

INVERTEC[®] V160

OPERATOR'S MANUAL

MANUALE OPERATIVO

BEDIENUNGSANLEITUNG

MANUAL DE INSTRUCCIONES

MANUEL D'UTILISATION

BRUKSANVISNING OG DELELISTE

GEBRUIKSAANWIJZING

BRUKSANVISNING

INSTRUKCJA OBSŁUGI



LINCOLN[®]
ELECTRIC

LINCOLN ELECTRIC ITALIA S.r.l
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Declaration of conformity
Dichiarazione di conformità
Konformitätserklärung
Declaración de conformidad
Déclaration de conformité
Samsvars erklæring
Verklaring van overeenstemming
Försäkran om överensstämmelse
Deklaracja zgodności

LINCOLN ELECTRIC ITALIA S.r.l.



Declares that the welding machine:
Dichiara che Il generatore per saldatura tipo:
Erklärt, daß die Bauart der Maschine:
Declara que el equipo de soldadura:
Déclare que le poste de soudage:
Bekrefter at denne sveisemaskin:
Verklaart dat de volgende lasmachine:
Försäkrar att svetsomriktaren:
Deklaruje, że spawalnicze źródło energii:

INVERTEC® V160 s/n

conforms to the following directives:
è conforme alle seguenti direttive:
den folgenden Bestimmungen entspricht:
es conforme con las siguientes directivas:
Est conforme aux directives suivantes:
er i samsvar med følgende direktiver:
Overeenkomst conform de volgende richtlijnen:
överensstämmer med följande direktiv:
spełnia następujące wytyczne:

73/23/CEE, 93/68/CEE, 89/336/CEE, 92/31/CEE

and has been designed in conformance with the following norms:
ed è stato progettato in conformità alle seguenti norme:
und in Übereinstimmung mit den nachstehenden Normen hergestellt wurde:
y ha sido diseñado de acuerdo con las siguientes normas:
et qu'il a été conçu en conformité avec les normes:
og er produsert og testet iht. følgende standarder:
en is ontworpen conform de volgende normen:
och att den konstruerats i överensstämmelse med följande standarder:
i że zostało zaprojektowane zgodnie z wymaganiami następujących norm:

EN 50199, EN 60974-1

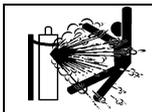
Dario Gatti
LINCOLN ELECTRIC ITALIA European Engineering Manager
LINCOLN ELECTRIC ITALIA S.r.l., Via Fratelli Canepa 8, 16010 Serra Riccò (GE), Italia



WARNING

This equipment must be used by qualified personnel. Be sure that all installation, operation, maintenance and repair procedures are performed only by qualified individuals. Read and understand this manual before operating this equipment. Failure to follow the instructions in this manual could cause serious personal injury, loss of life, or damage to this equipment. Read and understand the following explanations of the warning symbols. Lincoln Electric is not responsible for damages caused by improper installation, improper care or abnormal operation.

	<p>WARNING: This symbol indicates that instructions must be followed to avoid serious personal injury, loss of life, or damage to this equipment. Protect yourself and others from possible serious injury or death.</p>
	<p>READ AND UNDERSTAND INSTRUCTIONS: Read and understand this manual before operating this equipment. Arc welding can be hazardous. Failure to follow the instructions in this manual could cause serious personal injury, loss of life, or damage to this equipment.</p>
	<p>ELECTRIC SHOCK CAN KILL: Welding equipment generates high voltages. Do not touch the electrode, work clamp, or connected work pieces when this equipment is on. Insulate yourself from the electrode, work clamp, and connected work pieces.</p>
	<p>FUMES AND GASES CAN BE DANGEROUS: Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. To avoid these dangers the operator must use enough ventilation or exhaust to keep fumes and gases away from the breathing zone.</p>
	<p>ARC RAYS CAN BURN: 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. Use suitable clothing made from durable flame-resistant material to protect you skin and that of your helpers. Protect other nearby personnel with suitable, non-flammable screening and warn them not to watch the arc nor expose themselves to the arc.</p>
	<p>WELDING SPARKS CAN CAUSE FIRE OR EXPLOSION: Remove fire hazards from the welding area and have a fire extinguisher readily available. Welding sparks and hot materials from the welding process can easily go through small cracks and openings to adjacent areas. Do not weld on any tanks, drums, containers, or material until the proper steps have been taken to insure that no flammable or toxic vapors will be present. Never operate this equipment when flammable gases, vapors or liquid combustibles are present.</p>
	<p>ELECTRICALLY POWERED EQUIPMENT: Turn off input power using the disconnect switch at the fuse box before working on this equipment. Ground this equipment in accordance with local electrical regulations.</p>
	<p>ELECTRICALLY POWERED EQUIPMENT: Regularly inspect the input, electrode, and work clamp cables. If any insulation damage exists replace the cable immediately. Do not place the electrode holder directly on the welding table or any other surface in contact with the work clamp to avoid the risk of accidental arc ignition.</p>
	<p>ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS: Electric current flowing through any conductor creates electric and magnetic fields (EMF). EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before operating this equipment.</p>
	<p>WELDED MATERIALS CAN BURN: Welding generates a large amount of heat. Hot surfaces and materials in work area can cause serious burns. Use gloves and pliers when touching or moving materials in the work area.</p>
	<p>CE COMPLIANCE: This equipment complies to the European Communities directives.</p>
	<p>SAFETY MARK: This equipment is suitable for supplying power for welding operations carried out in an environment with increased hazard of electric shock.</p>



CYLINDER MAY EXPLODE IF DAMAGED: 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. Always keep cylinders in an upright position securely chained to a fixed support. Do not move or transport gas cylinders with the protection cap removed. Do not allow the electrode, electrode holder, work clamp or any other electrically live part to touch a gas cylinder. Gas cylinders must be located away from areas where they may be subjected to physical damage or the welding process including sparks and heat sources.

HF

CAUTION: The high frequency used for contact-free ignition with TIG (GTAW) welding, can interfere with the operation of insufficiently shielded computer equipment, EDP centers and industrial robots, even causing complete system breakdown. TIG (GTAW) welding may interfere with electronic telephone networks and with radio and TV reception.

Installation and Operator Instructions

Read this entire section before installation or operation of the machine.

Location and Environment

This machine will operate in harsh environments. However, it is important that simple preventative measures are followed to assure long life and reliable operation.

- Do not place or operate this machine on a surface with an incline greater than 15° from horizontal.
- This machine must be located where there is free circulation of clean air without restrictions for air movement to and from the air vents. Do not cover the machine with paper, cloth or rags when switched on.
- Dirt and dust that can be drawn into the machine should be kept to a minimum.
- This machine has a protection rating of IP23S. Keep it dry when possible and do not place it on wet ground or in puddles.
- Locate the machine away from radio controlled machinery. Normal operation may adversely affect the operation of nearby radio controlled machinery, which may result in injury or equipment damage. Read the section on electromagnetic compatibility in this manual.
- Do not operate in areas with an ambient temperature greater than 40°C.

Input Supply Connection

Check the input voltage, phase, and frequency supplied to this machine before turning it on. The allowable input voltage is indicated in the technical specification section of this manual and on the rating plate of the machine. Verify the connection of grounding wires from the machine to the input source.

Make sure the amount of power available from the input connection is adequate for normal operation of the machine. The necessary fuse and cable sizes are indicated in the technical specification section of this manual.

This machine is designed to operate on engine driven generators as long as the 230Vac (or 115Vac for V160 2V) auxiliary can supply adequate power as indicated in the technical specification section of this manual. The auxiliary supply of the generator must also meet the following conditions:

- The AC waveform peak voltage is below 205V (for 115Vac input) or 410V (for 230Vac input).
- The AC waveform frequency is between 50 and 60

hertz.

- The RMS voltage of the AC waveform is always equal to:

For V160:	230Vac ± 15%
For V160 2V:	115Vac or 230Vac ± 10%

It is important to check these conditions because many engine driven generators produce high voltage spikes. Operation of this machine on engine driven generators not conforming to these conditions is not recommended and may damage the machine.

The V160 2V has an internal fuse placed on the input power circuit for prevention of internal damages. This fuse limits the current absorbed from the input supply.

Output Connections

A quick disconnect system using Twist-Mate™ cable plugs is used for the welding cable connections. Refer to the following sections for more information on connecting the machine for operation of stick welding (MMA) or TIG welding (GTAW).



Stick Welding (MMA)

First determine the proper electrode polarity for the electrode to be used. Consult the electrode data for this information. Then connect the output cables to the output terminals of the machine for the selected polarity. For example, if DC(+) welding will be used then connect the electrode cable to the (+) terminal of the machine and the work clamp to the (-) terminal. Insert the connector with the key lining up with the keyway and rotate approximately ¼ turn clockwise. Do not over tighten.

For DC(-) welding switch the cable connections at the machine so that the electrode cable is connected to (-) and the work clamp is connected to (+).

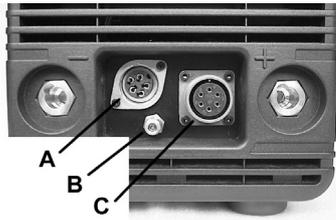
TIG Welding (GTAW)

This machine does not include a TIG torch necessary for TIG welding, but one may be purchased separately. Refer to the accessories section for more information. Most TIG welding is done with DC(-) polarity; connect the torch cable to the (-) terminal of the machine and the work clamp to the (+) terminal. Insert the connector with the key lining up with the keyway and rotate

approximately ¼ turn clockwise. Do not over tighten.

For V160-S machines, connect the gas hose from the TIG torch to a gas regulator on the cylinder of gas to be used.

For V160-T machines, connect the gas hose from the TIG torch to the gas connector (B) on the front of the machine. If necessary, an extra gas connector for the fitting on the front of the machine is included in the package. Next, connect the fitting on the back of the machine to a gas regulator on the cylinder of gas to be used. An input gas line and the required fittings are also included in the package. Connect the TIG torch trigger to the trigger connector (A) on the front of the machine.

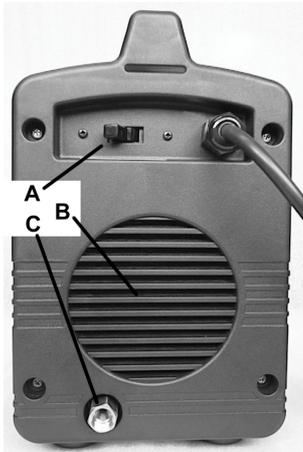


Remote Control Connection

For V160-T machines only, refer to the accessories section for a list of remote controls. If a remote control is used, it will be connected to the remote connector (C) on the front of the machine. The machine will automatically detect the remote control, turn on the REMOTE LED, and switch to remote control mode. More information on this mode of operation will be given in the next section.

Controls and Operational Features

A. **Power Switch:** Controls the input power to the machine. Make sure the machine is properly connected to the input supply before turning the machine on.



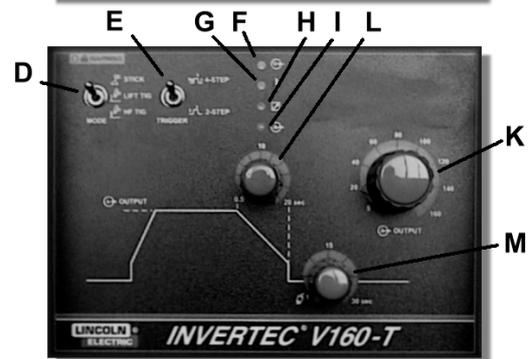
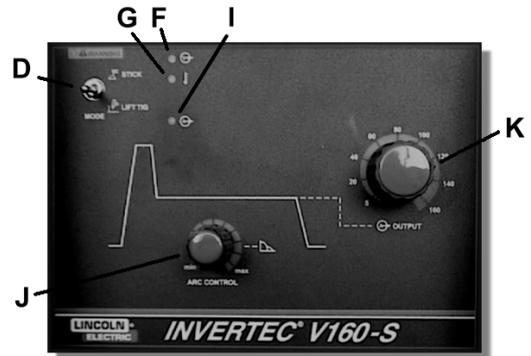
B. **Fan:** The cooling fan will turn ON when the machine is turned ON and it will continue to run whenever the output of the machine is ON. If the output of the machine is OFF for more than five minutes, the fan will turn OFF. This reduces the amount of dirt that is deposited inside the machine and reduces power consumption.

Refer to the Output LED section below for more information about conditions when the output of the machine is ON. The V160-S always has the output turned ON so the fan will not turn OFF. Additionally, when the V160-T machines are in Stick mode, the fan will not turn OFF because the output remains ON.

C. **Gas Inlet (V160-T machines only):** Connector for the TIG shielding gas. Use the supplied gas line and connector to connect the machine to the gas source. The gas source must have a pressure regulator and flow gage installed.

D. **Mode Switch:** This switch changes the welding modes of the machine. The V160-S has two

welding modes: Stick (SMAW) and Lift TIG (GTAW). The V160-T machines have three welding modes: Stick (SMAW), Lift TIG (GTAW) and HF TIG (GTAW).



When the mode switch is in the Stick position, the following welding features are enabled:

- **Hot Start:** This is a temporary increase in the output current during the start of the stick welding process. This helps ignite the arc quickly and reliably.
- **Arc Force:** This is a temporary increase in the output current during normal stick welding. This temporary increase in output current is used to clear intermittent connections between the electrode and the weld puddle that occur during normal stick welding. The amount of arc force can be adjusted on the V160-S, refer to Arc Control, described below.
- **Anti-Sticking:** This is a function which decreases the output current of the machine to a low level when the operator makes an error and sticks the electrode to the work piece. This decrease in current allows the operator to remove the electrode from the electrode holder without creating large sparks which can damage the electrode holder.

When the mode switch is in the Lift TIG position, the stick welding functions are disabled and the machine is ready for Lift TIG welding. Lift TIG is a method of starting a TIG weld by first pressing the TIG torch electrode on the work piece in order to create a low current short circuit. Then, the electrode is lifted from the work piece to start the TIG arc.

The last mode switch position, HF TIG, is only available on the V160-T machines. When the mode switch is in this position, the stick welding functions are disabled and the machine is ready for HF TIG welding. During the HF TIG mode, the TIG arc is started by HF without pressing the electrode on the work piece. The HF used for starting the TIG arc will remain on for 6.5 seconds; if the arc is not started in this time limit, the trigger sequence must be restarted.

- E. Trigger Mode Switch (V160-T machines only): This switch changes between 2-step and 4-step trigger sequences. For an explanation of these trigger sequences refer to the trigger sequences explained below.
- F. Power LED: This indicator will flash on and off when the machine is first turned on. After approximately 2 seconds it will stop flashing and remain on to signal that the machine is ready.
- G. Thermal LED: This indicator will turn on when the machine is overheated and the output has been disabled. This normally occurs when the duty cycle of the machine has been exceeded. Leave the machine on to allow the internal components to cool. When the indicator turns off, normal operation is again possible.
- H. Remote LED (V160-T machines only): This indicator will turn on when a remote control is connected to the machine via the remote control connector. Using a remote control will change the function of the output current control, refer to the output current control section below.
- I. Output LED: This indicator turns on when the output of the machine is on. Both the type of machine and the position of the mode switch determine when the output of the machine is turned on.

V160-S: In both welding modes, selected by the mode switch, the output of the machine is always turned ON.

V160-T: In stick welding mode, the output of the machine is automatically turned on. However, in both of the TIG welding modes, the output of the machine is turned ON and OFF by the TIG torch connected to the trigger connector on the front of the machine.

- J. Arc Control (V160-S only): In stick welding mode, this controls the amount of current used during any intermittent short circuiting of the electrode during welding. In TIG welding mode, this is not used.
- K. Output Current Control: This controls the output, or welding, current of the machine.

For V160-T machines, the function of this control knob is changed if a remote control is connected. If the Remote LED is ON, this indicates that a remote control is connected and the function of the output current control will be:

Stick Welding Mode: The remote control will adjust the output current of the machine from 5 to 160A. The output current control knob on the display panel is not used.

TIG Welding Modes: The maximum output current of the machine is set by the output current control knob. Then the remote control adjusts the output current from the minimum output (5A) to the value set by the output current control knob. For example, if the output current control knob on the machine is set to 100A then the remote control will adjust the output current from a minimum of 5A to a maximum of 100A.

- L. Downslope Control (V160-T machines only): In the TIG welding modes, this control knob will adjust the downslope time from 0.5 to 20 seconds. (The upslope time is always 0.5 seconds.) Refer to the trigger sequence section below to understand how downslope is activated. In Stick welding mode, this is not used.
- M. Postflow Control (V160-T machines only): In the TIG welding modes, this control knob will adjust the shielding gas postflow time from 0.5 to 30 seconds. (The preflow time is always 0.5 seconds.) In Stick welding mode, this is not used.
- N. Meter (V160-T Pulse only): This meter displays the preset welding current before welding and the actual welding current during welding. Like the output current control, the function of the meter is changed if a remote control is connected. If the Remote LED is ON, this indicates that a remote control is connected and the meter will display the following information before welding (during welding, the meter always displays the actual welding current):

Stick Welding Mode: The meter displays the preset welding current but this is adjusted from the remote control as explained in the Output Current Control section.

TIG Welding Modes: The meter displays the maximum output current which is set by the output current control knob. The preset welding current is then adjusted by the remote control, but it is not displayed on the meter.

- O. Pulsing Mode Switch (V160-T Pulse only): In the TIG welding modes, this switch turns the pulsing function ON and controls the pulsing frequency range (20Hz or 300Hz). In Stick welding mode, this is not used.
- P. Pulsing LED (V160-T Pulse only): This indicator shows the pulsing frequency when pulsing is turned ON. With this indication, the operator can adjust the frequency to the desired value before welding. (Note: At higher frequencies the LED flashes very fast and seems to be continuously ON however it is pulsing.) If pulsing is turned OFF or if the machine

is in Stick welding mode, the indicator will be OFF.

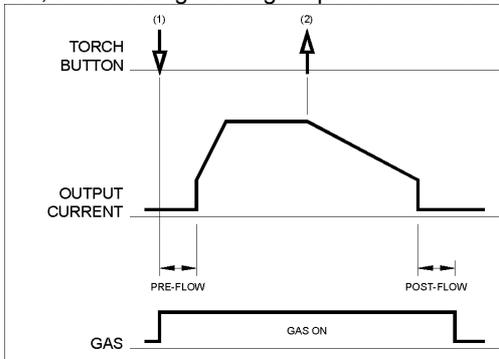
- Q. Pulsing Frequency Control (V160-T Pulse only): When the pulsing function is ON, this control knob will adjust the pulsing frequency. The pulsing frequency adjustment range is 0.2-20Hz or 3-300Hz depending on the Pulsing Mode Switch position.
- R. Pulsing Background Current Control (V160-T Pulse only): When the pulsing function is ON, this control knob will adjust the pulsing background current. This is the current during the low portion of the pulse waveform; it can be adjusted from 10% to 90% of the welding current.

TIG Trigger Sequences

TIG welding can be done in either the 2-step or 4-step mode. The specific sequences of operation for these two trigger modes are explained below.

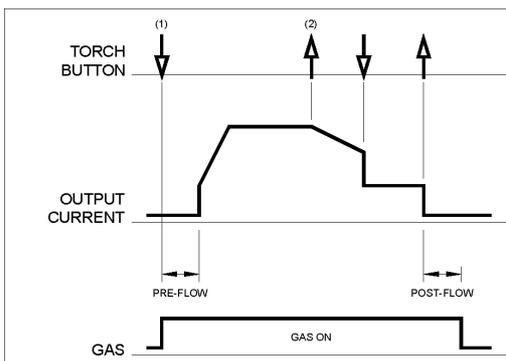
2-Step TIG Sequence

With the 2-step trigger mode and a TIG welding mode selected, the following welding sequence will occur.



1. Press and hold the TIG torch trigger to start the sequence. The machine will open the gas valve to start the flow of the shielding gas. After the preflow time, to purge air from the torch hose, the output of the machine is turned ON. At this time the arc is started according to the selected welding mode. After the arc is started the output current will be increased at a controlled rate, or upslope time, until the Welding current is reached.
2. Release the TIG torch trigger to stop welding. The machine will now decrease the output current at a controlled rate, or downslope time, until the Crater current is reached and the output of the machine is turned OFF.

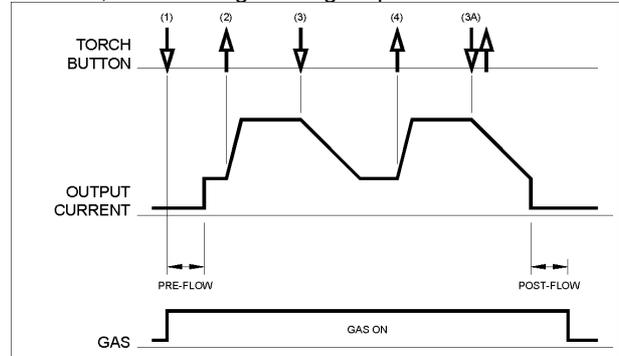
After the arc is turned OFF, the gas valve will remain open to continue the flow of the shielding gas to the hot electrode and work piece.



As shown above, it is possible to press and hold the TIG torch trigger a second time during downslope to end the downslope function and maintain the output current at the Crater current. When the TIG torch trigger is released the output will turn OFF and the postflow time will start. This operation, 2-step restart disabled, is the default setting from the factory.

4-Step Sequence

With the 4-step trigger mode and a TIG welding mode selected, the following welding sequence will occur.



1. Press and hold the TIG torch trigger to start the sequence. The machine will open the gas valve to start the flow of the shielding gas. After the preflow time, to purge air from the torch hose, the output of the machine is turned ON. At this time the arc is started according to the selected welding mode. After the arc is started the output current will be at the Start current. This condition can be maintained as long or as short as necessary.

If the Start current is not necessary, do not hold the TIG torch trigger as described at the beginning of this step. In this condition, the machine will pass from Step 1 to Step 2 when the arc is started.

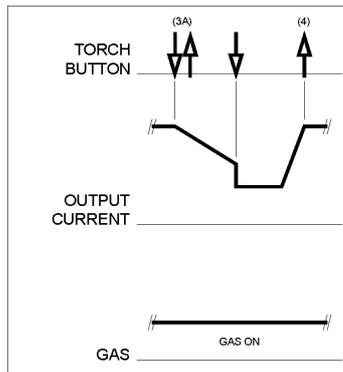
2. Releasing the TIG torch trigger starts the upslope function. The output current will be increased at a controlled rate, or upslope time, until the Welding current is reached.
3. Press and hold the TIG torch trigger when the main part of the weld is complete. The machine will now decrease the output current at a controlled rate, or downslope time, until the Crater current is reached. This Crater current can be maintained as long or as short as necessary.

This sequence has an automatic restart so welding will continue after this step. This operation, 4-step restart enabled, is the default setting from the factory. If the weld is completely finished, use the following sequence instead of step 3 described above.

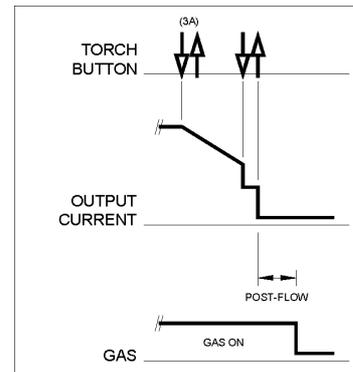
3A. Quickly press and release the TIG torch trigger. The machine will now decrease the output current at a controlled rate, or downslope time, until the Crater current is reached and the output of the machine is turned OFF. After the arc is turned OFF the postflow time will start.

4. Release the TIG torch trigger. The output current will again increase to the Welding current, like in step 2, to continue welding. When the main part of the weld is complete go to step 3.

As shown here, after the TIG torch trigger is quickly pressed and released from step 3A, it is possible to press and hold the TIG torch trigger another time to end the downslope time and maintain the output current at the Crater current. When the TIG torch trigger is released the output will again increase to the Welding current, like in step 4, to continue welding. When the main part of the weld is complete go to step 3.



As shown here, again after the TIG torch trigger is quickly pressed and released from step 3A, it is possible to quickly press and release the TIG torch trigger a second time to end the downslope time and stop welding.



04/03

Electromagnetic Compatibility (EMC)

02/02

This machine has been designed in accordance with all relative directives and norms. However, it may still generate electromagnetic disturbances that can affect other systems like telecommunications (telephone, radio, and television) or other safety systems. These disturbances can cause safety problems in the affected systems. Read and understand this section to eliminate or reduce the amount of electromagnetic disturbance generated by this machine.



This machine has been designed to operate in an industrial area. To operate in a domestic area it is necessary to observe particular precautions to eliminate possible electromagnetic disturbances. The operator must install and operate this equipment as described in this manual. If any electromagnetic disturbances are detected the operator must put in place corrective actions to eliminate these disturbances with, if necessary, assistance from Lincoln Electric.

Before installing the machine, the operator must check the work area for any devices that may malfunction because of electromagnetic disturbances. Consider the following.

- Input and output cables, control cables, and telephone cables that are in or adjacent to the work area and the machine.
- Radio and/or television transmitters and receivers. Computers or computer controlled equipment.
- Safety and control equipment for industrial processes. Equipment for calibration and measurement.
- Personal medical devices like pacemakers and hearing aids.
- Check the electromagnetic immunity for equipment operating in or near the work area. The operator must be sure that all equipment in the area is compatible. This may require additional protection measures.
- The dimensions of the work area to consider will depend on the construction of the area and other activities that are taking place.

Consider the following guidelines to reduce electromagnetic emissions from the machine.

- Connect the machine to the input supply according to this manual. If disturbances occur it may be necessary to take additional precautions such as filtering the input supply.
- The output cables should be kept as short as possible and should be positioned together. If possible connect the work piece to ground in order to reduce the electromagnetic emissions. The operator must check that connecting the work piece to ground does not cause problems or unsafe operating conditions for personnel and equipment.
- Shielding of cables in the work area can reduce electromagnetic emissions. This may be necessary for special applications.

Technical Specifications

V160:

INPUT			
Input Voltage 230V ± 15% Single Phase	Input Power at Rated Output 5.4kW @ 100% Duty Cycle 7.0kW @ 35% Duty Cycle	Frequency 50/60 Hertz (Hz)	
RATED OUTPUT AT 40°C			
Duty Cycle (Based on a 10 min. period) 100% 35%	Output Current 130A 160A	Output Voltage 25.2 Vdc 26.4 Vdc	
OUTPUT RANGE			
Welding Current Range 5-160 Amps		Maximum Open Circuit Voltage 48 Vdc	
RECOMMENDED INPUT CABLE AND FUSE SIZES			
Fuse or Circuit Breaker Size 16A Superlag	Type of Plug SCHUKO 16A/250V (Included with Machine)	Input Power Cable 3 Conductor, 2.5mm ²	
PHYSICAL DIMENSIONS			
Height 320 mm	Width 200 mm	Length 430 mm	Weight 10.5 – 11.0 Kg
Operating Temperature -10°C to +40°C		Storage Temperature -25°C to +55°C	

V160 2V:

INPUT			
Input Voltage 115 / 230V ± 10% Single Phase	Input Power at Rated Output 5.4kW @ 100% Duty Cycle 7.0kW @ 35% Duty Cycle	Frequency 50/60 Hertz (Hz)	
RATED OUTPUT AT 40°C			
Duty Cycle (Based on a 10 min. period)	Output Current	Output Voltage	Input Circuit
100%	50A (Stick)	22.0 Vdc	115 Vac (16A Circuit)
	80A (TIG)	13.2 Vdc	
	85A (Stick)	23.4 Vdc	115 Vac (32A Circuit)
	125A (TIG)	15.0 Vdc	
	75A (Stick)	23.0 Vdc	230 Vac (13A Circuit)
	120A (TIG)	14.8 Vdc	
35%	130A	25.2 Vdc	230 Vac
	70A (Stick)	22.8 Vdc	115 Vac (16A Circuit)
	110A (TIG)	14.4 Vdc	
	105A (Stick)	24.2 Vdc	115 Vac (32A Circuit)
	150A (TIG)	16.0 Vdc	
	115A (Stick)	24.6 Vdc	230 Vac (13A Circuit)
	160A (TIG)	16.4 Vdc	
160A	26.4 Vdc	230 Vac	
OUTPUT RANGE			
Welding Current Range 5-160 Amps		Maximum Open Circuit Voltage 48 Vdc	
RECOMMENDED INPUT CABLE AND FUSE SIZES			
Type of Plug UK 250V with 13A fuse inside (Included with Machine)		Input Power Cable 3 Conductor, 2.5mm ²	

For any maintenance or repair operations it is recommended to contact the nearest technical service center or Lincoln Electric. Maintenance or repairs performed by unauthorized service centers or personnel will null and void the manufacturers warranty.