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Rev. 05

TOMAHAWK® 1025 & 1538

OPERATOR'S MANUAL

ENGLISH

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

CE
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Declaration of conformity

Lincoln Electric Bester Sp. z o.o.

Declares that the plasma machine:

TOMAHAWK® 1025
TOMAHAWK® 1538

conforms to the following directives:

2006/95/CEE, 2004/108/CEE

and has been designed in compliance with the following standards:

EN 60529, EN 60974-1, EN 60974-7, EN 60974-10

(15.02.2013)

Paweł Lipiński
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 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

Safety

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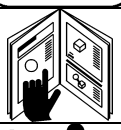
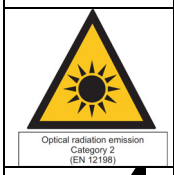
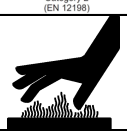
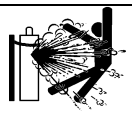
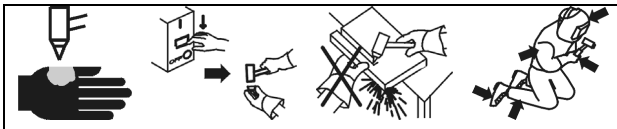
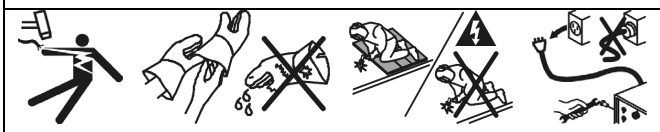
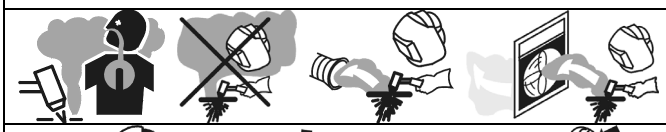
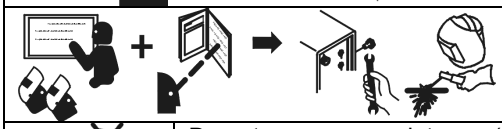
WARNING

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

Installation and Operator Instructions

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

Location and Environment

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

- Do not place or operate this machine on a surface with an incline greater than 15° from horizontal.
- Do not use this machine for pipe thawing.
- This machine must be located where there is free circulation of clean air without restrictions for air movement to and from the air vents. Do not cover the machine with paper, cloth or rags when switched on.
- Dirt and dust that can be drawn into the machine should be kept to a minimum.
- This machine has a protection rating of IP23. Keep it dry when possible and do not place it on wet ground or in puddles.
- Locate the machine away from radio controlled machinery. Normal operation may adversely affect the operation of nearby radio controlled machinery, which may result in injury or equipment damage. Read the section on electromagnetic compatibility in this manual.
- Do not operate in areas with an ambient temperature greater than 40°C.

Duty Cycle

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

Example: 60% duty cycle means that is possible cut for 6 minutes, then the machine stops for 4 minutes.

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

Input Supply Connection

Check the input voltage, phase, and frequency supplied to this machine before turning it on. The allowable input voltage is indicated in the technical specification section of this manual and on the rating plate of the machine. Be sure that the machine is grounded.

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

This machine is designed to operate on engine driven generators as long as the 400Vac auxiliary can supply adequate power as indicated in the technical specification section of this manual. The auxiliary supply of the generator must also meet the following conditions.

- The AC waveform peak voltage is below 700V.
- The AC waveform frequency is between 50 and 60 Hz.
- The RMS voltage of the AC waveform is always equal to 400Vac ±15%.

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

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

⚠ WARNING

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.

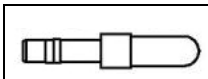
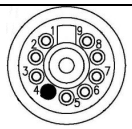
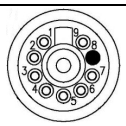
⚠ WARNING

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

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

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

Torch Connector Polarization Key:
This Plasma Cutting Machine shall be used with its specific torch. The polarized torch connector avoid the risk to use the machine with a not proper torch model. The position of the polarized key is shown in the table below.

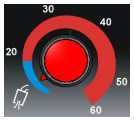
 Polarization Key	 60A machines	 100A machines

Controls and Operational Features

Machine Auto-Test:

When the machine is turned ON, an auto-test is executed; during this test all of the LEDs of the Commands Front Panel lights up. If one or some LED remains OFF, contact the nearest technical service center or Lincoln Electric and report the LED Status found on the machine Front Panel.

Front Panel Controls

	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. Gas Purge: The Output Current Knob completely rotated counterclockwise enables the gas purge function.
	Power ON/OFF LED: It lights up when the machine is ON. Blinking LED: Mains out of range condition. The machine is disabled: when the mains returns in the correct range, the machine restart automatically. Note: The Fan could be automatically switched OFF if the error condition persist for more than 2seconds.
	Output LED: The cutting torch is energized. Blinking LED: Internal auxiliary undervoltage condition. The machine needs to be turned OFF then ON again to restart.
	Thermal LED: 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.
	Low gas pressure condition LED: With this LED ON the machine stops cutting or gouging operations. The machine restart automatically when a correct gas pressure is detected. To check / adjust the primary gas pressure (see recommended values in the Tecnical Specifications of this manual): • When this LED lights up, for 10 seconds the machines goes automatically in Purge mode. • During Purge time check and adjust the gas pressure through the manometer and primary gas pressure regulator knob. • If necessary, check and adjust also the inlet gas pressure through the commands of the inlet primary gas.

	PIP LED: Part in place condition: the torch retaining cap (or the torch connector) is not properly screwed on the torch head (or in the machine torch connector). To restore the machine: • Screw firmly the torch retaining cap (or the torch connector). • After the torch is restored, the machine cannot restart for about 5 seconds. During this time the PIP LED blinks. (Note: When the LED is blinking, if another PIP error occours or if the Torch Trigger pushbutton is pressed the machine returns to the error condition: PIP LED returns steady ON and the restoring procedure begins again). • When the PIP LED turns OFF the machine is ready to operate.
 TH1025  TH1538	Primary Gas Pressure Gauge and Regulator Knob: Allow to regulate and monitoring the primary gas pressure. **The inlet primary gas pressure is limited by this pressure regulator, set at factory at 5.5bar. In case to adjust the gas pressure, put the machine in Purge mode.**
	Cutting Operating Mode Selection: Press the pushbutton to select the desired operating mode (the "ON" LED indicates the selected mode): • CUT (top LED ON): for cutting or piercing operations on a solid work piece. • GRID (middle LED ON): for cutting operations on a grid work piece. • GOUGE (bottom LED ON): for removing material from a solid work piece (e.g.: removing a failed welded bead). It is possible change the Operating Mode with the machine at idle and also during the Purge, Post Flow and Cooling time. Pressing the pushbutton during Pilot Arc or Cutting time has no effects.

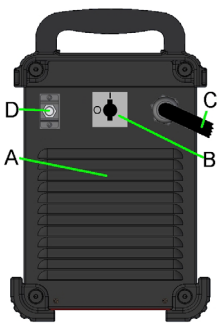
Error condition list.

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.

Head Torch	 On Blink Blink This occurs if after 4seconds the Pilot Arc isn't transfered to the workpiece. The machine stops the pilot arc to avoid overheating on the Torch Head. To restore the machine: • Release the Torch Trigger pushbutton. The blinking LEDs are now permanently ON • Press again the release the Torch Trigger pushbutton.
No pilot arc estabilished	 On On On The Torch Trigger pushbutton is pressed. During this period the machine try to start the pilot arc for 4 times. If the pilot arc doesn't start the machine automatically goes in a safe condition that allow to check as necessary. To restore the machine: • Turn OFF the Power switch. • Check the correct placement of the Torch Head consumables and parts. • Check the Torch electrical connections. • Turn ON again the machine.
Trigger Pushed	 On On On On This occurs if the machine is switched ON (or if it restart after cooling time) with the Torch Trigger pushbutton hold. This status avoids unsafe operating conditions: manual cutting or gouging processes must be started ONLY under the direct control of the operator. To restore the machine: • Release the Torch Trigger pushbutton. • Press again the Torch Trigger pushbutton. If this error condition persist check for eventual malfunctions of the the Torch Trigger pushbutton.

Rear Panel Controls and Connections

A. 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 torch trigger pushbutton is



pressed. If the torch trigger pushbutton is released for more than five minutes, the fan will turn OFF.

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

C. Input cable: Connect it to the mains.

D. Gas Inlet: Connect here the hose carrying the gas to the machine.

⚠ WARNING

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

Cutting Process

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

The pilot arc is struck as follow: the torch button energize an electrovalve (solenoid valve). This valve lets the gas 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 operate, 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.

- With the machine switched OFF, prepare the torch with the consumables adequate to the desired process (CUT / GRID / GOUGE). Refer to the Torches Instruction Manual to select the correct combination of consumables.
- Connect the Torch and the worck cable to the machine.
- Turn ON the Power Switch placed on the back of the machine; the Power ON/OFF LED on the front panel will turn ON. The unit is now ready to operate.
- Check that the primary gas is available through the Gas Purge function.
- Select the desired Operating Mode process.
- Set the desired current value with the Output Current knob.

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

Once the process is terminated releasing off the torch button will cause the plasma arc to be turned off; the gas flow will continue to allow the cooling down of the torch. The Post Flow time is proportional to the selected cutting current and it is divided into 4 time ranges:

Selected Cutting Current	Post Flow Time
Less than 30A	15seconds
Between 30A and 40A	20seconds
Between 40A and 50A	25seconds
Greater than 50A	30seconds

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.

⚠ 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.

	TH1025				**TH1538**			
		Speed (cm/min.)				Speed (cm/min.)		
Thickness	Current (A)	MILD STEEL	ALUMINUM	STAINLESS STEEL	Current (A)	MILD STEEL	ALUMINUM	STAINLESS STEEL
4 mm	---	---	---	---	---	---	---	---
6 mm	---	---	---	---	---	---	---	---
¼ ”	---	---	---	---	---	---	---	---
8 mm	---	---	---	---	---	---	---	---
10 mm	60	119	206	105	---	---	---	---
½ ”	60	91	157	77	---	---	---	---
15 mm	60	72	122	55	100A	180	223	147
¾ ”	60	48	75	40	100A	117	152	99
20 mm	60	43	65	36	100A	106	140	91
25 mm	60	26	36	17	100A	70	98	63
1 ”	60	25	35	16	100A	68	95	61
30 mm	60	---	22	---	100A	50	73	46
1 ¼ ”	60	---	16	---	100A	45	66	42
35 mm	---	---	---	---	100A	38	55	36
1 ½ ”	---	---	---	---	100A	32	48	31

Electromagnetic Compatibility (EMC)

01/11

This machine has been designed in accordance with all relevant directives and standards. However, it may still generate electromagnetic disturbances that can affect other systems like telecommunications (telephone, radio, and television) or other safety systems. These disturbances can cause safety problems in the affected systems. Read and understand this section to eliminate or reduce the amount of electromagnetic disturbance generated by this machine.

This machine has been designed to operate in an industrial area. The operator must install and operate this equipment as described in this manual. If any electromagnetic disturbances are detected the operator must put in place corrective actions to eliminate these disturbances with, if necessary, assistance from Lincoln Electric. The Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There may be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated disturbances. This equipment does not comply with IEC 61000-3-12. If it is connected to a public low-voltage system, it is responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment may be connected.

Before installing the machine, the operator must check the work area for any devices that may malfunction because of electromagnetic disturbances. Consider the following.

- Input and output cables, control cables, and telephone cables that are in or adjacent to the work area and the machine.
- Radio and/or television transmitters and receivers. Computers or computer controlled equipment.
- Safety and control equipment for industrial processes. Equipment for calibration and measurement.
- Personal medical devices like pacemakers and hearing aids.
- Check the electromagnetic immunity for equipment operating in or near the work area. The operator must be sure that all equipment in the area is compatible. This may require additional protection measures.
- The dimensions of the work area to consider will depend on the construction of the area and other activities that are taking place.

Consider the following guidelines to reduce electromagnetic emissions from the machine.

- Connect the machine to the input supply according to this manual. If disturbances occur 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	Input Power at Rated Output		EMC Class	Frequency
400V ±15% Three Phase	**TH1025**	4.3kW @ 100% Duty Cycle 7.1kW @ 40% Duty Cycle	A	50/60Hz
	TH1538	7.1kW @ 100% Duty Cycle 13.7kW @ 40% Duty Cycle	A	

RATED OUTPUT AT 40°C			
	Duty Cycle (Based on a 10 min. period)	Output Current	Output Voltage
TH1025	100%	40A	96VDC
	60%	50A	100VDC
	40%	60A	104VDC
TH1538	100%	60A	104VDC
	60%	85A	114VDC
	40%	100A	120VDC

OUTPUT RANGE					
Cutting Current Range		Maximum Open Circuit Voltage		Pilot Arc Current	
TH1025	20 - 60A	**TH1025**	320VDC	**TH1025**	20A
TH1538	20 - 100A	**TH1538**	320VDC	**TH1538**	20A

COMPRESSED AIR or GAS		
	Required Flow Rate	Required Inlet Pressure
TH1025	130 ±20% l/min @ 5.5bar	6.0bar ÷ 7.5bar
TH1538	280 ±20% l/min @ 5.5bar	

RECOMMENDED INPUT CABLE AND FUSE SIZES			
Fuse (delayed) or Circuit Breaker ("D" characteristic) Size		Input Power Cable	
TH1025	20A	**TH1025**	4 x 2.5mm^2
TH1538	32A	**TH1538**	4 x 4mm^2

PHYSICAL DIMENSIONS							
Height		Width		Length		Weight	
TH1025	389mm	**TH1025**	247mm	**TH1025**	510mm	**TH1025**	22kg
TH1538	455mm	**TH1538**	301mm	**TH1538**	640mm	**TH1538**	34kg
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 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE) and its implementation in accordance with national law, electrical equipment that has reached the end of its life must be collected separately and returned to an environmentally compatible recycling facility. As the owner of the equipment, you should get information on approved collection systems from our local representative.
By applying this European Directive you will protect the environment and human health!

Spare Parts

12/05

Part List reading instructions

- 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.