Operator’s Manual

SAE-400® DC ARC WELDING POWER SOURCE

For use with machines having Code Numbers:
11808

Register your machine:
www.lincolnelectric.com/register

Authorized Service and Distributor Locator:
www.lincolnelectric.com/locator

Need Help? Call 1.888.935.3877
to talk to a Service Representative

Hours of Operation:
8:00 AM to 6:00 PM (ET) Mon. thru Fri.

After hours?
Use “Ask the Experts” at lincolnelectric.com
A Lincoln Service Representative will contact you
no later than the following business day.

For Service outside the USA:
Email: globalservice@lincolnelectric.com

Save for future reference

Date Purchased

Code: (ex: 10859)

Serial: (ex: U1060512345)
THANK YOU FOR SELECTING A QUALITY PRODUCT BY LINCOLN ELECTRIC.

PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY
When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

SAFETY DEPENDS ON YOU
Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation ... and thoughtful operation on your part. DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT. And, most importantly, think before you act and be careful.

KEEP YOUR HEAD OUT OF THE FUMES.
DON’T get too close to the arc. Use corrective lenses if necessary to stay a reasonable distance away from the arc.
READ and obey the Safety Data Sheet (SDS) and the warning label that appears on all containers of welding materials.
USE ENOUGH VENTILATION or exhaust at the arc, or both, to keep the fumes and gases from your breathing zone and the general area.
IN A LARGE ROOM OR OUTDOORS, natural ventilation may be adequate if you keep your head out of the fumes (See below).
USE NATURAL DRAFTS or fans to keep the fumes away from your face.
If you develop unusual symptoms, see your supervisor. Perhaps the welding atmosphere and ventilation system should be checked.

WEAR CORRECT EYE, EAR & BODY PROTECTION
PROTECT your eyes and face with welding helmet properly fitted and with proper grade of filter plate (See ANSI Z49.1).
PROTECT your body from welding spatter and arc flash with protective clothing including woolen clothing, flame-proof apron and gloves, leather leggings, and high boots.
PROTECT others from splatter, flash, and glare with protective screens or barriers.
IN SOME AREAS, protection from noise may be appropriate.
BE SURE protective equipment is in good condition.
Also, wear safety glasses in work area AT ALL TIMES.

SPECIAL SITUATIONS
DO NOT WELD OR CUT containers or materials which previously had been in contact with hazardous substances unless they are properly cleaned. This is extremely dangerous.
DO NOT WELD OR CUT painted or plated parts unless special precautions with ventilation have been taken. They can release highly toxic fumes or gases.
Additional precautionary measures
PROTECT compressed gas cylinders from excessive heat, mechanical shocks, and arcs; fasten cylinders so they cannot fall.
BE SURE cylinders are never grounded or part of an electrical circuit.
REMOVE all potential fire hazards from welding area.
ALWAYS HAVE FIRE FIGHTING EQUIPMENT READY FOR IMMEDIATE USE AND KNOW HOW TO USE IT.

WARNING
This statement appears where the information must be followed exactly to avoid serious personal injury or loss of life.

CAUTION
This statement appears where the information must be followed to avoid minor personal injury or damage to this equipment.
SECTION A: WARNINGS

CALIFORNIA PROPOSITION 65 WARNINGS

WARNING: Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects, or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an exposed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65warnings.ca.gov/diesel

WARNING: This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code § 25249.5 et seq.)

WARNING: Cancer and Reproductive Harm www.P65warnings.ca.gov

ARC WELDING CAN BE HAZARDOUS. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of “Safety in Welding & Cutting - ANSI Standard Z49.1” from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of “Arc Welding Safety” booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

FOR ENGINE POWERED EQUIPMENT.

1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.

1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.

1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

1.d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.

1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines

2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

2.c. Exposure to EMF fields in welding may have other health effects which are now not known.

2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

2.d.1. Route the electrode and work cables together - Secure them with tape when possible.

2.d.2. Never coil the electrode lead around your body.

2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

2.d.5. Do not work next to welding power source.
3.a. The electrode and work (or ground) circuits are electrically “hot” when the welder is on. Do not touch these “hot” parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (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, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- Semiautomatic DC Constant Voltage (Wire) Welder.
- DC Manual (Stick) Welder.
- AC Welder with Reduced Voltage Control.

3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically “hot”.

3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.

3.e. Ground the work or metal to be welded to a good electrical (earth) ground.

3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

3.g. Never dip the electrode in water for cooling.

3.h. Never simultaneously touch electrically “hot” parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.

3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

3.j. Also see Items 6.c. and 8.

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.

4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. When welding hardfacing (see instructions on container or SDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation unless exposure assessments indicate otherwise. In confined spaces or in some circumstances, outdoors, a respirator may also be required. Additional precautions are also required when welding on galvanized steel.

5.b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.

5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

5.e. Read and understand the manufacturer’s instructions for this equipment and the consumables to be used, including the Safety Data Sheet (SDS) and follow your employer’s safety practices. SDS forms are available from your welding distributor or from the manufacturer.

5.f. Also see item 1.b.
WELDING AND CUTTING SPARKS CAN CAUSE FIRE OR EXPLOSION.

6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to “Safety in Welding and Cutting” (ANSI Standard Z49.1) and the operating information for the equipment being used.

6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.

6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned". For information, purchase “Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances”, AWS F4.1 from the American Welding Society (see address above).

6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

6.h. Also see item 1.c.

6.i. Read and follow NFPA 51B “Standard for Fire Prevention During Welding, Cutting and Other Hot Work”, available from NFPA, 1 Batterymarch Park, PO box 9101, Quincy, MA 022690-9101.

6.j. Do not use a welding power source for pipe thawing.

CYLINDER MAY EXPLODE IF DAMAGED.

7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

7.c. Cylinders should be located:
   - Away from areas where they may be struck or subjected to physical damage.
   - A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

7.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.

7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, “Precautions for Safe Handling of Compressed Gases in Cylinders,” available from the Compressed Gas Association, 14501 George Carter Way Chantilly, VA 20151.

FOR ELECTRICALLY POWERED EQUIPMENT.

8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer’s recommendations.

8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer’s recommendations.

Refer to http://www.lincolnelectric.com/safety for additional safety information.
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## INSTALLATION

### TECHNICAL SPECIFICATIONS - SAE-400® (K1278-15)

#### INPUT - DIESEL ENGINE

<table>
<thead>
<tr>
<th>Make/Model</th>
<th>Description</th>
<th>Speed (RPM)</th>
<th>Displacement</th>
<th>Starting System</th>
<th>Capacities</th>
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<tr>
<td>K1278-15</td>
<td>4 cylinder 64.4 HP @ 1710 RPM</td>
<td>High Idle 1800</td>
<td>269 cu. in</td>
<td>12VDC battery</td>
<td>Fuel: 29.0 gal.</td>
</tr>
<tr>
<td>Perkins 1104A-44 Diesel Engine Not EPA Tier 4 Compliant Export Only</td>
<td>Low Idle 1100 Full Load 1725</td>
<td>Bore x Stroke 4.13” x 5.00” (105.0 mm x 127.0 mm)</td>
<td>Oil: 10.1 Qts. 9.6 L</td>
<td>Coolant: 3.4 gal. 12.8 L</td>
<td></td>
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#### RATED OUTPUT - WELDER

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<th>Welding Output</th>
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<tr>
<td>60% (NEMA)</td>
<td>500 amps</td>
<td>40 volts</td>
</tr>
<tr>
<td>100% (NEMA)</td>
<td>400 amps</td>
<td>36 volts</td>
</tr>
<tr>
<td>100% (Lincoln Plus)</td>
<td>400 amps</td>
<td>40 volts</td>
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#### OUTPUT - WELDER AND GENERATOR

<table>
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<tbody>
<tr>
<td>80 - 575 Amps</td>
<td>97 Max. OCV @ 1800 RPM</td>
<td>120/240 VAC 10,000 Watts, 60 Hz., Single Phase 13,000 Watts, 3 Phase Auxiliary, 240V 100% Duty Cycle</td>
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#### RECEPTACLES AND CIRCUIT BREAKERS

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<tr>
<td>1 - 120VAC Duplex NEMA (5-20R)</td>
<td>2 - 20 amp for 120VAC Duplex NEMA</td>
</tr>
<tr>
<td>1 - 120VAC European (IEC-309)</td>
<td>1 - 15 amp for 120VAC European (IEC-309)</td>
</tr>
<tr>
<td>1 - 240VAC Duplex NEMA</td>
<td>1 - 15 amp (2-pole) for 240 V Duplex and European (IEC-309)</td>
</tr>
<tr>
<td>1 - 240VAC European (IEC-309)</td>
<td>1 - (30ma), (RCD) Residual Current Detector</td>
</tr>
<tr>
<td>1 - 240VAC (15-50R) NEMA 3 Phase</td>
<td>1 - 50amp (3-pole), 240VAC Circuit Breaker</td>
</tr>
<tr>
<td>1 - 120VAC / 240VAC (14-50R) NEMA 1 Phase</td>
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#### PHYSICAL DIMENSIONS

<table>
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<th>HEIGHT</th>
<th>WIDTH</th>
<th>DEPTH</th>
<th>WEIGHT</th>
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<tr>
<td>49.80 in.</td>
<td>27.70 in.</td>
<td>83.10 in.</td>
<td>2286 lbs.</td>
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<tr>
<td>1,264.9 mm</td>
<td>703.6 mm</td>
<td>2,110.7 mm</td>
<td>1037 kg.</td>
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(1) Based on a 10 minute period.
Read this entire installation section before you start installation.

SAFETY PRECAUTIONS

**WARNING**

Do not attempt to use this equipment until you have thoroughly read all operating and maintenance manuals supplied with your machine. They include important safety precautions, detailed engine starting, operating and maintenance instructions and parts lists.

**ELECTRIC SHOCK can kill.**

- Do not touch electrically live parts such as output terminals or internal wiring.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.

**ENGINE EXHAUST can kill.**

- Use in open, well ventilated areas or vent exhaust outside
- Do not stack anything near the engine.

**MOVING PARTS can injure.**

- Do not operate with doors open or guards off.
- Stop engine before servicing.
- Keep away from moving parts

Only qualified personnel should install, use or service this equipment.

LOCATION / VENTILATION

The welder should be located to provide an unrestricted flow of clean, cool air to the cooling air inlets and to avoid restricting the cooling air outlets. Also, locate the welder so that the engine exhaust fumes are properly vented to an outside area.

**CAUTION**

**DO NOT MOUNT OVER COMBUSTIBLE SURFACES**

Where there is a combustible surface directly under stationary or fixed electrical equipment, that surface should be covered with a steel plate at least .06" (1.6mm) thick, which should extend not less than 5.90 (150mm) beyond the equipment on all sides.

**STACKING**

These machines cannot be stacked.

**ANGLE OF OPERATION**

To achieve optimum engine performance the machine should be run in a level position. The maximum angle of operation for the Perkins engine is 30 degrees in all directions. If the engine is to be operated at an angle, provisions must be made for checking and maintaining the oil level at the normal (FULL) oil capacity in the engine crankcase. When operating the welder at an angle, the effective fuel capacity will be slightly less than the specified 29.0 Gal. (109.8 ltr.).

**LIFTING**

The equipment lift bail should be used to lift the machine.

**WARNING**

- Lift only with equipment of adequate lifting capacity.
- Be sure machine is stable when lifting.
- Do not lift this machine using lift bail if it is equipped with a heavy accessory such as a trailer or gas cylinder.

**FALLING EQUIPMENT can cause injury.**

- Do not lift machine if lift bail is damaged.
- Do not operate machine while suspended from lift bail.
HIGH ALTITUDE OPERATION

At higher altitudes, output derating may be necessary. As a rule of thumb, derate the welder output 5% for every 500 meters (1640 ft.) above 1000 meters (3280 ft.).

Contact a Perkins Service Representative for any engine adjustments that may be required for high altitude operation.

TOWING

The recommended trailers for use with this equipment for in-plant and yard towing by a vehicle\(^{(1)}\) are Lincoln’s K2641-2 and K2637-2. The K2637-2 is also designed to be used at highway speeds\(^{(1)}\). If the user adapts a non-Lincoln trailer, he must assume responsibility that the method of attachment and usage does not result in a safety hazard nor damage the welding equipment. Some of the factors to be considered are as follows:

1. Design capacity of trailer vs. weight of Lincoln equipment and likely additional attachments.
2. Proper support of, and attachment to, the base of the welding equipment so that there will be no undue stress to the trailer’s framework.
3. Proper placement of the equipment on the trailer to insure stability side to side and front to back when being moved and when standing by itself.
4. Typical conditions of use, such as travel speed, roughness of surface on which the trailer will be operated, and environmental conditions.
5. Proper preventative maintenance of trailer.
6. Conformance with federal, state and local laws.\(^{(1)}\)

\(^{(1)}\) For highway use, consult applicable federal, state and local laws regarding specific requirements for use on public highways, such as brakes, lights, fenders, etc.

VEHICLE MOUNTING

\[\text{WARNING}\]

Improperly mounted concentrated loads may cause unstable vehicle handling and tires or other components to fail.
- Only transport this equipment on serviceable vehicles which are rated and designed for such loads.
- Distribute, balance and secure loads so vehicle is stable under conditions of use.
- Do not exceed maximum rated loads for components such as suspension, axles and tires.
- Mount equipment base to metal bed or frame of vehicle.
- Follow vehicle manufacturer’s instruction.

PRE-OPERATION ENGINE SERVICE

READ the engine operating and maintenance instructions supplied with this machine.

ENGINE OIL

The engine is shipped with the engine crankcase filled with high quality SAE 10W-30 oil (API class CD or better). Check the oil level before starting the engine. If it is not up to the full mark on the dip stick, add oil as required. Check the oil level every four hours of running time during the first 35 running hours. Refer to the engine Operator’s Manual for specific oil recommendations and break-in information. The oil change interval is dependent on the quality of the oil and the operating environment. Refer to the engine Operator’s Manual for the proper service and maintenance intervals.
INSTALLATION

**WARNING**

- Stop engine while fueling.
- Do not smoke when fueling.
- Keep sparks and flame away from tank.
- Do not leave unattended while fueling.

**SAE-400®**

1. Connect the welder output studs to a suitable resistive load bank. Note that any attempt to short the output studs by connecting the welding leads together, direct shorting of the output studs, or connecting the output leads to a length of steel will result in catastrophic damage to the generator and voids the warranty.

2. Set the welder controls for an output current and voltage within the welder rating and duty cycle. Note that any attempt to exceed the welder rating or duty cycle for any period of time will result in catastrophic damage to the generator and voids the warranty.

3. Periodically shut off the engine and check the crankcase oil level.

**BATTERY CONNECTION**

**WARNING**

Use caution as the electrolyte is a strong acid that can burn skin and damage eyes.

Remove and discard the insulating cap from the negative battery terminal. Attach and tighten negative battery cable terminal.

**NOTE:** This machine is furnished with a wet charged battery; if unused for several months, the battery may require a booster charge. Be careful to charge the battery with the correct polarity. Make sure that the battery is level while charging.

**WARNING**

GASES FROM BATTERY can explode.

- Keep sparks, flame and cigarettes away from battery.

To prevent EXPLOSION when:

- **INSTALLING A NEW BATTERY** — disconnect negative cable from old battery first and connect to new battery last.

- **CONNECTING A BATTERY CHARGER** — remove battery from welder by disconnecting negative cable first, then positive cable and battery clamp. When reinstalling, connect negative cable last. Keep well ventilated.

---

Fill the fuel tank with clean, fresh diesel fuel. The capacity of the fuel tank is 29.0 gallons (109.8 liters). See engine Operator’s Manual for specific fuel recommendations.

Note: Before starting the engine, be sure the fuel shut-off valve is in the open position.

**ENGINE COOLING SYSTEM**

The cooling system has been filled at the factory with a 50-50 mixture of ethylene glycol antifreeze and water. Check the radiator level and add a 50-50 solution as needed. (See Engine Manual or antifreeze container for alternate antifreeze recommendation.)

**ENGINE BREAK-IN PERIOD**

Lincoln Electric selects high quality, heavy-duty industrial engines for the portable welding machines we offer. While it is normal to see a small amount of crankcase oil consumption during initial operation, excessive oil use, wet stacking (oil or tar like substance at the exhaust port), or excessive smoke is not normal.

Larger machines with a capacity of 350 amperes and higher, which are operated at low or no-load conditions for extended periods of time are especially susceptible to the conditions described above. To accomplish successful engine break-in, most diesel-powered equipment needs only to be run at a reasonably heavy load within the rating of the welder for some period of time during the engine’s early life. However, if the welder is subjected to extensive light loading, occasional moderate to heavy loading of the engine may sometimes be necessary. Caution must be observed in correctly loading a diesel/generator unit.

---

**DIAGRAM**

**SAE-400®**

LINCOLN ELECTRIC
- USING A BOOSTER — connect positive lead to battery first then connect negative lead to negative battery lead at the lower control panel support.

BATTERY ACID can burn eyes and skin.
- Wear gloves and eye protection and be careful when working near battery.
- Follow instructions printed on battery.

IMPORTANT: To prevent ELECTRICAL DAMAGE WHEN:

a) Installing a new battery.
b) Using a booster.

Use correct polarity — Negative Ground.
To prevent BATTERY BUCKLING, tighten the nuts on battery until snug. DO NOT OVERTIGHTEN.

SPARK ARRESTER

WARNING

- Spark Arrester and Muffler may be hot!
- Allow engine to cool before servicing spark arrester!
- Do not operate engine while servicing spark arrester!

Some federal, state or local laws may require that gasoline or diesel engines be equipped with exhaust spark arresters when they are operated in certain locations where unarrested sparks may present a fire hazard. The muffler included with this welder has been modified and now qualifies as a spark arrester. Spark arresting mufflers will have a clean out service plug and will have “US FOREST SERVICE APPROVED” stamped on the muffler shell. Any spark arrester must be serviced and properly maintained.

CAUTION
An incorrect arrester may lead to damage to the engine or adversely affect performance.

WELDING OUTPUT CABLES

With the engine off, connect the electrode and work cables to the studs provided. These connections should be checked periodically and tightened if necessary.

Listed in Table A.1 are copper cable sizes recommended for the rated current and duty cycle. Lengths stipulated are the distance from the welder to work and back to the welder again. Cable sizes are increased for greater lengths primarily for the purpose of minimizing cable voltage drop.

Table A.1 Combined Length of Electrode and Work Cables.

<table>
<thead>
<tr>
<th>AMPS @60% Duty Cycle</th>
<th>TOTAL COMBINED LENGTH OF ELECTRODE AND WORK CABLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>2/0 AWG up to 100ft. 31m up to 200-200ft. 61-250m</td>
</tr>
</tbody>
</table>

MACHINE GROUNDING

Because this portable engine driven welder creates its own power, it is not necessary to connect its frame to an earth ground, unless the machine is connected to premises wiring (home, shop, etc.).

To prevent dangerous electric shock, other equipment powered by this engine driven welder must:

a) be grounded to the frame of the welder using a grounded type plug, or
b) be double insulated.

When this welder is mounted on a truck or trailer, its frame must be securely connected to the metal frame of the vehicle. When this engine driven welder is connected to premises wiring such as that in a home or shop, its frame must be connected to the system earth ground. See the article on grounding in the latest U.S. National Electrical Code and the local code.

In general, if the machine is to be grounded, it should be connected with a #8 or larger copper wire to a solid earth ground such as a metal water pipe going into the ground for at least ten feet and having no insulated joints, or to the metal framework of a building which has been effectively grounded. The U.S. National Electrical Code lists a number of alternate means of grounding electrical equipment. A machine grounding stud marked with the symbol is provided on the welding generator frame foot.
OPERATING INSTRUCTIONS
Read and understand this entire section before operating your equipment.

SAFETY INSTRUCTIONS

WARNING
Do not attempt to use this equipment until you have thoroughly read all operating and maintenance manuals supplied with your machine. They include important safety precautions, detailed engine starting, operating and maintenance instructions and parts lists.

- ELECTRIC SHOCK can kill.
  - Do not touch electrically live parts or electrodes with your skin or wet clothing.
  - Insulate yourself from the work and ground.
  - Always wear dry insulating gloves.
  - Do not use AC welder if your clothing, gloves or work area is damp or if working on, under or inside workpiece.

Use the following equipment:
- Semiautomatic DC constant voltage (wire) welder.
- DC manual (stick) welder.
- AC welder with reduced voltage control.

- ARC RAYS can injure eyes and burn skin.
  - Wear eye, ear, and body protection.

- Only qualified personnel should install, use or service this equipment.
- Consult instruction manual before operating.

Before operating, read and understand the manufacturer's instructions for this equipment and the consumables to be used including the Material Safety Data Sheet (MSDS) and follow your employer's safety practices.

- FUMES AND GASES can be dangerous to your health.
  - Keep your head out of fumes.
  - Use enough ventilation or exhaust at the arc, or both, to keep the fumes and gases from your breathing zone and general area.

WARNING
WELDING SPARKS can cause fire or explosion.
- Do not weld near flammable material.
- Do not weld on containers that have held flammable material.

MOVING PARTS can injure.
- Keep away from moving parts
- Do not operate with doors open or guards off.
- Stop engine before servicing.

ENGINE EXHAUST can kill.
- Use in open, well ventilated areas or vent exhaust outside.

Pipe Thawing with an arc welder can cause fire, explosion, damage to electric wiring or to the arc welder if done improperly. The use of an arc welder for pipe thawing is not approved by the CSA, nor is it recommended or supported by Lincoln Electric.

ADDITIONAL SAFETY PRECAUTIONS

Always operate the welder with the hinged doors closed as these provide maximum protection from moving parts and insure proper cooling air flow.

Read carefully the Safety Precautions page in the Instruction Manual before operating this machine. Always follow these and any other safety procedures included in this manual and in the engine instruction manuals.

GENERAL DESCRIPTION

The SAE-400® is a diesel engine driven welding power source. The machine uses a DC generator for DC stick electrode welding and an AC exciter for 10,000 watts single phase auxiliary 120V/240V power, 13,000 watts three phase auxiliary 240V power. As a welder it provides up to 575 amps of DC constant current output.

The engine 1104A-44 is a 64.4 Hp @ 1710 RPM (48kw), 4-cylinder water cooled diesel made by Perkins.
RECOMMENDED APPLICATIONS

WELDER
The SAE-400® provides excellent constant current DC welding output for stick (SMAW) welding. The field installed optional CV Adapter (K385-[ ]) provides up to 500 amps at 35 volts of constant voltage output for semiautomatic welding.

AUXILIARY POWER
The SAE-400® provides 10 KW of 120/240VAC Single Phase 13kw 240V, 3 Phase output for auxiliary power and emergency standby power.

DESIGN FEATURES AND ADVANTAGES

FOR STICK WELDING
• Excellent DC constant current output for stick welding applications.
• Continuous adjustment of both voltage and current for unsurpassed welds on demanding jobs.
• Remote control capability standard.

FOR AUXILIARY POWER
• 10 kVA of 120/240VAC, 13 kVA for 240 3ph. 60 Hz auxiliary power.
• Two 20 amp 120VAC duplex receptacle.
• One 15 amp, 240VAC duplex receptacle for up to 13 amps of 240VAC power.
• One 120VAC (European IEC-309) 16 amp receptacle.
• One 240VAC (European IEC-309) 15 amp receptacle.
• One 120/240V NEMA 50 amp receptacle.
• One 240V3 phase NEMA 50 amp receptacle.
• Weld and AC auxiliary power at the same time (within the limits shown on the chart below).

OTHER FEATURES
• Perkins 4-cylinder, water cooled diesel engine. Designed for long life, easy maintenance and excellent fuel economy.
• Engine protection system shuts the engine down for low engine oil pressure or high coolant temperature.
• Electronic Engine Idler. Engine automatically goes to low idle in 10 to 14 seconds after welding or use of auxiliary power stops. Includes high idle switch.
• Gauges for engine oil pressure, coolant temperature and battery charging ammeter.
• Engine hour meter standard.
• Extended range 29.0 gallon (109.8 L) fuel tank.

DUTY CYCLE

Duty cycle is the percentage of time the load is being applied in a 10 minute period. For example a 60% duty cycle, represents 6 minutes of load and 4 minutes of no load in a 10 minute period.

ENGINE CONTROLS

IGNITION SWITCH
When placed in the “ON” position, this switch energizes the fuel solenoid. When placed in the “OFF” position, the flow of fuel to the injection pump is stopped to shut down the engine.

“IDLER” SWITCH
The idler switch has two positions, “HIGH” and “AUTO”.

When in “HIGH” ( ) position, the engine will run continuously at high idle.

When in “AUTO” ( / ) idle position, the idler operates as follows:

a. Welding

When the electrode touches the work, the welding arc is initiated and the engine accelerates to full speed.

After welding ceases (and no auxiliary power is being drawn), the engine will return to low idle after approximately 10 to 14 seconds.

b. Auxiliary Power

With the engine running at low idle and auxiliary power for lights or tools is drawn (approximately 100-150 watts or greater) from the receptacles, the engine will accelerate to high speed. If no power is being drawn from the receptacles (and not welding) for 10-14 seconds, the idler reduces the engine speed to low idle.
ENGINE TEMPERATURE GAUGE
Displays the coolant temperature in the engine block.

ENGINE OIL PRESSURE GAUGE
Displays the oil pressure to the engine. When the engine starts running, watch for the oil pressure to build up. If no pressure shows within 30 seconds, stop the engine and consult the engine instruction manual.

BATTERY CHARGING AMMETER
Displays the current going from the charging alternator into the batteries. It is normal for charging current to be high (above 15 amps) after starting or when the batteries are ‘low’ on charge.

ENGINE HOUR METER
The engine hour meter records the total running time on the engine in hours. It can be used to keep a record of maintenance on the engine and or welder.

ENGINE PROTECTION SYSTEM
The engine protection system shuts down the engine under high coolant temperature or low engine oil pressure conditions by allowing the fuel solenoid valve to close.

WELDER CONTROLS
POLARITY SWITCH
Turn the Arc Polarity switch to electrode positive or electrode negative as required for each particular application.

CONTROL OF WELDING CURRENT
Purpose of Controls
The continuous “Current Control” is the main current adjuster. The “Job Selector” is both a fine current adjuster and the continuous Open Circuit Voltage adjuster. Open Circuit Voltage (OCV) controls the arc characteristics.

“Job Selector”
The “Job Selector” dial is divided into four colored sections providing OCV ranges as follows:

<table>
<thead>
<tr>
<th>Color</th>
<th>Title</th>
<th>OCV Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>Large Electrodes</td>
<td>High OCV</td>
</tr>
<tr>
<td>Black</td>
<td>Normal Welding</td>
<td>Medium OCV</td>
</tr>
<tr>
<td>Red</td>
<td>Overhead &amp; Vertical</td>
<td>Low OCV</td>
</tr>
<tr>
<td>Grey</td>
<td>Special Applications</td>
<td>Extra-Low OCV</td>
</tr>
</tbody>
</table>

The “Job Selector” is usually set in the black range because it provides a soft “Buttering “ arc desired for most welding. Some operators prefer to set the “Job Selector” in the red range for a snappy “Digging” arc when welding vertical up or overhead.

“CURRENT CONTROL”

CAUTION
Do not adjust the “Current Control” while welding because this can damage the control.

The “Current Control” dial is calibrated in amperes on three separate colored dials corresponding to the white, black and red ranges of the “Job Selector” dial. For example: when the “Job Selector” is set on the black range, the approximate welding current is indicated on the black scale of the “Current Control” dial.

How to Set the Controls
Assume you want a normal soft arc and about 135 amps, using a 5/32” (4.0 mm) electrode:

1. Set the “Job Selector” at the center of the black range.
2. Set the “Current Control” to read 135 amps on the black dial.
3. Start to weld.
4. If you want a little more current, turn the “Job Selector” up (counterclockwise) to increase current. If you want a little less current, turn the “Job Selector” down (clockwise) to decrease current.
5. If dialing the desired current with the “Job Selector” moves the setting outside the black range causing undesirable arc characteristics, turn the “Job Selector” back to the center of the black range. Then turn the “Current Control” up or down a little as needed. Readjust the “Job Selector” for the exact characteristics and current desired.

REMOTE CONTROL
A receptacle and “Local/Remote” control switch is located on the lower front control panel. A remote control box with 100 ft. (30.5 m) of cord for adjusting the OCV at the welding site is available. Putting the switch in the “REMOTE” position allows fine current control at the remote control box while placing the switch in the “LOCAL” position allows fine current control at the “Job Selector” on the machine. When using the optional field installed CV adapter (K385- [ ]) the “Local/Remote” switch is only active in the “VV” mode.
AUXILIARY POWER CONTROLS

120 VAC Receptacles

One 20 amp, (each side) 120VAC (5-20R) NEMA duplex receptacle provides 120VAC for auxiliary power.

One 120V (European IEC-309) 16 amp receptacle. IP44 rated.

One 120V/240V (14-50R) 1 phase 50 amp NEMA style receptacle.

The auxiliary power receptacles should only be used with three or four wire grounded type plugs or approved double insulated tools. The current rating of any plug used with the system must be at least equal to the current capacity of the associated receptacle.

240VAC Receptacles

One 15 amp, 240VAC duplex receptacle provides 240 VAC for auxiliary power.

One 240V (European IEC-309) 15 amp receptacle. IP44 rated.

One 240V (15-50R) 3 phase 50 amp NEMA style receptacle.

Circuit Breakers

2 pole 15 amp rated provides overload protection for the 240VAC (European IEC-309) receptacle and the 240VAC duplex receptacle.

2 Single pole 20 amp rated circuit breakers provides overload protection for the 120VAC (5-20R NEMA) duplex receptacle.

Single pole 15 amp rated provides overload protection for the 120VAC (European IEC-309) receptacle.

3 pole, 50 amp circuit breaker provides overload protection to 240V, 3 phase and 120/240 1 phase NEMA (15-50R and 14-50R) plugs.

RESIDUAL CURRENT DEVICE

The SAE-400® is configured with a Residual Current Device (RCD) to protect all receptacles against current leakage (eg. to ground) from all receptacles.

GROUND STUD

Provides a connection point for connecting the machine to earth ground. For the safest grounding procedure refer to “Machine Grounding” in the INSTALLATION section of this manual.
ENGINE OPERATION

**WARNING**

Do not attempt to use this equipment until you have thoroughly read the engine manufacturer’s manual supplied with your welder. It includes important safety precautions, detailed engine starting, operating and maintenance instructions, and parts lists.

**ELECTRIC SHOCK** can kill.
- Do not touch electrically live parts or electrode with skin or wet clothing.
- Insulate yourself from work and ground
- Always wear dry insulating gloves.

**ENGINE EXHAUST** can kill.
- Use in open, well ventilated areas or vent exhaust outside.

**MOVING PARTS** can injure.
- Do not operate with doors open or guards off.
- Stop engine before servicing.
- Keep away from moving parts.

See additional warning information at the front of this operator’s manual.

For added safety always operate the welder with the doors closed. Further, leaving the doors open changes the designed air flow and may cause engine, generator overheating.

**CAUTION**

Do not adjust the high idle engine speed (rpm) above the factory setting specification as this will void warranty.

**STARTING INSTRUCTIONS**

Be sure all Pre-Operation Maintenance has been performed. (See INSTALLATION section of this manual).

1. Turn the “IDLER” switch to “HIGH”.
2. Turn the “IGNITION” switch to “ON”.
3. Press the Glow Plug button for 20 to 30 seconds. (maximum 60 seconds).
4. Press the Glow Plug and the Start button at the same time. When the engine starts running, release both buttons. If the engine fails to start in 20 seconds, wait 30 seconds and repeat the above procedure.
5. Observe the oil pressure. If no pressure shows within 30 seconds, stop the engine and consult the engine operating manual. To stop the engine, turn the “IGNITION” switch to “OFF”.
6. If the engine protection warning light comes on during cranking or after start up, the “IGNITION” switch must be turned “OFF” to reset the engine protection system.
7. Allow the engine to run at high idle speed for several minutes to warm the engine. Stop the engine and recheck the oil level, after allowing sufficient time for the oil to drain into the pan. If the level is down, fill it to the full mark again. The engine controls were properly set at the factory and should require no adjusting when received.

**COLD WEATHER STARTING:**

**WARNING**

Under **NO** conditions should ether or other starting fluids be used!

With a fully charged battery and the proper weight oil, the engine should start satisfactorily even down to about -5°F (-20°C), it maybe desirable to install cold-starting aides.

Note: Extreme cold weather starting may require longer glow plug operation.

**STOPPING THE ENGINE**

1. Turn the “IGNITION” switch to “OFF”

At the end of each day’s welding, check the crankcase oil level, drain accumulated dirt and water from the water separator and refill the fuel tank to minimize moisture condensation in the tank. Also, running out of fuel tends to draw dirt into the fuel system.

When hauling the welder between job sites, close the fuel shut-off valve.
TYPICAL FUEL CONSUMPTION
SAE-400® 10KVA

<table>
<thead>
<tr>
<th>TEST CONDITION</th>
<th>FUEL CONSUMPTION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>US gal./ hr.</td>
<td>liters/ hr.</td>
</tr>
<tr>
<td>Low Idle, No Load</td>
<td>0.54</td>
<td>2.04</td>
</tr>
<tr>
<td>High Idle, No Load</td>
<td>0.79</td>
<td>2.99</td>
</tr>
<tr>
<td>Welding 400A 40V</td>
<td>1.84</td>
<td>6.95</td>
</tr>
<tr>
<td>Welding 500A 40V</td>
<td>2.01</td>
<td>7.60</td>
</tr>
<tr>
<td>Auxiliary 10KVA</td>
<td>1.22</td>
<td>4.61</td>
</tr>
<tr>
<td>Auxiliary 13KVA</td>
<td>1.39</td>
<td>5.27</td>
</tr>
<tr>
<td>Weld 400A 40V, Auxiliary 10KVA</td>
<td>2.33</td>
<td>8.28</td>
</tr>
<tr>
<td>Weld 400A 40V, Auxiliary 13KVA</td>
<td>2.24</td>
<td>8.47</td>
</tr>
</tbody>
</table>
K930-2 TIG Module - Provides high frequency plus a gas valve for TIG welding. A water valve is available as an option. Requires 115 volt AC input. (Limited to 250A - 60% Duty Cycle).

K802D Power Plug Kit - Kit includes male plug for 20 amp receptacle.

K2641-2 Trailer - FOUR-WHEEL STEERABLE YARD TRAILER WITH DUO-HITCH
• For off-road, plant and yard use with an overall width of 55 in.
• Includes an automatically engaging drawbar lock when the drawbar is raised to the vertical position.
• 13 in wheels with wheel bearings packed with high viscosity, high pressure, low washout Lubriplate® grease.
• Stiff 3/16 in welded rectangular steel frame construction is phosphate etched and powder coat painted for superior rust and corrosion resistance.
• Also includes a Duo-Hitch™ - a 2 in Ball/Lunette Eye combination hitch.

K2637-2 Trailer - A 2-wheel trailer designed for road, off road, in-plant and yard towing. Trailer mounts directly to welder base. Comes standard with a Duo-Hitch™, a 2” Ball and Lunette Eye combination hitch.

Order:
K2637-2 Trailer
K2639-1 Fender & Light Kit
K2640-1 Cable Storage Rack

1For highway use, consult applicable federal, state and local laws regarding possible requirements for brakes, lights, fenders, etc.

WARNING

Pipe Thawing with an arc welder can cause fire, explosion, damage to electric wiring or to the arc welder if done improperly. The use of an arc welder for pipe thawing is not approved by the CSA, nor is it recommended or supported by Lincoln Electric.

K704 Standard Accessory Kit - Includes electrode and work cables, headshield, work clamp and electrode holder.

K385-2 CV Adapter - Provides constant voltage output for semiautomatic welding. (Field installation only).

K1735-1 MULTI-WELD 350 - For multiple arcs from the DC output of a welding power source. See bulletin E5.300 for Multi-Weld 350 and distribution system.

K2144-1 Oil Drain Kit- Includes ball valve, hose and clamp.
**WARNING**

**ELECTRIC SHOCK** can kill.
- Do not touch electrically live parts such as output terminals or internal wiring.

**ENGINE EXHAUST** can kill.
- Use in open, well ventilated areas or vent exhaust outside.

**MOVING PARTS** can injure.
- Do not operate with doors open or guards off.
- Stop engine before servicing.
- Keep away from moving parts.

- Remove guards only when necessary and replace when work requiring removal is complete.
- Only qualified personnel should install, use, or service this equipment.

**ROUTINE MAINTENANCE**

At the end of each day’s welding, refill the fuel tank to minimize moisture condensation in the tank. Also, running out of fuel tends to draw dirt into the fuel system. Check the engine crankcase oil levels.

**ENGINE AIR FILTER**

The engine air filter element is a dry cartridge type. It is located above the engine. It can be cleaned and reused; however, damaged elements should not be washed or re-used. Remove loose dirt from element with compressed air or water hose directed from inside out. Compressed Air: 100 psi maximum. The filter should never be removed while the engine is running.

**PERIODIC MAINTENANCE**

1. Blow out the welder and controls with an air hose at least once every two months. In particularly dirty locations, this cleaning may be necessary once a week. Use low pressure air to avoid driving dirt into the insulation.

2. The current control reactor brushes are self-lubricating and should not be greased. Keep the contacts clean. This control should be moved from maximum to minimum daily to prevent the controls from sticking.

3. See the engine Instruction Manual for periodic engine maintenance information. Change the crankcase oil at regular intervals using the proper grade of oil as recommended in the engine operating manual. Change the oil filter in accordance with the instructions in the engine operating manual. When the oil filter is changed add one quart of oil to the crankcase to replace the oil held in the filter during operation.

4. Belts tend to loosen after the first 30 or 40 hours of operation. Check the cooling fan belt and tighten if necessary. DO NOT OVER TIGHTEN.
COMMUTATOR AND BRUSH MAINTENANCE

**WARNING**

Uncovered rotating equipment can be dangerous. Use care so your hands, hair, clothing or tools do not catch in the rotating parts. Protect yourself from particles that may be thrown out by the rotating armature when stoning the commutator.

The generator brushes are properly adjusted when the welder is shipped. They require no particular attention. DO NOT SHIFT THE BRUSHES or adjust the rocker setting.

Shifting of the brushes may result in:
- Change in machine output
- Commutator Damage
- Excessive brush wear

Periodically inspect the commutator, slip rings and brushes by removing the covers. DO NOT remove or replace these covers while the machine is running.

Commutators and slip rings require little attention. However, if they are black or appear uneven, have them cleaned by an experienced maintenance person using fine sandpaper or a commutator stone. Never use emery cloth or paper for this purpose.

**NOTE:** If the welder is used in dirty or dusty locations, or if the welder is not used for prolonged periods of time, it may be necessary to clean the commutator and slip rings more often.

Replace brushes when they wear within 1/4" of the pigtail. A complete set of replacement brushes should be kept on hand. Lincoln brushes have a curved face to fit the commutator. Have an experienced maintenance person seat these brushes by lightly stoning the commutator as the armature rotates at full speed until contact is made across the full face of the brushes. After stoning, blow out the dust with low pressure air.

To seat the slip ring brushes, position the brushes in place. Then slide one end of a piece of fine sandpaper between slip rings and brushes with the coarse side against the brushes. With slight additional finger pressure on top of the brushes, pull the sandpaper around the circumference of the rings, in direction of rotation only - until brushes seat properly. In addition, stone slip ring with a fine stone. Brushes must be seated 100%.

Arcing or excessive exciter brush wear indicates a possible misaligned shaft. Have an authorized Field Service Shop check and realign the shaft.

COOLING SYSTEM

The SAE-400® is equipped with a pressure radiator. Keep the radiator cap tight to prevent loss of coolant. Clean and flush the cooling system periodically to prevent clogging the passage and overheating the engine. When antifreeze is needed, always use the permanent type.

FUEL PRE FILTER / WATER SEPARATOR

**WARNING**

When working on the fuel system

- Keep unguarded lights away, do not smoke!
- Do not spill fuel!

The SAE-400® is equipped with a Fuel Pre-Filter / Water Separator Assembly located before the lift pump mounted to the engine block.

FUEL PRE-FILTER / WATER SEPARATOR ASSEMBLY

The assembly uses a 30 micron pre-filter/water separator element that is designed to protect against gross contamination of the final fuel filter. Using chemically treated paper media the element also provides maximum protection against water in the fuel. The assembly is also equipped with a see-through bowl for easy visual checking for water. The recommended change interval for the pre-filter/water separator element is 1,000 hours. See below for information on the see-through bowl and for the procedure for changing the element.

**See-Through Bowl:**
- Check the see-through bowl for water regularly. Water will collect at the bottom of the bowl and appears different from the fuel.

**Note:** The see-through bowl is re-usable.

1. Close the fuel shut-off valve.
2. Drain by opening the self venting drain valve and allowing all water to escape.
3. Close the drain valve and open the fuel shut-off valve.

Pre-Filter/Water Separator Element:
1. Close the fuel shut-off valve located under the fuel tank.
2. Rotate the quick change ring (located just below filter-header) clockwise approximately 1/2 turn and slide it down and off of the element.
3. Grasp the element and pull down with a slight rocking motion to remove the element from the grommet post on the bottom of the filter header.
4. Slide the new element onto the grommet post on the bottom of the filter header until the element no longer easily moves up into the filter header. Now rotate the element (may take almost 1 full turn) with a slight upward pressure until the element begins to further engage the header. With the proper orientation now established apply additional pressure to seat the element in the filter header. You should feel the element “pop” into place when properly seated.

Note: The element will only go on one way. Never use excessive force when mounting the element to the header.

5. Slide the quick change ring up over the element and rotate counter clockwise until an audible click or pop is heard. If you do not hear the click you have not rotated the ring far enough and the element is not in the locked position. Another indication that the ring is in the locked position is that one set (it doesn’t matter which one) of arrows located on the outside of the ring should be located directly under the air vent valve.

6. Remove the see-through bowl from the old element and install on the new element.

7. Open the fuel shutoff valve.

8. Open the air vent valve on the front of the filter header until fuel emerges free of air bubbles and then close the air vent valve.

Note: Consult your engine operation manual for information on air bleeding the entire fuel system.

### SPARK ARRESTER

**WARNING**

- Spark Arrester and Muffler may be hot!
- Allow engine to cool before servicing spark arrester!
- Do not operate engine while servicing spark arrester!

**SAE-400® with integral spark arresting mufflers:**

Service spark arrester every 250 hours.

Service as follows:

1. Stop engine and allow to cool.
2. Remove clean out plug from side of spark arrester.
3. Without damaging the spark arrester, gently tap on the arrester shell near the clean out plug.
4. Once particles are removed, replace the clean out plug.

### ENGINE AND MAINTENANCE COMPONENTS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MAKE</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Air Filter</td>
<td>Donaldson</td>
<td>P822768</td>
</tr>
<tr>
<td>Fan Belt</td>
<td>Perkins</td>
<td>2614B655</td>
</tr>
<tr>
<td>Fuel Filter</td>
<td>Perkins</td>
<td>26560201</td>
</tr>
<tr>
<td>Engine Oil Filter</td>
<td>Perkins</td>
<td>2654407</td>
</tr>
<tr>
<td>Pre-Filter/Water Separator Element</td>
<td>Lincoln Stanadyne</td>
<td>M21584-B39420 LE</td>
</tr>
</tbody>
</table>
This Troubleshooting Guide is provided to help you locate and repair possible machine malfunctions. Simply follow the three-step procedure listed below.

### Step 1. LOCATE PROBLEM (SYMPTOM).
Look under the column labeled "PROBLEM (SYMPTOM)". This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting.

### Step 2. POSSIBLE CAUSE.
The second column labeled "POSSIBLE CAUSE" lists the obvious external possibilities that may contribute to the machine symptom.

### Step 3. RECOMMENDED COURSE OF ACTION
This column provides a course of action for the Possible Cause, generally it states to contact your local Lincoln Authorized Field Service Facility. If you do not understand or are unable to perform the Recommended Course of Action safely, contact your local Lincoln Authorized Field Service Facility.

---

**WARNING**

Service and Repair should only be performed by Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.

If you do not understand or are unable to perform the Recommended Course of Action safely, contact your local Lincoln Authorized Field Service Facility.

---

### CAUTION

**ELECTRIC SHOCK can kill.**
- Do not touch electrically live parts such as output terminals or internal wiring.

**ENGINE EXHAUST can kill.**
- Use in open, well ventilated areas or vent exhaust outside.

**MOVING PARTS can injure.**
- Do not operate with doors open or guards off.
- Stop engine before servicing.
- Keep away from moving parts.
- Remove guards only when necessary and replace when work requiring removal is complete.
- Only qualified personnel should install, use or service this equipment.

---

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Local Lincoln Authorized Field Service Facility for technical troubleshooting assistance before you proceed.
<table>
<thead>
<tr>
<th>PROBLEMS (SYMPTOMS)</th>
<th>POSSIBLE CAUSE</th>
<th>RECOMMENDED COURSE OF ACTION</th>
</tr>
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<tbody>
<tr>
<td>Machine fails to hold the “heat” constantly.</td>
<td>1. Rough or dirty commutator. 2. Brushes may be worn down to limit of life. 3. Brush springs may be broken. 4. Field circuit may have variable resistance connections or intermittent open circuit, due to loose connections or broken wire. 5. Electrode or work lead connections may be poor. 6. Wrong grade of brushes may be installed on generator. 7. Field rheostat may be making poor contact and overheating. 8. “Current Control” may not be operating properly. 9. “Current Control” brush holder contact springs may be worn out or missing. Contact surface may be dirty, rough and pitted. 10. “Current Control” brush holder support stud and mating contact surfaces may be dirty or pitted and burned. 11. Engine running at varying speeds.</td>
<td>1. True and clean commutator. 2. Replace brushes. 3. Replace brush springs. 4. Check field current with ammeter to discover varying current. This applies to both the main generator and exciter. 5. Tighten all connections. 6. Use only the recommended Lincoln brushes. 7. Inspect and clean rheostat. 8. Check for loose or missing set screw in control handles. 9. Inspect. Replace needed parts. Clean internal contact surface of control device. Do not lubricate. Smooth rough surfaces. 10. If brush holder internal contact surface is pitted and burned, replace the brush holder and support stud. If the contact surface is dirty, clean off the brush holder stud and internal contact surface. Apply mixture of three parts silicone grease and one part zinc powder (by weight) to stud. 11. Set welder controls for maximum output and weld. Then, while welding, check engine rpm. The engine should be running at full speed. If indicator shows a significant difference, consult your engine manual.</td>
</tr>
</tbody>
</table>

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Observe all Safety Guidelines detailed throughout this manual

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<tr>
<td><strong>FUNCTION PROBLEMS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Welder runs but fails to generate current.</td>
<td>1. Generator or exciter brushes may be loose or missing.</td>
<td>1. Be sure that all brushes bear on the commutator and have proper spring tension.</td>
</tr>
<tr>
<td></td>
<td>2. Exciter may not be operating.</td>
<td>2. Check exciter output voltage with voltmeter or lamp.</td>
</tr>
<tr>
<td></td>
<td>3. Field circuit of generator or exciter may be open.</td>
<td>3. Check for open circuits in rheostat, field leads and field coils. Also check resistors.</td>
</tr>
<tr>
<td></td>
<td>4. Polarity reversing switch may be in the neutral position.</td>
<td>4. Put handle in positive or negative position.</td>
</tr>
<tr>
<td></td>
<td>5. Exciter may have lost excitation.</td>
<td>5. Check components and continuity in flashing circuit.</td>
</tr>
<tr>
<td>Welding arc is loud and spatters excessively.</td>
<td>1. Series field circuit may be open circuited.</td>
<td>1. Check circuit with ringer or voltmeter.</td>
</tr>
<tr>
<td></td>
<td>2. Current setting may be too high.</td>
<td>2. Check setting and current output with ammeter.</td>
</tr>
<tr>
<td></td>
<td>3. Polarity may be wrong.</td>
<td>3. Check polarity. Try reversing polarity or try an electrode of the opposite polarity.</td>
</tr>
</tbody>
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Observe all Safety Guidelines detailed throughout this manual

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<td>Welding current too great or too small compared to indication on the dial.</td>
<td>1. “Current Control” shaft and handle may have turned slightly in the insulated bushing of the current control brush holder, caused by turning handle too hard against one of the stops.</td>
<td>1. With current control against the minimum stop, set pointer to within 1/8&quot; of the last scale division.</td>
</tr>
<tr>
<td></td>
<td>2. Exciter output low causing low output compared to dial indication.</td>
<td>2. Check for shorts in exciter armature with growler.</td>
</tr>
<tr>
<td></td>
<td>3. “Current Control” set to minimum and welder output so great that engine stalls when arc is struck.</td>
<td>3. Check to see that series field is properly connected and not shorted.</td>
</tr>
<tr>
<td>Welder has output and no control</td>
<td>1. Local/Remote switch is in wrong position.</td>
<td>1. Place switch in “LOCAL” position to control output at the welder. Place switch in “REMOTE” position to control output remotely.</td>
</tr>
</tbody>
</table>

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<tr>
<td>No auxiliary power</td>
<td>1. Circuit Breakers open.</td>
<td>1. Check and reset breakers. If breakers keep tripping check connections to auxiliary receptacles. Also make sure load does not exceed receptacle’s current rating.</td>
</tr>
<tr>
<td></td>
<td>2. Faulty connections to auxiliary receptacles.</td>
<td>2. Check connections.</td>
</tr>
<tr>
<td></td>
<td>3. RCD tripped.</td>
<td>3. Clear any ground fault and reset RCD circuit by pressing “Reset” button.</td>
</tr>
</tbody>
</table>

**CAUTION**

SAE-400®
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The specific diagram for a particular code is pasted inside the machine on one of the enclosure panels.
WARNING

Do not touch electrically live parts or electrode with skin or wet clothing.
Insulate yourself from work and ground.

Keep flammable materials away.

Wear eye, ear and body protection.

Spanish
AVIS DE PRECAUCION

No toque las partes o los electrodos bajo carga con la piel o ropa mojada.
Aiselese del trabajo y de la tierra.

Mantenga el material combustible fuera del área de trabajo.

Protéjase los ojos, los oídos y el cuerpo.

French
ATTENTION

Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension.
Isol-ez-vous du travail et de la terre.

Gardez à l’écart de tout matériel inflammable.

Protégez vos yeux, vos oreilles et votre corps.

German
WARNUNG

Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung!
Isolieren Sie sich von den Elektroden und dem Erdboden!

Entfernen Sie brennbarres Material!

Tragen Sie Augen-, Ohren- und Körperschutz!

Portuguese
ATENÇÃO

Não toque partes elétricas e eletródos com a pele ou roupa molhada.
Isol-se da peça e terra.

Mantenha inflamáveis bem guardados.

Use proteção para a vista, ouvido e corpo.

Chinese
警告

皮肤或湿衣物切勿接触带电部件及线路。
使你自己与地面和工件绝缘。

把一切易燃物品移离工作场所。

佩戴眼、耳及身体防护用具。

Korean
위험

전도체나 용접부ジョ 정상 또는 피부로 접촉하지 마십시오.
모래아 접촉과 점착되지 마십시오.

인화성 물질을 접근 시키지 마십시오.

눈, 귀와 몸에 보호망구를 착용하십시오.

Arabic
تحذير

لا تمس الأجزاء التي يجري فيها التيار الكهربائي أو الأطراف بشبا خزان أو بملابس المثبتة بالماء.
ضع عزلًا على جسمك خارج العمل.

ضع أدوات ومعدات واقي على عينيك وآذائك.

ضع المواد القابلة للتشعل في مكان بعيد.

وضع ارتداء وملابس واقي على عينيك وآذائك.

وضع مواد القابلة للتشعل في مكان بعيد.
### WARNING

- Keep your head out of fumes.
- Use ventilation or exhaust to remove fumes from breathing zone.

### AVISO DE PRECAUCIÓN

- Los humos fuera de la zona de respiración.
- Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases.

### ATTENTION

- Débranchez le courant avant l’entretien.
- N’opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.

### WARNUNGS 

- Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)
- Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!

### ATENÇÃO

- NÃO opere com as tampas removidas.
- Mantenha-se afastado das partes moventes.

### ATENÇÃO

- Não opere com os painéis abertos ou guardas removidas.

### 注意事項

- メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切って下さい。
- パネルやカバーを取り外したままで機械操作をしないで下さい。

### 警告

- 不要空腹で作業。

### 위험

- 안전수칙을 바르게 따라 하십시오.
- 본 제품에 동봉된 작업지시서를 숙지하시고, 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

### تحذير

- لا تطعم هذا الجهاز إذا كانت الخطية
- الحديدية الوقائية ليست عليه.

**LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.**
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