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REV11

INVERTEC® PC208 & PC210

OPERATOR'S MANUAL

ENGLISH

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THANKS! For having choosen 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:	
.....	.....

ENGLISH INDEX

Technical Specifications

NAME	INDEX
INVERTEC® PC208 CE	**K12037-1**
INVERTEC® PC208 AUS	**K12037-2**
INVERTEC® PC210 CE	**K12038-1**
INVERTEC® PC210 AUS	**K12038-2**

INPUT			
Input Voltage	Input Power at Rated Output	EMC Class	Frequency
230 V ±10% Single Phase	2 kW @ 100% Duty Cycle	A	50Hz
	2.5 kW @ 60% Duty Cycle		
	3 kW @ 35% Duty Cycle		

RATED OUTPUT AT 40°C		
Duty Cycle (Based on a 10 min. period)	Output Current	Output Voltage
100%	15 A	86 Vdc
60%	20 A	88 Vdc
35%	25 A	90 Vdc

OUTPUT RANGE		
Cutting Current Range	Maximum Open Circuit Voltage	Pilot Arc Current
10 - 25 A	500 Vdc	12 A

EXTERNAL INLET COMPRESSED AIR	
Required Inlet Flow Rate	Required Inlet Pressure
80 ±20% l/min @ 5.0bar	6.0bar - 7.5bar

RECOMMENDED INPUT CABLE AND FUSE SIZES		
Fuse (delayed) or Circuit Breaker (“D” characteristic) Size	Type of Plug (Included with Machine)	Input Power Cable
16 A	SCHUKO 16A / 250V	3 x 1.5 mm^2
	AUSTRALIAN 15A / 250V	

PHYSICAL DIMENSIONS			
Height	Width	Length (case only,without torch)	Weight
385 mm	215 mm	480 mm	18 – 18.5 kg

Operating Temperature	Storage Temperature
-10°C to +40°C	-10°C to +40°C

ECO design information

The equipment has been designed in order to be compliant with the Directive 2009/125/EC and the Regulation 2019/1784/EU.

Efficiency and idle power consumption:

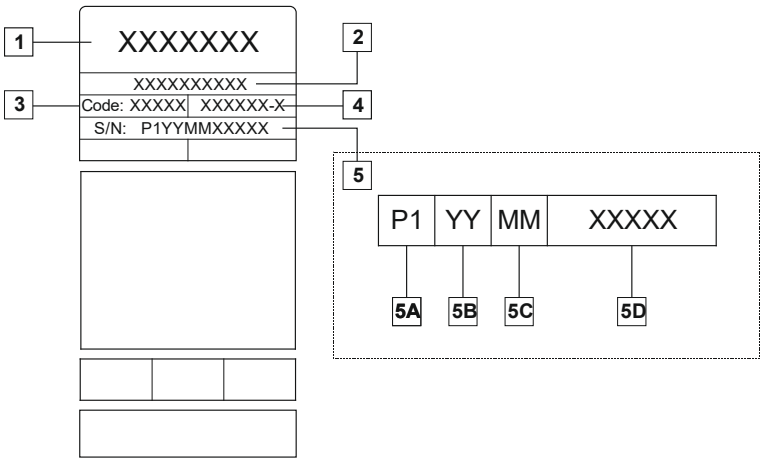
Index	Name	Efficiency when max power consumption / Idle power consumption	Equivalent model
K12038-1	**PC210**	83,7% / 58W	No equivalent model

Idle state occurs under the condition specified in below table:

IDLE STATE	
Condition	**Presence**
MIG mode	
TIG mode	
STICK mode	
After 30 minutes of non-working	X
Fan off	

The value of efficiency and consumption in idle state have been measured by method and conditions defined in the product standard EN 60974-1:20XX.

Manufacturer's name, product name, code number, product number, serial number and date of production can be read from rating plate.



Where:

- **1-** Manufacturer name and address
- **2-** Product name
- **3-** Code number
- **4-** Product number
- **5-** Serial number
  - **5A-** country of production
  - **5B-** year of production
  - **5C-** month of production
  - **5D-** progressive number different for each machine

Typical gas usage for **MIG/MAG** equipment:

Material type	Wire diameter [mm]	DC electrode positive		Wire Feeding [m/min]	Shielding Gas	Gas flow [l/min]
		Current [A]	Voltage [V]			
Carbon, low alloy steel	0,9 ÷ 1,1	95 ÷ 200	18 ÷ 22	3,5 – 6,5	Ar 75%, CO_2 25%	12
Aluminium	0,8 ÷ 1,6	90 ÷ 240	18 ÷ 26	5,5 – 9,5	Argon	14 ÷ 19
Austenic stainless steel	0,8 ÷ 1,6	85 ÷ 300	21 ÷ 28	3 - 7	Ar 98%, O_2 2% / He 90%, Ar 7,5% CO_2 2,5%	14 ÷ 16
Copper alloy	0,9 ÷ 1,6	175 ÷ 385	23 ÷ 26	6 - 11	Argon	12 ÷ 16
Magnesium	1,6 ÷ 2,4	70 ÷ 335	16 ÷ 26	4 - 15	Argon	24 ÷ 28

Tig Process:

In TIG welding process, gas usage depends on cross-sectional area of the nozzle. For comonnly used torches:

Helium: 14-24 l/min.
Argon: 7-16 l/min.

Notice: Excessive flow rates causes turbulence in the gas stream which may aspirate atmospheric contamination into the welding pool.

Notice: A cross wind or draft moving can disrupt the shielding gas coverage, in the interest of saving of protective gas use screen to block air flow.

End of life

At end of life of product, it has to be disposal for recycling in accordance with Directive 2012/19/EU (WEEE), information about the dismantling of product and Critical Raw Material (CRM) present in the product, can be found at https://www.lincolnelectric.com/en-gb/support/Pages/operator-manuals-eu.aspx.

Electromagnetic Compatibility (EMC)

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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. This machine is not in accordance with IEC 61000-3-12. If it is powered by a low voltage public distribution network in the connection responsibility of the installer or user of equipment, consultation, if necessary, with the electricity service distributor.

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 if 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.

WARNING

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 can be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radio-frequency disturbances.

Safety

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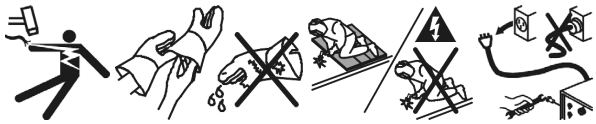
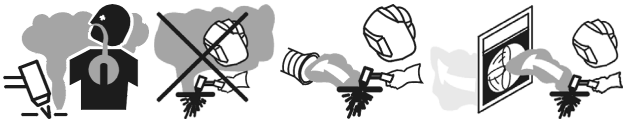
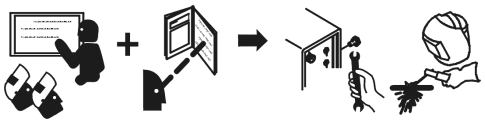
WARNING

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.

	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.
	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.
	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.
	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.
	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.
	CE COMPLIANCE: This equipment complies with the European Community Directives.
	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.
	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.
	EQUIPMENT WEIGHT OVER 30kg: Move this equipment with care and with the help of another person. Lifting may be dangerous for your physical health.
	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.

	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.
	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.
S	SAFETY MARK: This equipment is suitable for supplying power for cutting operations carried out in an environment with increased hazard of electric shock.

The manufacturer reserves the right to make changes and/or improvements in design without upgrade at the same time the operator's manual.

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 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.

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 means that is possible cut for 3,5 minutes, then the machine stops for 6,5minutes.

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.

The machines:

- PC208 (230Vac, 50Hz, single phase)
- PC210 (230Vac, 50Hz, single phase)

are designed to operate on engine driven generators as long as the auxiliary can supply adequate voltage, frequency and power as indicated in the "Technical Specification" section of this manual. The auxiliary supply of the generator must also meet the following conditions:

- Vac peak voltage: below 410V.
- Vac frequency: 50Hz.
- RMS voltage of the AC waveform: 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.

Output Connections

⚠ WARNING

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

⚠ WARNING

Always turn OFF the machine when working on the torch.

⚠ WARNING

Do not remove the work clamp during cutting, plasma cutting generates high voltages that can kill.

⚠ WARNING

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

This machine is sent from the factory with a cutting torch and work clamp installed. The work clamp must be securely connected to the work piece. If the work piece is painted or extremely dirty it may be necessary to expose the bare metal in order to make a good electrical connection.

Built-In Compressor

This machine has a built-in compressor that allow to operates in areas where an external primary air is not available. Only an electrical mains supply is necessary!

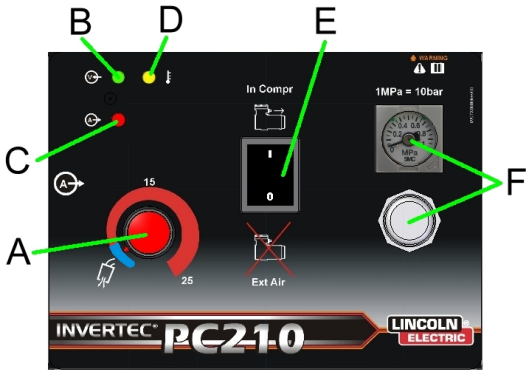
Controls and Operational Features

INVERTEC PC208 front command panel.

The PC208 machine front panel has a lower quantity of commands than the PC210 showed below, but the displacement is the same:

- The commands [A], [B], [C], [D] are available on the PC208 front panel.
- The commands [E], [F] aren't available on the PC208 front panel.

INVERTEC PC210 front command panel.



Commands descriptions:

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.

Air Purge: The Output Current Knob completely rotated counterclockwise enables the air purge function. A 5 minutes timeout stops the purge function; this happens only if the Output Current Knob remains in the purge mode for a long time.

B. Power ON/OFF green LED: It lights up when the machine is ON.

C. Output red LED: See meanings in the following table.

D. Thermal yellow LED: See meanings in the following table.

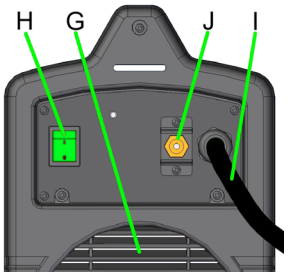
LEDs		Meaning
Output (Red)	**Thermal (Yellow)**	
On	**Off**	The cutting torch is energized.
On	**On**	Part in place error: the retaining cap is not properly screwed. To restore the machine: • Screw firmly the torch retaining cap. • Wait for 5seconds; during this time the Output and Thermal LEDs blinks alternately. • After 5seconds the machine is automatically restored and ready to operate.
Off	**On**	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 turns off, normal operation is again possible.
Off	**Blink**	Mains undervoltage or overvoltage error: the machine is disabled. When the mains return in the correct range, the machine restart automatically.
Blink	**Off**	Low air pressure error. To check / adjust the air pressure (see recommended values in the Tecnical Specifications of this manual): • Put the machine in Purge mode [A]. • Check and adjust the air pressure through the manometer and air pressure regulator knob [F]. • If necessary, check and adjust also the inlet air pressure through the commands of the external compressor.

E. Internal / External air selection (PC210 only): This switch determine the air supply. With the “In Compr” position selected, the machine operates through the built-in compressor. With the “Ext Air” position selected, the internal compressor is completely disabled and the machine operates through an external air supply hose connected to the proper air inlet connection placed on the machine rear side.

⚠ WARNING

PC210 Only: If operate with external air, be sure to select the “Ext Air” switch position in order to completely disable the built-in compressor. Otherwise the compressor may be damaged by the probable greater pressure of the external air.

F. Air Pressure Gauge and Regulator Knob (PC210 only): Allow to regulate and monitoring the air pressure.



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

H. Power Switch: It turns ON / OFF the input power to the machine.

I. Input cable: Connect it to the mains.

J. Air Inlet (PC210 only): If the “Ext Air” operating mode is selected, connect here the hose carrying the air to the machine.

⚠ WARNING

A clean, dry air 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.

Cutting Process

The air plasma cutting process uses air as primary cutting gas and as torch cooling gas.

PC208 – PC210: the air is provided by the built-in compressor with a pressure of 3.5bar (approximate value).

The PC210 can reach the best cutting performances operates also with external air; in this case the air pressure is limited by a pressure regulator [F], set at factory at 5.0bar. In case to adjust the air pressure, put the machine in Purge mode [A].

The pilot arc is struck as follow:

- PC208:
  The torch button enables the built-in compressor that provide the air flow to the torch. Releasing the torch button the cutting process is stopped, but the compressor continues to run for the post-flow stage.

- PC210:
  “In Compr” operating mode: same as PC208.
  “Ext Air” operating mode: the torch button energize an electrovalve (solenoid valve). This valve lets the air flow during the cutting and the post-flow stages.

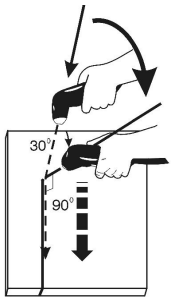
The design concept at the basis of these power sources is to have available a current which remains constant at the set value, independently from the length of the plasma arc.

When preparing to cut, make sure you have all materials needed to complete the job and have taken all safety precautions. Install the machine as instructed in this manual and remember to attach the work clamp to the work piece.

- Turn ON the Power Switch [H] placed on the back of the machine; the LED [B] on the front panel will turn ON. The unit is now ready to operate.
- Check that the primary air is available through the Air Purge function [A].
- 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.

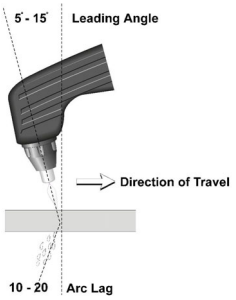
To piercing the work piece, lower the torch onto the metal at a 30° angle away from the operator. This will blow the dross (melted metal) away from the torch tip.



Slowly rotate the torch to the vertical position as the arc becomes deeper.

Once the work piece is pierced normal cutting can occur.

Keep moving while cutting and cut at a steady speed so that the arc leg is 10° to 20° behind the travel direction. Use a 5° to 15° leading angle in the direction of the cut.



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 20sec. (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.

⚠ WARNING

Refer to the torch 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.
- Regularly clean the compressor air inlet filter.

⚠ 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.

	PC208 – PC210 (internal air)				PC210 (external air)			
	Speed (cm/min.)				Speed (cm/min.)			
Thickness	Current (A)	MILD STEEL	ALUMINUM	STAINLESS STEEL	Current (A)	MILD STEEL	ALUMINUM	STAINLESS STEEL
4 mm	25	147	94	77.7	25	179	122	112.8
5 mm	25	108	86	59	25	131	104	90
6 mm	25	73	68	47	25	80.6	81.6	70
¼”	25	55	58	43	25	67	70	62
8 mm	---	---	---	---	---	---	---	---
⅜”	25	10	---	23	25	12	---	30
10 mm	25	---	---	20.4	25	---	---	23.6
11 mm	---	---	---	---	---	---	---	---
½”	25	---	---	11	25	---	---	12
15 mm	---	---	---	---	---	---	---	---
¾”	---	---	---	---	---	---	---	---

Customer Assistance Policy

The business of The Lincoln Electric Company is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for advice or information about their use of our products. We respond to our customers based on the best information in our possession at that time. Lincoln Electric is not in a position to warrant or guarantee such advice, and assumes no liability, with respect to such information or advice. We expressly disclaim any warranty of any kind, including any warranty of fitness for any customer's particular purpose, with respect to such information or advice. As a matter of practical consideration, we also cannot assume any responsibility for updating or correcting any such information or advice once it has been given, nor does the provision of information or advice create, expand or alter any warranty with respect to the sale of our products

Lincoln Electric is a responsive manufacturer, but the selection and use of specific products sold by Lincoln Electric is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric affect the results obtained in applying these types of fabrication methods and service requirements.

Subject to Change – This information is accurate to the best of our knowledge at the time of printing. Please refer to www.lincolnelectric.com for any updated information

WEEE

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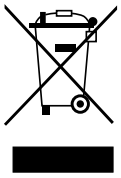

Do not dispose of electrical equipment together with normal waste!
In observance of European Directive 2012/19/EC on Waste Electrical and Electronic Equipment (WEEE) and its implementation in accordance with national law, electrical equipment that has reached the end of its life must be collected separately 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

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Part List reading instructions

- 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.

Authorized Service Shops Location

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- The purchaser must contact a Lincoln Authorized Service Facility (LASF) about any defect claimed under Lincoln's warranty period.
- Contact your local Lincoln Sales Representative for assistance in locating a LASF or go to www.lincolnelectric.com/en-gb/Support/Locator.

Electrical Schematic

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