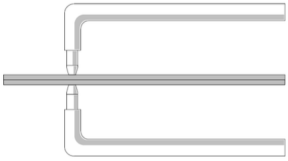
U.S. SOLID

Manual No. 9319

SPOT WELDING MACHINE

MODEL: DN-120T

INSTRUCTION MANUAL



EQUIPMENT FOR RESISTANCE SPOT WELDING FOR INDUSTRIAL AND PROFESSIONAL USE.

Thank you for choosing the U.S. Solid spot welding machine.

Please check the package firstly to make sure it is not damaged in transit before use. For questions, please contact us at service@ussolid.com for help.

To ensure the best user experience, we recommend reading the user manual thoroughly and keeping it for future reference.

CONTENTS

1. SAFETY PRECAUTIONS - READ BEFORE USING

Protect yourself and others from injury — read and follow these precautions.

1.1 SYMBOL USAGE

DANGER! -Indicates a hazardous situation which, if not avoided, will result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

Indicates a hazardous situation which, if not avoided, could result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

NOTICE -Indicates statements not related to personal injury.

☞ *Indicates special instructions.*

This group of symbols means Warning! Watch Out! ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

Symbol indicating separation of electrical and electronic appliances for refuse collection. The user is not allowed to dispose of these appliances as solid, mixed urban refuse, and must do it through authorized refuse collection centers.

1.2 RESISTANCE SPOT WELDING HAZARDS

The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-4. Read and follow all Safety Standards.

Only qualified persons should install, operate, maintain, and repair this unit.

During operation, keep everybody, especially children, away. The operator must receive full instructions regarding safe use of the spot welding machine and must be informed of the risks related to resistance welding procedures, as well as the related safety measures and emergency procedures.

- **SPOT WELDING CAN CAUSE FIRE OR EXPLOSION**

Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.

- Remove all flammables within 35 ft (10.7 m) of the weld. If this is not possible, tightly cover them with approved covers.
- Do not spot weld where flying sparks can strike flammable material.
- Protect yourself and others from flying sparks and hot metal.
- Be alert that welding sparks can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared according to AWS F4.1 (see Safety Standards).
- Do not weld where the atmosphere may contain flammable dust, gas, or liquid vapors (such as gasoline).
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.
- After completion of work, inspect area to ensure it is free of sparks, glowing embers, and flames.
- Do not exceed the equipment rated capacity.
- Use only correct fuses or circuit breakers. Do not oversize or bypass them.
- Follow requirements in OSHA 1910.252 (a) (2) (iv) and NFPA 51B for hot work and have a fire watcher and extinguisher nearby.

- **ELECTRIC SHOCK CAN KILL**

Touching live electrical parts can cause fatal shocks or severe burns. The input power circuit and machine internal circuits are also live when power is on. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Additional safety precautions are required when any of the following electrically hazardous conditions are present: in damp locations or while wearing wet clothing; on metal structures such as floors, gratings, or scaffolds; when in cramped positions such as sitting, kneeling, or lying; or when there is a high risk of unavoidable or accidental contact with the workpiece or ground. For these conditions, see ANSI Z49.1 listed in Safety Standards. And, do not work alone!
- Disconnect input power before installing or servicing this equipment.Lockout/ tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install and ground this equipment according to this manual and national, state, and local codes.
- Always verify the supply ground - check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach the grounding conductor first -double-check connections.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- Frequently inspect input power cord and ground conductor for damage or bare wiring -replace immediately if damaged -bare wiring can kill. Check ground conductor for continuity.
- Turn off all equipment when not in use.
- For water-cooled equipment, check and repair or replace any leaking hoses or fittings. Do not use any electrical equipment if you are wet or in a wet area.
- Use only well-maintained equipment. Repair or replace damaged parts at once.
- Wear a safety harness if working above floor level.
- Keep all panels, covers, and guards securely in place.

- **FLYING SPARKS CAN INJURE**

Very often sparks fly off from the joint area.

- Wear approved face shield or safety goggles with side shields.
- Wear protective garments such as oil-free, flame-resistant leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap. Synthetic material usually does not provide such protection.
- Protect others in nearby areas by using approved flame-resistant or noncombustible fire curtains or shields. Have all nearby persons wear safety glasses with side shields.

- **HOT PARTS CAN BURN**

- Do not touch hot parts bare handed.
- Allow cooling period before working on equipment.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.

- **MOVING PARTS CAN INJURE**

The tong tips, tongs, and linkages move during operation.

- Keep away from moving parts.
- Keep away from pinch points.
- Do not put hands between tips.
- Keep all guards and panels securely in place.
- OSHA and/or local codes may require additional guarding to suit the application.

- **FUMES AND GASES CAN BE HAZARDOUS**

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

- Keep your head out of the fumes. Do not breathe the fumes.
- If inside, ventilate the area and/or use local forced ventilation at the arc to remove welding fumes and gases.
- If ventilation is poor, wear an approved air-supplied respirator.
- Read and understand the Material Safety Data Sheets (MSDSs) and the manufacturer's instructions for metals, consumables, coatings, cleaners, and degreasers.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watch person nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

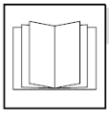
1.3 ADDITIONAL SYMBOLS FOR INSTALLATION, OPERATION, MAINTENANCE

- **FIRE OR EXPLOSION HAZARD**

- Do not install or place unit on, over, or near combustible surfaces.
- Do not install or operate unit near flammables.
- Do not overload building wiring -be sure power supply system is properly sized, rated, and protected to handle this unit.

- **FALLING EQUIPMENT CAN INJURE**

- Use equipment of adequate capacity to lift and support unit.
- Follow the guidelines in the Applications Manual for the Revised NIOSH Lifting Equation (Publication No. 94-110) when manually lifting heavy parts or equipment.
- Secure unit during transport so it cannot tip or fall.



- **READ INSTRUCTIONS**

- Read and follow all labels and the Owner's Manual carefully before installing, operating, or servicing unit. Read the safety information at the beginning of the manual and in each section.
- Use only genuine replacement parts from the manufacturer.
- Perform maintenance and service according to the Owner's Manuals, industry standards, and national, state, and local codes.

- **FLYING METAL OR DIRT CAN INJURE EYES**

- Wear approved safety glasses with side shields or wear face shield.

- **ELECTRIC AND MAGNETIC FIELDS (EMF) CAN AFFECT IMPLANTED MEDICAL DEVICES**

- Wearers of Pacemakers and other Implanted Medical Devices should keep away.
- Implanted Medical Device wearers should consult their doctor and the device manufacturer before going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations.

- **OVERUSE CAN CAUSE OVERHEATING**

- Allow cooling period; follow rated duty cycle.
- Reduce duty cycle before starting to weld again.

1.4 WARNINGS

- Welding or cutting equipment produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer.
- Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.
- This product contains chemicals, including lead, known to the state of California to cause cancer, birth defects, or other reproductive harm. Wash hands after use.

For Gasoline Engines:

- Engine exhaust contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

For Diesel Engines:

- Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

1.5 EMF INFORMATION

Electric current flowing through any conductor causes localized electric and magnetic fields (EMF). Welding current creates an EMF field around the welding circuit and welding equipment. EMF fields may interfere with some medical implants, e.g. pacemakers. Protective measures for persons wearing medical implants have to be taken. For example, access restrictions for passers−by or individual risk assessment for welders. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

- Keep cables close together by twisting or taping them, or using a cable cover.
- Do not place your body between welding cables. Arrange cables to one side and away from the operator.
- Do not coil or drape cables around your body.
- Keep head and trunk as far away from the equipment in the welding circuit as possible.
- Connect work clamp to workpiece as close to the weld as possible.
- Do not work next to, sit or lean on the welding power source.
- Do not weld whilst carrying the welding power source or wire feeder.

About Implanted Medical Devices:

Implanted Medical Device wearers should consult their doctor and the device manufacturer before performing or going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations. If cleared by your doctor, then following the above procedures is recommended.

2. INTRODUCTION AND GENERAL DESCRIPTION

2.1 INTRODUCTION

Resistance welding is one of the oldest of the electric welding processes in use by industry today. The weld is made by a combination of heat, pressure, and time. As the name resistance welding implies, it is the resistance of the material to be welded to current flow that causes a localized heating in the part. The pressure exerted by the tongs and electrode tips, through which the current flows, holds the parts to be welded in intimate contact before, during, and after the welding current time cycle. The required amount of time current flows in the joint is determined by material thickness and type, the amount of current flowing, and the cross-sectional area of the welding tip contact surfaces.

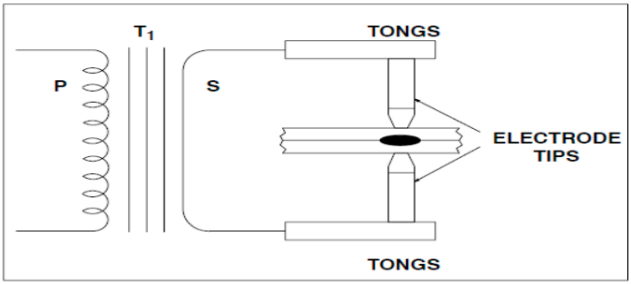


Figure 2-1. Resistance Spot Welding Machine With Work

In Figure 2-1, a complete secondary resistance spot welding circuit is illustrated. For clarity, the various parts of the resistance spot welding machine are identified. Some technical parameters is shown on the nameplate of the resistance spot welding machine.
Portable spot-welding machine for resistance welding. Portable spot-welding machine with digital microprocessor control.

The most important properties managed by the control panel are:

- Selection of the thickness of the sheet to be spot-welded.
- Correction of spot-welding time.
- Possibility of enabling pulsed welding current.
- Adjustment of spot-welding force.
- Spot welding capacity on low carbon steel sheet (standard arms) up to 2+2 mm thick.

2.2 STANDARD ACCESSORIES

The standard spot-welding machine includes 120 mm arms and standard electrodes or electrode Tips.

2.3 OPTIONAL ACCESSORIES

Internal agon wrench and wrench.

3. TECHNICAL DATA

3.1 RATING PLATE

The main data relating to use and performance of the spot-welding machine are summarized on the rating plate and have the following meanings:

- **Norm**: Application standards, for example, **EN 62135-1:2015**.
- **U1**: Rated AC input voltage of the welding power source, 1～,110V.
- **1~60HZ** : Rated frequency of single phase AC power supply.
- **U20**: Non-load voltage. It is the open-circuit output voltage of the welding power source.
- **SP**: Input Power,Mains power with permanent running (100%) or Input power corresponding to continuous or continuous output current, KVA.
- **S50**: Input Power,Rated mains power with 50% duty cycle.Or Input power corresponding to 50% duty cycle, and the time period of theduty cycle is 10 seconds, KVA.
- **I2cc**: Maximum output current when electrodes are shorted.
- **I2p**: Current to secondary when running permanently (100%), or Current with continuous or continuous output current.

 : **Beyond rain.**

 **Duty cycle.It is the ratio between the load duration time and the full cycle time.This ratio is between 0~100%.50%,based on 10 second time period – unit can weld for 5 seconds out of each 10 second time interval.For this standard, one full cycle time is 10 second.For example, if the rate is 30%, the loaded time shall be 3 second and rest time shall be 7 second.If it is used more than 3 second during several successive 10 second periods, it may overheat.**

Note: The rating plate shown is an example to show the meaning of the symbols and numbers; the exact values of the technical specifications for your spot-welding machine can be found on the rating plate of the spot-welding machine itself.

3.2 OTHER TECHNICAL DATA

General specifications and Weight of the spot-welding machine **TAB. 1**.

TAB.1 GENERAL FEATURES

Model	DN-120T
Power supply voltage and frequency	110V，~AC，1ph，60Hz
Electrical protection class	IP20
Type of cooling	Natural Cooling
Dimensions (LxWxH)	460x180x100mm
Mass with arms	9.6Kg
INPUT	
Max short circuit power	5.3KVA
Rated power at 50% (S50)	0.55KVA
Delayed mains fuses	80 A
Circuit Breaker	80-100 A
OUTPUT	
Secondary no-load voltage (U_{20} max)	1.9V
Max short circuit current (I_{2cc})	3.8KA
Spot-welding capacity (low content carbon steel and standard arms)	2+2mm
Spots/minute on steel 2+2mm	1~4
Minimum rest period between successive spot-welds on steel 2+2mm	15S
Spot-welding time	120~1800ms (Normal spot welding) / 280-3000ms (Pulse spot welding)
Maximum force at the electrodes	460N
Projection of arms	120mm

4. MATERIALS DATA FOR RESISTANCE SPOT WELDING

This section of the text will consider methods used for resistance spot welding some of the common metals that are used in fabrication work. It is not intended that all the possible problems that could arise will be answered. The purpose of this part of the text is to provide general operational data for use with resistance spot welding machines. Where applicable, the data provided will be related to specific models and size (KVA) of units.

The units listed in this section are not recommended for aluminum or copper alloys.

Mild Steel

Mild or low-carbon steel comprises the largest percentage of material welded with the resistance spot welding process. All low-carbon steels are readily weldable with the process if proper equipment and procedures are used.
The carbon steels have a tendency to develop hard, brittle welds as the carbon content increases if proper post-heating procedures are not used. Quick quenching of the weld, where the nuggets cools rapidly, increases the probability of hard, brittle micro-structure in the weld.

Hot rolled steel will normally have mill scale on the surface of the metal. This type of material is usually not resistance spot welded with resistance welding machines of the KVA ratings of specific built units.

Cold rolled steel (CRS) and hot rolled steel, pickled and oiled (HRSP & O), may be resistance spot welded with very little trouble. If the oil concentration is excessive on the sheet metal, it could cause the formation of carbon at the electrode tips
thereby decreasing their useful life. Degreasing or wiping is recommended for heavily oiled sheet stock.

The resistance spot weld should have shear strength equal to the base metal shear strength and should exceed the strength of a rivet or a fusion plug weld of the same cross sectional area. Shear strength is normally accepted as the criteria for resistance spot weld specifications, although other methods may be used.

A common practice is to "peel" two welded sample strips apart to see if a clean "rivet" is pulled from one piece. If it is, the resistance spot welding condition is considered correct.

With magnetic materials such as mild steel, the current through the weld can vary substantially depending on how much of the magnetic material is within the tong loop. The tong loop is sometimes called the "throat" of the resistance spot welding machine.
For example, the part to be welded may have the largest amount of the base metal within the throat of the unit for any one resistance spot weld and almost none of the base metal in the throat for the second spot weld. The current at the weld joint will be less for the first weld.

The reason is the reactance caused by the ferrous material within the arc welding circuit. Resistance spot welding machines are applicable to low carbon steel welding. They must be used within their rated capacity of total thickness of material for best results. They should not be used over the duty cycle since damage to the contactor and transformer may result. The 30 percent duty cycle provided for this type of equipment should be adequate for all applications within their rating. The 30 percent duty cycle is a RWMA standard rating for general duty resistance welding machines. The 30 percent duty cycle is based on a 10 second time period and means the unit can weld 3 second out of each 10 second time period.

Low Alloy And Medium Carbon Steels

There are some pertinent differences in resistance spot welding low alloy and medium carbon steels as compared to mild or low carbon steels. The resistance factor for the low alloy and medium carbon steels is higher; therefore, the current
requirements are slightly lower. Time and temperature are more critical since metallurgical changes will be greater with these alloys. There is certainly more possibility of weld embrittlement than there is with mild steel.

Resistance spot welding pressures are normally higher with these materials because of the additional compressive strength inherent in the low alloy and medium carbon steels. It is always a good idea to use longer welding times when welding these alloys to retard the cooling rate and permit more ductile welds.

Stainless Steels

The chrome-nickel steel alloys (austenitic) have very high electrical resistance and are readily joined by resistance spot welding. The consideration of great importance with these materials is rapid cooling through the critical range, 800 to 1400 F.The rapid quench associated with resistance spot welding is ideal for reducing the possibility of chromium carbide precipitation at the grain boundaries.Of course, the longer the weldment is held at the critical temperatures, the greater the possibility of carbide precipitation.

Steels, Dip Coated Or Plated

The overwhelming majority of material in this category is galvanized, or zinc coated steel. Although some galvanized steel is eletro-plated, the dip-coated costs less and is in predominant use. The zinc coating is uneven in thickness on dip-coated steel. The resistance factor will vary from weld to weld, and it is very difficult to set conditions in chart form for the material.

It is impossible to maintain the integrity of the galvanized coating when resistance spot welding. The low melting point of the zinc coating, compared to the fusion temperature of the steel sheet, causes the zinc to vaporize. Of course, there must be
adequate pressure to force the zinc aside at the weld interface to permit steel-to-steel fusion. Otherwise, the strength of the resistance spot weld is open to question.

Materials are available to repair the external damage to the coating that may be incurred because of the welding heat. There is no remedy for the loss of coating material at the interfaces of the weld, unfortunately. In fact, the vaporization of the zinc can cause porosity in the weld and a general weakening of the expected shear strength.

The **VAPORIZED ZINC**, upon condensation to solid material, forms particles shaped like fishhooks. These particles **CAN IMBED THEMSELVES IN THE TISSUES OF THE BODY** and cause irritation. Use forced ventilation or exhaust at the weld area and wear long sleeve shirts, long pants, and protective face shields when working with this process and coated material.
Other coated material, such as terne plate (lead coated) may have varying degrees of toxicity. Adequate ventilation is mandatory when working with these materials.
The vaporization of the coating material has a tendency to foul the electrode tips. The tips should be cleaned frequently to prevent the alloying of the lower melting materials with the copper tips. The tips may require cleaning and dressing every
fourth or fifth weld to maintain quality in the product, although for some galvanized applications the best welds are made after several spots blacken the tips. The use of short weld times will increase the possibility of good welds with the least amount of tip fouling.

Aluminum And Aluminum Alloys

Resistance spot welding machines with KVA ratings much greater than 20 KVA are necessary to make sound welds on most aluminum materials and any other high conductivity type of base metal. The electrical conductivity of aluminum is high, and welding machines must provide high currents and exact pressures in order to provide the heat necessary to melt the aluminum and produce a sound weld.

Summary

Resistance spot welding is welding technique that is used for almost all known metals. The actual weld is made at the interface of the parts to be joined. The electrical resistance of the material to be welded causes a localized heating at the interfaces of the metals to be joined.

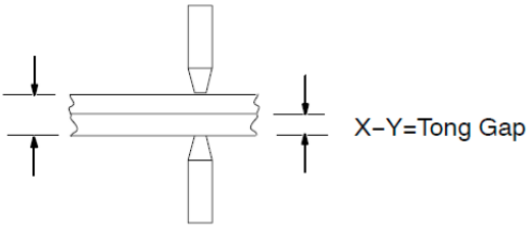
Welding procedures for each type of material must be developed for the most satisfactory results.

It is possible that shunt currents flowing through a previously made spot weld will take welding current away from the second second spot weld to be made. This will occur if the two spot welds are too close together, and it will happen with all metals.

The following general data is provided to assist the operator in setting up welding procedures when using the resistance spot welding machine.

Tong pressure settings should be made ONLY when the primary power cord is disconnected from the primary power input supply.

1. Close tongs and measure space between electrode tip contact surfaces.
2. Measure the thickness of the total weldment.
3. Adjust tong gap to measurement of Step 2 less 1/2 the thickness of the thinnest weld number.



4. Insert the parts to be welded between the electrode tips and bring tips to welding pressure. There should be a slight deflection of the tongs. This may be measured with a straight edge set on the tong longitudinal axis.
5. Energize the spot welding machine and make a sample weld.
6. Test the weld by visual and mechanical means. Check the electrode tip for deformation and contamination (see test procedures).
7. Adjust tong pressure as required (see Operating Manual for tong adjustment procedures).

Test Procedures

The test procedures outlined are very simple and require a minimum of equipment to perform.

1. Visual Test

Observe the deformation and shape of the surface contact points at both sides of the weld. Excessive "dishing" of the surface contact point indicates one or more of the following:

a. Excessive tong pressure.
b. Weld time too long.
c. Misalignment of the electrode tips.

If the resistance spot weld does not have an even, concentric surface appearance, the problem could be misalignment of the electrode tips. Align electrode tips with the power off and a typical weld joint between the tip surfaces.

2. Mechanical Test

Place one end of the resistance spot weld sample in vice jaws. Use mechanical means to force the weld apart. One side of the weld should pull loose from the parent metal with a metal extension from the weld. Check for proper weld diameter.

5. DESCRIPTION OF THE SPOT-WELDING MACHINE

5.1 PRINCIPAL COMPONENTS AND ADJUSTMENTS

- 1. Electrode force adjustment screw.
- 2. Left/right hand positionable handgrip.
- 3. Hole for eyebolt if used.
- 4. Movable welding arm or Upper Tong.
- 5. Fixed welding arm or Lower Tong.
- 6. Power supply cable(H07RN-F 3G2.5mm2). 7-Microswitch.
- 8. Control Panel.
- 9. Spot-welding lever or Operating lever.

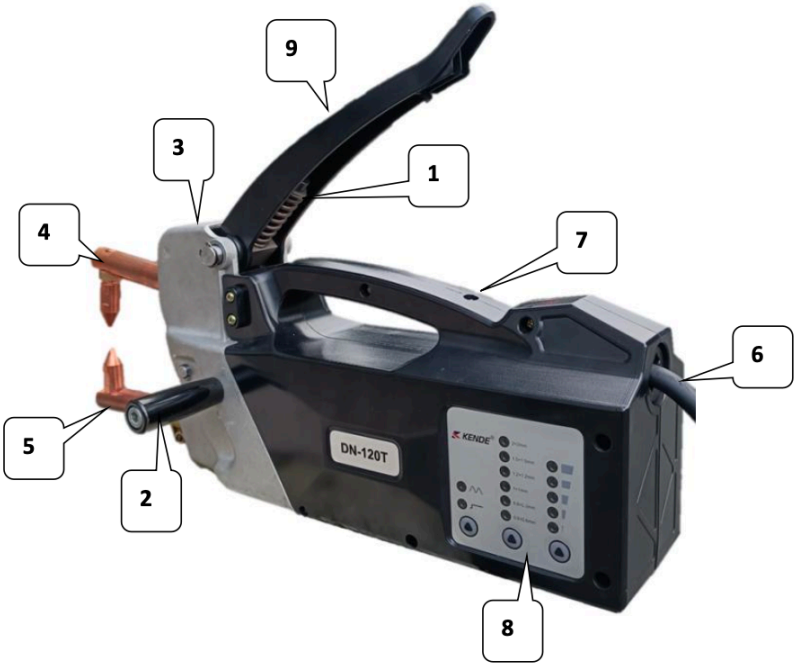


FIG.1

5.2 CONTROL PANEL

FIG. 2 Control Panel

1-Key for correcting spot-welding time.

Adjusts spot-welding time with respect to the factory default setting.

2-Key for selecting sheet thickness.

Selects the thickness of the sheet to be welded.

3-Key for selecting spot-welding mode.

The welding current is pulsed.
The length of the pulse is automatic and requires no regulation.

Normal spot welding.

4-Buzzer for indicating triggering of thermal safeguard.

The buzzer sounds or makes a sound, indicating that the spot-welding machine is shut down due to overheating; reset is automatic when the temperature returns within the allowed limits.

6. INSTALLATION

WARNING! CARRY OUT ALL INSTALLATION OPERATIONS AND ELECTRICAL AND PNEUMATIC CONNECTIONS WITH THE SPOT-WELDING MACHINE COMPLETELY SWITCHED OFF AND DISCONNECTED FROM THE POWER SUPPLY OUTLET. THE ELECTRICAL AND PNEUMATIC CONNECTIONS MUST BE MADE ONLY AND EXCLUSIVELY BY AUTHORIZED, SKILLED PERSONNEL.

6.1 PRELIMINARY OPERATIONS

Unpack the spot-welding machine, assemble the separate parts included in the package.

6.2 LIFTING THE SPOT-WELDING MACHINE

WARNING: None of the spot-welding machines described in this handbook have lifting devices.

6.3 POSITION

The installation area must be sufficiently large and without obstacles, suitable for ensuring safe access to the control panel and to the work area (electrodes). Ensure that there are no obstacles near the cooling air inlets and outlets and that no conductive dusts, corrosive vapour, humidity, etc. can be sucked in. Position the spot welding machine on a flat surface of homogeneous and compact material that is suitable for supporting its weight (see “technical data”) to avoid the danger of toppling or dangerous movements.

6.4 CONNECTION TO THE MAIN POWER SUPPLY

6.4.1 WARNINGS

- Before making any electrical connection, check the rating plate data on the spot welding machine to make sure they correspond to the voltage and frequency of the available power supply where the machine is to be installed.
- The spot welding machine must be connected only and exclusively to a power supply with the neutral conductor connected to earth.
- In order to satisfy the requirements of the EN 61000-3-11 (Flicker) standard we recommend connecting the spot welding machine to interface points of the main power supply that have an impedance of less than Zmax = 0.179 ohm.
- The spot welding machine does not fall within the requisites of IEC/EN 61000-3-12 standard. Should it be connected to a public mains system, it is the installer’s responsibility to verify that the spot welding machine itself is suitable for connecting to it (if necessary, consult the distribution network company).

6.4.2 CONNECTION TO THE MAIN POWER SUPPLY

Note: The power supply of the welding machine is single phase， 110VAC. Connect the power supply correctly when using the welding machine.

Connect the power supply cable of the spot-welding machine to the power supply system of appropriate capacity and prepare a power supply switch system fitted with fuses or an automatic circuit-breaker;

The corresponding earth terminal of the power supply system should be connected to the earth conductor cable (yellow-green) of the spot-welding machine.

In addition to the earth conductor cable (yellow-green) line in the power supply cable, the other two power power cables of the spot-welding machine are connected to the power supply system.

Special attention: The voltage connection relationship between the power supply voltage of the welding machine and the voltage of the power supply system;

The choice problem on the voltage conversion switch of the welding machine.

The capacity and specifications of the fuses and circuit-breaker are given in the tables TAB. 1.

WARNING! Failure to observe the rules given above will invalidate the (class I) safety system provided by the manufacturer causing serious risks to people (e.g. electric shock) and objects (e.g. fire).

7. SPOT WELDING

7.1 PRELIMINARY OPERATIONS

Before carrying out any spot welding operation, it is necessary to carry out a series of checks and tests with the spot welding machine disconnected from the main power supply.

- 1-Ensure that the electrical connections are correct, in accordance with the above instructions.
- 2-Electrode force and alignment.
- lock the lower electrode securely in the most suitable position for the job to be done,
- loosen the fastening screw on the top electrode so that it is able to slide in the hole in the arm,
- between the electrodes place a shim with the same thickness as the sheets to be spot welded,
- **FIG. 4** close lever **1** until the arms are parallel and the electrode tips coincide; tighten it to lock the lever in a suitable position for adjusting the electrode force.
- lock the top electrode in the correct position, tightening the screw securely,
- regulate the force exerted by the electrodes during spot welding **FIG.3**, by adjusting the screw (**2**) fitted for this purpose using the key supplied; the value of the setting, according to the position of the indicator on the graduated scale, is shown in **FIG. 4**.

Turn it clockwise to increase the force in proportion to the increase in sheet thickness but make the adjustment so that the clamp is able to close, and trigger the corresponding microswitch, with very little effort.

FIG. 3

7.2 ADJUSTING THE PARAMETERS

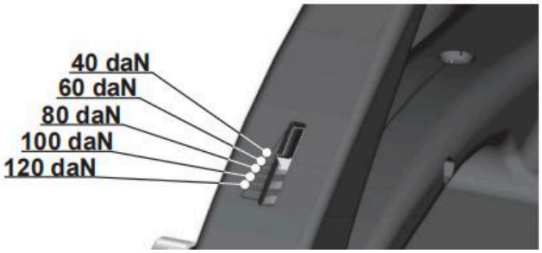


FIG. 4

- Select the **thickness of the sheet to be spot welded** using the key (**2-FIG. 2**) on the spot welding machine control panel.
- Select the **type of spot welding** (**continuous** or **pulsed**) using the key (**3-FIG. 2**).
- When necessary it is possible to correct the default **spot welding time** upwards or downwards using key (**1- FIG. 2**).

7.3 PROCEDURE

To make a spot-weld, power the spot welding machine then follow the instructions below:

- place the bottom electrode on the sheet to be spot-welded;
- pull the clamp lever to the end of its stroke, and hence until the **microswitch** is pressed (**8-FIG.1**) so that:

  a) the sheets close between the electrodes with the preset force;
  b) the welding current passes for the preset time.

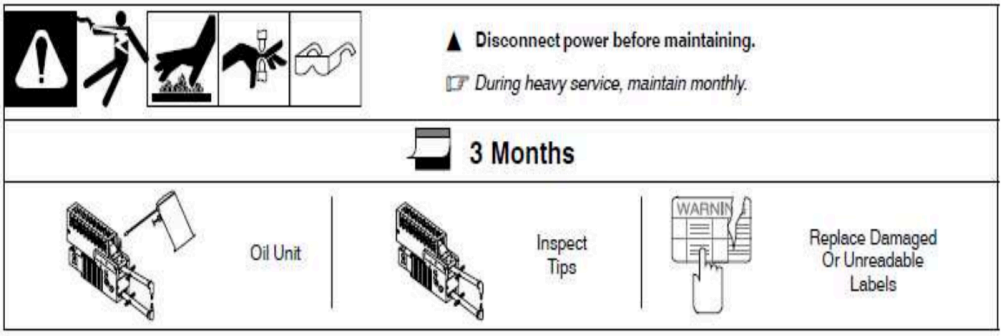
- release the clamp lever shortly afterwards. This delay (holding) improves the mechanical properties of the spot-weld.

When specific experience is lacking we recommend carrying out a number of test welds using sheet of the same thickness and quality as that of the workpiece. The spot-welding operation is deemed correct when a tensile test causes the spot welding core to come out of one of the two sheets.

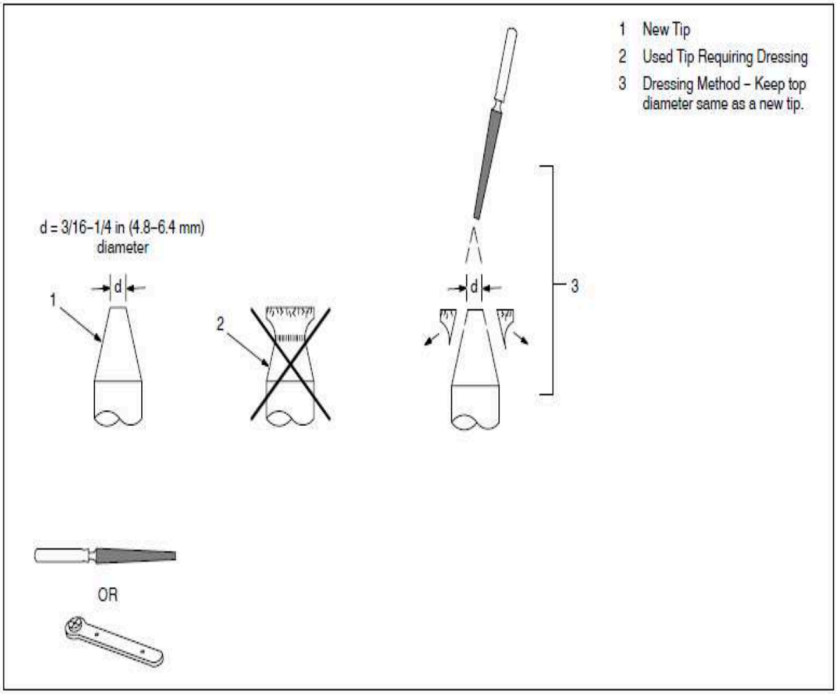
WARNING! The spot welding machine is equipped with a protective conductor that connects the welding circuit directly to earth. Weld only if the plates to be joined are insulated against earth! If they are not, immediately interrupt welding and get a technician who is expert or qualified on this subject to check the system and spot welding machine protective conductor.

8. MAINTENANCE

WARNING! BEFORE CARRYING OUT MAINTENANCE, MAKE SURE THE SPOT WELDING MACHINE IS OFF AND DISCONNECTED FROM THE MAINS. With versions operated with pneumatic cylinder, the main switch must be locked at "O" using the supplied lock.



Dressing Tips



8.1 ROUTINE MAINTENANCE

ROUTINE MAINTENANCE CAN BE CARRIED OUT BY THE OPERATOR.

- electrode tip diameter and profile adaptation/restoration;
- electrode alignment check;
- spring load check (electrode strength);
- spot welding machine and clamp power cable integrity check;
- electrode and arm replacement;

8.2 SPECIAL MAINTENANCE

SPECIAL MAINTENANCE MUST ONLY BE CARRIED OUT BY TECHNICIANS WHO ARE EXPERT OR QUALIFIED IN AN ELECTRIC-MECHANICAL FIELD.
WARNING! BEFORE REMOVING THE SPOT WELDING MACHINE PANELS AND LOOKING INSIDE IT, MAKE SURE THE SPOT WELDING MACHINE IS OFF AND DISCONNECTED FROM THE ELECTRIC AND PNEUMATIC (if present) POWER SUPPLIES.
If checks are carried out while the inside of the spot welding machine is live this could cause serious electric shock due to direct contact with live parts and/or injury due to direct contact with moving parts. Periodically and as frequently as required by the use and environmental conditions, inspect inside the spot welding machine and remove the dust and metal particles that have deposited on the transformer, thyristor module, diode module, power terminal board, etc. using a blast of dry compressed air (max. 5 bar).

Do not direct the jet of compressed air onto the electronic circuit board;
if necessary clean them with a very soft brush or suitable solvents. At the same time:

- make sure the wiring does not show signs of insulation damage or loose oxidized connections.
- lubricate the joints and the pins.
- make sure the screws that connect the transformer secondary with the cast arm holders are tight and that there are no signs of oxidation or overheating; do the same for the arm locking and electrode-holder screws.
- make sure the screws that connect the transformer secondary with the output bars / wires are tight and that there are no signs of oxidation or overheating.
- check machine earthing circuit continuity with the welding circuit (electrodes).
- make sure the transformer secondary screws (if present) are tight and that there are no signs of oxidation or overheating.
- after having carried out maintenance or repairs, restore the connections and wiring as they were before, making sure they do not come into contact with moving parts or parts that can reach high temperatures. Tie all the wires as they were before, being careful to keep the primary high voltage connections separate from the secondary low voltage ones.

Use all the original washers and screws when re-closing the structural work.

9. TROUBLE SHOOTING TABLE

Trouble	Remedy
Tips overheating.	Not enough tong pressure. Increase tong pressure.
	Weld time too long. Reduce weld time.
	Material too thick for the spot welding machine.
Tips arcing on material.	Not enough tong pressure. Increase tong pressure.
	Tips not aligned correctly. Realign tips or dress tips to proper diameter (see Section 4-2).
	Base material may be welded to tips causing high resistance and poor electrical current flow. Clean or dress tips (see Section 4-2).
Spatter or molten material being expelled out during welding operation.	Incorrect tip alignment. Dress tips so that they align and are flat on the material (see Section 4-2).
	Excessive tong pressure. Reduce tong pressure.
	Output amperage too high. Reduce amperage setting, if applicable (not available on air-cooled models).
	Weld time too long. Reduce weld time.
Inconsistent weld nugget.	Inconsistent weld time. Install a weld timer, if applicable.
	Not enough tong pressure. Increase tong pressure.
Hole in middle of weld.	Contact area of tips is too large. Change to a smaller tip diameter or dress tips back to original diameter (see Section 4-2).
Poor weld or no weld at tips.	Material too thick for spot welding machine. Check that material thickness is within capacity of spot welding machine.
	Tongs are too long. Reduce tong length.
	Remove coating from material for intimate contact between pieces. Remove oxides and chemical compounds including galvanized coating.

10. WARRANTY

U.S. Solid warrants your spot welding machine to be free from defects in materials or workmanship under normal use and service for one year from the date of original purchase. All defective devices under normal use will be repaired or replaced for free. All parts, except for consumable welding accessories, will be covered under this warranty.

This warranty shall not apply to any U.S. Solid spot welding machine that:

- is defective due to misuse, neglect or accident;
- is used for a purpose that the device is not designed for;
- has been repaired or altered in a way that adversely affect its performance and reliability;
- is serviced by unauthorized parties;
- Is intended for commercial or professional use.

This warranty is only applicable to the original purchaser.

U.S. Solid would not assume or authorize any person to assume any other liability in connection with its product. No responsibility is assumed for any consequential damages that may result from the use of a U.S. Solid product, nor for damages due to accident, abuse, lack of care, affixing of unauthorized attachment, loss of parts or subjecting this unit to any but the specified voltage.

If your product is broken and meets the warranty requirements, please email us to service@ussolid.com with the original receipt showing the purchase date and the description of the problem for customer service.

Please note should any return or replacement be incurred, transportation and packing costs are the responsibility of the customer.

This warranty gives you specific legal rights, you may have other rights that may vary from state to state.

For More High-quality Products From U.S. Solid, Please Visit

www.ussolid.com

11. CONTACT INFO

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