INSTRUCTION MANUAL FOR CAPACITOR DISCARGE WELDING MACHINE

IMPORTANT: BEFORE STARTING THE EQUIPMENT, READ THE CONTENTS OF THIS MANUAL, WHICH MUST BE STORED IN A PLACE FAMILIAR TO ALL USERS FOR THE ENTIRE OPERATIVE LIFE-SPAN OF THE MACHINE.
THIS EQUIPMENT MUST BE USED SOLELY FOR WELDING OPERATIONS.

1 SAFETY PRECAUTIONS

WELDING AND ARC CUTTING CAN BE HARMFUL TO YOURSELF AND OTHERS. The user must therefore be educated against the hazards, summarized below, deriving from welding operations. For more detailed information, order the manual code 3.300.758

NOISE

These power source alone do not produce noise levels exceeding 80 dB. The welding procedure, however, may produce noise levels in excess of 80 dB. in which case the machine operator must take the necessary safety precautions as prescribed by the national safety regulation.

ELECTRIC AND MAGNETIC FIELDS INFORMATION

· Electric current following through any conductor causes localized Electric and Magnetic Fields (EMF). Welding/cutting current creates EMF fields around cables and power sources.
· The magnetic fields created by high currents may affect the operation of pacemakers. **Pacemaker wearers are prohibited from using the machine or approach the cables**.
· Exposure to EMF fields in welding/cutting may have other health effects which are now not known.
· All operators should use the followingprocedures in order to minimize exposure to EMF fields from the welding/cutting circuit:
- Route the electrode and work cables together
- Secure them with tape when possible.
- Never coil the electrode/torch lead around your body.
- Do not place your body between the electrode/torch lead and work cables. If the electrode/torch lead cable is on your right side, the work cable should also be on your right side.
- Connect the work cable to the workpiece as close as possible to the area being welded/cut.
- Do not work next to welding/cutting power source.

EXPLOSIONS

· Do not weld in the vicinity of containers under pressure, or in the presence of explosive dust, gases or fumes.
· All cylinders and pressure regulators used in welding operations should be handled with care.

ELECTROMAGNETIC COMPATIBILITY
This machine is manufactured in compliance with the instructions contained in the standard IEC 60974-10 (CL. A), and must be used solely for professional purposes in an industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in non-industrial environments.

DISPOSAL OF ELECTRICAL AND ELECTRONIC EQUIPMENT.
Do not dispose of electrical equipment together with normal waste! Electrical equipment that has reached the end of its life must be collected separately and returned to an environmentally compatible recycling facility. As the owner of the equipment, you should get information on approved collection systems from our local representative.
Extra precautions are to be observed when working on elevated positions.

IN CASE OF MALFUNCTIONS, REQUEST ASSISTANCE FROM QUALIFIED PERSONNEL.

1.1 WARNING LABEL

The following numbered text corresponds to the label numbered boxes.
B. Drive rolls can injure fingers.
C. Welding wire and drive parts are at welding voltage during operation - keep hands and metal objects away.
1 Electric shock from welding electrode or wiring can kill.
1.1 Wear dry insulating gloves. Do not touch electrode with bare hand. Do not wear wet or damaged gloves.

1.2 Protect yourself from electric shock by insulating yourself from work and ground.
1.3 Disconnect input plug or power before working on machine.
2 Breathing welding fumes can be hazardous to your health.
2.1 Keep your head out of fumes.
2.2 Use forced ventilation or local exhaust to remove fumes.
2.3 Use ventilating fan to remove fumes.
3 Welding sparks can cause explosion or fire.
3.1 Keep flammable materials away from welding.
3.2 Welding sparks can cause fires. Have a fire extinguisher nearby and have a watchperson ready to use it.
3.3 Do not weld on drums or any closed containers.
4 Arc rays can burn eyes and injure skin.
4.1 Wear hat and safety glasses. Use ear protection and button shirt collar. Use welding helmet with correct shade of filter. Wear complete body protection.
5 Become trained and read the instructions before working on the machine or welding.
6 Do not remove or paint over (cover) label.

2 GENERAL DESCRIPTIONS

2.1 SPECIFICATIONS

The machine has been designed and built for welding ferrous and non-ferrous stud bolts, Ø 3-4,5-6 and 8 mm. This welding system uses the extremely rapid (2-3 ms) discharge of a battery of charged capacitors, which allows the welding of stud bolts with contact point start-up.

2.2 EXPLANATION OF THE TECHNICAL SPECIFICATIONS LISTED ON THE MACHINE PLATE

This machine is manufactured according to the following standards: IEC 60974.1 / IEC 60974.10 (CL. A) / IEC 61000-3-11 / IEC 61000-3-12.

N° Serial number, which must be indicated on any request regarding the welding machine

 Single-phase transformer-rectifier with device for charging and discharging the capacitors

U0 Secondary open-circuit voltage
E Welding energy
C Capacity value
Uc Voltage adjustable on the capacitors
U1 Rated supply voltage. The machine is set up for voltages of 120V and 240V with automatic voltage change.
1-50/60Hz 50- or 60-Hz single-phase power supply
I1 Max Max. absorbed current at the corresponding supply voltage.
I1 Eff This is the current absorbed considering the duty cycle at the corresponding input voltage.
IP23S Protection rating for the housing. Grade **3** as the second digit means that this equipment may be stored, but it is not suitable for use outdoors in the rain, unless it is protected

S Suitable for use in high-risk environments.

Note:
The machine has also been designed for use in environments with a pollution rating of 3. (See IEC 60664).

2.3 DESCRIPTION OF PROTECTIVE DEVICES

2.3.1 Thermal protection

This machine is protected by a thermostat, which prevents the machine from operating if the allowable temperatures are exceeded. Under these conditions the fan keeps running and the display will show "Warning 08".

3 INSTALLATION

Only skilled personnel should install the machine. All connections must be carried out according to current regulations, and in full observance of safety laws.

1. **Do not place the welding machine on floor with inclination greater than 10°.**
   Air must circulate freely, both incoming and outgoing, and the welding machine must be protected from entry by liquids, dirt, metal filings, etc.
2. Make sure that the supply voltage matches the voltage indicated on the specifications plate of the welding machine. When mounting a plug, make sure it has an adequate capacity, and that the yellow/green conductor of the power supply cable is connected to the earth pin.
   The capacity of the overload cutout switch or fuses installed in series with the power supply must be equivalent to the absorbed current I1 of the machine.
   Any extension cords must be sized appropriately for the absorbed current I1.
   If the power supply is 115V, the machine may run for voltages between 96V and 140V.
   If the power supply is 230V, the machine may run for voltages between 190V and 260V.
   The machine must be switched off when changing the power supply.
3. **Pacemaker wearers are prohibited from using the machine or approach the cables**.
4. Fully insert the earth cable plug into the socket **B** and turn clockwise.
5. Fully insert the gun plug into the socket **C** and turn clockwise.
6. Turn on the welding machine using the **E** switch. (**start-up and shutdown should not be repeated frequently**, because dissipating the energy contained in the capacitors may cause overheating and damage).
7. To limit exposure to the magnetic field, keep the gun cable on the side of the hand holding it, avoiding wrapping the cable around.

3.1 DESCRIPTION OF THE EQUIPMENT

A- Display for the setting and control of welding operations
B- Positive output terminal
C- Negative output terminal

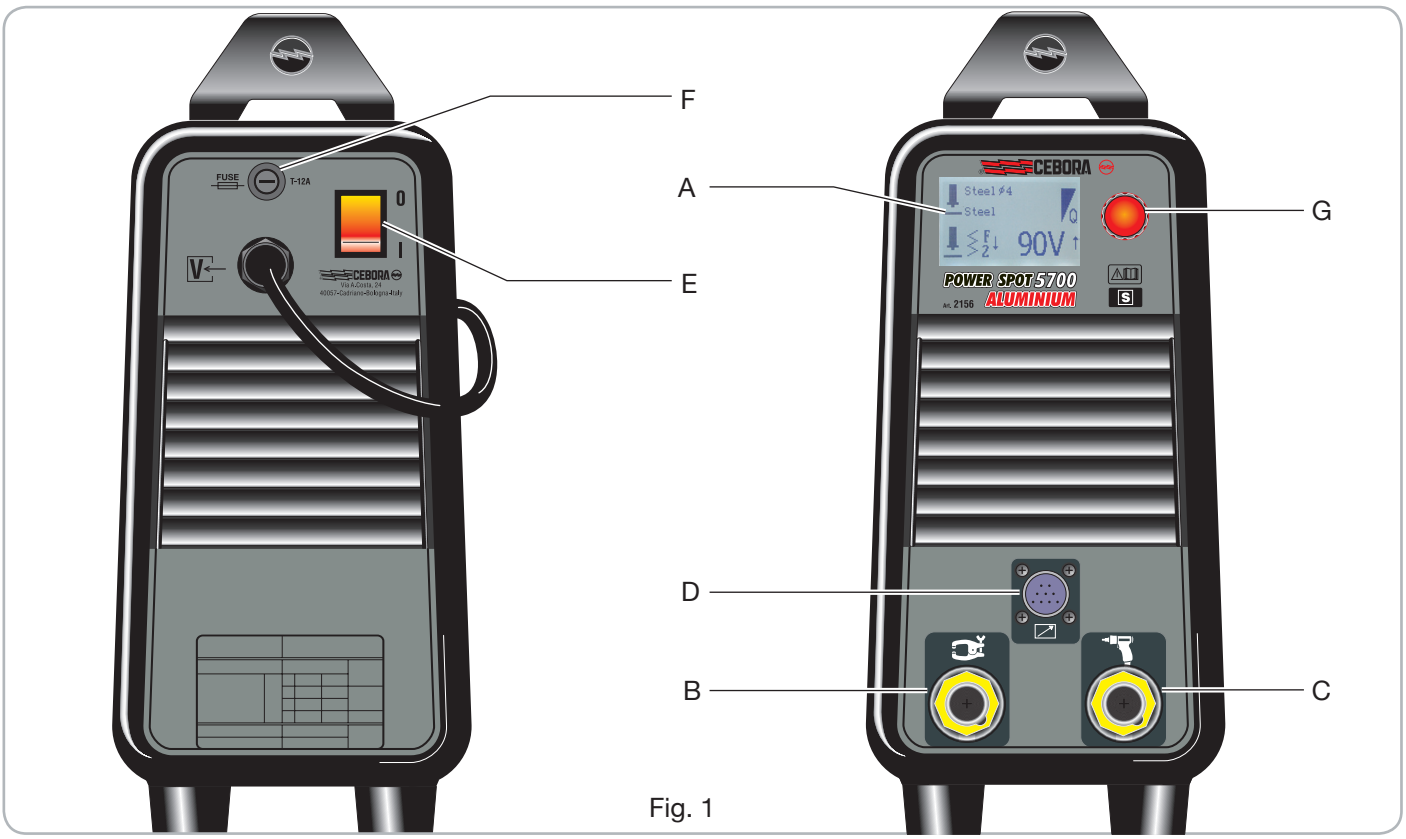


Fig. 1

D- Torch trigger connector
E- Main switch
F- Fuse Ø 6.3x32 (delayed type). The equipment is fitted with a 12A-T fuse.
G- Knob for the setting and control of welding operations.

3.2 GUN DESCRIPTION

K- Gun body
L- Grip
M- Control cable
N- Welding current cable
O- Welding command button (works only with the gun pressed against the sheet metal)
P- Force setting indicator
Q- Force adjustment screw (increases when turned clock wise)
R- Ring to hold spacer **Z**
S- Clamp locking ring-nut
T- Safety bellows
U- Holding screws for ring **R**
V- Screw to adjust stud bolt protrusion
W- Holding nut.
X- Stud bolt gripping clamp
Y- Screw
Z- Spacer

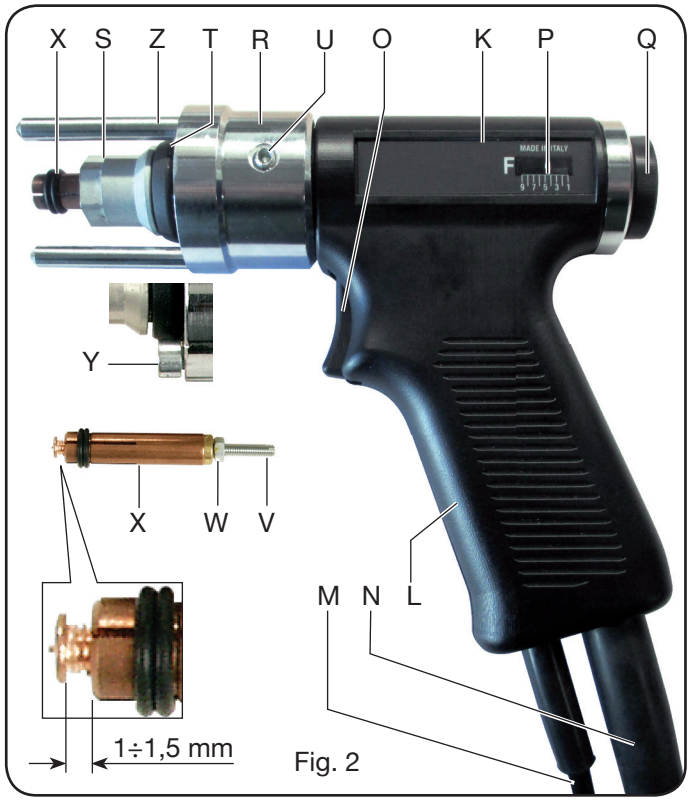


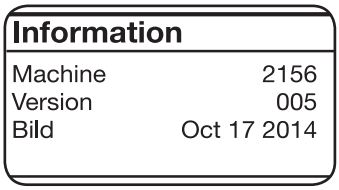
Fig. 2

3.2.1 Preparing the gun

Always use high-quality studs with contact point start-up for capacitor discharge welding, which comply with standards and are made of a metal compatible with the welding to be done.
Having selected the stud bolt to be welded for type, diameter, length and material, use and adjust the gripping

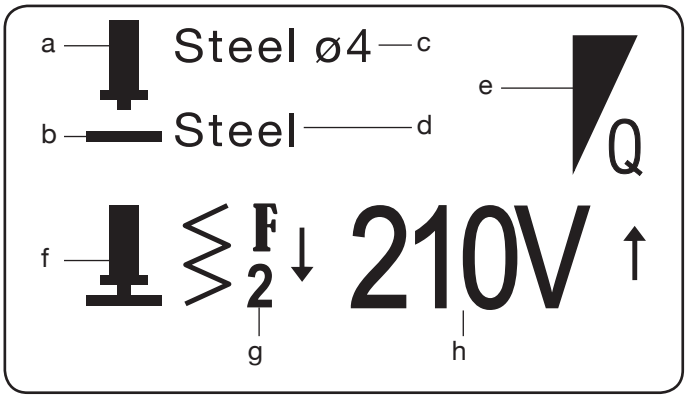
clamp according to the corresponding diameter.
Insert the stud bolt in the clamp **X** so that it is firmly held in place by the four springs.
Adjust the protrusion of the stud bolt from the front of the clamp to 1 ÷ 1.5 mm using the screw **V**, then tighten with the nut **W** (figure 2).
Insert the clamp **X** into the chuck of the gun (fig. 2), press until you feel it rest all the way down, and tighten the nut **S** using the 17-mm hexagon wrench provided.

3.3 DESCRIPTION OF FUNCTIONS SHOWN ON THE DISPLAY A.



When the machine is switched on, for a few seconds the display **A** will show the machine item number, version and development date of the software.

A few seconds later, the following screen will appear on the display **A**:



a Stud bolt
b Base material
c Rivet material and dimensions
NOTE: the maximum rivet length that can be used is 30mm (1-1/4")
d Type of base material
e Indication as to weld quality.
This symbol with the letter Q indicates that the stud material and the base material that have been selected are weldable, poorly weldable or non-weldable (See table 1).

good weldability

poor weldability

non-weldable

f Indications/warnings during the welding phase. During welding phases these symbols provide process-related indications:

f steadily lit: indicates that the generator is ready to carry out a w**elding operation**.

f steadily lit: indicates that the stud bolt is in contact with the base material and the generator is ready to carry out the welding operation.

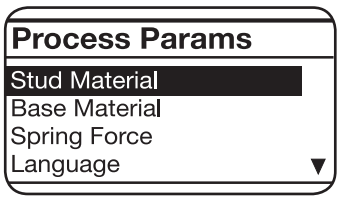
f flashing: indicates that, after the welding was completed, the gripping clamp **X** of the gun was not removed from the stud bolt.

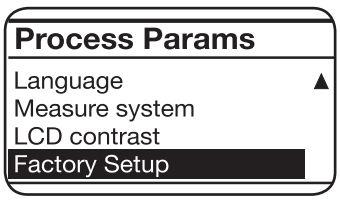
f flashinge: indicates that, after the welding was completed, the start button and microswitch inside the gun were pressed during charging of the capacitors.

g Value suggested by the force of the spring inside the gun (if the force setting is changed, it is recommended also to change the value indicated on the display so that in the future this change will remain memorized. The change from the suggested value will be indicated by an arrow pointing upward if it is increased or downward if it is decreased).
h Charge voltage of the capacitors (if the voltage setting is changed from the suggested value, it will be indicated by an arrow pointing upward if it is increased or downward if it is decreased).
During the adjustment, the voltage value will flash to indicate that the generator is working to reach the requested value.
Whilst the voltage value is flashing, it is not possible to perform any welding operation.

3.3.1 SETTINGS

Press the knob **G** for at least 2 seconds to open the "**Process Params**" (Process Parameters) menu.
The following parameters are selectable from this menu:

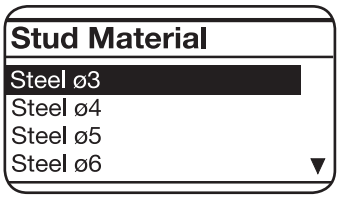


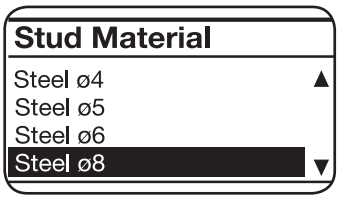


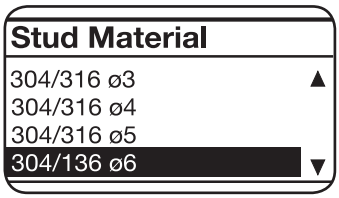
- Stud Material
- Base material
- Spring Force
- Language
- Measure system
- LCD contrast
- Factory Setup

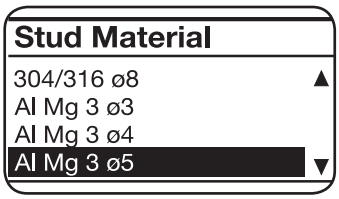
To access each parameter, select it by turning the knob **G** and then press it for less than 2 seconds.
Once you have accessed the parameter, turn the knob **G** to make the desired choice and then press it again for less than 2 seconds to confirm the choice made and go back to the menu with the list of parameters. To go back to the initial screen, press the knob **G** for more than 2 seconds.

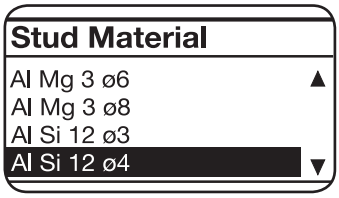
- **“Stud Material” parameter.**

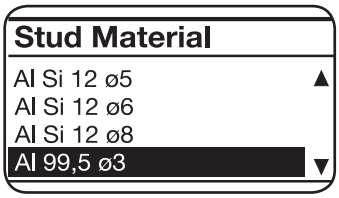


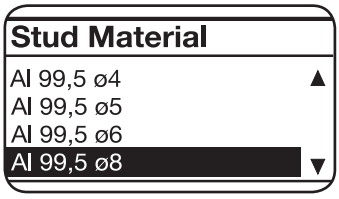




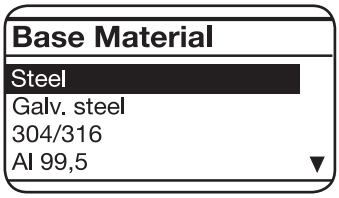


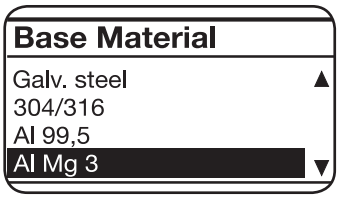


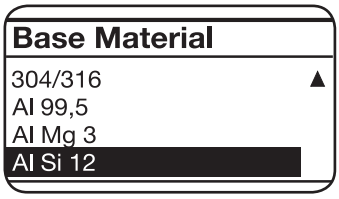




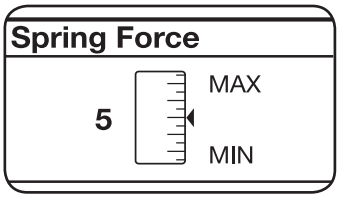
- **“Base Material” parameter.**







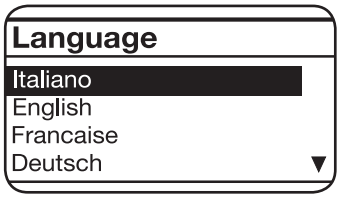
- **“Spring Force” parameter.**

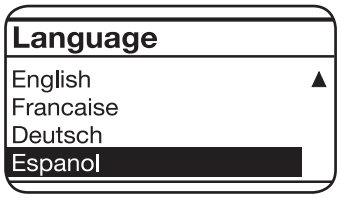


The value can be changed by means of the knob **Q**.
Note: if the force on the gun is changed from the proposed value, we recommend adjusting this value. The newly changed value will appear on the display and next to it an arrow pointing downward if the value was decreased or upward the value was increased.
Based on the choices made, the force and voltage to be used will be indicated on the display.

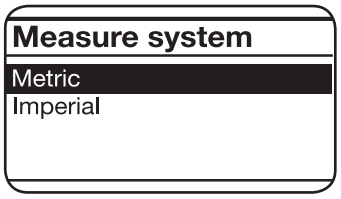
It is possible to change the voltage by means of the knob **G**, whereas the force displayed on the scale P can be changed by means of the knob **Q**.

- **“Language” parameter.**

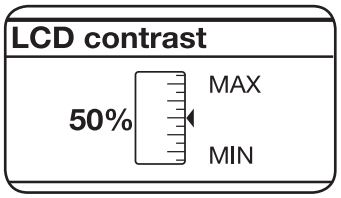




- **“Measure system” parameter.**

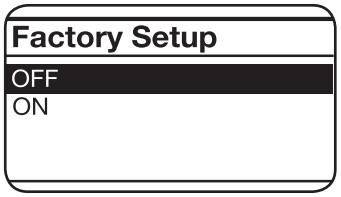


- **“LCD contrast” parameter.**



The value can be changed from 0 to 100% by means of the knob **G**.
This function enables you to increase or reduce the brightness of the display **A**.

- **“Factory setup” parameter.**



“ON” can be selected by turning the knob **G** and pressing it briefly; the message “Factory Done” will appear to confirm that the reset was successful.

4 OPERATING PRINCIPLE OF WELDING THREADED STUD BOLTS WITH CONTACT POINT START-UP (Fig. 3)

The stud bolt is inserted in the clamp **X** (phase 1), then positioned and pressed with its start-up contact directly against the surface of the sheet metal to be welded (phase 2). The spring of the gun presses the stud bolt against the metal, the start command begins sending current which melts the start-up contact, and the electrical arc is propagated along the entire surface of the stud bolt (phase 4) pushed against the metal surface. The molten metal solidifies, thereby welding the stud bolt (phase 5).
The gun must be extracted in perfect alignment with the bolt to avoid deforming the clamp, and thus ensuring its long life-span (phase 6).

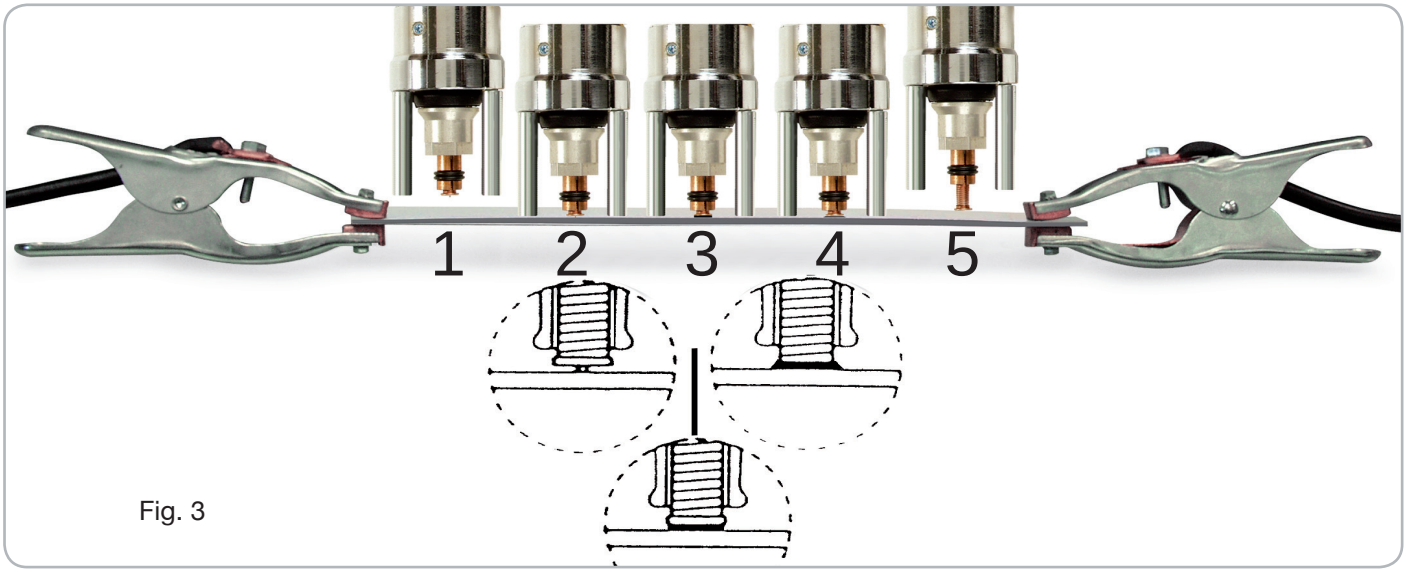


Fig. 3

5 WELDABILITY OF TYPICAL STUD BOLT/BASE METAL COM BINATIONS FOR CAPACITOR DISCHARGE WELDING. (Table 1)

It is important to pay careful attention to the resistance and deformity at the welding point between the stud bolt and base metal. In the case of steel, you must pay particular attention to brittleness. The material and resistance of the stud bolt have limited tolerance; the carbon content in steel threaded stud bolts must be < 0.20%.

The surface of the base metal must be clean. Layers of paint, rust, waste, grease and non-weldable metal coatings must be removed from the welding area. This must be done using appropriate means. Base metals with layers of waste and rust must be cleaned thoroughly.

6 WELDING

This technology makes it possible to weld stud bolts on clean, but not oxidized, surfaces of mild steel, galvanized steel, stainless steel, aluminum and brass.

The rapidity of the process does not alter the surfaces on the side opposite from the welding. Welding is not possible on case-hardened steel, oxidized or painted metal.

Before beginning production it is essential to carry out a few test welds to determine the proper setting of the power source and gun (spring force), proceeding as follows:

- Insert the chosen stud bolt in the clamp **X** (previously adjusted as described in Fig. 2).
- Arrange the base sheet metal in conditions identical to those that will be used for the job in terms of thickness, earth connection area, size of the workpiece, material quality.
- The terminals of the earth cable should be placed symmetrically, and as close as possible to the welding point.
- Activate the power source by means of the lighted switch **E**.
- Hold the gun and place the stud on the welding spot, avoiding to give blows, consequently damaging the striking tip of the stud. Press the trigger **O** and, holding it pressed, push the gun evenly and not quickly. Once the right pressure is reached, the weld will be automatically activated. If the surface of the material on which the stud bolt is to be welded is flat, we recommend mounting the three spacers **Z** after first unscrewing the screws **Y**
- In this case it is recommended to push the gun until the three spacers are in touch with the piece and then press the trigger to activate the welding.
  These procedures are required to obtain the same pressure of the stud on the base material and consequently a higher quality of the weld.
- The voltage and force values recommended on the display are intended as a starting point for calculating the correct power source setting and for calibrating gun force.
- These values have been tested on samples of “base materials” (2 mm thick for steel and stainless steel and

Stud material / Base metal	Copper plated steel up to 0.2 C%	Stainless steel 304/316	Al Mg 3	Al Si 12	Al 99,5
Steel up to 0.30 C %	A	A	-	-	-
Galvanized steel	B	B	-	-	-
Stainless steel 304/316	A	A	-	-	-
Al 99,5	-	-	A	B	B
Al Mg 3	-	-	B	A	B
Al Si 12	-	-	B	A	B
High weldability: A Low weldability: B Not weldable: -					

Tab. 1

1.2 mm thick for aluminium).

- Carry out a few welds, adjusting the voltage using the knob **G**, and the force of the gun using the setting knob **Q**, until the welding is perfect.
- The gun should be removed keeping it perfectly aligned with the bolt, to avoid deforming the clamp (Fig4).
- **Do not make welds to welded stud bolts**.

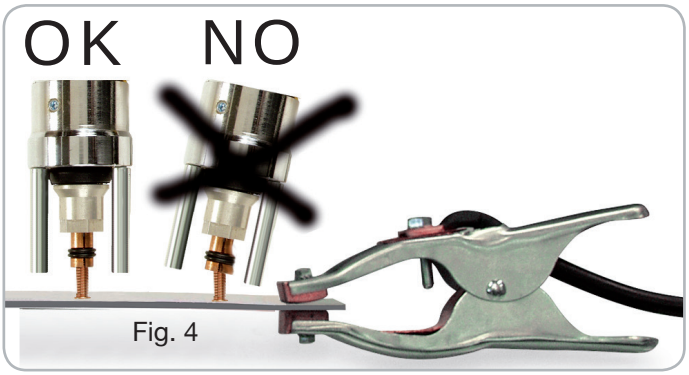


Fig. 4

7 MAINTENANCE

7.1 ROUTINE

Keep all instructions and figures on the welding machine clear and legible.
The mains cable and welding cables must be insulated and in perfect condition; be careful with the tips, which flex: near the connection terminals, earth clamps and gun input.
Keep the welding current connectors to sockets **B** and **C** clean and firmly tightened (see Fig. 1)
The terminals for connecting to the base metal must make good contact to avoid overheating, sparks, uneven current circulation, damage to the components where the pins are welded, and welding of uneven quality.
Prevent dirt, dust and filings from getting into the welding machine.
Always make sure the cooling air circulates freely.
Make sure that the fan functions properly.
Make sure that the clamps hold the stud bolts firmly, with all contact springs.
The clamp must slide freely throughout its length, without changes due to friction or foreign matter.

7.2 SPECIAL

Only qualified personnel should perform maintenance.
Some functional errors are highlighted by the appearance of an error code on the display **A**.

Wait at least 5 minutes after shutting off the switch **E** before opening the welding machine, and unplug the plug from the power socket.
Use a volt meter to make sure that the capacitors are discharged.
Carefully remove any dust, metal fragments and filings from the machine using compressed air to avoid damaging or projecting metal fragments onto the electronic or electrical parts.
Make sure that all connectors are fully inserted.
Make sure that all welding circuit terminals are firmly tightened.
After making a repair, make sure to rearrange the wiring so that there is secure insulation between the primary and secondary sides of the machine. Do not allow wires to come into contact with moving parts or those that heat up during operation. Reassemble all of the clamps as they were on the original machine, to prevent an accidental connection between the primary and secondary circuits if a conductor should break or disconnect.
Also remount the screws with geared washers as on the original equipment.

Error code	Problem	Solution
WARNING 1	It means that the gun start button and microswitch are pressed at the moment the generator is turned on.	Release the start button.
ERROR 2	It means that the relay RL1 is faulty.	Power circuit fault. Contact the technical support service.
ERROR 3	It means that the relay RL1 is faulty.	Power circuit fault. Contact the technical support service.
ERROR 4	It means that the SCR has short circuited	Contact the technical support service.
ERROR 5	It means that there is a fault in the capacitor charging circuit	Contact the technical support service.
ERROR 7	It means that there is a fault in the capacitor charging circuit	Contact the technical support service.
WARNING TH	It means that the thermal protector has tripped.	Wait a few minutes without turning off the welding machine.
ERROR 9	It means that there is a fault in the circuit that measures the voltage across the capacitors.	Power circuit fault. Contact the technical support service.
ERROR 10	It means that there is a short circuit in the capacitor discharging circuit.	Power circuit fault. Contact the technical support service.

QUESTA PARTE È DESTINATA ESCLUSIVAMENTE AL PERSONALE QUALIFICATO.

THIS PART IS INTENDED SOLELY FOR QUALIFIED PERSONNEL.

DIESER TEIL IST AUSSCHLIEßLICH FÜR DAS FACHPERSONAL BESTIMMT.

CETTE PARTIE EST DESTINEE EXCLUSIVEMENT AU PERSONNEL QUALIFIE.

ESTA PARTE ESTÁ DESTINADA EXCLUSIVAMENTE AL PERSONAL CUALIFICADO.

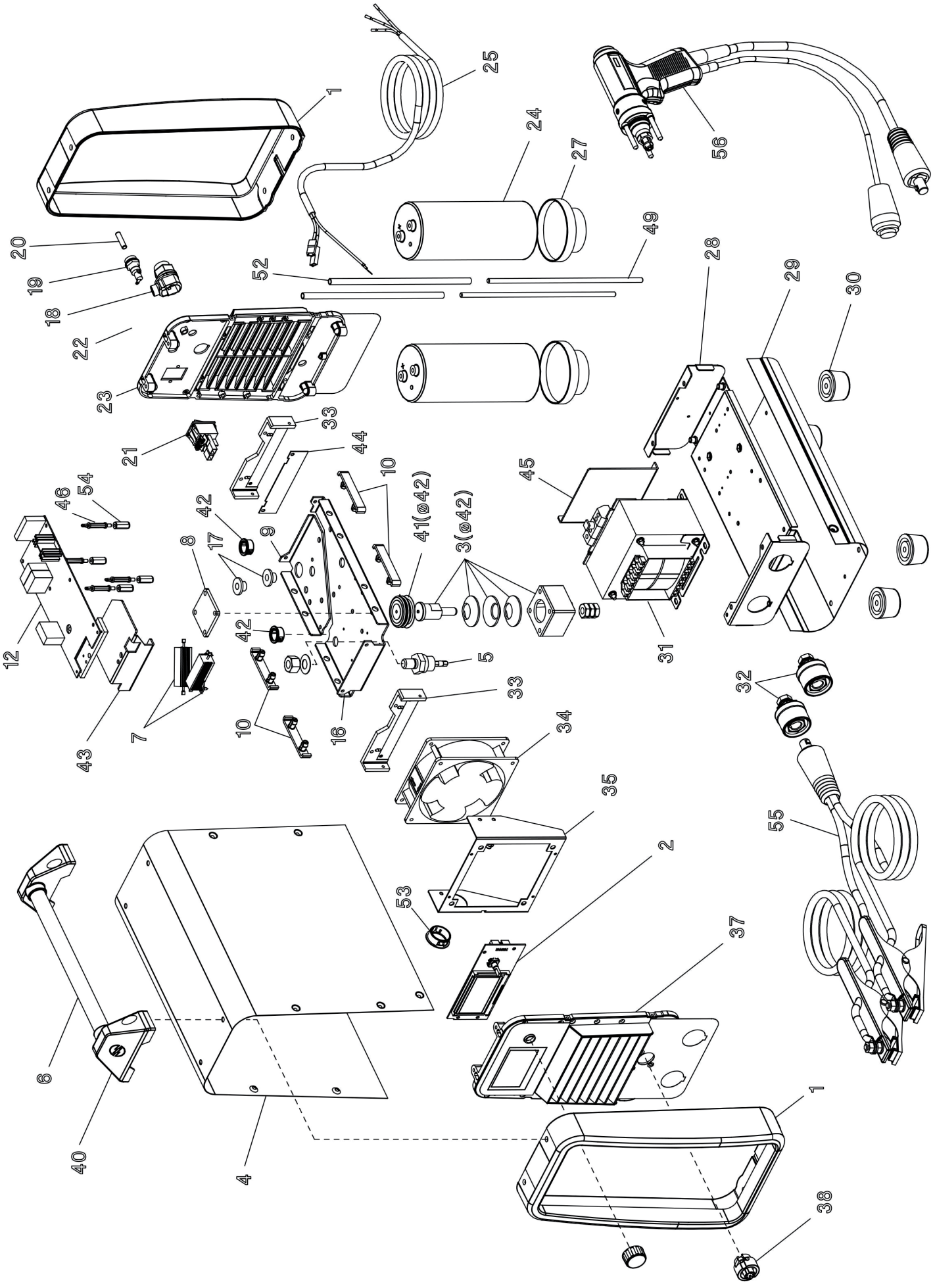
POS	DESCRIZIONE	DESCRIPTION
01	CORNICE	FRAME
02	CIRCUITO PANNELLO	PANEL CIRCUIT
03	GRUPPO SCR	SCR UNIT
04	FASCIONE	HOUSING
05	DIODO	DIODE
06	MANICO	HANDLE
07	RESISTENZA	RESISTANCE
08	RINFORZO SRC	SCR REINFORCEMENT
09	PIANO INTERMEDIO POSITIVO	POSITIVE INSIDE BAFFLE
10	DISTANZIALE	SPACER
12	CIRCUITO POTENZA	POWER CIRCUIT
16	PIANO INTERMEDIO NEGATIVO	NEGATIVE INSIDE BAFFLE
17	BOCCOLA ISOLANTE	INSULATING BUSH
18	PASSACAVO	CABLE OUTLET
19	PORTAFUSIBILE	FUSE HOLDER
20	FUSIBILE	FUSE
21	INTERRUTTORE	SWITCH
22	COPERTURA	COVER
23	PANNELLO POSTERIORE	BACK PANEL
24	CONDENSATORE	CAPACITOR
25	CAVO RETE	POWER CORD
27	ISOLAMENTO CONDENSATORE	CAPACITOR INSULATION
28	PIANO INTERMEDIO	INSIDE BAFFLE

POS	DESCRIZIONE	DESCRIPTION
29	FONDO	BOTTOM
30	PIEDE	FOOT
31	TRASFORMATORE POTENZA	POWER TRANSFORMER
32	INNESTO GIFAS	GIFAS SOCKET
33	DISTANZIALE ISOLANTE	INSULATING SPACER
34	MOTOVENTOLA	MOTOR WITH FAN
35	SUPPORTO VENTOLA	FAN SUPPORT
37	PANNELLO ANTERIORE	FRONT PANEL
38	CONNETTORE	CONNECTOR
40	SUPPORTO MANICO	HANDLE SUPPORT
41	SCR	SCR
42	PASSACAVO	CABLE OUTLET
43	ATTACCO SCHEDA	CIRCUIT SUPPORT
44	ISOLAMENTO CONDENSATORE	CAPACITOR INSULATION
45	PROTEZIONE TRASFORMATO.	TRANSFORMER PROTECTION
46	DISTANZIALE	SPACER
49	TIRANTE	TIE ROD
52	TUBO RILSAN	RILSAN HOSE
53	PASSACAVO	CABLE OUTLET
54	DISTANZIALE	SPACER
55	CAVO MASSA	EARTH CABLE
56	TORCIA COMPLETA	COMPLETE TORCH

La richiesta di pezzi di ricambio deve indicare sempre: numero di articolo, matricola e data di acquisto della macchina, posizione e quantità del ricambio.

When ordering spare parts please always state the machine item and serial number and its purchase data, the spare part position and the quantity.

Art. 2156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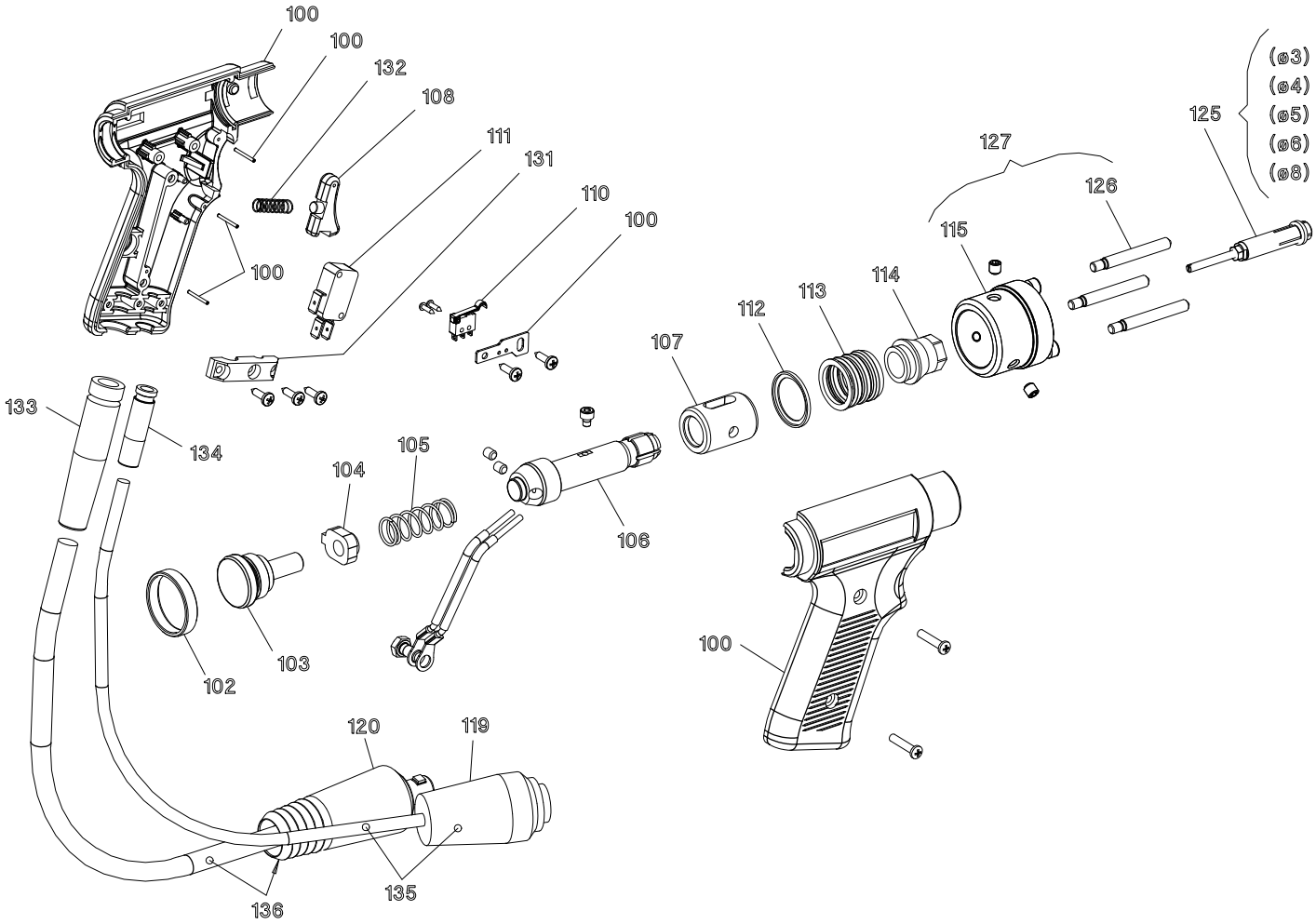

POS	DESCRIZIONE	DESCRIPTION
100	IMPUGNATURA	HANDGRIP
102	ANELLO POSTERIORE	BACK RING
103	REGOLAZIONE MOLLA	SPRING ADJUSTMENT
104	INDICE DI REGOLAZIONE	REGULATION POINTER
105	MOLLA	SPRING
106	PERNO CON PINZA	PIN WITH HOOK
107	BOCCOLA	BUSH
108	PULSANTE	SWITCH
110	MICRO INTERRUTTORE	MICRO SWITCH
111	MICRO INTERRUTTORE	MICRO SWITCH
112	ANELLO DI PROTEZIONE	PROTECTION RING
113	SOFFIETTO	BELLOWS
114	GHIERA MANDRINO	HOOK RING NUT
115	FLANGIA PORTA DISTAN-ZIALI	SPACERS FLANGE HOLDER
119	CONNETTORE	CONNECTOR
120	SPINA	PLUG

POS	DESCRIZIONE	DESCRIPTION
125	MANDRINO STRINGI RIVETTI M3	HOOK GRIP STUD BOLT M3
125	MANDRINO STRINGI RIVETTI M4	HOOK GRIP STUD BOLT M4
125	MANDRINO STRINGI RIVETTI M5	HOOK GRIP STUD BOLT M5
125	MANDRINO STRINGI RIVETTI M6	HOOK GRIP STUD BOLT M6
125	MANDRINO STRINGI RIVETTI M8	HOOK GRIP STUD BOLT M8
126	DISTANZIALE	SPACER
127	DISTANZIALE A 3 PUNTE	THREE-POINT SPACER
131	BLOCCAGGIO CAVI	CABLES LOCKING DEVICE
132	MOLLA PULSANTE	SWITCH SPRING
133	PASSACAVO	CABLE OUTLET
134	PASSACAVO	CABLE OUTLET
135	CAVO COMANDI	CONTROLS CABLE
136	CAVO POTENZA	POWER CABLE

La richiesta di pezzi di ricambio deve indicare sempre: numero di articolo, matricola e data di acquisto della macchina, posizione e quantità del ricambio.

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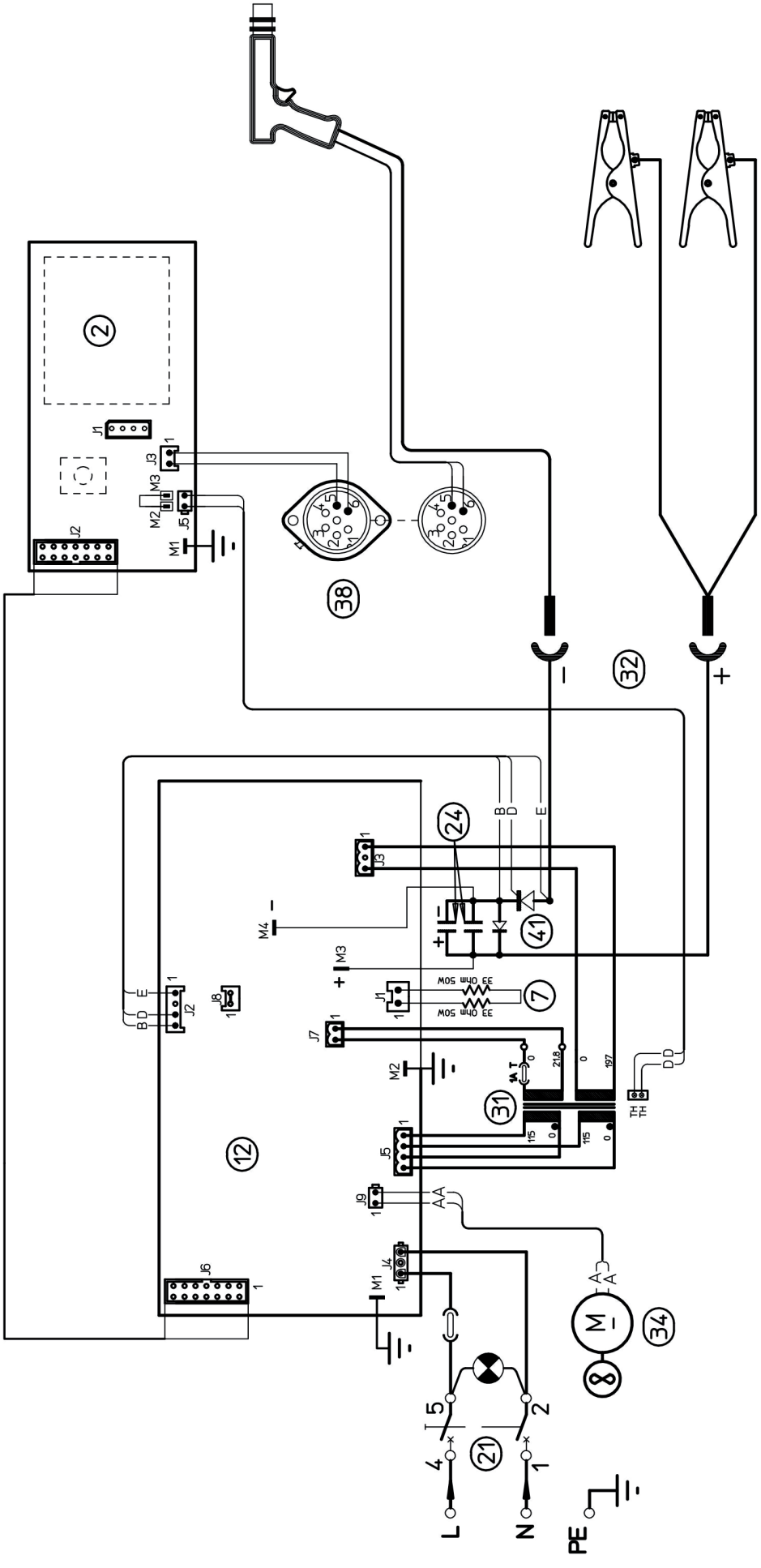

WIRING DIAGRAM COLOUR CODE	
A	BLACK
B	RED
C	GREY
D	WHITE
E	GREEN
F	PURPLE
G	YELLOW
H	BLUE
K	BROWN
J	ORANGE
I	PINK
L	PINK-BLACK
M	GREY-PURPLE
N	WHITE-PURPLE
O	WHITE-BLACK
P	GREY-BLUE
Q	WHITE-RED
R	GREY-RED
S	WHITE-BLUE
T	BLACK-BLUE
U	YELLOW-GREEN
V	BLUE

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