse welding.
26. MMA hot start setting Indicator\*.
27. Pulse welding off.
28. Power Indicator.

\* Denotes more detailed explanation of function to follow.

#### 6.1.2. Further Controls Explained

##### TIG HF/ Lift Ignition Modes (10,11)

For TIG welding process, contact of the torch tungsten to the workpiece will cause contamination of the tungsten and the workpiece that will adversely affect the weld quality, especially when the tungsten is electrically energised.

**HF Ignition** (High Frequency) sends a pulse of high energy electricity through the torch system that is capable of 'jumping' between the tungsten and the workpiece, ensuring arc starting without any contact between the tungsten and workpiece. The disadvantage of HF ignition is that the high energy electrical pulse creates significant electrical and radio signal interference, which limits its use around sensitive electronic equipment such as computers.

**Lift TIG Ignition** is a compromise that minimises tungsten contamination while eliminating the electrical interference of HF start systems. Lift arc starting works by lightly resting the tungsten on the work piece, activating the torch trigger signal and then lifting the tungsten off. The control circuit will sense when the tungsten is removed from the work piece and send a low powered pulse of electricity through the tungsten that will cause the TIG arc to initiate. Because the tungsten is not 'live' when it is in contact with the work, contamination is minimised.

##### TIG 2T/4T Trigger Control (12)

2T mode the trigger is pulled and held on to activate the welding circuit, when the trigger is released, the welding circuit stops. 4T is known as 'latching' mode. The trigger is pulled once and released to activate the welding circuit, pulled and released again to stops

the welding circuit. This function is useful to longer welds as the trigger is not required to be held on continuously. TIG series of welding machines also has more advanced current controls that can be used in 4T mode.

### Alarm Indicator (17)

Lights when over voltage, over current or electrical overheating (due to exceeding duty cycle) is detected and protection is activated. When protection is activated, welding output will be disabled until the safety system senses the overload has reduced sufficiently and indicator lamp goes out. May also trigger if machine experiences an internal power circuit failure.

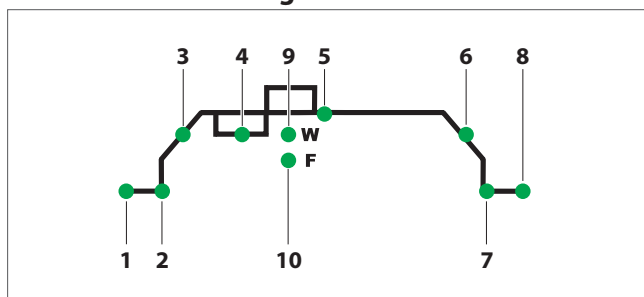
### Digital Multifunction Display (18)

Before welding displays the setting selected/being adjusted using the control knob (22). During welding, displays welding current. The parameter setting displayed is indicated by the LEDs 15, 16, 17, 19, 20, 21. If left inactive for several seconds, display will revert back to main welding current setting.

### Parameter Select/ Adjust Knob (22)

Switch between welding parameter settings by pressing this knob, adjust by turning the knob. Value of the parameter selected will be shown on the digital multifunction display (18).

### TIG Parameter Setting



### Pre gas flow setting indicator (1)

Controls the period shielding gas will flow for when the torch is triggered before the arc starts. This purges the work area of atmospheric gas which could contaminate the weld before the weld starts. Unit(S) and setting range (0-2S).

### Start current setting indicator (2)

Available in 4T trigger mode, sets a welding current 5-100% of the main welding current activated when the trigger is held on to 'latch' the trigger before the main weld current is started. Once the trigger is released, the current will go through the upslope (3) period if it is set, to the main welding current (4).

### Up slope setting indicator (3)

When the trigger is activated, the welding current will increase gradually over the time selected up to the set main welding current (4). Unit(S) and setting range (0-10S).

### TIG welding current setting indicator (4)

Sets the main welding current. Unit(A) and setting range (5-200A).

### Base current setting indicator (5)

Only available when pulse mode (12) is selected. Sets the current of the low/ base pulse. Unit(A) and setting range (5-200A).

### Down slope setting indicator (6)

When the trigger is released, the welding current will reduce gradually over the time selected down to 0. This allows the operator to complete the weld without leaving a 'crater' at the end of the weld pool. Unit(S) and setting range (0-10S).

### End current setting indicator (7)

Available in 4T trigger mode, sets a welding current 5-100% of the main welding current activated when the trigger is held on to 'unlatch' the trigger before the weld is finished. If downslope (6) is set, the current will go through the downslope period before going to the end current set. When the trigger is released, the arc will stop.

### Post gas flow setting indicator (8)

Controls the period of time the shielding gas continues to flow for after the arc is stopped. This protects the weld area and torch tungsten from contamination while it is still hot enough to react with atmospheric gases, after the weld is finished. Unit(S) and setting range (0-10S).

### Pulse width setting indicator (9)

Only available when pulse mode (12) is selected. Sets the time proportion as a percentage between the peak current and base current when using pulse mode. Neutral setting is 50%, the time period of the peak current and base current pulse is equal. Higher pulse duty setting will give greater heat input, while lower pulse duty will have the opposite effect. Unit(%) and setting range (5-95%).

### Pulse frequency setting indicator (10)

Only available when pulse mode (12) is selected. Sets the rate that the welding output alternates between the peak and base current settings. Unit(Hz) and setting range (0.5-200Hz).

### Pulse mode 'off' indicator (11)

### Pulse mode 'On' indicator (12)

### Pulse welding

Pulse welding mode switches the welding output between a high and low current output in a cyclical manner. When used correctly this function has substantial benefits in the TIG welding process including greater weld penetration for less work heat input and greater control of the weld pool.

The basic theory for setting the base current using pulse mode is that the base current should be sufficient to maintain the existing molten weld pool, while the peak current is sufficient to melt new metal in order to move/ expand the molten weld pool. Increased pulse frequency will have the effect of making the arc more tightly focused which is useful for fine stainless work and similar. Pulsing can also be used to help move the weld pool, this technique is useful for welding out of position or with materials that have higher viscosity weld pool. Higher pulse duty setting will give greater heat input, while lower pulse duty will have the opposite effect.

### MMA Parameter Setting

#### Hot start (26)

Hot start provides extra power when the weld starts to counteract the high resistance of the electrode and workpiece as the arc is started. setting range (0-10).

#### Arc force (24)

An MMA welding power source is designed to produce constant output current (DC). This means with different types of electrode and arc length; the welding voltage varies to keep the current constant. This can cause instability in some welding conditions as MMA welding electrodes will have a minimum voltage they can operate with and still have a stable arc. Arc Force control boosts the welding power if it senses the welding voltage is getting too low. The higher the arc force adjustment, the higher the minimum voltage that the power source will allow. This effect will also cause the welding current to increase. 0 is Arc Force off, 10 is maximum Arc Force. This is practically useful for electrode types that have a higher operating voltage requirement or joint types that require a short arc length such as out of position welds.

## 6.2. POWER SUPPLY INPUT CONNECTION

The TIG series of welding machines is designed to operate on a 110V /220V AC power supply. When the power supply voltage is over the safe work

voltage, there are over voltage and under voltage protection inside the welder, the alarm light will on, at the same time, the current output will be cut off.

If the power supply voltage continually goes beyond the safe work voltage range, it will shorten the welder life-span. The below measures can be used:

- Change the power supply input net. Such as, connect the welder with the stable power supply voltage of distributor;
- Induce the machines using power supply in the same time;
- Set the voltage stabilization device in the front of power cable input.

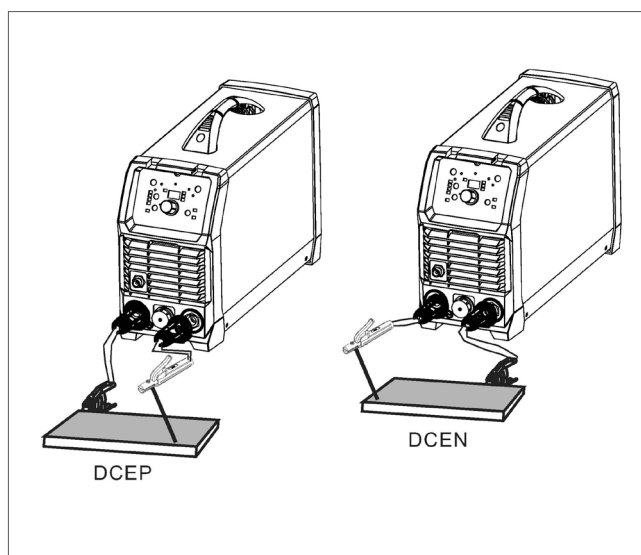
## 6.3. INSTALLATION & OPERATION FOR MMA WELDING

### 6.3.1. Set up installation for MMA Welding

Connection of Output Cables Two sockets are available on this welding machine. For MMA welding the electrode holder is shown be connected to the positive socket, while the earth lead (work piece) is connected to the negative socket, this is known as DCEP. However various electrodes require a different polarity for optimum results and careful attention should be paid to the polarity, refer to the electrode manufacturers information for the correct polarity.

DCEP: Electrode connected to "+" output socket.

DCEN: Electrode connected to "-" output socket.



1. Connect the earth lead to "-", tighten clockwise;
2. Connect the earth clamp to the work piece. Contact with the work piece must be firm contact with clean, bare metal, with no corrosion, paint or scale at the contact point.
3. Connect the electrode lead to "+", tighten clockwise;

4. Each machine is equipped with a power cable should be based on the input voltage welding power cable connected to the appropriate position, not to pick the wrong voltage;
5. With the corresponding input power supply terminal or socket good contact and prevent oxidation;
6. With a multi meter measure the input voltage is within the fluctuation range;
7. The power ground is well grounded.

### 6.3.2. Operation for MMA Welding

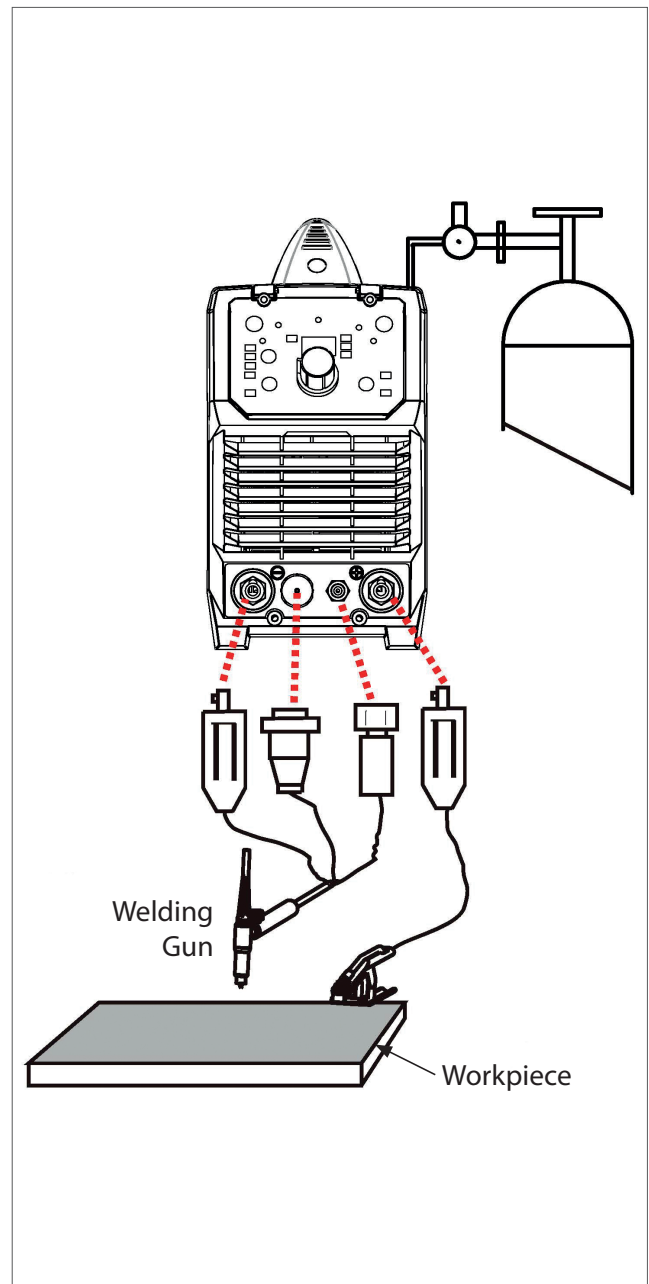
1. According to the above method to install is correct, turn the power switch, so that the power switch is "ON" position, then the power indicator light, the fan comes on, the device work properly.
2. Set to 'MMA' welding mode.
3. Set the welding parameters as required using the parameters control knob (following the instructions in the previous section).
4. Place the electrode into the electrode holder and clamp tight.
5. Strike the electrode against the work piece to create an arc and hold the electrode steady to maintain the arc.
6. Commence welding. If necessary, readjust the Welding parameters control knob to obtain the welding condition required.
7. After completion of welding the Power Source should be left turned ON for 2 to 3 minutes. This allows the fan to run and cool the internal components.
8. Switch the ON/OFF Switch (located on the rear panel) to the OFF position.

#### Note:

- Note the polarity of wiring, the general DC welding wire in two ways. Selected according to the technical requirements of welding the appropriate connection, if you choose incorrectly will result in arc instability and spatter large adhesion and other phenomena, such cases can be quickly reversed to joints.
- If the work piece distance from the welding machine, the second line (electrode holder and ground) is longer, so choose the appropriate conductor cross-sectional area should be larger to reduce cable voltage drop.

## 6.4. INSTALLATION & OPERATION FOR TIG WELDING

### 6.4.1. Set up installation for TIG Welding



1. Switch the ON/OFF Switch (located on the rear panel) to OFF.
2. Connect the earth lead to "+", tighten clockwise;
3. Connect the earth clamp to the work piece. Contact with the work piece must be firm contact with clean, bare metal, with no corrosion, paint or scale at the contact point.
4. Connect the TIG torch cable to "-", tighten clockwise;
5. Connect TIG torch gas connection to the TIG



gas outlet and TIG torch remote plug to remote socket, ensuring all connections are tight.

6. Connect the gas regulator to the Gas Cylinder and connect the gas line to the Gas Regulator.
7. Connect the gas line to the machine inlet gas connector via the quick push lock connector located on the rear panel. **Check for Leaks!**
8. Open gas cylinder valve and adjust regulator, flow should be between 5-10 l/min depending on application. Re-check regulator flow pressure with torch valve open as static gas flow setting may drop once gas is flowing.
9. Each machine is equipped with a power cable should be based on the input voltage welding power cable connected to the appropriate position, not to pick the wrong voltage;
10. With the corresponding input power supply terminal or socket good contact and prevent oxidation;
11. With a multi meter measure the input voltage is within the fluctuation range;
12. The power ground is well grounded.

**Note:**

- Secure the gas cylinder in an upright position by chaining them to a stationary support to prevent falling or tipping.

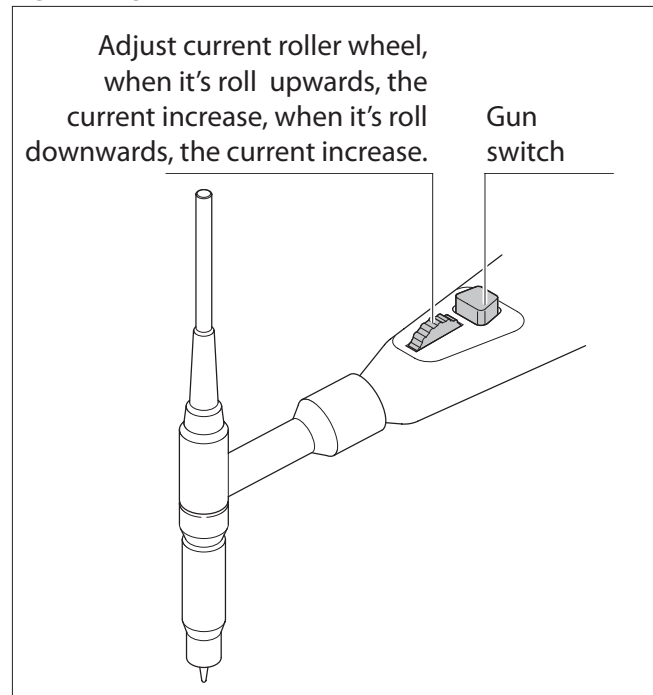
#### 6.4.2. Operation for TIG Welding

1. According to the above method to install is correct, turn the power switch to the "ON" position, the power L.E.D. light should illuminate, the fan comes on, the device work properly.
2. Set the welding mode to 'Lift TIG' or 'HF TIG'.
3. Set the welding parameters as required using the parameters control knob (following the instructions in the previous section).
4. The tungsten must be ground to a blunt point in order to achieve optimum welding results. It is critical to grind the tungsten electrode in the direction the grinding wheel is turning.
5. Install the tungsten with approximately 3mm to 7mm sticking out from the gas cup, ensuring you have correct sized collet.
6. Tighten the back cap.
7. Commence welding. If necessary, readjust the parameters control knob to obtain the welding condition re-quired.
8. After completion of welding the Power Source should be left turned ON for 2 to 3 minutes. This allows the fan to run and cool the internal components.
9. Switch the ON/OFF Switch (located on the rear panel) to the OFF.

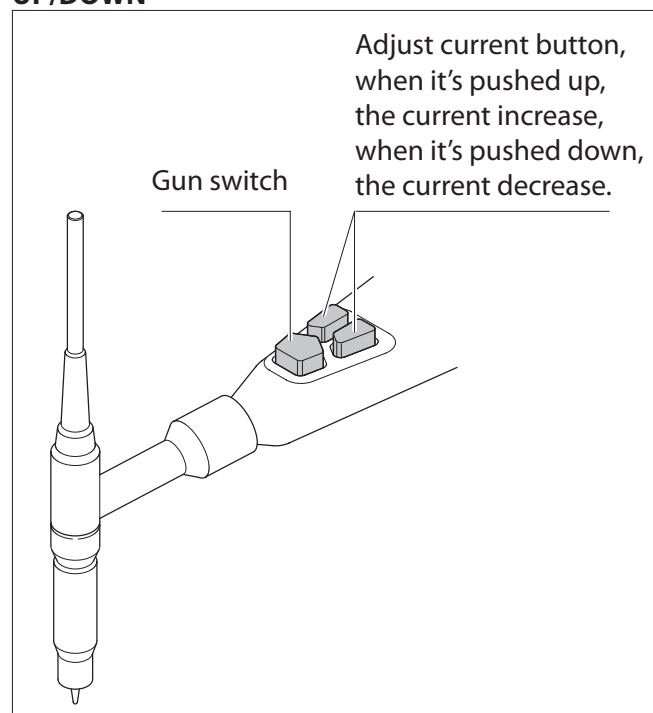
#### 6.4.3. Remote current control

TIG series of welding machines can accept remote current control from a potentiometer / analogue signal or a digital up/down button signal. Potentiometer remote control will change the current from the 5A minimum to the maximum set using the machine current control. Using an up/ down button remote signal, the current may be increased or decreased in 1A increments, or 'scrolls' up to 30A at a time if the button is held down. This is very useful for precision work.

##### POTENTIOMETER

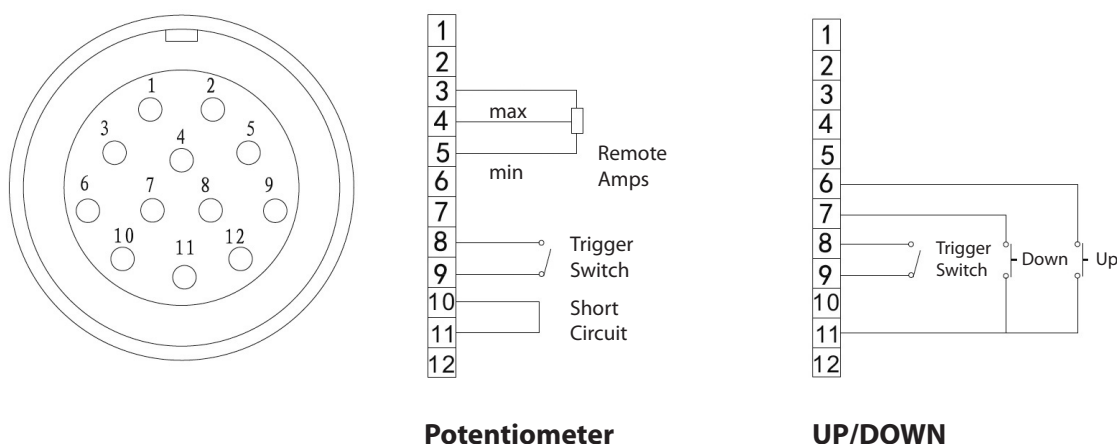


##### UP/DOWN





## Pin Remote Plug Connection



Socket Pin	Function	
	Potentiometer	Up/down
1	Not connected	Not connected
2	Not connected	Not connected
3	10k ohm (maximum) connection to 10k ohm remote control potentiometer	Not connected
4	Wiper arm connection to 10k ohm remote control potentiometer	Not connected
5	Zero ohm (minimum) connection to 10k ohm remote control potentiometer	Not connected
6	Not connected	The button of "UP" input
7	Not connected	The button of "DOWN" input
8	Trigger Switch Input	Trigger Switch Input
9	Trigger Switch Input	Trigger Switch Input
10	Be shorted with 11	Not connected
11	Be shorted with 10	The button of "UP"& "DOWN" input
12	Not connected	Not connected

## 6.5. REMOTE CONTROL CONFIGURATION

### 6.5.1. Wireless remote control Configuration

TIG series of welding machines can be configured to communicate exclusively with wireless foot pedal or remote control panel. This is done by a simple process of synchronising the wireless remote control and the machine frequencies. Each interface frequency assigned is unique, so it is possible to use several wireless controlsystems / machines in the same area with no problems. The direct range of the wireless control system is approximately 100m, this will be affected by the physical location of the machine and the remote control.

#### To synchronise a remote control to a machine, follow these instructions

1. Ensure the welding power supply is switched off.
2. Press and hold the parameter select/adjust knob on the front panel of the power supply (2-4 seconds) while at the same time turning the machine ON using the ON-OFF switch on the back of the welding power supply.
3. When the display on the front panel of the power supply is blank, release the control knob. Turn on the remote control or foot pedal while at the same time pressing any buttons on the remote control panel or foot pedal, the digital meter on the front panel of the welding power supply flick twice to

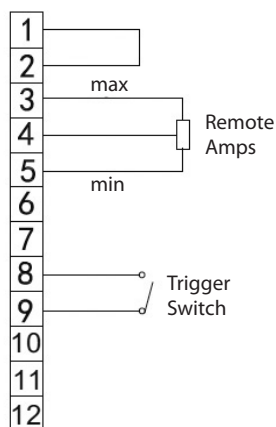
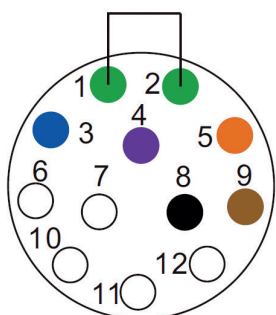
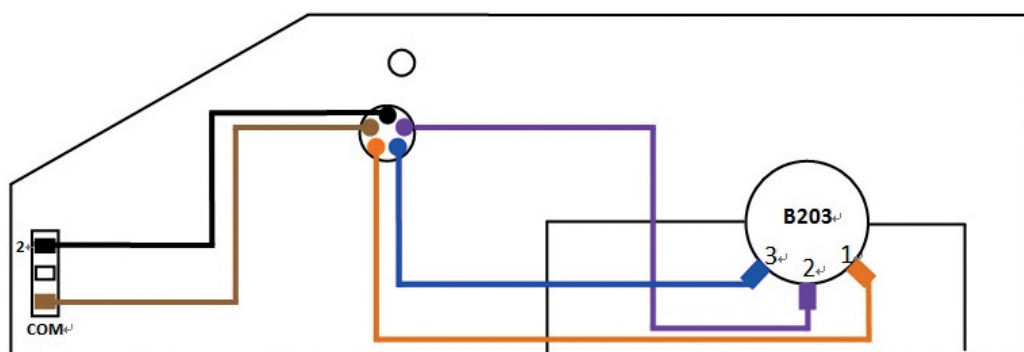
indicate the synchronization is successful and complete. (Synchronization has to accomplish in 10s after the display is blank).

4. Switch the machine off and back on again to start welding operation.
5. If the operation is unsuccessful, repeat steps 1 to 4.
6. During operation, the front panel control on the power supply is still functional but the remote control panel or foot pedal has higher priority level.
7. When the remote control panel or foot pedal is idles for 10 seconds, it will automatically go into "sleep" mode.

8. Only front Panel Control is active when wireless remote control or foot pedal is in "sleep" mode. Any operation on the wireless remote control panel or foot pedal will "wake it up and resumes control of the machine.

#### 6.5.2. Wire foot pedal Configuration

- When plug the twelve-lead aero-socket of pedal switch in it. Welder will identify the pedal switch, the welding current knob on the front panel will can't use and only 2T can be selected.
- When use the adjustment knob of max-welding current beside the pedal, can set the max-current you want.



Socket Pin	Function
1	Be shorted with 2
2	Be shorted with 1
3	20k ohm (maximum) connection to 20k ohm remote control potentiometer
4	Wiper arm connection to 20k ohm remote control potentiometer
5	Zero ohm (minimum) connection to 20k ohm remote control potentiometer
6	Not connected
7	Not connected
8	Trigger Switch Input
9	Trigger Switch Input
10	Not connected
11	Not connected
12	Not connected

## 6.6. START-UP

After turning on machine or line power, conduct a careful visual inspection of the entire machine and make sure that no persons or material are obstructing its normal operation, and that no objects have inadvertently been left on it.

Check that all the machine safety devices are enabled; if necessary, reset them, and in particular check for:

- Unlocked emergency stops;
- Correct operation of the safety barriers, if installed, or the guards not removed
- Protection guard.

## 6.7. NORMAL STOP

Turn the switch on the welder panel to **OFF**.

To completely disconnect the power supply from the power line, turn the switch on the main panel to **O**.

## 6.8. DECOMMISSIONING

During long periods of inactivity it is necessary to:

- Disconnect the power supply from the general electrical panel and all other power supplies (pneumatic and/or hydraulic) which the machine needs.
- Perform all maintenance operations.
- Accurately clean the machine.
- Store the machine in a protected area with a stable support surface.
- Cover the machine to avoid dust accumulation.
- Make sure that the environmental conditions are suitable for preserving the machine over time.

## 7. MAINTENANCE

### 7.1. MACHINE ISOLATION

Before carrying out any type of Maintenance or Repair, it is necessary to isolate the machine from the power supply and from all other energy sources present.

### 7.2. SPECIAL PRECAUTIONS

When carrying out any maintenance or repair work, the following recommendations should be followed:

- Before starting work, display a sign stating "MACHINE UNDER MAINTENANCE" in a visible spot;
- Do not use flammable materials or solvents;
- Be careful not to pollute the environment with coolants;
- To access the highest parts of the machine, use the appropriate means and procedures;
- Do not climb on the machine parts, as they are not designed to support people;
- When finished, refit and properly secure all safety guards and devices that may have been removed or opened.

**IMPORTANT: The Manufacturer cannot be held liable for the failure to comply with the aforementioned recommendations nor for any other use that is inconsistent or not mentioned in these instructions.**

### 7.3. CLEANING

Before carrying out any cleaning operation, disconnect the device from the mains and from the energy sources present.

Do not use corrosive cleaning products, flammable or containing substances harmful to health.

Make sure that the parts being cleaned are completely cold.

Do not wet the internal parts to avoid damaging the electrical and electronic components.

Do not direct any jets of compressed air directly on the electrical and electronic components so as not to damage them.

**ATTENTION: Always use the appropriate PPE such as gloves, mask, glasses according to current safety standards.**

### 7.4. ROUTINE MAINTENANCE

#### General requirements

The machine is designed to minimise routine maintenance, thus it is up to the operator to assess its condition and suitability for use.

It is recommended to stop and perform maintenance whenever non-optimal operation is detected, so as to ensure maximum efficiency at all times. Check the operation of safety devices monthly. In the event of faults or malfunction, entrust only qualified personnel to search for the fault or call the manufacturer's technical support. Check the continuity of the earth circuit every 2 years by performing the continuity measurement according to the provisions of the CEI 44 - 5 III Art. 19 standard. Visually check the condition of the individual parts of the machine, verifying that there is no alteration due to sagging or deformation. At each use of the machine, if equipped with a cooling unit, check the coolant level and top up if necessary.

**ATTENTION: Use only "SincoFluid" coolant supplied on request by the manufacturer or an authorised dealer.**

**The use of different coolants automatically voids the warranty and excludes the manufacturer from any liability.**

**ATTENTION: Allow the system to cool before proceeding with maintenance; hot surfaces can cause serious burns.**

**ATTENTION: For the entire duration of maintenance, it is necessary to stop the system by disconnecting the plug from the mains power supply or by disconnecting the power supply from the main panel circuit breaker, moving it to the "O" position and locking it with a special padlock.**

Always use the appropriate PPE - Personal Protective Equipment:

- Gloves;
- Non-slip shoes;
- Suitable clothing.

#### Scheduled maintenance

The operations described below must be carried out in line with the schedules indicated.

**IMPORTANT: Failure to comply with the above shall exempt the manufacturer from any liability as specified in the Warranty.**

**ATTENTION: These operations, although simple, must be performed by a Qualified or Qualified and Authorised Technician.**

Remove dust or foreign materials every 6 months, which may have been deposited on the transformer or on the diodes of the rectifier unit; to do this use a jet of dry, clean air.

Do not direct the compressed air jet directly onto the electrical and electronic components so as not to damage them.

When reassembling the wire feeder roller, after having cleaned or replaced it, make sure that the groove is aligned with the wire and that it corresponds to the diameter of the wire used.

Keep the inside of the gas nozzle constantly clean, so as to avoid metal bridges consisting of welding sprays between the gas nozzle and the contact tip.

Make sure that the output hole of the current collector nozzle is not excessively enlarged, otherwise replace it.

Absolutely avoid beating the torch or subjecting it to violent impacts.

## 7.5. WELDING MACHINE REPAIRS

Experience has shown that many accidents originate from repairs not performed to perfection.

For this reason, careful and complete control over a repaired welding machine is just as important as that performed on a new welding machine. Moreover, in this way, manufacturers can be protected from being held liable for defects, when the liability is to be attributed to others.

Welding machine repairs must be carried out exclusively by trained and qualified personnel, in possession of the necessary requisites to guarantee a workmanlike repair and in full compliance with safety standards EN 60974-4.

### A) Instructions for repairs

- After rewinding the transformer or the inductances, the welding machine must pass the same applied voltage tests, passed at the time of the first test according to the regulations in force.
- If no rewinding has been carried out, a welding machine, which has been cleaned and/or overhauled, must pass a particular applied voltage test with values given by current regulations.
- After rewinding and/or replacing parts, the no-load voltage must not exceed certain values given by current regulations.

- If repairs are not carried out by the manufacturer, repaired welding machines, in which some components have been replaced or modified, must be marked so that the person who carried out the repair can be identified.

### B) Additional repair Instructions

- After having carried out a repair, be careful to re-order the wiring, so that there is a secure insulation between the primary side and the secondary side of the machine.
- Do not allow the wires to come into contact with moving parts (i.e. with the fan motor) or parts that become hot during operation.
- Also re-assemble all the clamps that hold the wiring, as originally arranged on the machine, so that, if a conductor is accidentally broken or disconnected, it is still possible to avoid a connection between the primary and the secondary.
- Avoid cleaning the electronic boards with a jet of compressed air to preserve the integrity of the components.
- At the end of any repair, make sure that you have not forgotten any tools inside the machine and close the machine with all the bulkheads available and taking care to replace all the fixing devices of the bulkheads themselves.

## 7.6. DIAGNOSTICS AND TROUBLESHOOTING

For defects or malfunctions of the machine not described in this manual, please contact the manufacturer.

### List of error code

Error Type	Error code	Description	Lamp status
Thermal relay	E01	Over-heating(1st thermal relay)	Yellow lamp (thermal protection) always on
	E02	Over-heating(2nd thermal relay)	Yellow lamp (thermal protection) always on
	E03	Over-heating(3rd thermal relay)	Yellow lamp (thermal protection) always on
	E04	Over-heating(4th thermal relay)	Yellow lamp (thermal protection) always on
	E09	Over-heating(Program in default)	Yellow lamp (thermal protection) always on
Welding machine	E10	Phase loss	Yellow lamp (thermal protection) always on
	E11	No water	Yellow lamp (lack water) always on
	E12	No gas	Red lamp always on
	E13	Under voltage	Yellow lamp (thermal protection) always on
	E14	Over voltage	Yellow lamp (thermal protection) always on
	E15	Over current	Yellow lamp (thermal protection) always on
	E16	Wire feeder over load	
Switch	E20	Button fault on operating panel when switch on the machine	Yellow lamp (thermal protection) always on
	E21	Other faults on operating panel when switch on the machine	Yellow lamp (thermal protection) always on
	E22	Torch fault when switch on the machine	Yellow lamp (thermal protection) always on
	E23	Torch fault during normal working process	Yellow lamp (thermal protection) always on
Accessory	E30	Cutting torch disconnection	Red lamp blink
	E31	Water cooler disconnection	Yellow lamp (lack water) always on
Communication	E40	Connection problem between wire feeder and power source	
	E41	Communication error	



## 8. ACCESSORIES AND SPARE PARTS

### 8.1. CUSTOMER SERVICE

The Manufacturer is always at your disposal for any type of information regarding the use, maintenance, and installation of the equipment.

It is suggested that the Customer asks clear questions, making reference to this Manual and the instructions listed.

### 8.2. SPARE PARTS

**IMPORTANT: ALWAYS USE ORIGINAL SPARE PARTS. The Manufacturer cannot be held liable for breakages, malfunctions or damage to persons or property arising from the use of non-original parts.**

In the event that non-original spare parts are used, the conditions of the Warranty (if still in place) and of the Manufacturer's liability in the use of the machine and any damage deriving to persons and/or property are void.

## 9. ADDITIONAL INSTRUCTIONS

### 9.1. WASTE DISPOSAL

It is the responsibility of the user, in accordance with the laws in force in their country, to ensure correct disposal of the waste produced by the machine during production.

The disposal of hydraulic oil lubricants and the replaced parts must be carried out in compliance with the regulations in force in the country where the machine is in use.

### 9.2. DECOMMISSIONING AND DISMANTLING

With reference to the WEEE Directive 2012/19 / EU (Waste Electrical and Electronic Equipment), the user, during disposal, must dispose of the equipment in the appropriate authorised collection centres, or return it still installed to the seller at the time of a new purchase.

**IMPORTANT: do not dispose of polluting materials in the environment. Dispose of such products in compliance with legislation in force.**

**IMPORTANT: the illegal disposal of Waste Electrical and Electronic Equipment is punished with sanctions regulated by the laws in force in the territory in which the infringement is ascertained. Waste Electrical and Electronic Equipment may contain hazardous substances with potentially harmful effects on the environment and on people's health. It is recommended to dispose of it properly.**

WEEE refers to Waste Electrical and Electronic Equipment (EEE) including all components, sub-assemblies and consumables that are an integral part of the product at the time the decision is made to discard it. The law divides these into 2 main categories called **PROFESSIONAL WEEE** or **DOMESTIC WEEE**.

**PROFESSIONAL WEEE** means all waste electrical and electronic equipment intended for purely industrial use.

**DOMESTIC WEEE** means all waste electrical and electronic equipment intended for mixed use both in an industrial environment and in a domestic environment.

**DOMESTIC WEEE** is identified as all single-phase power supply generators with output current MAX  $\leq 200A$  with their accessories.

There are 2 ways to discard **DOMESTIC WEEE**:

- a) If you decide to buy a new equivalent equipment, the user can deliver it to the distributor, who will have to collect it for free.
- b) Alternatively, it must be deposited in the Municipal pitch, in the container or specific area identified as "GROUPING 4".

As of the date of preparation of the Instruction Manual, as the application of the Regulations is not yet definitive, please contact the distributor and/or the manufacturer for information on **PROFESSIONAL WEEE** disposal.

**THE SYSTEM DESCRIBED IN THE MANUAL BELONGS TO CATEGORY: DOMESTIC "EEE"**

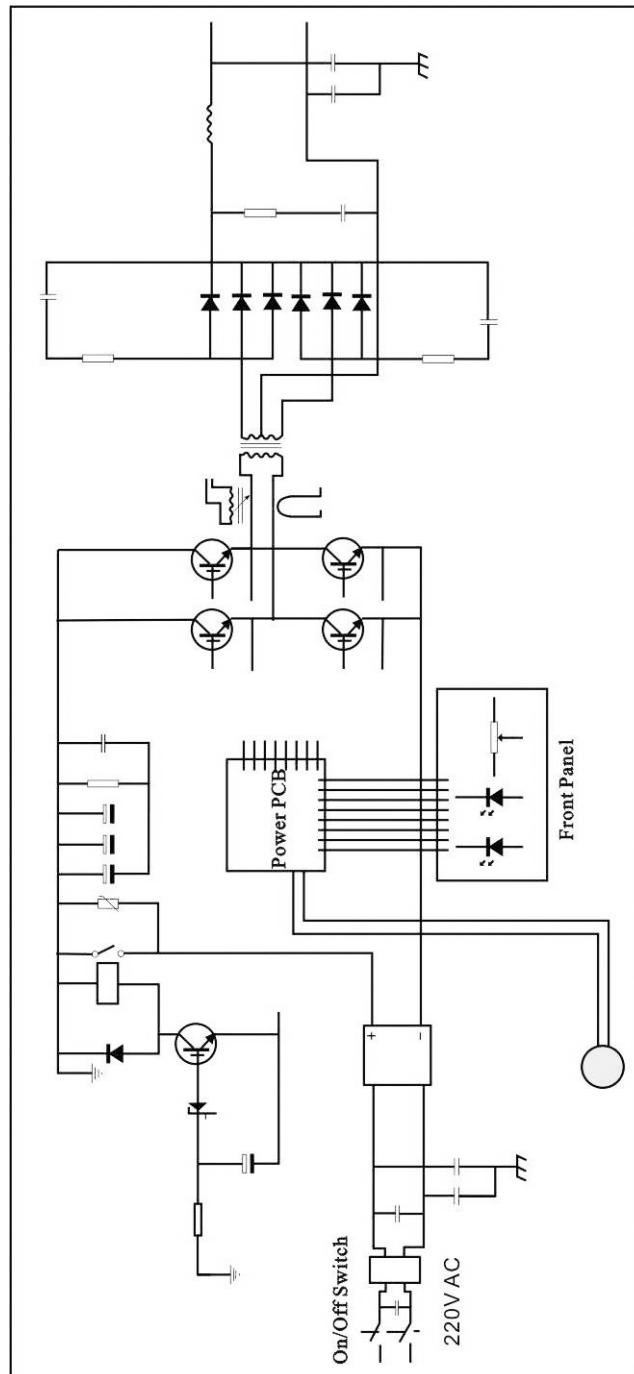
**For the management of "WEEE", SINCOSALD relies on ecoR Consortium "it"**



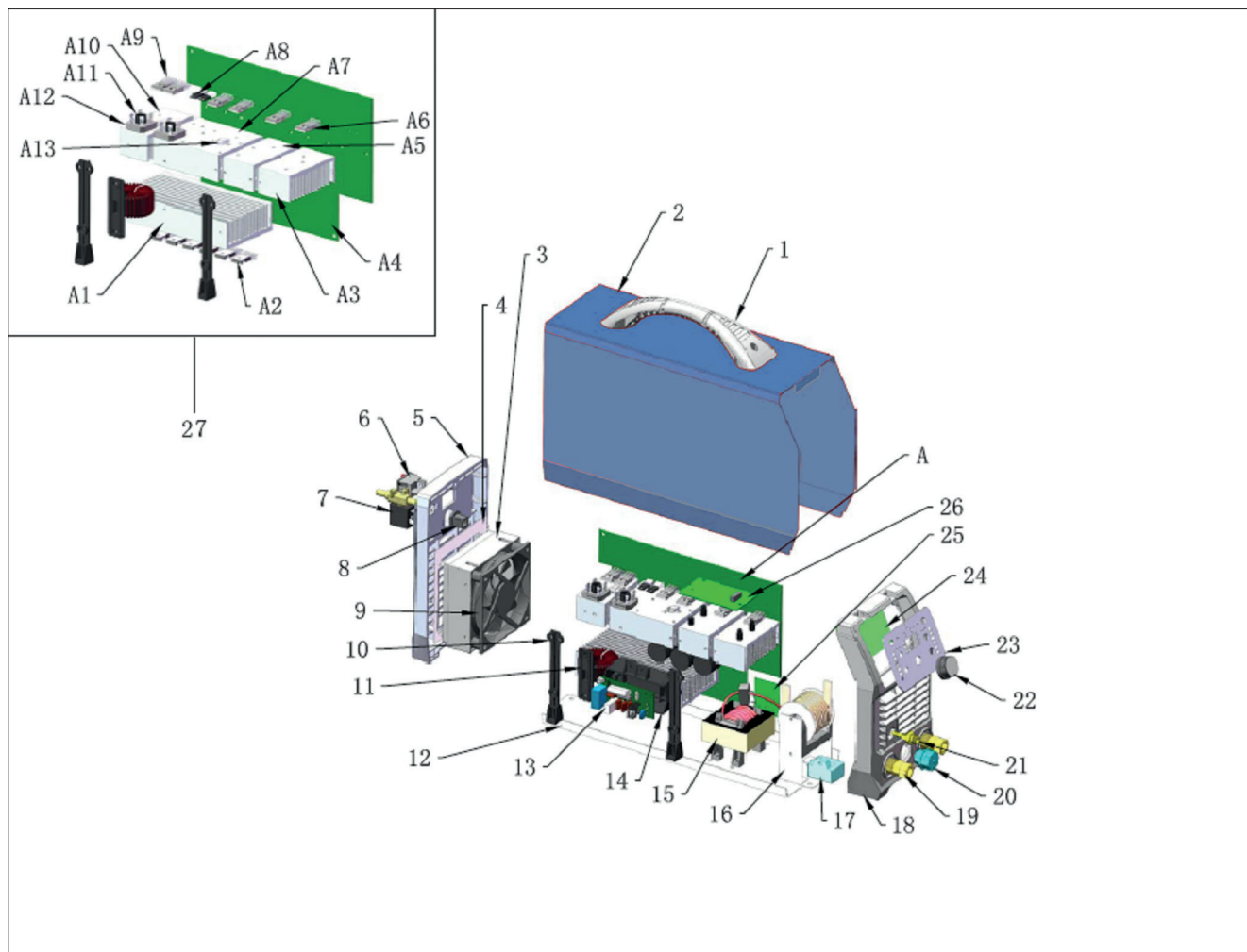
**AS OF THE DATE OF THE PREPARATION OF THIS INSTRUCTION MANUAL THIS INFORMATION SHOULD BE CONSIDERED TO BE NON-DEFINITIVE AS SUBJECT TO POSSIBLE CHANGES ACCORDING TO THE OBLIGATIONS LINKED TO LEGISLATIVE DECREE N ° 151/2005 THAT WILL COMPLETE DIRECTIVE 2002/96/EC.**

## 10. ANNEXES

### 10.1. WIRING DIAGRAMS



## 10.2. SPARE PARTS



Pos.	Code	Description	Qt.
1	8.225.076	Handle	1
2	8.221.025	Machine cover	1
3	8.291.026	Fan cover	1
4	8.221.020	Fixing plate for fan	1
5	8.221.017	Rear panel	1
6	8.295.077	ON/OFF switch	1
7	8.295.079	Gas valve	1
8	8.295.074	Fixing clamp for power cable	1
9	8.295.094	Fan	1
10	8.220.013	Plastic holder	2
11	8.222.018	PFC inductor	1
12	8.221.012	Bottom plate	1
13	8.223.079	High frequency PCB	1
14	8.221.045	High frequency PCB mounting box	1

Pos.	Code	Description	Qt.
15	8.222.011	Main transformer	1
16	8.222.015	Inductance	1
17	8.292.010	Hall current sensor	1
18	8.221.018	Front panel	1
19	8.295.070	Euro socket (without plastic cover)	2
20	8.295.067	12 Pin socket	1
21	8.291.053	Front gas fitting	1
22	8.295.085	Knob	1
23	8.221.034	Fixing plate for front panel	1
24	8.223.068	Digital display PCB	1
25	8.223.080	Three-phase absorber PCB	1
26	8.223.085	Control PCB	1

Pos.	Code	Description	Qt.
27	8.226.005	Inverter module	
A1	8.221.038	Frd heat sink	1
A2	8.295.082	Fast recovery diode	6
A3	8.221.043	Heat sink	1
A4	8.223.065	PFC main PCB	1
A5	8.221.042	Heat sink	1
A6	8.295.107	IGBT	6
A7	8.221.041	Heat sink	1
A8	8.295.080	Fast recovery diode	2
A9	8.295.103	Insulation block	12
A10	8.221.030	Heat sink	1
A11	8.295.091	Spiral cover buckle	2
A12	8.222.020	Rectifier bridge	2
A13	8.225.078	Switch	2





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