

INSTRUCTION MANUAL

SPOT WELDING MACHINE (Digital control)



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- We thank your preference for our mark. We continue building equipments that guarantee reliability and robustness. We thank you any suggestion which can help us to serve you better.

- This manual must be read and understood carefully. Do not install, operate or maintain this appliance before read this user's guide. The equipment must be installed, operated or maintained only by qualified persons. Never start up this welding rectifier without his casing. Before open disconnect it from the main's socket.

1 - SAFETY PRESCRIPTIONS FOR ARC WELDING GENERATORS

The Safety Prescriptions given in this manual do not replace but summarize the obligations for compliance with the current safety and accident-prevention regulations. Before install, operate or maintain the welding equipment, read and understand carefully the current safety and accident-prevention regulations.

In any case, the personnel involved in the use of the welding machine must be adequately trained with regard to use of the machine and observance of the fundamental welding rules.

Setting up of the work area must comply with certain fundamental principles. Basic safety of persons and things depends on the observance of these minimum requires.

1. Personal Protection

The skin or eyes burns resulting from the exposure to the electric arc welding radiations or metal fusion can bring more dangerous effects than sunburn. Therefore:

a) Use a protection mask equipped with the respective inhatinic filter to protect the eyes, face, neck and ears from the projections and the arc welding radiation. Prevent the persons near the welding places of the negative effects provoked by the arc welding radiations or metal fusion.

b) Use non-inflammable gloves, long sleeves shirt, trousers without folds, boots, welding mask, apron and hat to protect the hair. These protections are needed to insure that the skin stays protected from the referred radiations.

Avoid using clothes with pockets or folds so that in case of occurring any projection of hot metal these will not deposit in the clothes' folds or pockets.

c) To protect the persons near the welding place, separations of non-inflammable curtains ought to be installed.

d) Always use safety glasses when standing in a place where metal projections can occur. Persons that circulate in the working area ought to use safety glasses.

2. Preventing Fires

The projections can cause fires when in contact with combustible substances, liquids or gaseous. Therefore:

a) Every combustible material must stay far from the working place. When possible the combustible materials must be covered with non-inflammable covers. These materials include wool, clothes, sawdust, natural gas, acetylene, propane and similar materials.

b) The metal projections can penetrate in wall or floor cracks causing non detectable latent fire. These cracks must be conveniently protected from the metal fusion projections.

c) Welding, cutting or any kind of hot operation should not be made in recipients, deposits, tanks or other kind of used containers that haven't been carefully cleaned from substances that can produce toxic or inflammable vapors.

d) For protection against fire must exists a fire extinguisher system nearby, that can be used quickly like a water hose, a water recipient, sand or a portable extinguisher.

e) Once the welding operations are concluded, the working area must be inspected to insure the absence of metal fusion projections that can cause further fires.

3. Electric Discharge

Burns or mortal electrocution can be caused by 110 voltages or less. The gravity of this kind of discharges is determined by the intensity of electric current that passes through the human body. Therefore:

a) Do not permit contact of the skin with metal pieces or even the use of wet or humid clothing. Wear only well dry gloves.

b) If it's really needed to make welding operations in humid places the operators must wear very well dry gloves, rubber shoes or boots and stepping the dry floor in order to be isolated from the electric current.

c) The welding machine must be connected to an electrical board equipped with an appropriate differential and earth connection. The earth connection wire's section must be correct according the norms about electric cables.

d) Do not use damaged welding cables. Do not overload the cable. Cable extensions or connections must be always correctly isolated.

e) The equipment must remain disconnected when not in use because an accidental electrical discharge can cause overheating and provoke a fire. Do not roll the welding cable around the body.

f) The earth cable must be connected to the welding piece closest from the welding area. Welding current must pass through metallic elevations or crane cables if long distance earth cable connections are made.

Ventilation

The smoke produced by the welding, mainly in closed spaces can provoke irritations if breathed during a long period of time.

- a) Always take special care having proper ventilation in the welding places by the means of natural or forced ventilation systems. Do not weld over zinc galvanised materials, cadmium, lead or beryllium, without prevent the needed ventilation to avoid smoke provoked by the welding of these materials.
- b) Do not weld near places containing chlorinated hydrocarbon vapors resultants from degreasing operations. Reactions can be provoked from the vapors of dissolvent with the resultant heat of electric welding arc producing toxic or irritating gas.
- c) Eye, nose or throat irritations during the welding process means that the ventilation system isn't proper. In this case the ventilation should be increased in the welding area. Stop the welding operation if the irritations persist.

5. Equipment maintenance

The quality of the welding process depends on the good condition of the welding equipment. To maintain its good condition and protect the operator, maintenance reviews should be made periodically. If reviews aren't made, accidents can occur due to fire or electric discharges. Therefore:

- a) The equipment installation and maintenance operations must be done by qualified personal. Do not proceed with electric repairs if you are not properly qualified.
- b) Before starting with any maintenance operation the welding equipment must be disconnect from the power supply.
- c) The welding cables and the power supply cable and even the welding machine must be kept in good working conditions. This equipment must never be used in less proper working conditions.
- d) The welding equipment and its accessories must be treated carefully. Keep the machine far from heating sources, ovens or hothouses, from humid places as water wells, oils or lubricants, from corrosive environments or intemperate weather.
- e) Keep the safety systems and the chassis of the machine in proper working conditions.
- f) Use the welding equipment only in jobs that are according to the equipment characteristics.

6. Using WELDING or GAS CUTTING equipment.

- a) The operator of welding or gas cutting equipments must know the specific characteristics and the correct form of use.
- b) The pressures ought to be according to the manufacture recommendations.
- c) The welding torches, hoses and reducers must be kept well tightened with no leaks, cleaned and free from oils or lubricant greases.
- d) The pressure reducers can not be submitted to sudden changes of pressure and must be used according to the manufacturer specifications. Do not use an installation without being equipped with proper retention valves.
- e) Periodical checks must be made to the installation for detection possible gas leaks or other defects. Qualified personnel must execute the maintenance operations.

7. Handling of Gas Tubes

The user must know and follow the safety instructions for stocking, use and transportation of compressed, liquefied and dissolved gases under pressure used in welding or cutting operations.

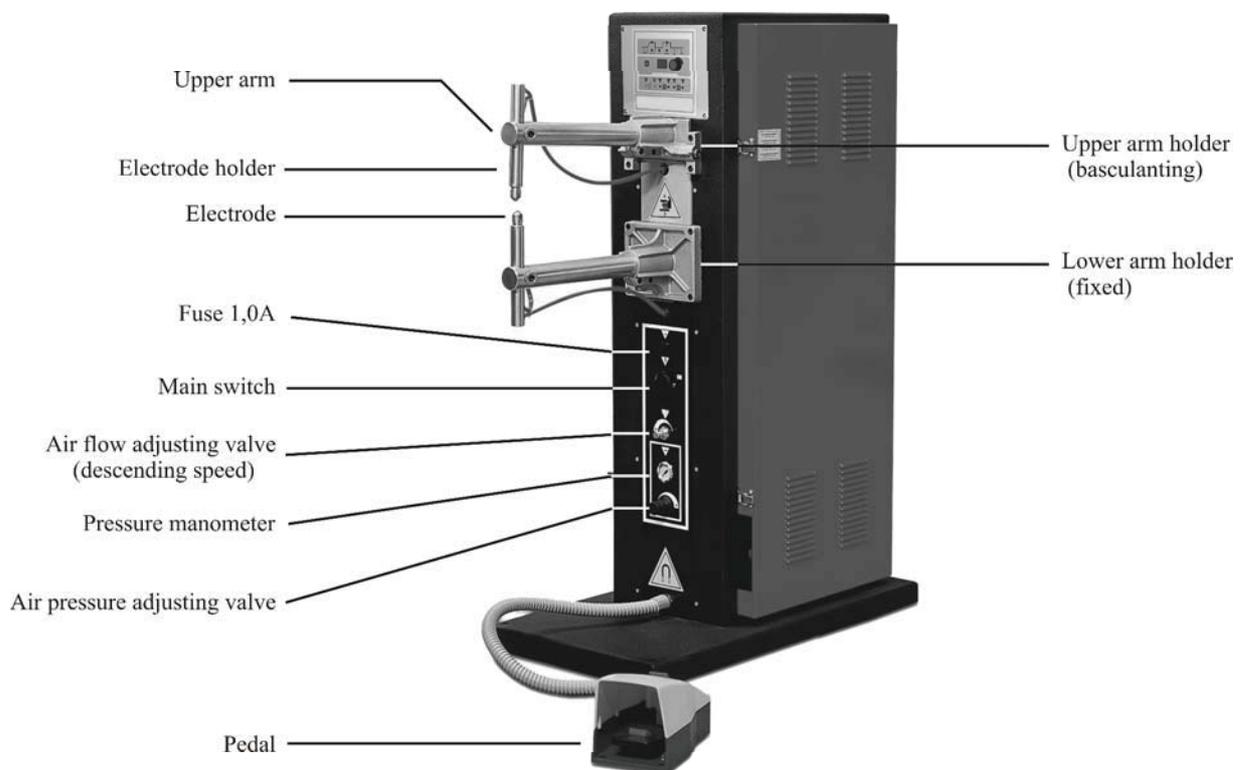
Besides the specified norms must follow those that concern the kind of welding process to be used (Electrode, Tig, Mig, Plasma, Plasmacutting, Laser, etc.), as well as the specific characteristics of the equipment, the power supply conditions, hygiene norms and safety at work and the machine's safety regulations. The fulfillment of this safety norms, does not guarantee that the content is enough for all cases or conditions, or invalids the fulfillment of current legal norms.

2 - DESCRIPTION

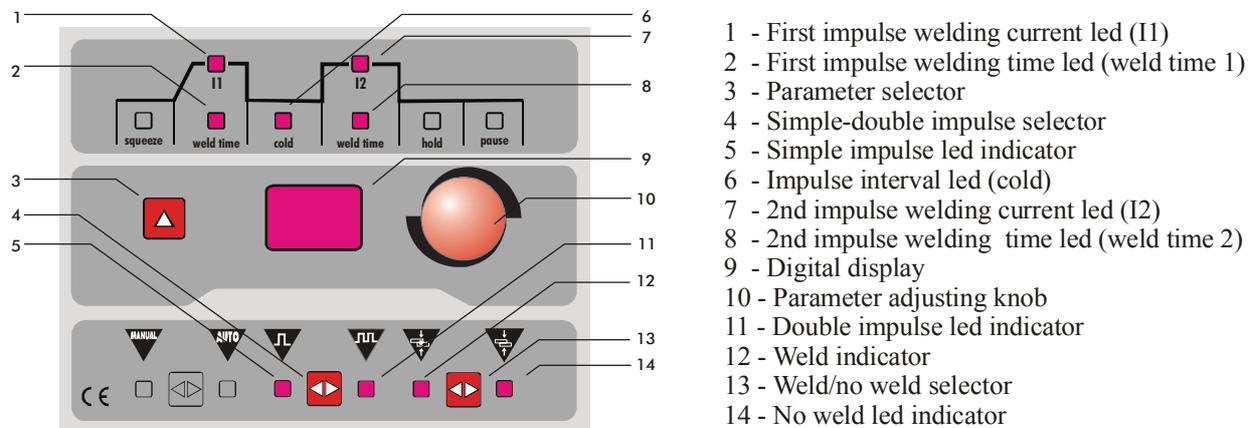
The Spot Welding Machines of the digital series are electronically controlled by thyristors.

The digital control allows the parameters adjustment in a simple way, with the possibility of effectuating welding cycles with one or two current impulses. This characteristic allows the welding of plates with some degree of oxide or protection covering. The first impulse effectuates the pickling of the plate, while the second consolidates the weld point. The parameters of each impulse (current and time) as the interval between the impulses (cold) can be adjusted separately.

- The welding current of the first impulse is established by means of an ascending current (up-slope), avoiding current peaks in the mains. The absence of power contactors, increases the liability of the machine.
- Excellent precision of the parameters repeatability (current/time).
- By means of the weld/no weld selector switch, it is possible to simulate cycles without current in the electrodes, allowing the user to effectuate the necessary adjustments in the position of the holders and the electrodes, before initiating the welding operation.



CONTROLLER



1 - Programming one welding cycle with one welding current impulse:

- 1.1- Push key-button 4 until led 5 lights on (simple impulse).
- 1.2- Push key-button 3 (parameter selection) until led 1 (I1) lights on.
- 1.3- Adjust with adjusting knob 10 the welding current of 1st. impulse (I1) from 1 to 100%.
- 1.4- Push key-button 3 until led indicator 2 (weld time 1) lights on.
- 1.5- Adjust, with adjusting knob, welding time of 1st. impulse (weld time 1) from 1 to 100%.
- 1.6- Adjust welding pieces and weld stepping pedal.
- 1.7- The welding cycle becomes complete when led 1 (I1) indicates again the welding settled current.

2 - Programming welding cycle with 2 impulses of current:

- 2.1 - Push key-button 4 until led indicator 11 lights on (double impulse).
- 2.2 - Follow steps 1.2 to 1.5.
- 2.3 - Push key-button 3 until led indicator 6 (cold) lights on.
- 2.4 – Adjust, with adjusting knob, interval time (cold) between impulses.
- 2.5 - Push key-button 3 until led indicator 7 (I2) lights on.
- 2.6 - Adjust with adjusting knob welding current of 2nd. impulse (I2) from 1 to 100%.
- 2.7 - Push key-button 3 until led indicator 8 (weld time 2) lights on.
- 2.8 - Adjust with adjusting knob the welding time of 2nd. impulse (weld time 2) from 1 to 100%.
- 2.9 - Adjust the pieces to be weld and weld by stepping the pedal.
- 2.10 - The welding cycle becomes complete when led 1 (I1) indicates again the settled welding.

Attention: When the machine is connected in the main switch, the digital indicator indicates the mains frequency (50 or 60 Hz). The microcontroller detects the frequency and adjusts automatically these conditions. Next, it effectuates a sequential automatic test to every LED and digital indicator. Finally, the digital indicator indicates “ON”, informing that the machine is ready to operate.

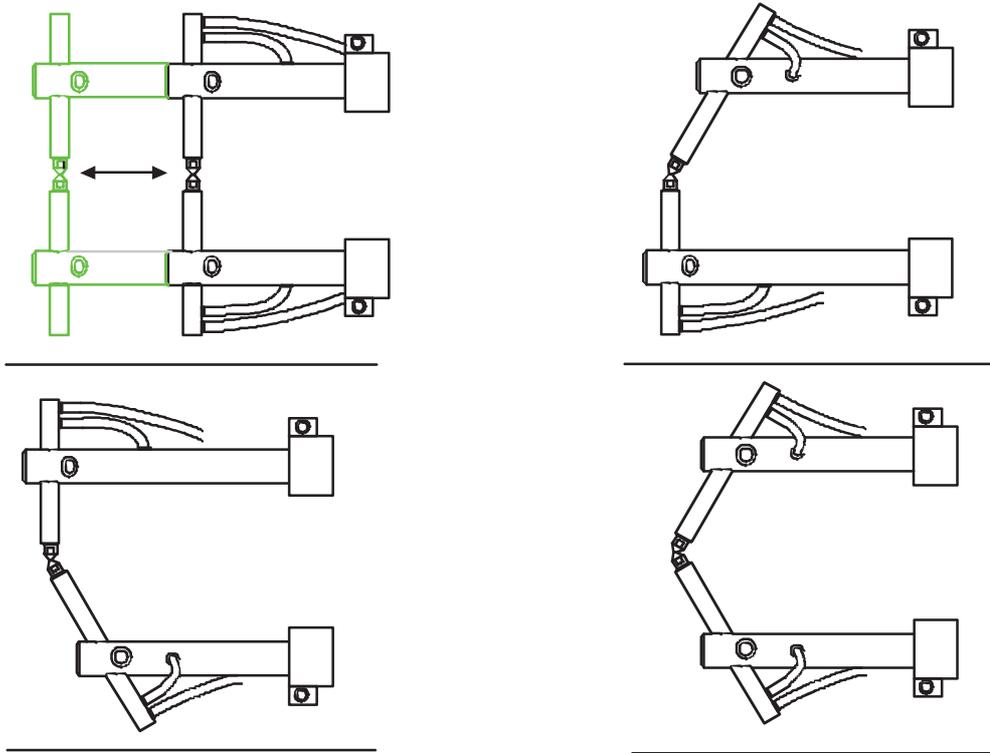
Conversion table (nr. periods/seconds)

<i>Periodes</i>	<i>Seconds</i>
1	0,02
5	0,10
10	0,20
15	0,30
20	0,40
25	0,50
30	0,60
35	0,70
40	0,80
45	0,90
50	1,00
55	1,10
60	1,20
65	1,30
70	1,40
75	1,50
80	1,60
85	1,70
90	1,80
99	1,98

“Error” messages

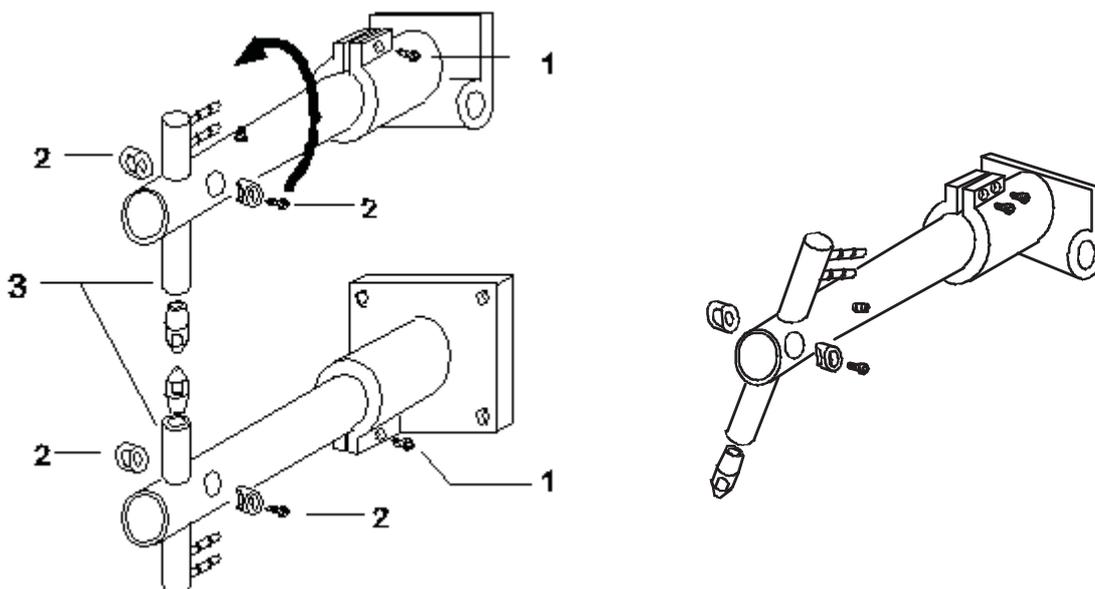
- ***E1: The operator did not press the foot pedal until the end of the welding cycle (this may cause welding imperfections).***
- ***E2: When the machine is turned on, the pedal or any button is activated.***

The positions of arms and electrodes can be modified according to the shape of the welding piece:



To change arms position:

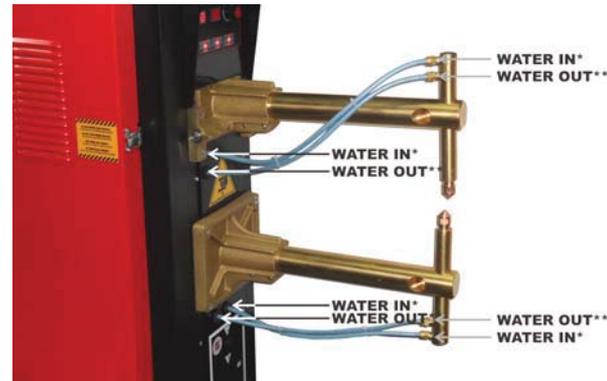
- Upright the arm fixing screw (1) to rotate the desired angle.
- Change positions of electrode holder fixing set (2) and electrode holder (3).
- Adjust arms and electrodes according to their new positions.
- Electrode shapes must be changed, if necessary, to make perfect electrical contact with the welding piece (see pag. 32).
- Retighten all screws.



3 - INSTALATION

Following cares must be taken when installing spot welding machines:

Arms, electrode holders and electrodes water cooling system tubes must be connected to the main water supply, or other closed water cooling system. Water pressure must not exceed 2 Kg/cm² and the flowing rate must be adjusted according to electrode temperature (<50° C).

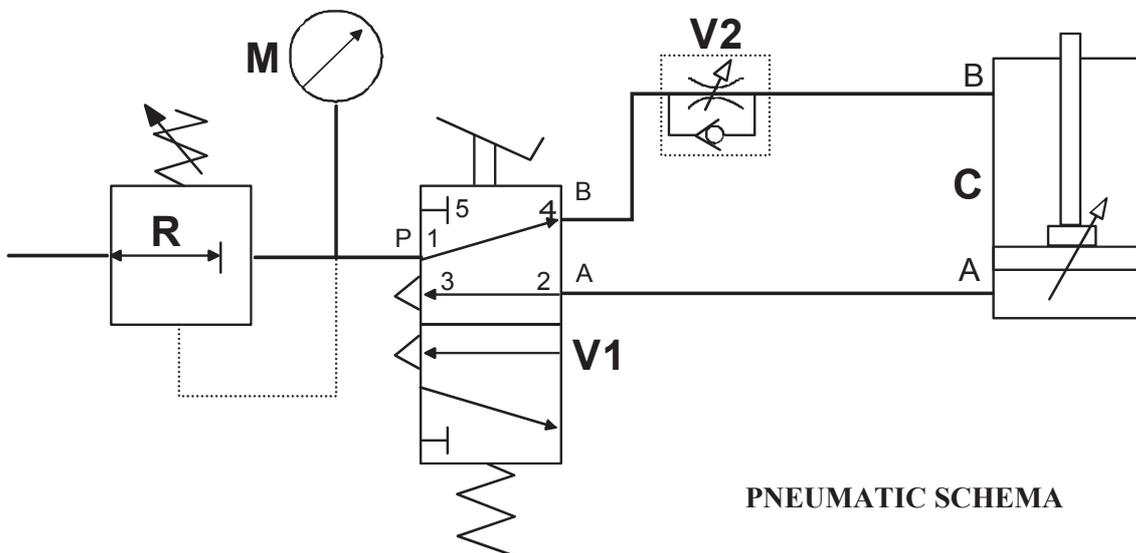


COOLING CIRCUIT

* **WATER IN** - Inlet cold water
 ** **WATER OUT** - Outlet hot water

CLOSED WATER COOLING SYSTEM

On pneumatic machines, compressed air system must be provided with a lubricating and filtering set. In order to obtain the adequate filter, please contact your distributor. Air pressure must not exceed 8 Kg/cm².

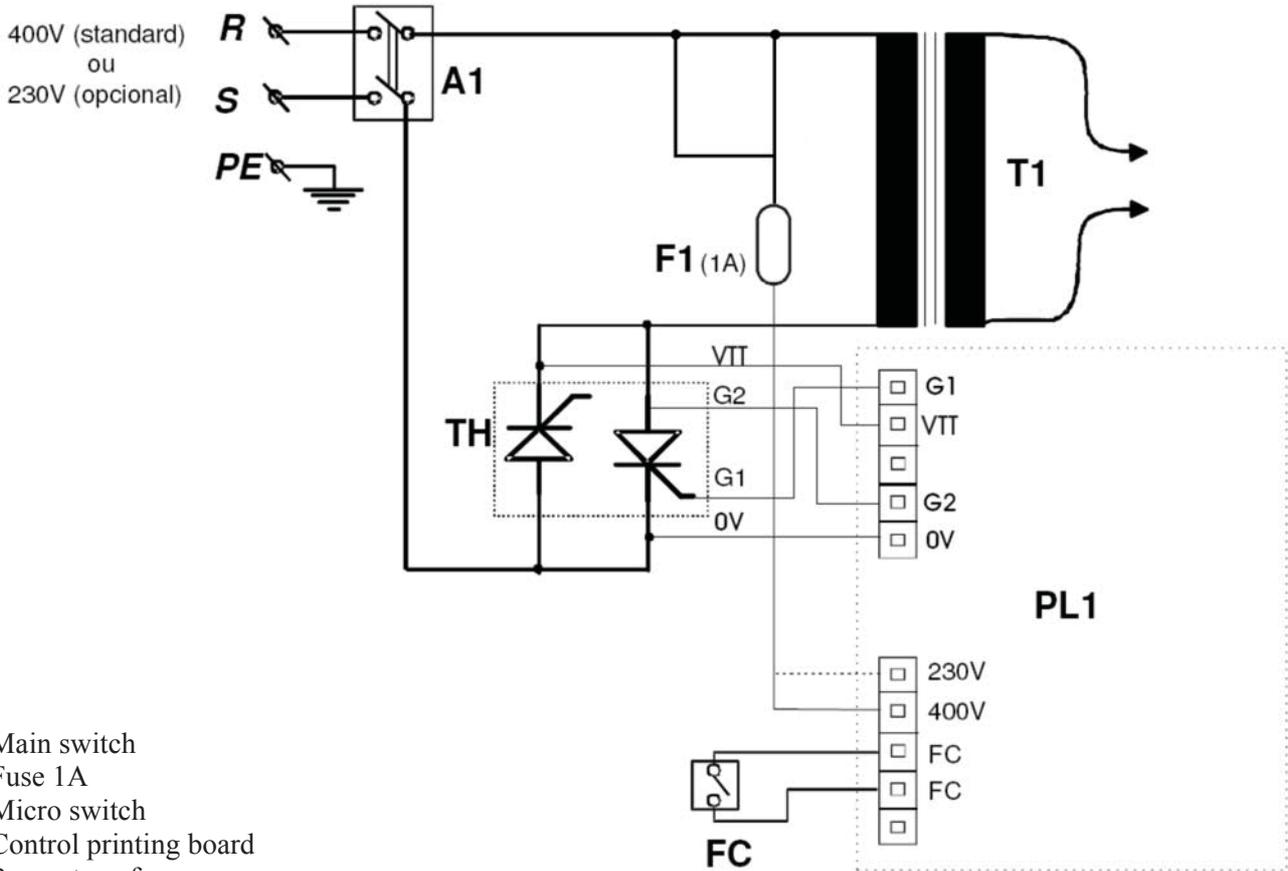


PNEUMATIC SCHEMA

- A - Ascending movement (positive)
- B - Descending movement (negative)
- C - Pneumatic cylinder diam. 50 - 100
- M - Air pressure manometer
- R - Air pressure regulator
- V1 - Command valve (pedal)
- V2 - Air flow regulator

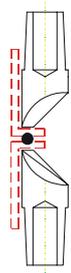
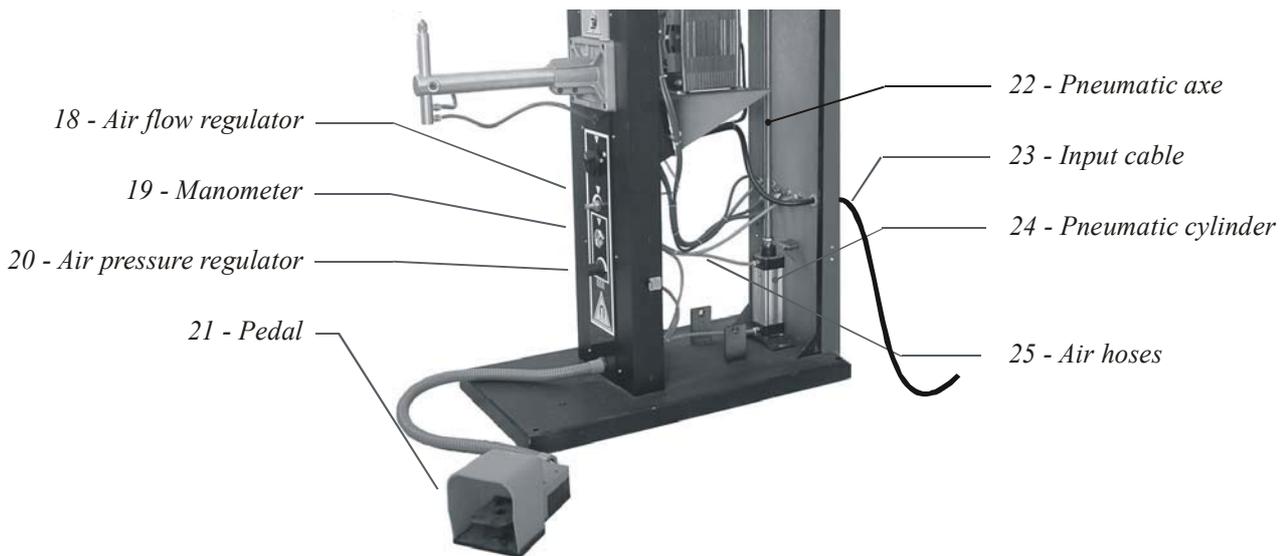
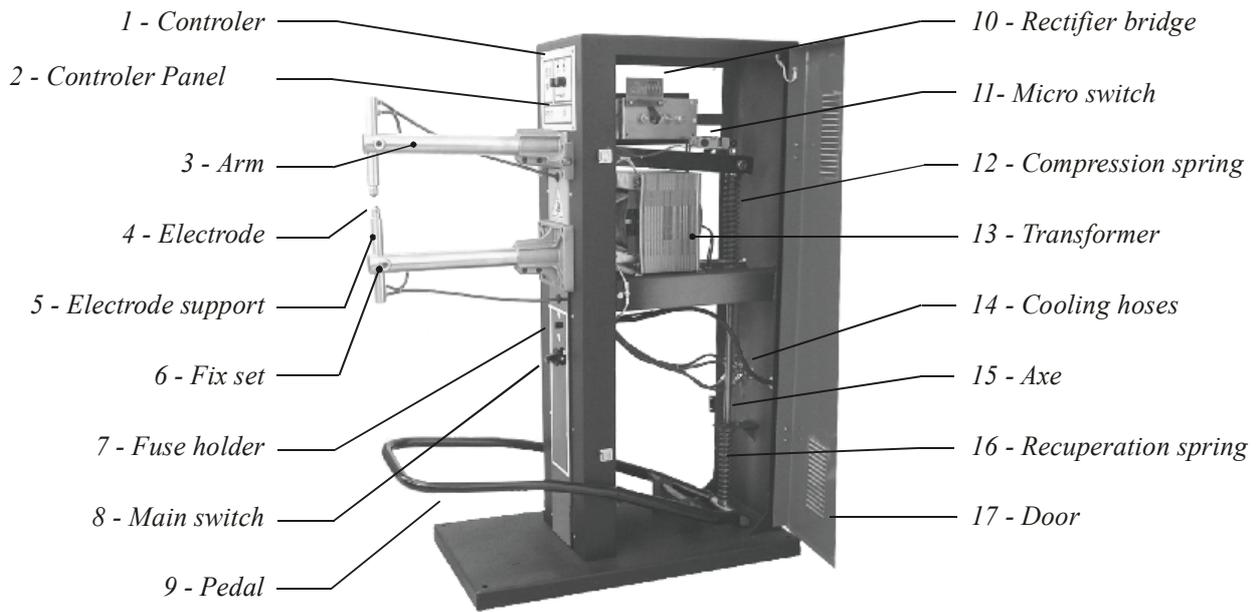
Before connecting the primary cable to main supply, voltage must be checked (400 V or optional 230V). The connection of earth wire (green/yellow) is strongly recommended in order to avoid physical risks to operators. Machine electrical protection must be made with retarded fusion fuses.

4 - ELECTRICAL SCHEMA

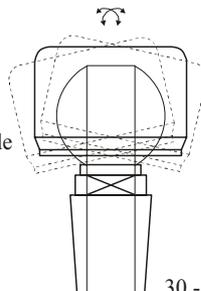


- A1 - Main switch
- F1 - Fuse 1A
- FC - Micro switch
- PL1 - Control printing board
- T1 - Power transformer
- TH - Thyristors

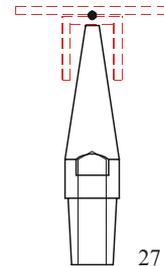
5 – SPARE PARTS LIST



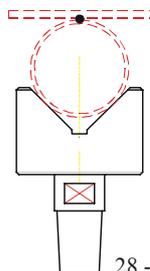
26 - Excentric electrode



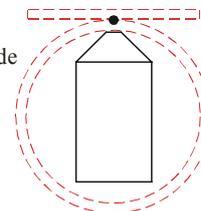
30 - Swivel electrode



27 - Long electrode



28 - Tube electrode \leq 60mm



29 - Tube electrode $>$ 60mm

Designation**Code****MECHANICAL**

1 - Controller thi digit	PA210001001
2 - Controller panel	PFG90900THID0000
3 - Standard arm 450 mm	PFB340450MS
4 - Standard electrode	PFH7L12010C04700
5 - Electrode holder	PFJ2Q1900250255C
6 - Electrode holder fixing set	PFC3MA20250M08
7 - Fuse holder (1A)	CO0Z1M063
8 - Main switch 400 V	CO0B503002
- Main switch 220 V	CO0B632E03
9 - Mechanical foot pedal	PFH1136863080
10 - Printed circuit thyristors	PFC8IN7041100070
11 - Micro switch	CO0GIP6652R
12 - Compression spring	CO8IH7002613270
13 - Transformer 30 KVA 400V	PFK3704030K40001
- Transformer 50 KVA 400V	PFK3704050K40001
- Transformer 30 KVA 230V	PFK3704030K23001
- Transformer 50 KVA 230V	PFK3704050K23001
14 - Water cooling tubes	MP041208000150C1
15 - Mechanical shaft	PFK1117M12967121
16 - Recuperation spring	CO8IH5002618250
17 - Right door	PFL5D1190491500S
- Left door	PFL5E1190491500S

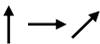
PNEUMATIC

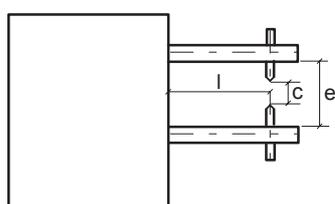
18 - Air flow regulator	CO4CFP1/4
19 - Manometer	CO4A01/81243
20 - Pressure regulator	CO4CPP1/4
21 - Foot pedal	CO4B5/21/4
22 - Pneumatic shaft	PFK1215M16670121
23 - Primary cable (400V)	PFB4A704THI400S
- Primary cable (230V)	PFB4A704THI230S
24 - Pneumatic cylinder	CO4E050100A
25 - Compressed air tubes	MP041508000100C2

Electrodes

26 - Exocentric electrode	PFH7L22010C05007
27 - Long electrode	PFH7L12010C09000
28 - Tube electrode \leq 60 mm	PFH7L32510C05000
29 - Tube electrode \geq 60 mm	PFH7L32010C07400
30 - Swivel electrode	CC4000A19R205030

6 - TECHNICAL DATA

		15	15 Pneum.	25	25 Pneum.
Welding capacity	plate	4+4	4+4	5+5	5+5
	Crossed wire	15+15	15+15	20+20	20+20
No-load voltage	V	1 - 3, 4 V	1 - 3, 4 V	1 - 4,0 V	1 - 4,0 V
Max. Power 50% duty/MAX	KVA	15/30	15/30	25/50	25/50
Primary voltage	V(std.)	1~400	1~400	1~400	1~400
	V(opc.)	1~230	1~230	1~230	1~230
Fuses (retarded fusion)	A (400V)	40	40	50	50
	A (230V)	63	63	80	80
Max. electrode pressure	daN	95 - 250	75 - 175	95 - 250	75 - 175
Arm depth (l) diam(min-max standard)	mm (standard)	340 - 480	340 - 480	340 - 480	340 - 480
	mm (max)	1000	1000	1000	1000
Distance between arms (e)	mm	200	200	200	200
Arms diameter	mm	45	45	45	45
Electrode holder diameter	mm	25	25	25	25
Electrode diameter	mm	20	20	20	20
Max. electrode throat (c)	mm	100	100	100	100
Air pressure	bar	-	4 - 8	-	4 - 8
Water flow	lt/min	4	4	5	5
Dimensions 	cm	127x45x100	127x45x100	127x45x100	127x45x100
Weight	Kg	173	170	183	180



l - Arms depth
e - Distance between electrodes
c - Electrode throat

The following table presents some parameters for steel welding according to three categories:
 Class A: welding for high mechanical efforts; Class B: welding for medium mechanical efforts; Class C: welding for low mechanical efforts.
 Note: This table is merely indicative, once the quality of resistance welding is influenced by different elements.

Common factors to every class			Class A (OPTIMAL)				Class B (GOOD)				Class C (SUFFICIENT)				
e (mm)	d (mm)	P (mm)	L (mm)	Welding time (perodes)	Welding current (A)	Electrodes effort (Kg)	Welding Point diameter	Welding time (perodes)	Welding current (A)	Electrodes effort (Kg)	Welding Point diameter	Welding time (perodes)	Welding current (A)	Electrodes effort (Kg)	Welding Point diameter
0,25	3,0	6,5	9,5	4	Sufficient	Sufficient	3,0	15	Sufficient	Sufficient	2,8	20	Sufficient	Sufficient	2,3
0,50	4,0	9,5	11,0	5	Medium	Medium	4,2	20	Sufficient	Sufficient	3,5	50	Sufficient	Sufficient	2,5
0,75	4,5	12,5	11,0	6	Medium	Medium	4,8	25	Sufficient	Sufficient	4,3	55	Sufficient	Sufficient	2,7
1,00	5,0	19,0	12,0	8	Medium	Medium	5,6	30	Sufficient	Sufficient	5,3	70	Sufficient	Sufficient	3,0
1,25	6,0	22,0	14,0	10	Medium	Strong	6,3	35	Medium	Sufficient	5,6	75	Sufficient	Sufficient	3,5
1,50	6,5	25,0	16,0	12	Medium	Strong	7,0	40	Medium	Sufficient	6,4	80	Sufficient	Sufficient	4,0
2,0	7,0	35,0	18,0	17	Forte	Strong	7,6	50	Medium	Medium	7,0	85	Sufficient	Sufficient	5,0
2,5	8,0	40,0	19,0	21	Forte	Strong	8,6	55	Medium	Medium	7,9	90	Strong	Sufficient	6,0
3,0	9,5	50,0	22,0	25	Forte	Strong	10,2	65	Medium	Medium	9,4	95	Strong	Medium	7,0
3,5	10,0	60,0	28,0	34	Forte	Strong	11,0	85	Medium	Medium	9,8	99	Strong	Medium	7,8
4,0	11,0	70,0	32,0	40	Forte	Strong	11,8	95	Strong	Strong	10,7	99	Strong	Medium	9,0
4,5	11,5	80,0	40,0	55	Forte	Strong	13,2	99	Strong	Strong	11,5	99	Strong	Strong	10,0
5,0	12,5	90,0	44,0	70	Forte	Strong	14,5	99	Strong	Strong	12,5	99	Strong	Strong	11,5

