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INVERTEC® 270SX & 400SX

OPERATOR'S MANUAL

ENGLISH

LINCOLN ELECTRIC
THE WELDING EXPERTS®

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

LINCOLN ELECTRIC
THE WELDING EXPERTS®

Declaration of conformity

CE
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Lincoln Electric Bester Sp. z o.o.

Declares that the welding machine:

K12040-1	**INVERTEC® 270SX**
K12040-2	**INVERTEC® 270SX**
K12042-1	**INVERTEC® 400SX**
K12042-2	**INVERTEC® 400SX**

conforms to the following directives:

2006/95/CEE, 2004/108/CEE

and has been designed in compliance with the following standards:

EN 60974-1, EN 60974-10:2007

02.04.2013

Paweł Lipiński
Operations Director
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12/05

LINCOLN ELECTRIC

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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	
.....	.....

ENGLISH INDEX

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. 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.
	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.
	ELECTRICALLY POWERED EQUIPMENT: Regularly inspect the input, electrode, and work clamp cables. If any insulation damage exists replace the cable immediately. Do not place the electrode holder directly on the welding table or any other surface in contact with the work clamp to avoid the risk of accidental arc ignition.
	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 Equipment (PPE) having filter with a protection degree up to a maximum of 15, as required by EN169 Standard.
	FUMES AND GASES CAN BE DANGEROUS: Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. To avoid these dangers the operator must use enough ventilation or exhaust to keep fumes and gases away from the breathing zone.
	ARC RAYS CAN BURN: Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing. Use suitable clothing made from durable flame-resistant material to protect you skin and that of your helpers. Protect other nearby personnel with suitable, non-flammable screening and warn them not to watch the arc nor expose themselves to the arc.
	WELDING SPARKS CAN CAUSE FIRE OR EXPLOSION: Remove fire hazards from the welding area and have a fire extinguisher readily available. Welding sparks and hot materials from the welding process can easily go through small cracks and openings to adjacent areas. Do not weld on any tanks, drums, containers, or material until the proper steps have been taken to insure that no flammable or toxic vapors will be present. Never operate this equipment when flammable gases, vapors or liquid combustibles are present.

	WELDED MATERIALS CAN BURN: Welding generates a large amount of heat. Hot surfaces and materials in work area can cause serious burns. Use gloves and pliers when touching or moving materials in the work area.
	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 electrode, electrode holder, work clamp or any other electrically live part to touch a gas cylinder. Gas cylinders must be located away from areas where they may be subjected to physical damage or the welding process including sparks and heat sources.
HF	CAUTION: The high frequency used for contact-free ignition with TIG (GTAW) welding, can interfere with the operation of insufficiently shielded computer equipment, EDP centers and industrial robots, even causing complete system breakdown. TIG (GTAW) welding may interfere with electronic telephone networks and with radio and TV reception.
S	SAFETY MARK: This equipment is suitable for supplying power for welding 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:
  - 270SX: IP23
  - 400SX: 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

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 670V.
- Vac frequency: in the range of 50 and 60Hz.
- RMS voltage of the AC waveform: 400Vac ± 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.

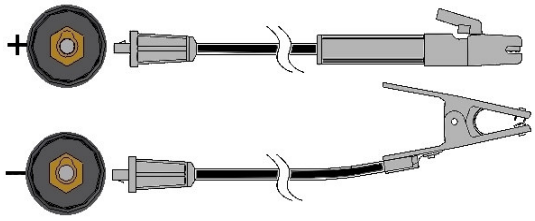
Output Connections

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.

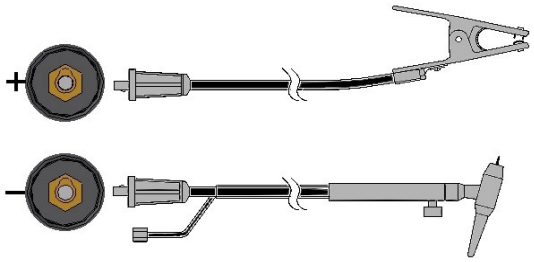


Connect the electrode cable to the (+) terminal and the work clamp to the (-) terminal. Insert the connector with the key lining up with the keyway and rotate approximately ¼ turn clockwise. Do not over tighten.

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 showed 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.

Remote Control Connection

Refer to the accessories section for a list of remote controls. If a remote control is used, it will be connected to the remote connector on the front of the machine. The machine will automatically detect the remote control, turn on the REMOTE LED, and switch to remote control mode. More information on this mode of operation will be given in the next section.

Features Enabled With MMA Welding

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.

Arc Force

This is a temporary increase in the output current during normal stick welding. This temporary increase in output current is used to clear intermittent connections between the electrode and the weld puddle that occur during normal stick welding.

Auto Adaptive Arc Force (only with Soft or Crisp MMA welding)

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 joins looks better, also if not brushed after the welding.

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 all LEDs and display's shown "888"; after few seconds the LEDs and display turn OFF. Only the Power ON/OFF LED lights up.

- The Machine is ready to operate when on the Front Control Panel lights up the Power ON LED with one of the four LED of the Welding mode command.

Front Panel Controls

Output Current Knob: Potentiometer used to set the output current used during welding.

Power ON/OFF LED: This LED lights up when the machine is ON.

If blinking, this LED indicates that an Input Voltage is overstep protection is active; the Machine restarts automatically when the Input Voltage returns in the correct range. If the Machine does not restart automatically, an Internal auxiliary under voltage condition may be present: the machine needs to be turned OFF then ON again to restart.

Note: The Fan could be automatically switched OFF if the error condition persists for more than 2seconds.

Remote LED: This indicator will turn on when a remote control is connected to the machine via the remote control connector. Using a remote control will replace the function of the output current control that will be automatically disabled.

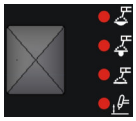
Thermal LED: This indicator will turn on when the machine is overheated and the output has been disabled. This normally occurs when the duty cycle of the machine has been exceeded. Leave the machine on to allow the internal components to cool. When the indicator turns off, normal operation is again possible.

VRD LED's (enabled on Australian Machines only): This machine is provided by VRD (Voltage Reduction Device) function: this reduces the voltage at the output leads.

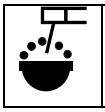
The VRD function is enabled by factory default only on machines that meet the AS 1674.2 Australian Standards. (C-Tick logo "✓" on/near the Rating Plate applied on the machine).

The VRD LED is ON when the Output Voltage is below 12V with the Machine at idle (no welding time).

For others machines this function is disabled (the LED is always OFF).



Welding Mode Switch: With four positions, controls the welding mode of the machine: three for Stick welding (Soft, Crisp and User defined) and one for Lift TIG welding.

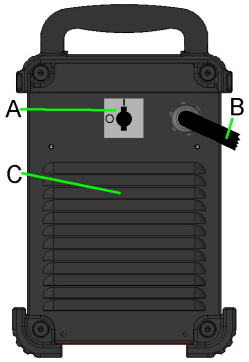
	• Soft Stick: For a welding with a low spatter presence. The Auto Adaptive Arc Force is enabled.
	• Crisp Stick: For an aggressive welding, with an increased Arc stability. The Auto Adaptive Arc Force is enabled.
  	• User defined MMA parameters: with this welding mode the Auto Adaptive Arc Force is disabled. This welding mode allows to manually adjust the Hot Start and the Arc Force as following: Hot Start: The Output Current initial increment is adjustable between 0 and 60% of the current set through the Output Current Knob. Arc Force: The Output Current temporary increments are adjustable between 0 and 50% of the current set through the Output Current Knob.
	• 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.

Meter: The meter displays the preset welding current before welding and the actual welding current during welding.

Through the Pushbutton on the Display right side, the Display alternatively shown the output Current (A) or Voltage (V). The LEDs (A) (V) on top side indicates the measure unit of the value shown by the Display.

A flashing dot on the Display indicates that the value read is the average value (V or A) of the previous welding time. This feature has shown the average value for 5seconds after every welding time.

Other Controls and Features



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

B. Input cable: Connect it to the mains.

C. Fan: This machine has a F.A.N. (Fan As Needed) circuitry inside: the fan is automatically turned ON or 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. If the machine doesn't weld for more than five minutes, the fan will turn OFF.

Maintenance

⚠ WARNING

For any repair operations, modifications or maintenances, it is recommended to contact the nearest Technical Service Center or Lincoln Electric. Repairs and modifications performed by unauthorized service or personnel will cause, that the manufacturer's warranty will become null and void.

Any noticeable damage should be reported immediately and repaired.

Routine maintenance (everyday)

- Check condition of insulation and connections of the work leads and insulation of power lead. If any insulation damage exists replace the lead immediately.
- 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 at list once every year)

Perform the routine maintenance and, in addition:

- Keep the machine clean. Using a dry (and low pressure) airflow, remove the dust from the external case and from the cabinet inside.
- If it is required, clean and tighten all weld terminals.

The frequency of the maintenance operations may vary in accordance with the working environment where the machine is placed.

⚠ WARNING

Do not touch electrically live parts.

⚠ WARNING

Before the case of welding machine will be removed, the welding machine had to be turned off and the power lead had to be disconnected from mains socket.

⚠ 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. 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 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.

Technical Specifications

INPUT				
Input Voltage 400V ± 15% Three Phase	Input Power at Rated Output		EMC Group / Class	Frequency
	270SX	6.3kW @ 100% Duty Cycle 9.5kW @ 35% Duty Cycle	II / A	50/60Hz
	400SX	10.9kW @ 100% Duty Cycle 16.4kW @ 35% Duty Cycle	II / A	

RATED OUTPUT AT 40°C			
	Duty Cycle (Based on a 10 min. period)	Output Current	Output Voltage
270SX	100% 35%	200A 270A	28.0Vdc 30.8Vdc
400SX	100% 35%	300A 400A	32.0Vdc 36.0Vdc

OUTPUT RANGE		
	Welding Current Range	Open Circuit Voltage
270SX	5 – 270A	45Vdc (CE model) 12Vdc (AUSTRALIA model)
400SX	5 – 400A	

RECOMMENDED INPUT CABLE AND FUSE SIZES		
	Fuse (delayed) or Circuit Breaker (“D” characteristic) Size	Input Power Cable
270SX	20A	4x2.5mm^2
400SX	30A	4x4mm^2

PHYSICAL DIMENSIONS				
	Height	Width	Length	Weight
270SX	389mm	247mm	502mm	22kg
400SX	455mm	301mm	632mm	37kg
Operating Temperature -10°C to +40°C			Storage Temperature -25°C to +55°C	

WEEE

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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

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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

W6100317R	Remote Connector (6 pins).
K10095-1-15M	Hand Amptrol.
K870	Foot Amptrol.