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INVERTEC[®] PC 65 & PC 105

OPERATOR'S MANUAL



ENGLISH

LINCOLN[®]
ELECTRIC

LINCOLN ELECTRIC ITALIA S.r.l
Via Fratelli Canepa 8, 16010 Serrà Riccò (GE), Italia
www.lincolnelectric.eu

Declaration of conformity
LINCOLN ELECTRIC ITALIA S.r.l.



Declares that the plasma machine:

INVERTEC[®] PC65
INVERTEC[®] PC105

conforms to the following directives:

2006/95/CEE, 2004/108/CEE

and has been designed in compliance with the
following standards:

EN 60529, EN 60974-1, EN 60974-10

A handwritten signature in red ink, appearing to read 'Dario Gatti'.

(2005)

Dario Gatti

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

12/05



THANKS! For having chosen the QUALITY of the Lincoln Electric products.

- Please Examine Package and Equipment for Damage. Claims for material damaged in shipment must be notified immediately to the dealer.
- For future reference record in the table below your equipment identification information. Model Name, Code & Serial Number can be found on the machine rating plate.

Model Name:	
.....	
Code & Serial number:	
.....
Date & Where Purchased:	
.....

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WARNING

This equipment must be used by qualified personnel. Be sure that all installation, operation, maintenance and repair procedures are performed only by qualified person. 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. Plasma cutting or gouging 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>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>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 shall consult their physician before operating this equipment.</p>
	<p>CE COMPLIANCE: This equipment complies with the European Community Directives.</p>
	<p>ARTIFICIAL OPTICAL RADIATION: According with the requirements in 2006/25/EC Directive and EN 12198 Standard, the equipment is a category 2. It makes mandatory the adoption of Personal Protective Equipments (PPE) having filter with a protection degree up to a maximum of 15, as required by EN169 Standard.</p>
	<p>WORK MATERIALS CAN BURN: Cutting 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>SAFETY MARK: This equipment is suitable for supplying power for cutting operations carried out in an environment with increased hazard of electric shock.</p>
	<p>EQUIPMENT WEIGHT OVER 30kg: Move this equipment with care and with the help of another person. Lifting may be dangerous for your physical health.</p>
	<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 torch, 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 cutting process including sparks and heat sources.</p>
	<p>Cutting sparks can cause explosion or fire. Keep flammables away from cutting. Do not cut near flammables. Have a fire extinguisher nearby, and have a watch person ready to use it. Do not cut on drums or any closed container.</p>

	The plasma arc can cause injury and burns. Keep your body away from nozzle and plasma arc. Turn off power before disassembling torch. Do not grip material near cutting path. Wear complete body protection.
	Electric shock from torch or wiring can kill. Wear dry insulating gloves. Do not wear wet or damaged gloves. Protect yourself from electric shock by insulating yourself from work and ground. Disconnect input plug or power before working on machine.
	Breathing cutting fumes can be hazardous to your health. Keep your head out of the fumes. Use forced ventilation or local exhaust to remove the fumes. Use ventilating fan to remove fumes.
	Arc rays can burn eyes and injure skin. Wear hat and safety glasses. Use ear protection and button shirt collar. Use welding helmet with correct shade of filter. Wear complete body protection.
	Become trained and read the instructions before working on the machine or cutting.
	Do not remove or paint over (cover) the label.

Installation and Operator Instructions

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

Location and Environment

This machine can 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.
- Do not use this machine for pipe thawing.
- 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 IP23. 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.

Duty Cycle

The duty cycle of a plasma machine is the percentage of time in a 10 minute cycle at which the operator can operate the machine at rated cutting current.

Example: 35% duty cycle:



Cutting for 3.5 minutes.

Break for 6.5 minutes.

Refer to the Technical Specification section for more information about the machine rated duty cycles.

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. Be sure that the machine is grounded.

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

WARNING

This machine is not designed to operate on engine driven generators. Operation of this machine with engine driven generators may damage the machine.

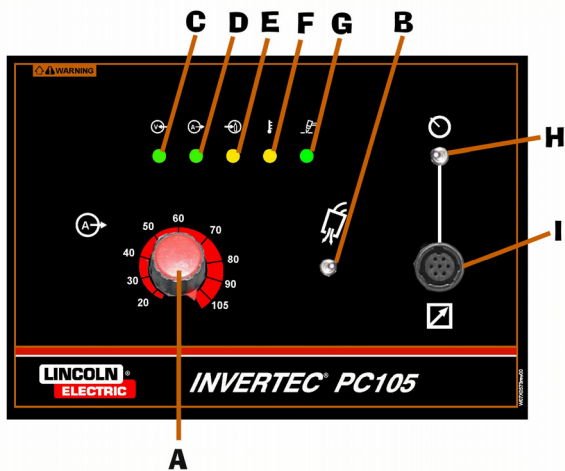
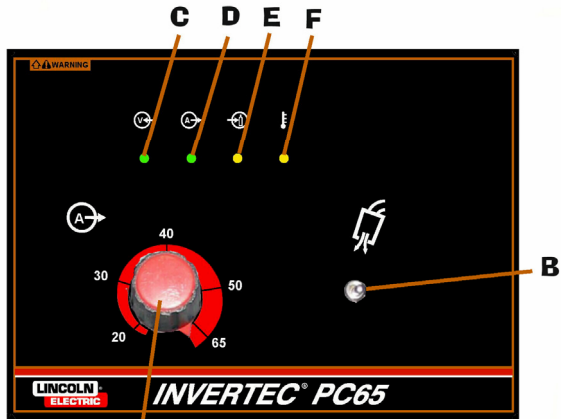
Output Connections

Refer to the points [J] and [K] below.

WARNING

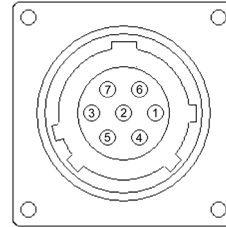
Open Circuit Voltage $U_0 > 100Vdc$. For more information refer to the Technical Specification section.

Controls and Operational Features



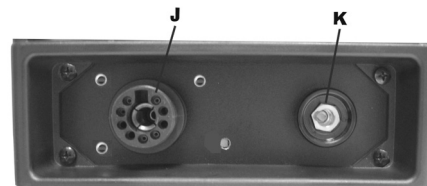
- A. **Output Current Knob:** Potentiometer used to set the output current used during cutting. Refer to the Technical Specification section for more information about the machine rated current range.
- B. **Gas Test/Purge Switch:** This switch opens the air stream from the torch with no cutting current being present; this feature is very useful to blow the work piece, to cool the torch or to simply check the availability of air in the torch circuit.
- C. **Power ON/OFF LED:** This LED lights up when the machine is ON.
- D. **Output LED:** This LED lights up when the output terminals of the power source are energized.
- E. **Gas Alarm LED:** This indicator lit when the value of the cutting torch air pressure falls below the minimum level required.
- F. **Thermal LED:** This LED lights up when the machine is overheated and the output has been disabled. This usually occurs when the duty cycle of the machine has been exceeded. Leave the machine on to allow the internal components to cool. When the thermal LED light turns off, normal operation is again possible.
- G. **Cutting LED (PC 105 only):** This LED lights up during cutting.

- H. **Remote ON/OFF Switch (PC 105 only):** This switch enables/disables the Remote Control Connector.
- I. **Remote Control Connector (PC 105 only):** Connect here the remote control unit. Refer to the picture below for the functions related to each pin of the connector (front view):

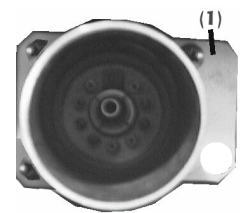


1. INPUT 0-5Vdc: Output Current Adjustment.
2. OUTPUT 12Vdc @ 1A max: Auxiliary Power supply.
3. GROUND.
4. INPUT: Start power source active connecting to GROUND.
5. GROUND.
6. CLEAN CONTACT POLE (1st pole): Normally Open contact closes when the arc is transferred to the work. Maximum contact rating: 120Vac @ 1A.
7. CLEAN CONTACT POLE (2nd pole): See point 6 above.

- J. **Torch Connector:** Connect here the cutting torch. The torch connection to the power source is very easily performed through a quick-connector carrying the torch trigger circuit, the gas line and the torch power cable.



- Slide the metal safety sleeve (1) on the torch cable, over the torch connector.
- Insert the torch connector into the corresponding receptacle on the front panel.
- Slide down the safety sleeve until it fits on the front panel and fasten it using the 3 supplied screws.



WARNING

Use **ONLY** the torch supplied with this machine. For a replacement refer to the Maintenance section of this manual.

WARNING

TORCH PROTECTION: The torch delivered with the power source is equipped with a safety device that prevents the operator from accidental contact with electrically live parts.

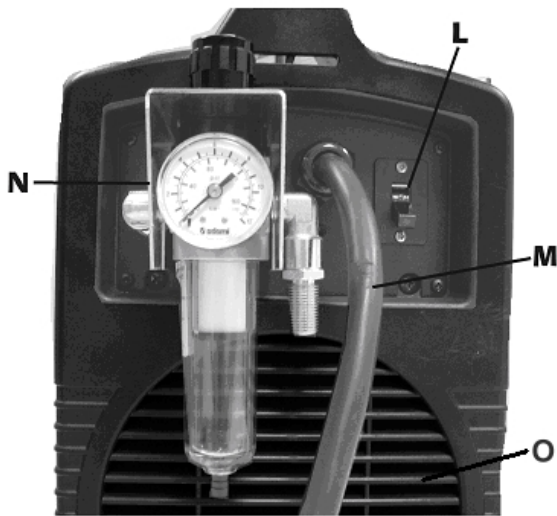
⚠ WARNING

The machine doesn't operate without its safety protection device (torch protection sleeve) properly mounted.

⚠ WARNING

Always turn OFF the machine when working on the torch.

- K. Positive Quick Disconnect: Positive output connector for the cutting circuit. As far the ground connection, this is to be connected to the work piece and to a "DINSE" connector on the front of the power source.



- L. Power Switch: It turns ON / OFF the input power to the machine.
- M. Input cable: Connect it to the mains.
- N. Gas Inlet and Pressure Regulator: Connect here the hose carrying the gas to the machine.

The air plasma cutting process uses air as primary cutting gas and as torch cooling gas. The air circuit includes a pressure regulator set at 5bar.

The pilot arc is struck by energizing a first electrovalve (solenoid valve). Once the cutting arc is activated a second electrovalve (solenoid valve) is energized allowing the primary air the flow. This valve lets the air flow only when driven by the electronic logic devices during the pre-flow, post-flow and cutting stages, or if the Gas Test switch on the front panel is turned on.

⚠ WARNING

A clean, dry air or nitrogen must be supplied to the machine. A pressure setting above 7,5bar could damage the torch. Failure to observe these precautions could result in excessive operating temperatures or damage to the torch.

- O. Fan: Provides machine cooling. It is switched ON with the machine and continues to run till the machine is turned OFF.

The design concept at the basis of these power sources is to have available a current which remains constant at the set value, independently from the length of the plasma arc.

- Connect the torch [J] and the work cable [K].
- Turn ON the Power Switch [L] placed on the back of the machine; the LED [C] on the front panel will turn ON. One second after the switching ON a "click" from the starter relay will be heard; the unit is now ready to operate.
- Check through the Gas Test [B] switch that the primary air [N] is available. The working pressure should be set at 5bar.
- Set the desired current value with the Output Current [A] knob.

To start the cutting process just press the torch button, making sure you are not aiming the torch air blow towards people or foreign objects. During the cutting process it is possible to hold the torch away from the work piece for an extended period of time.

- Avoid to touch the work piece directly with the torch, when you do not have the torch with the proper nozzles.
- The arc length should not be more than 6-7mm.

Once the cutting process is terminated releasing off the torch button will cause the plasma arc to be turned off; the air flow will continue for approximately 30sec. (post-flow) to allow the cooling down of the torch.

Maintenance

⚠ WARNING

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.

The frequency of the maintenance operations may vary in accordance with the working environment. Any noticeable damage should be reported immediately.

- Check cables and connections integrity. Replace, if necessary.
- Regularly clean the torch head, check its consumables and if necessary replace them. Refer to the torch instruction manual before changing or servicing the torch.

⚠ WARNING

Refer to the instructions before changing or servicing the torch.

- Keep clean the machine. Use a soft dry cloth to clean the enclosing case, especially the airflow inlet / outlet louvers.

⚠ WARNING

Do not open this machine and do not introduce anything into its openings. Power supply must be disconnected from the machine before maintenance and service. After each repair, perform proper tests to check safety requirements.

Cutting Speed

The cutting speed is a function of:

- Thickness and of material to be cut.
- Value of set current. The current setting affects the quality of the cut edge.
- Geometrical shape of the cut (whether straight or curved).

In order to provide indications on the most suitable setting, the following table was established, based on tests performed on an automatic test-bench; the best results however can only be achieved from direct experience by the operator in his actual working conditions.

MILD STEEL			ALUMINIUM			STAINLESS STEEL		
Thickness (mm)	Current (A)	Speed (m/min.)	Thickness (mm)	Current (A)	Speed (m/min.)	Thickness (mm)	Current (A)	Speed (m/min.)
4	40	0,86	8	40	0,61	4	40	0,74
6	40	0,72	15	40	0,38	6	40	0,61
15	40	0,38	6,0	60 (80)	1,12 (1,15)	15	40	0,33
6,0	60 (80)	1,5 (2,40)	12,0	60 (100)	0,45 (0,76)	6,0	60 (80)	1,20 (2,00)
12,0	60 (80)	0,60 (1,00)	18,0	60 (100)	0,15 (0,25)	12,0	60 (100)	0,45 (0,76)
18,0	100	0,5	25,0	100	0,125	18,0	60 (100)	0,23 (0,38)
25,0	100	0,25				25,0	100	0,25
32,0	100	0,125				25,0	100	0,25

Electromagnetic Compatibility (EMC)

01/11

This machine has been designed in accordance with all relevant directives and standards. 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. 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. The Class A equipment is not intended for use in residential locations where the electrical

power is provided by the public low-voltage supply system. There may be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated disturbances. This equipment does not comply with IEC 61000-3-12. If it is connected to a public low-voltage system, it is responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment may be connected.

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

INPUT			
Input Voltage 400 V ± 15% Three Phase	Input Power at Rated Output PC65 5 kW @ 100% Duty Cycle 9 kW @ 35% Duty Cycle PC105 8 kW @ 100% Duty Cycle 15 kW @ 35% Duty Cycle	EMC Class A A	Frequency 50/60 Hz
RATED OUTPUT AT 40°C			
Duty Cycle (Based on a 10 min. period)	Output Current	Output Voltage	
PC65 100% 60% 35%	40 A 50 A 65 A	96 Vdc 100 Vdc 106 Vdc	
PC105 100% 60% 35%	60 A 80 A 105 A	104 Vdc 112 Vdc 122 Vdc	
OUTPUT RANGE			
Cutting Current Range PC65 20 ÷ 65 A PC105 20 ÷ 105 A	Maximum Open Circuit Voltage PC65 540 Vdc PC105 540 Vdc	Pilot Arc Current PC65 20 A PC105 20 A	
COMPRESSED AIR or GAS			
Required Inlet Pressure 5.0bar ÷ 7.5bar			
RECOMMENDED INPUT CABLE AND FUSE SIZES			
Fuse (delayed) or Circuit Breaker ("D" characteristic) Size PC65 25 A PC105 32 A	Input Power Cable PC65 4 Conductor, 2.5 mm ² PC105 4 Conductor, 4 mm ²		
PHYSICAL DIMENSIONS			
Height PC65 385 mm PC105 500 mm	Width PC65 215 mm PC105 275 mm	Length PC65 586 mm PC105 711 mm	Weight PC65 19 kg PC105 32 kg
Operating Temperature -10°C ÷ +40°C		Storage Temperature -25°C ÷ +55°C	

WEEE

07/06

English		Do not dispose of electrical equipment together with normal waste! In observance of European Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE) and its implementation in accordance with national law, electrical equipment that has reached the end of its life must be collected separately and returned to an environmentally compatible recycling facility. As the owner of the equipment, you should get information on approved collection systems from our local representative. By applying this European Directive you will protect the environment and human health!

Spare Parts

12/05

Part List reading instructions
<ul style="list-style-type: none"> Do not use this part list for a machine if its code number is not listed. Contact the Lincoln Electric Service Department for any code number not listed. Use the illustration of assembly page and the table below to determine where the part is located for your particular code machine. Use only the parts marked "X" in the column under the heading number called for in the assembly page (# indicate a change in this printing).

First, read the Part List reading instructions above, then refer to the "Spare Part" manual supplied with the machine, that contains a picture-descriptive part number cross-reference.

Electrical Schematic

Refer to the "Spare Part" manual supplied with the machine.