

# POWERTEC 161C, 191C, 231C, 271C

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## OPERATOR'S MANUAL



ENGLISH



Lincoln Electric Bester Sp. z.o.o.  
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Declaration of conformity



**Lincoln Electric Bester Sp. z o.o.**

Declares that the welding machine:

<b>K14040-2</b>	<b>POWERTEC 161C</b>
<b>K14045-1</b>	<b>POWERTEC 191C</b>
<b>K14046-1</b>	<b>POWERTEC 231C</b>
<b>K14047-1</b>	<b>POWERTEC 271C</b>

conforms to the following directives:

**2014/35/EU , 2014/30/EU**

and has been designed in compliance with the following standards:

**EN 60974-1:2012, EN 60974-5:2013,  
EN 60974-10:2014**

A handwritten signature in black ink, consisting of several overlapping, stylized strokes.

20.04.2016

Piotr Spyttek  
Operations Director

Lincoln Electric Bester Sp. z o.o., ul. Jana III Sobieskiego 19A, 58-263 Bielawa, Poland

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><b>WARNING:</b> 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><b>READ AND UNDERSTAND INSTRUCTIONS:</b> 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><b>ELECTRIC SHOCK CAN KILL:</b> 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><b>ELECTRICALLY POWERED EQUIPMENT:</b> 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><b>ELECTRICALLY POWERED EQUIPMENT:</b> 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><b>ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS:</b> 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><b>CE COMPLIANCE:</b> This equipment complies with the European Community Directives.</p>
	<p><b>FUMES AND GASES CAN BE DANGEROUS:</b> 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><b>ARC RAYS CAN BURN:</b> 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><b>WELDING SPARKS CAN CAUSE FIRE OR EXPLOSION:</b> 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><b>WELDED MATERIALS CAN BURN:</b> 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><b>SAFETY MARK:</b> 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.

## Installation and Operator Instructions

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

### Location and Environment

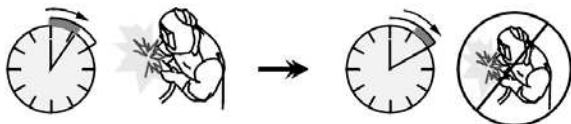
This machine will operate in harsh environments. However, it is important that simple preventative measures are followed to assure long life and reliable operation.

- Do not place or operate this machine on a surface with an incline greater than 15° from horizontal.
- 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 and Overheating

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

20% duty cycle:

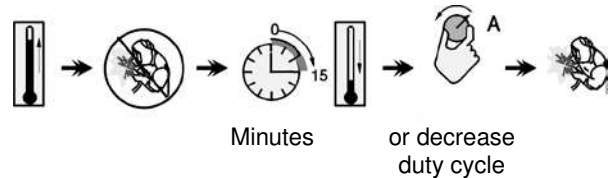


Welding for 2 minutes.

Break for 8 minutes.

Excessive extension of the duty cycle will cause the thermal protection circuit to activate.

The welding transformer in the machine is protected from overheating by a thermostat. When the machine is overheated the output of the machine will turn "OFF", and the Thermal Indicator Light will turn "ON". When the machine has cooled to a safe temperature the Thermal Indicator Light will go out and the machine may resume normal operation. Note: For safety reasons the machine will not come out of thermal shutdown if the trigger on the welding gun has not been released.



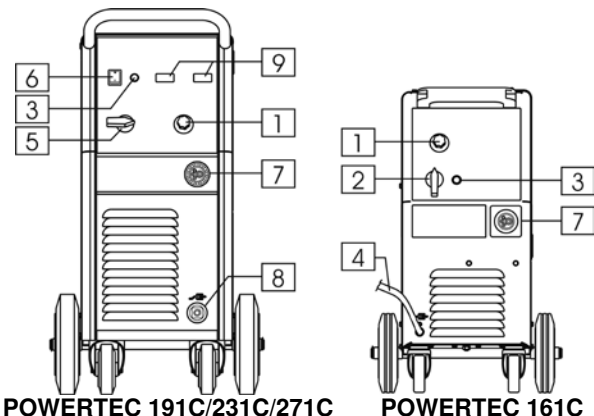
### Input Supply Connection

Installation and mains outlet socket shall be made and protected according to appropriate rules.

Check the input voltage, phase, and frequency supplied to this machine before turning it on. Verify the connection of grounding wires from the machine to the input source. The allowable input voltages are 1x230V 50Hz/60Hz. For more information about input supply refer to the technical specification section of this manual and to the rating plate of the machine.

Make sure the amount of power available from the input connection is adequate for normal operation of the machine. The necessary delayed fuse (or circuit breaker with "D" characteristic) and cable sizes are indicated in the technical specification section of this manual.

### Controls and Operational Features

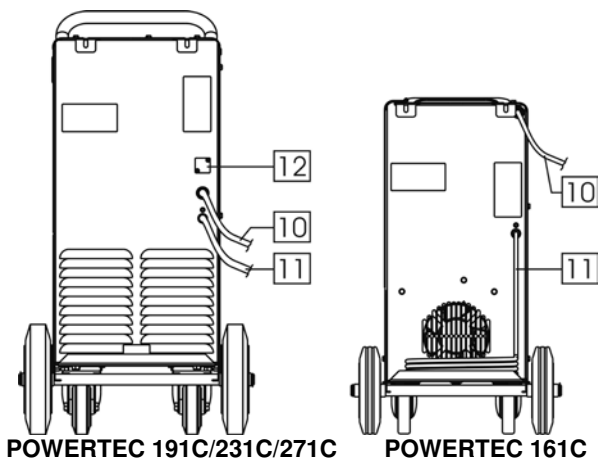


POWERTEC 191C/231C/271C

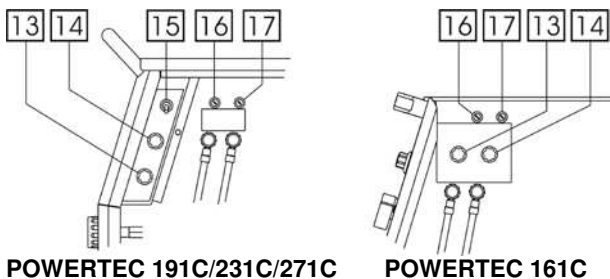
POWERTEC 161C

- WFS (Wire Feed Speed) Control Knob:** It enables continuous control of wire feeding speed in the range from 1.0 to 20m/min
- Power and Welding Voltage Changing Switch:** It enables to turn the machine ON and switching the voltage. The POWERTEC 161C has a 7-steps switch.
- Thermal Overload Indicator:** This lamp will light up when the machine is overheated and the output has been turned off. Leave the machine on to allow the internal components to cool, when the lamp turns off normal operation is possible.

4. Return Welding Cable Fixed With Clamp.
5. Welding Voltage Changing Switch: The POWERTEC 191C has a 8-steps switch. The POWERTEC 231C and 271C have a 12-steps switch.
6. Power Switch and Power Indicator: After input power is connected and the power switch is turned on, the indicator will light up to indicate the machine is ready to weld.
7. EURO Socket: For connecting welding torch.
8. Output Socket: For connecting the return welding cable.
9. Digital Display Panel: Available as the option K14044-1 (see chapter "Accessories"). It displays welding parameters - welding voltage in [V] and welding current in [A]. After finishing welding process, it shows the average value of welding parameters.

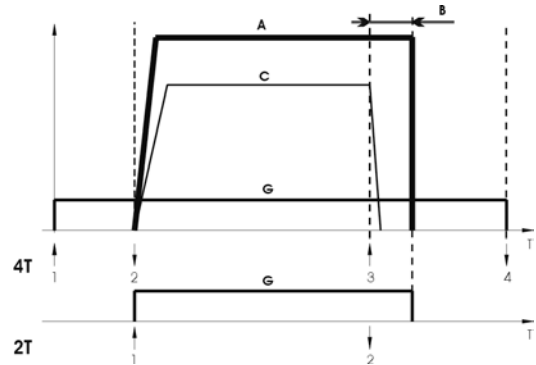


10. Gas hose.
11. Power Input Cable: Connect the proper plug to the input cable to the rated output, in accord to appropriate rules (for POWERTEC 191C, 231C and 271C only). Only qualified personnel shall connect this plug.
12. Hole Covered: For CO<sub>2</sub> gas heater kit K14048-1 (see chapter "Accessories").



13. Spot Welding Time Control Knob: It enables time control in the range from 0.2 to 8 s.
14. Burnback Time Control Knob: It enables to obtain the desired length of electrode wire, which protrudes from the tip of the torch after ending welding; adjusting range from 20 to 250ms.

15. Torch Mode Switch: It enables selection of 2-step or 4-step torch mode. The functionality of 2T/4T mode is shown in the picture below:



↑ Trigger pressed  
↓ Trigger released

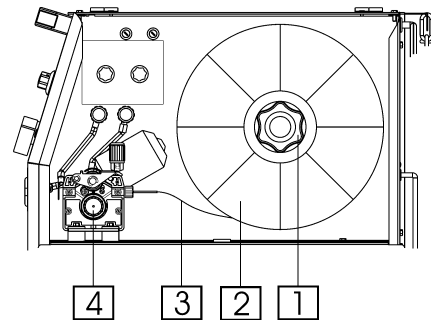
- A. Welding Current.
- B. Burnback time.
- C. WFS.
- G. Gas.

16. Fuse: This fuse (1A) protects the PC Board.
17. Fuse: This fuse (4A) protects the wire feeder motor.

### Loading the Wire Spool

Load the wire spool on the sleeve such that the spool turns clockwise when the wire is fed into the wire feeder.

Machine is designed to use 15kg (300mm) wire spool. For 5kg (200mm) wire spool use enclosed adaptor.



1. Sleeve
2. Wire spool
3. Electrode wire
4. Feeding unit

Make sure that the spool locating pin on sleeve goes into the fitting hole on the spool.

Free the end of the wire and cut off the bent end making sure it has no burr.

Rotate the wire spool clockwise and thread the end of the wire into the entrance guide tube pushing it into the wire guide of the welding torch.

### ⚠ WARNING

Clean the wire liner with compressed air when replacing the wire spool, especially if you use FCAW 1,1mm wire.

## Feeding the Electrode Wire

Rise side cover of the machine.

Put on the drive roll using the correct groove corresponding to the wire diameter.

Load the spool of wire onto the sleeve of the machine.

Free the end of the wire and cut off the bent end making sure it has no burr.

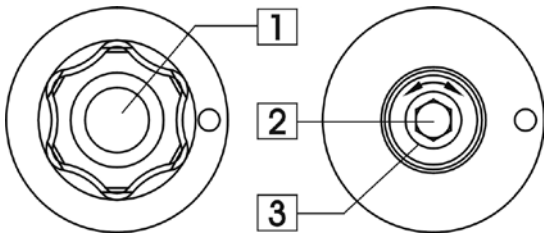
Insert the electrode wire into to the wire feeder.

Properly adjust the wire tension arm of the feeder.

## Adjustments of Brake Torque of Sleeve

To avoid spontaneous unrolling of the welding wire the sleeve is fitted with a brake.

Adjustment is carried by rotation of its screw M10, which is placed inside of the sleeve frame after unscrewing the fastening cap of the sleeve.



1. Fastening cap.
2. Adjusting screw M10.
3. Pressing spring.

Turning the screw M10 clockwise increases the spring tension and you can increase the brake torque.

Turning the screw M10 counterclockwise decreases the spring tension and you can decrease the brake torque.

After finishing of adjustment, you should screw in the fastening cap again.

## Adjusting of Force of Pressure Roll Force

Before welding you should understand how to properly set the wire tension.

Pressure force is adjusted by turning the adjustment nut clockwise to increase force, counterclockwise to decrease force.

### WARNING

If the roll pressure is too low the roll will slide on the wire. If the roll pressure is set too high the wire may be deformed, which will cause feeding problems in the welding gun. The pressure force should be set properly. Decrease the pressure force slowly until the wire just begins to slide on the drive roll and then increase the force slightly by turning of the adjustment nut by one turn.

## Inserting Electrode Wire into Welding Torch

Remove the gas diffuser and contact tip from the

welding gun.

Set wire feeding speed knob in its central position.

After switching the machine "ON" press the torch button until the electrode wire leaves the contact tip of the welding torch.

### WARNING

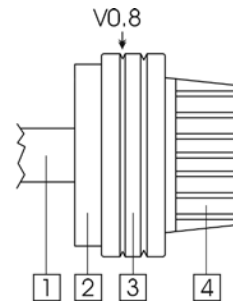
Take precaution to keep eyes and hands away from the end of the torch while feeding wire.

### WARNING

Once the wire has finished feeding through the welding gun turn the machine "OFF" before replacing to contact tip and gas diffuser.

## Assembling of the Drive Roll of the Wire Feeder

The machine has V0.8/V1.0 drive roll in standard. The picture below shown the assembly of drive roll for 0.8 solid wire.



1. Motor shaft.
2. Mount ring.
3. Drive roll.
4. Cap.

To disassemble the drive roll you should:

- Release the wire tension arm of the wire feeder.
- Unscrew the fastening cap.
- Take off the drive roll from the mount ring.

To assemble the drive roll you should:

- Put on the drive roll onto the mounting ring.
- Screw in the fastening cap onto the mount ring.
- Insert the electrode wire.
- Engage the wire tension arm of the feeder.

## Gas Supplying

Put the gas cylinder on the machine shelf secure it with the chain.

Take off the safety cap from the shielding gas cylinder and install the flow regulator on it.

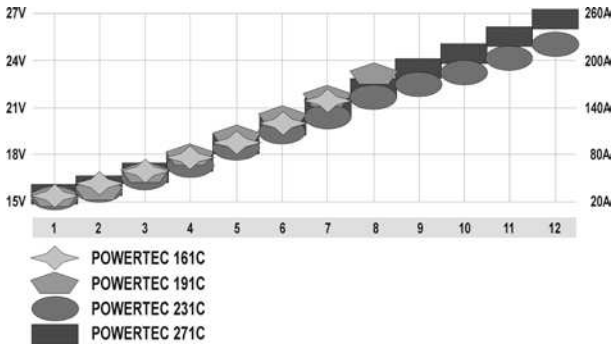
Connect the gas hose of the machine to the regulator with the clamp band.

## Welding with MIG / MAG method

To begin welding process with MIG/MAG method you should:

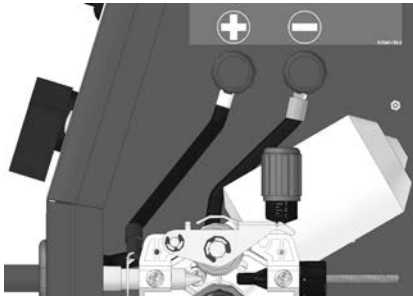
- Insert the plug of input supply cable into the main socket.
- Switch ON the machine with the "Power Switch".
- Insert the electrode wire into the torch.

- According to selected welding mode and material thickness set proper welding voltage and wire feeding speed. The chart below can be useful for welding setting selection:



- Obeying the appropriate rules, you can begin to weld.

## Changing Polarity



1. For Positive Polarity (DC +):
  - connect Welding Torch Cable to the Positive (+) output terminal.
  - connect Return Welding Cable to the Negative (-) output terminal.

This is the typical configuration for the Metal Inert Gas (**MIG**).

2. For Negative Polarity (DC -):
  - connect Welding Torch Cable to the Negative (-) output terminal.
  - connect Return Welding Cable to the Positive

(+) output terminal.

This is the typical configuration for most of the Innershield wires (Flux Cored Arc Welding Self-Shielded / **FCAW-S**).

## 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 where the machine is placed.

Any noticeable damage should be reported immediately.

### **Routine maintenance (everyday)**

- Check cables and connections integrity. Replace, if necessary.
- Remove the spatters from the welding gun nozzle. Spatters could interfere with the shielding gas flow to the arc.
- Check the welding gun condition: replace it, if necessary.
- Check condition and operation of the cooling fan. Keep clean its airflow slots.

### **Periodic maintenance (every 200 working hours but not more rarely than once a year)**

Perform the routine maintenance and, in addition:

- Keep clean the machine. Using a dry ( and low pressure) airflow, remove the dust from the external case and from inside of the cabinet.
- Check and tighten all screws.

### **WARNING**

Mains supply network must be disconnected from the machine before each maintenance and service. After each repair, perform proper tests to ensure safety.



# 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. 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.

## 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.



## WARNING

This equipment complies with IEC 61000-3-12 provided that the short-circuit power  $S_{sc}$  is greater than or equal to:

POWERTEC 161C:	$S_{sc} \geq 9,3 \text{ MVA}$
POWERTEC 191C:	$S_{sc} \geq 17,6 \text{ MVA}$
POWERTEC 231C:	$S_{sc} \geq 17,6 \text{ MVA}$
POWERTEC 271C:	$S_{sc} \geq 17,6 \text{ MVA}$

at the interface point between the user's supply and the public system. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment is connected only to a supply with a short circuit power  $S_{sc}$  greater than or equal to data on the table above.

# Technical Specifications

## POWERTEC 161C, 191C, 231C & 271C

INPUT				
Input Voltage 230 ± 10% Single Phase		Input Power at Rated Output	EMC Group / Class	Frequency 50/60 Hz
	<b>161C:</b>	6.0 kVA @ 20% Duty Cycle	II / A	
	<b>191C:</b>	8.2 kVA @ 20% Duty Cycle	II / A	
	<b>231C:</b>	10.6 kVA @ 20% Duty Cycle	II / A	
	<b>271C:</b>	12.9 kVA @ 20% Duty Cycle	II / A	
RATED OUTPUT AT 40°C				
	Duty Cycle (Based on a 10 min. period)	Output Current	Output Voltage	
<b>161C:</b>	20%	150A	21.5 Vdc	
	60%	87A	18.7 Vdc	
	100%	70A	17.5 Vdc	
<b>191C:</b>	20%	180A	23.0 Vdc	
	60%	105A	19.3 Vdc	
	100%	80A	18.0 Vdc	
<b>231C:</b>	20%	220A	25.0 Vdc	
	60%	130A	20.5 Vdc	
	100%	100A	19.0 Vdc	
<b>271C:</b>	20%	255A	26.8 Vdc	
	60%	150A	21.5 Vdc	
	100%	120A	20.0 Vdc	
OUTPUT RANGE				
	Welding Current Range		Maximum Open Circuit Voltage	
<b>161C:</b>	30A - 150A		<b>161C:</b>	37 Vdc
<b>191C:</b>	30A - 180A		<b>191C:</b>	42 Vdc
<b>231C:</b>	30A - 220A		<b>231C:</b>	45 Vdc
<b>271C:</b>	30A - 255A		<b>271C:</b>	47 Vdc
RECOMMENDED INPUT CABLE AND FUSE SIZES				
	Fuse or Circuit Breaker Size		Input Power Cable	
<b>161C:</b>	16A Superlag		<b>161C:</b>	3 Conductor, 1.5mm <sup>2</sup>
<b>191C:</b>	20A Superlag		<b>191C:</b>	3 Conductor, 2.5mm <sup>2</sup>
<b>231C:</b>	25A Superlag		<b>231C:</b>	3 Conductor, 2.5mm <sup>2</sup>
<b>271C:</b>	32A Superlag		<b>271C:</b>	3 Conductor, 4.0mm <sup>2</sup>
PHYSICAL DIMENSIONS				
	Height	Width	Length	Weight
<b>161C:</b>	615 mm	390 mm	825 mm	53 kg
<b>191C:</b>	765 mm	427 mm	850 mm	70 kg
<b>231C:</b>	765 mm	427 mm	850 mm	80 kg
<b>271C:</b>	765 mm	427 mm	850 mm	83 kg
	Operating Temperature -10°C to +40°C		Storage Temperature -25°C to +55°C	

## WEEE

07/06

English



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.

## Electrical Schematic

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

## Accessories

### POWERTEC 161C: Drive rolls and guide tubes 2 driven rolls

KP14016-0.8	Solid wires: 0,6 ÷ 0,8mm
KP14016-1.0	0,8 ÷ 1,0mm
KP1401-1.2	1,0 ÷ 1,2mm
KP14016-1.1R	Cored wires: 1.0 ÷ 1.2mm
KP14016-1.6R	1.2 ÷ 1.6mm

### POWERTEC 161C

K14042-1	Adaptor for 5kg / 200mm wire spool.
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### POWERTEC 191C, 231C, 271C: Drive rolls and guide tubes 2 driven rolls

KP14016-0.8	Solid wires: 0,6 ÷ 0,8mm
KP14016-1.0	0,8 ÷ 1,0mm
KP14016-1.2	1,0 ÷ 1,2mm
KP14016-1.2A	Aluminum wires: 1.0 ÷ 1.2mm
KP14016-1.1R	Cored wires: 1.0 ÷ 1.2mm
KP14016-1.6R	1.2 ÷ 1.6mm

### POWERTEC 191C, 231C, 271C

K14042-1	Adaptor for 5kg / 200mm wire spool
K14048-1	CO <sub>2</sub> aansluitset.
K14044-1	AV Meter Kit