

# INVERTEC<sup>®</sup> 135S, 150S & 170S

## OPERATOR'S MANUAL



ENGLISH



Lincoln Electric Bester Sp. z o.o.  
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[www.lincolnelectric.eu](http://www.lincolnelectric.eu)

Declaration of conformity



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

Declares that the welding machine:

**INVERTEC<sup>®</sup> 135S**

**INVERTEC<sup>®</sup> 150S**

**INVERTEC<sup>®</sup> 170S**

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 60974-10:2014**

A handwritten signature in black ink, consisting of several overlapping loops and a long horizontal stroke at the end.

20.04.2016

Piotr Spytek  
Operations Director

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

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**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 style="font-size: small;">Optical radiation emission Category 2 (EN 12198)</p>	<p><b>ARTIFICIAL OPTICAL RADIATION:</b> 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><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>

<b>S</b>	SAFETY MARK: This equipment is suitable for supplying power for welding operations carried out in an environment with increased hazard of electric shock.
	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 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:
  - 135S: IP21
  - 150S: IP23
  - 170S: 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.

### 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 power available at 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.

### Input Supply From Engine Driven Generators

- 135S:

#### WARNING

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

- 150S / 170S:  
The machines 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: in the range of 50 and 60Hz.
  - RMS voltage of the AC waveform: 230Vac ± 15%.

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

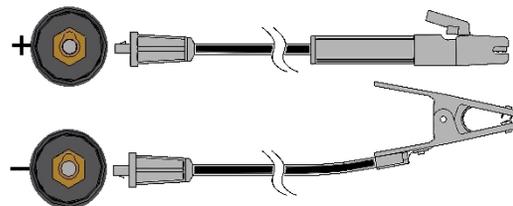
### Output Connections

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.

- **(+) Positive Quick Disconnect:** Positive output connector for the welding circuit.
- **(-) Negative Quick Disconnect:** Negative output connector for the welding circuit.

### 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. Shown here is the connection method for DC(+) welding.



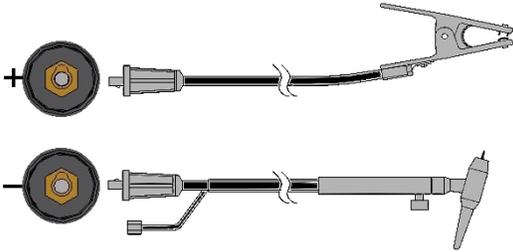
Connect the electrode cable to the (+) terminal and the work clamp to the (-) terminal. Insert the connector with the key lining up with the keyway and rotate approximately ¼ turn clockwise. Do not over tighten.

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

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 shown here. If DC(+) polarity is necessary switch the cable connections at the machine.



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. Finally, connect the gas hose to the gas regulator on the cylinder of gas to be used.

### Allowable TIG processes:

- 135S: Scratch TIG
- 150S / 170S: Lift TIG

### Arc Force

#### Auto Adaptive Arc Force (with MMA welding) (150S / 170S only):

During MMA welding is activated the function Auto Adaptive Arc Force that increases temporary the output current, used to clear intermittent connections between the electrode and the weld puddle that occur during stick welding.

This is an active control feature that guarantees the best arrangement between the arc stability and spatter presence. The feature "Auto Adaptive Arc Force" has instead of a fixed or manual regulation, an automatic and multilevel setting: its intensity depends by the output voltage and it is calculated in real time by the microprocessor where are also mapped the Arc Force levels. The control measure in each instant the output voltage and it determines the amount of the peak of current to apply; that value is enough to breaks the metal drop that is being transferred from the electrode to the workpiece as to guarantee the arc stability, but not too high to avoid spatters around the welding puddle. That means:

- Electrode / workpiece sticking prevention, also with low current values.
- Spatters reduction.

The welding operations are simplified and the welded joints looks better, also if not brushed after the welding.

With the MMA welding are also enabled the following features:

- Hot Start: This is a temporary increase in the initial welding current. This helps ignite the arc quickly and reliably.

- Anti-Sticking: This is a function that 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 that can damage the electrode holder.

Refer to the section below for more details.

## Controls and Operational Features

### Machine Start-Up:

When the machine is turned ON, an auto-test is executed; during this test only the Thermal LED is ON; after few seconds the Thermal LED turns OFF and the Power ON/OFF LED lights up.

- 135S: The Machine is ready to operate when on the Front Control Panel lights up the Power ON LED.
- 150S / 170S: The Machine is ready to operate when on the Front Control Panel lights up the Power ON LED with one of the three LED of the Welding mode command.

### Front Panel Controls

	<p><b>Output Current Knob:</b> Potentiometer used to set the output current used during welding.</p>
	<p><b>Power ON/OFF LED:</b> This LED lights up when the machine is ON.</p> <p>150S / 170S: If blinking, this LED indicates that an Input Voltage Overrange protection is active; the Machine restarts automatically when the Input Voltage returns in the correct range.</p>
	<p><b>Thermal LED:</b> 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.</p>
<p>150S 170S only</p>	<p><b>VRD LED's (enabled on Australian Machines only):</b> This machine is provided by VRD (Voltage Reduction Device) function: this reduces the voltage at the output leads.</p> <p><b>The VRD function is enabled by factory default only on machines that meet the AS 1674.2 Australian Standards.</b> (C-Tick logo "C" on/near the Rating Plate applied on the machine).</p> <p><b>The VRD LED is ON</b> when the Output Voltage is below 32V with the Machine at idle (no welding time).</p> <p>For others machines this function is disabled (the LED is always OFF).</p>

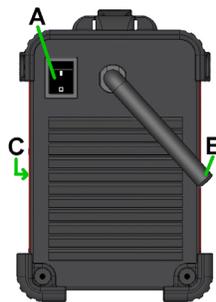
<p>150S 170S only</p> 	<p><b>Welding Mode Switch:</b> With three positions, controls the welding mode of the machine: two for Stick welding (Soft and Crisp) and one for Lift TIG welding.</p> <ul style="list-style-type: none"> <li>• Soft Stick: For a welding with a low spatter presence.</li> <li>• Crisp Stick: For an aggressive welding, with an increased Arc stability.</li> <li>• Lift TIG: 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.</li> </ul>
<p>170S only</p> 	<p><b>Meter:</b> The meter displays the preset welding current before welding and the actual welding current during welding.</p>

**Error condition list.**

If occurs, try to turn Off the machine, wait for a few seconds, then turn ON again. If the error remains, a maintenance is required. Please contact the nearest technical service center or Lincoln Electric and report the LED Status found on the machine Front Panel.

<p>150S 170S only</p> <p>Voltage Lockout</p>	<table border="1"> <tr> <td data-bbox="402 947 565 993">  </td> <td data-bbox="630 947 727 993">  </td> </tr> <tr> <td data-bbox="402 993 565 1024"> <p>Blink</p> </td> <td data-bbox="630 993 727 1024"> <p>Blink</p> </td> </tr> <tr> <td colspan="2" data-bbox="332 1024 787 1073"> <p>This occurs when an Internal auxiliary undervoltage condition is detected.</p> </td> </tr> <tr> <td colspan="2" data-bbox="332 1073 787 1169"> <p>To restore the machine:</p> <ul style="list-style-type: none"> <li>• Turn OFF then ON the Mains Switch to restart the machine.</li> </ul> </td> </tr> </table>			<p>Blink</p>	<p>Blink</p>	<p>This occurs when an Internal auxiliary undervoltage condition is detected.</p>		<p>To restore the machine:</p> <ul style="list-style-type: none"> <li>• Turn OFF then ON the Mains Switch to restart the machine.</li> </ul>	
									
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- A. **Power Switch:** It turns ON / OFF the input power to the machine.
- B. **Input cable:** This machine is provided with a plugged input cord. Connect it to the mains.
- C. **Fan:**
  - 135S: The fan is turned ON / OFF by the machine Power Switch.
  - 150S / 170S: This machine has a F.A.N. (Fan As Needed) circuitry inside. The machine automatically reduces the speed of the fan or turns it OFF. This feature reduces the amount of dirt which can be drawn inside the machine and reduces power consumption. When the machine is turned ON the fan will turn ON. The fan will continue to run whenever the machine is welding. The F.A.N. feature is active after that the machine doesn't weld for more than 10 minutes, the fan speed will return to the maximum speed if a welding operation restarts.



**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.
- Keep clean the machine. Use a soft dry cloth to clean the external 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 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. 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 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.

## **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.



# Technical Specifications

INPUT				
Input Voltage 230V ± 15% Single Phase	Input Power at Rated Output		EMC Class	Frequency 50/60Hz
	135S / 135S AUS	2.0kW @ 100% Duty Cycle 3.5kW @ 25% Duty Cycle	A	
	150S / 150S AUS	2.5kW @ 100% Duty Cycle 4.2kW @ 25% Duty Cycle	A	
	170S / 170S AUS	2.9kW @ 100% Duty Cycle 5.1kW @ 20% Duty Cycle	A	
RATED OUTPUT AT 40°C				
Duty Cycle (Based on a 10 min. period)		Output Current		Output Voltage
135S / 135S AUS	100%	70A		22.8Vdc
	25%	120A		24.8Vdc
135S AUS (10A circuit)	100%	50A		22.0Vdc
	7.5%	90A		23.6Vdc
150S / 150S AUS	100%	80A		23.2Vdc
	25%	140A		25.6Vdc
170S / 170S AUS	100%	80A		23.2Vdc
	20%	160A		26.4Vdc
OUTPUT RANGE				
Welding Current Range			Maximum Open Circuit Voltage	
135S / 135S AUS	10 – 120A		45Vdc (CE model)	
150S / 150S AUS	10 – 140A		32Vdc (150S 170S AUSTRALIA model)	
170S / 170S AUS	10 – 160A			
RECOMMENDED INPUT CABLE AND FUSE SIZES				
Fuse (delayed) or Circuit Breaker ("D" characteristic) Size		Input Power Cable		Type of Plug (Included with Machine)
135S	16A	3 x 1.5mm <sup>2</sup>		SCHUKO 16A-250V
135S AUS	10A	3 x 1.5mm <sup>2</sup>		AUS 10A-250V
150S / 150S AUS	16A	3 x 2.5mm <sup>2</sup>		SCHUKO 16A-250V / AUS 15A-250V
170S / 170S AUS	16A	3 x 2.5mm <sup>2</sup>		SCHUKO 16A-250V / AUS 15A-250V
PHYSICAL DIMENSIONS				
	Height	Width	Length	Weight
135S / 135S AUS	224mm	148mm	315mm	4.6kg
150S / 150S AUS	244mm	148mm	365mm	6.7kg
170S / 170S AUS	244mm	148mm	365mm	7.0kg
Operating Temperature -10°C to +40°C			Storage Temperature -25°C to +55°C	

## WEEE

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 English	<p>Do not dispose of electrical equipment together with normal waste!</p> <p>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.</p> <p>By applying this European Directive you will protect the environment and human health!</p>
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# 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

K10513-17-4VS	TIG torch with tap, 4m.
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