

# **PT-31XL and PT-31XLPC** *Plasma Arc Cutting Torches*



Instruction Manual (GB)

0558005178

## BE SURE THIS INFORMATION REACHES THE OPERATOR. YOU CAN GET EXTRA COPIES THROUGH YOUR SUPPLIER.

# CAUTION

These INSTRUCTIONS are for experienced operators. If you are not fully familiar with the principles of operation and safe practices for arc welding and cutting equipment, we urge you to read our booklet, "Precautions and Safe Practices for Arc Welding, Cutting, and Gouging," Form 52-529. Do NOT permit untrained persons to install, operate, or maintain this equipment. Do NOT attempt to install or operate this equipment until you have read and fully understand these instructions. If you do not fully understand these instructions, contact your supplier for further information. Be sure to read the Safety Precautions before installing or operating this equipment.

## **USER RESPONSIBILITY**

This equipment will perform in conformity with the description thereof contained in this manual and accompanying labels and/or inserts when installed, operated, maintained and repaired in accordance with the instructions provided. This equipment must be checked periodically. Malfunctioning or poorly maintained equipment should not be used. Parts that are broken, missing, worn, distorted or contaminated should be replaced immediately. Should such repair or replacement become necessary, the manufacturer recommends that a telephone or written request for service advice be made to the Authorized Distributor from whom it was purchased.

This equipment or any of its parts should not be altered without the prior written approval of the manufacturer. The user of this equipment shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, damage, improper repair or alteration by anyone other than the manufacturer or a service facility designated by the manufacturer.

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## 1.0 Safety Precautions

Users of ESAB welding and plasma cutting equipment have the ultimate responsibility for ensuring that anyone who works on or near the equipment observes all the relevant safety precautions. Safety precautions must meet the requirements that apply to this type of welding or plasma cutting equipment. The following recommendations should be observed in addition to the standard regulations that apply to the workplace.

All work must be carried out by trained personnel well acquainted with the operation of the welding or plasma cutting equipment. Incorrect operation of the equipment may lead to hazardous situations which can result in injury to the operator and damage to the equipment.

- 1. Anyone who uses welding or plasma cutting equipment must be familiar with:
  - its operation
  - location of emergency stops
  - its function
  - relevant safety precautions
  - welding and / or plasma cutting
- 2. The operator must ensure that:
  - no unauthorized person stationed within the working area of the equipment when it is started up.
  - no one is unprotected when the arc is struck.
- 3. The workplace must:
  - be suitable for the purpose
  - be free from drafts
- 4. Personal safety equipment:
  - Always wear recommended personal safety equipment, such as safety glasses, flame proof clothing, safety gloves.
  - Do not wear loose fitting items, such as scarves, bracelets, rings, etc., which could become trapped or cause burns.
- 5. General precautions:
  - Make sure the return cable is connected securely.
  - Work on high voltage equipment may only be carried out by a qualified electrician.
  - Appropriate fire extinguishing equipment must be clearly marked and close at hand.
  - Lubrication and maintenance **must not** be carried out on the equipment during operation.

# WARNING

#### WELDING AND PLASMA CUTTING CAN BE INJURIOUS TO YOURSELF AND OTHERS. TAKE PRECAUTIONS WHEN WELDING OR CUTTING. ASK FOR YOUR EMPLOYER'S SAFETY PRACTICES WHICH SHOULD BE BASED ON MANUFACTURERS' HAZARD DATA.

#### **ELECTRIC SHOCK** - Can kill.

- Install and earth (ground) the welding or plasma cutting unit in accordance with applicable standards.
- Do not touch live electrical parts or electrodes with bare skin, wet gloves or wet clothing.
- Insulate yourself from earth and the workpiece.
- Ensure your working stance is safe.

FUMES AND GASES - Can be dangerous to health.

- Keep your head out of the fumes.
- Use ventilation, extraction at the arc, or both, to take fumes and gases away from your breathing zone and the general area.

**ARC RAYS** - Can injure eyes and burn skin.

- Protect your eyes and body. Use the correct welding / plasma cutting screen and filter lens and wear protective clothing.
- Protect bystanders with suitable screens or curtains.

#### **FIRE HAZARD**

- Sparks (spatter) can cause fire. Make sure therefore that there are no inflammable materials nearby.

**NOISE** - Excessive noise can damage hearing.

- Protect your ears. Use earmuffs or other hearing protection.
- Warn bystanders of the risk.

**MALFUNCTION** - Call for expert assistance in the event of malfunction.

READ AND UNDERSTAND THE INSTRUCTION MANUAL BEFORE INSTALLING OR OPERATING.

#### **PROTECT YOURSELF AND OTHERS!**

## 2.1 DESCRIPTION

The patented PT-31XL and PT-31XLPC are manual torches with a 75° head designed for use with several plasma arc cutting packages using clean, dry air as the plasma gas. The service lines are 4.5, 7.6 or 15.2 meters (15, 25 or 50 feet) long and the torch is rated to operate up to 50 amperes at 100% duty cycle for cutting most metals.

P1-31XLPC, 7.6M
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ELECTRIC SHOCK CAN KILL.Plasma cutting uses high voltage. Skin contact with the<br/>torch, the power source, the workpiece or any grounded object MUST BE AVOIDED<br/>whenever the power source is on.Using the torch on any power source not equipped with a flow switch safety interlock<br/>may expose operator to unexpected high voltage.Before beginning operation of the torch, refer to the safety precautions and operat-<br/>ing instructions.

#### **2.2 ACCESSORIES**

A spare parts kit is recommended for maintaining the torch with minimum downtime. A spare parts kit is supplied with each plasma cutting package.

PowerCut-650, Spare Parts Kit	0558005392
PCM-500i ONLY and as an option on HandyPlasma 550	
35/40A XT Spare Parts Kit (Extended Life)	
PCM-500i, PowerCut-650, HandyPlasma 550 and HandyPlasma 380	
30/40A Standard Spare Parts Kit (High Performance)	0558003301

#### Note

The high performance kit (0558003301) is the preferred kit and is included with all of the above referenced plasma cutting systems.

#### Table 2-1 Contents of Spare Parts Kits:

		* PT-31XL and PT-31XLPC Spare Parts Kits P/Ns				
Description	P/N (optional P/N)	P/N 21980 35/40A	P/N 0558003301 30/40A	P/N 0558003464 50A / HP-50 (Europe only)	P/N 0558003462 35A / Caddycut (Europe only)	P/N 0558005392 40A / PC-650 (Europe only)
Heat Shield	20282	1	1			
Heat Shield, Long "CE"	0558000509 (36284)			1	1	1
30/40 amp High						
Performance Nozzle	0558000512 (20860)		3			3
35/40 amp Extended						
Life Nozzle	0558000508 (21008)	3			3	
Nozzle, 50 amp	0558000513 (20861)			3		
Swirl Baffle	0558000506 (20463)	1	1	1	1	1
Electrode	0558000507 (20862)	2	2	3	2	2
O-ring	0558000514 (950790)			1		
Lubricant (0.25 ounce)	0558000443 (17672)	1	1			1

#### \* Also see Tables 5-2 and 5-3.

#### Plasma Flow Measuring Kit:

#### **Torch Guide Kit:**

This complete kit, in a rugged plastic carrying case, includes	
attachments for circle and straight line cutting on ferrous and	
non-ferrous metals.	
Deluxe, 1-3/4" - 42" (44.5mm-1060mm) Radius05580032	58
Basic, 1-3/4" - 28" (44.5mm-710mm) Radius05580026	75

#### 2.3 TECHNICAL DATA (required by CE)

a. Process:

Manual torch used for plasma arc cutting

- b. Method of guidance: Manual
- c. Voltage class: M (113v peak to 400v peak) Striking voltage: 8000 VAC Stabilizing voltage: 200 VDC
- d. Maximum rated current: 50 amps
  Maximum current at 100% duty cycle: 50 amps
  Type gas: 120 l/min. at 5.5 bar (254 cfh at 80 psi)
- e. Max. and min. gas pressure at inlet: 4.8 to 5.9 bar (70 to 86 psi)
- f. Type of cooling: Air
- g. Rating of auxiliary electrical control in torch: N/A
- h. Requirements for connection of torch: Wrenches and screwdriver
- i. Essential information about safe operation of torch: Refer to all safety precautions in manual
- j. Essential information about safe operation of the plasma cutting torch and the functioning of interlocking and safety devices:

Meets requirements by means of pneumatic interlock safety system. The interlocking device deenergizes the torch when parts, particularly protective cone, are removed to expose electrode connection. For the interlocking device to function properly, the torch electrode must remain in the protective cone. Do not attempt to install the electrode into the torch without first placing it in proper position (with the other parts) within the protective cone.

- k. Type of plasma cutting power source that can form a safe system with the plasma cutting torch: PCM-500i, PowerCut 650, HandyPlasma 550, HandyPlasma 380, HandyPlasma 50 and Caddycut.
- I. Plasma cutting ability:

See Graphs 2-1a and 2-1b on following page:



Graph 2-1a 35 Amp Cutting Parameters



Graph 2-1b 50 Amp Cutting Parameters

#### 3.1 TORCH / CONSUMABLES INSPECTION

For detailed installation and operation follow all torch instructions in the plasma system manual packed with your cutting package. DO NOT install or attempt to operate this torch without following those instructions first.

WARNING	Conditions under which extra precautions are to be observed during plasma cutting: 1. Refer to general warnings in manual. 2. Do not cut closed containers. An explosion may result.
WARNING	Before inspecting or changing consumables make sure power switch on the power source is in the OFF position and primary input power is deenergized.
	BE SURE to install the swirl baffle in the torch. Failure to do so would allow the

BE SURE to install the swirl baffle in the torch. Failure to do so would allow the nozzle (tip) to contact the electrode. This contact would permit high voltage to be applied to the nozzle. Your contact with the nozzle or workpiece could then result in serious injury or death by electric shock.

- 1. Periodically check the heat shield, electrode, nozzle, and swirl baffle. Replace if worn or damaged.
- 2. The power cable assembly should be inspected periodically. If there are any cuts through the protective sheath or if gas leaks are noted, replace the damaged assembly.
- 3. Do not continue to use torch if the electrode erodes to a length shorter than 16mm (0.63 inch) as shown in Figure 3-1.



WAKNING

The torch head contains a gas flow check valve that acts in conjunction with the flow switch and circuitry within the power source. This system prevents the torch from being energized with high voltage if the torch switch is accidentally closed when the heat shield is removed. ALWAYS REPLACETORCH WITH THE APPROPRIATE TORCH MANUFACTURED BY ESAB SINCE IT ALONE CONTAINS ESAB'S PATENTED SAFETY INTERLOCK.

4. The gas flow check valve is part of the safety interlock and is permanently assembled in the torch head. The head must be replaced if this valve malfunctions. The light spring force used to close the ball check can be felt by pushing on the electrode when assembling the front end components.

#### Note

The electrode seat comes assembled in the front end of the torch. When using the XT consumables, make sure the plunger, P/N 0558000511 (20324), is installed under the seat. If missing, remove seat and install plunger. Make sure seat is tightened firmly with a wrench but do NOT overtighten.

#### 3.2 DISASSEMBLY OF TORCH - REMOVING CONSUMABLES

- 1. To disassemble the front end, hold the torch with the shield in an upright position as shown in Figure 3-2. This will prevent the nozzle, electrode, and swirl baffle from falling free when the shield is removed.
- 2. If the torch is fixed and cannot be rotated upward, the alternate method of disassembly is to disassemble the electrode, swirl baffle and nozzle as above being careful not to damage them by letting them fall.

#### 3.3 INSTALLING CONSUMABLES - ASSEMBLY OF TORCH

#### Note

Apply a small amount of lubricant - 0558000443 (17672), supplied in spare parts kit, to the heat shield or to the o-ring as shown in Figure 3-1. Check o-ring for damage whenever the shield is removed. Replace if necessary. O-ring part number is 0558000514 (950790).

- 1. To assemble with the torch front end facing up, assemble electrode, swirl baffle, tip and heat shield in that order as shown in Figure 3-2. The swirl baffle is symmetrical and it can be positioned either way. Tighten heat shield snugly to hold the parts in firm contact with each other and the torch head. Do not overtighten the heat shield.
- 2. If the torch is fixed and cannot be rotated upward, the alternate method of assembly is to assemble the electrode, swirl baffle and nozzle as above and drop them into the heat shield. Then thread the heat shield upward into the torch body.



Figure 3-1 O-ring and Electrode Maintenance

Figure 3-2 Front End Assembly

\*Note: Plunger, P/N 0558000511 (20324), used only with "XT" consumables.

#### **4.1 MAINTENANCE**

The power cable and switch leads in the service line should be inspected periodically. If there are any cuts through the protective sheath or if gas leaks are noted, replace the damaged component.

**ARNING** Before any maintenance is attempted on this torch, make sure the POWER SWITCH on the power source is in the OFF position and the PRIMARY INPUT POWER is DEENERGIZED.

#### 4.1.1 Disassembly of Service Line (refer to Figure 4-1)

- 1. Lay the line out straight.
- 2. Pull flex support back and remove the tape from around the switch lead splices.
- 3. Free the switch by cutting the leads close to the splices.
- 4. Replacement switches have extra long leads to make up for any loss due to cutting.
- 5. Remove the rubber boot from the inlet end of the cable.
- 6. Remove the tape that secures the sheath at each end.
- 7. Pull the sheath off the cable (over small fitting at torch end).

#### Note

The switch leads wrapped around the power cable are secured with tape several places along the cable.

## WARNING

BE SURE to loosen fittings using 2 wrenches during disassembly. Failure to do so could result in serious injury to the operator.

8. The leads, switch cord plug, and strain relief can now be removed. See Figure 4-1, Step 3.



DO NOT remove the white tape that forms a band around the power cable at each end. The sheath is taped to the cable in front of the band which acts as a shoulder to prevent the sheath from sliding back on the cable. Replacement cables have this tape in place.

If the switch leads are to be replaced, replace with 16 AWG STRANDED COPPER, 600- VOLT, 90° C (194° F) INSULATED WIRE.

9. Reassemble in reverse order.

#### 4.2 Repositioning Torch Switch

In some applications it is more convenient for the troch switch to be positioned 180 degrees from current configuration.

To reposition the switch on the torch, slide the flex support back, remove the tape securing the spliced leads to the power cable, reposition switch, retape the leads, and pull the flex support back in place. See Figure 4-1.

**Note** A thin film of silicone lubricant P/N 0558000443 (17672), supplied with the spare parts kit, applied inside of the flex support will ease the assembly of this part.

## MAINTENANCE

## **SECTION 4**

# WARNING

BE SURE to tighten fittings securely using 2 wrenches during reassembly. (Factory recommended torque is 3.39 n-m or 30 in-lbs). Failure to do so could result in serious injury to the operator.



Figure 4-1 Power Cable and Switch Disassembly Sequence

#### 5.1 Definitions

"XT" Consumables - Used with currently produced product (HandyPlasma 380, HandyPlasma 550, PCM-500i, PowerCut 650, Caddycut and HandyPlasma-50), and older products dating back to 1990.

<u>Standard Consumables / Heavy Duty Consumables</u> - Available for support of pre-1990 year machines (PCM-32i, PCM-50 and PCM-31) and consumables configurations. These are the original consumables designed for the torch.

High Performance Nozzle - Gives maximum cutting thickness and speed capability.

**Extended Life Nozzle** - Gives extended nozzle life at the expense of top end cutting thickness and speed capability.

#### 5.2 Ordering

To ensure proper operation, it is recommended that only genuine ESAB parts and products be used with this equipment. The use of non-ESAB parts may void your warranty.

Have the plasma power source model number and serial number handy if there are any questions concerning required parts.

Replacement parts may be ordered from your ESAB Distributor.

Be sure to indicate any special shipping instructions when ordering replacement parts.

Refer to the Communications Guide located on the back page of this manual for a list of customer service phone numbers.

#### 5.3 PT-31XL and PT-31XLPC Replacement Parts

- 1. The PT-31 torch is used on several different cutting packages which require different torch trigger connection configurations as shown in Figure 5-1 and Table 5-1.
- 2. The PT-31 torch is adaptable to standard, heavy duty or XT consumables to meet specific cutting applications. See Subsections 5.3.1, 5.3.2 and 5.3.3.
- 3. Individual consumable parts can be ordered as needed if spare parts kits do not fit current needs.

In most cases, it is recommended that you order the same consumable parts that were shipped with your plasma cutting system.



Figure 5-1 PT-31XL Torch Parts and Configurations



Figure 5-2 PT-31XLPC Torch Parts and Configurations

Configuration #	Complete Torch Assembly	Installed Consumables	Plasma Cutting System
1	20084 - 4.6m (15') lines 20080 - 7.6m (25') lines 20082 - 15.2m (50') lines	Seat and o-ring. Consumables and plunger not included.	
	21985 - 7.6m (25') lines	30A / 40A high performance "XT" consumables, standard heat shield P/N 20282, seat, o-ring and plunger.	PCM 500i, Handy Plasma-550 (Asia)
2	0558005393 7.6m (25') lines	30A / 40A high performance "XT" consumables, standard heat shield P/N 20282, seat, o-ring and plunger.	Powercut-650
3	0558004482 4.6m (15') lines	30A / 40A high performance "XT" consumables, standard heat shield P/N 20282, seat, o-ring and plunger. <b>NOTE:</b> When ordering the PT-31XL torch assembly for use on the HandyPlasma-380, Female Torch Connector P/N 0558004947 shown below <b>must</b> also be ordered.	HandyPlasma-380
	0558001466 4.6m (15') lines	30A / 40A high performance "XT" consumables, long heat shield P/N 0558000509 (36284), seat, o-ring and plunger.	CaddyCut (Europe)
	0558004498 7.6m (25') lines	30A / 40A high performance "XT" consumables,standard heat shield P/N 20282, seat, o-ring and plunger.	HandyPlasma-550 (North America)
	0558003467 7.6m (25') lines	30A / 40A high performance "XT" consumables, long heat shield P/N 0558000509 (36284), seat, o-ring and plunger.	HandyPlasma-50 (Europe)

Table 5-1 PT-31 Replacement Torch and Torch Parts

## 5.3.1 Standard Consumables

These consumable parts will give good cut quality on light to medium thick metals when used within the recommended cutting range of the plasma power source. The reversible electrode design gives extra electrode life and enables the safety interlock for operator safety.

The use of other than genuine ESAB consumables and replacement parts can cause personal injury and / or damage to the equipment.

ESAB does not warrant parts for its equipment which are not furnished by ESAB. The use of parts that are not furnished by ESAB does not automatically void ESAB's warranties for its equipment. Any obligations otherwise arising from ESAB's warranty will be voided if, but only if, the design, manufacture or composition of parts or components not supplied by ESAB are a material cause of the malfunction or poor performance of (or damage to) the equipment.



<u>Standard</u>

Figure 5-3 Torch Front End Standard Consumables

#### 5.3.2 Heavy Duty Consumables

The larger electrode diameter increases the electrode mass to provide improved cooling and reduced wear on medium to heavy cutting applications when correctly used within the recommended cutting range of the plasma power source. The reversible electrode design gives extra electrode life and enables the safety interlock for operator safety.

The use of other than genuine ESAB consumables and replacement parts can cause personal injury and / or damage to the equipment.

ESAB does not warrant parts for its equipment which are not furnished by ESAB. The use of parts that are not furnished by ESAB does not automatically void ESAB's warranties for its equipment. Any obligations otherwise arising from ESAB's warranty will be voided if, but only if, the design, manufacture or composition of parts or components not supplied by ESAB are a material cause of the malfunction or poor performance of (or damage to) the equipment.



Heavy Duty

Figure 5-4 Torch Front End Heavy Duty Consumables

#### 5.3.3 "XT" Consumables

The "XT" electrode and nozzle design extends the metal cutting thickness range and improves cut speed and edge quality for production plasma cutting applications. The torch safety interlock is enabled through the "non-consumable" plunger installed behind the removable seat in the torch head.



P/N 0558000509 (36284) CE (Long Heat Shield) Version

#### Figure 5-5 Torch Front End "XT" Consumables

	Standard Consumables Kits			
	<b>P/N 20464</b> <b>50 Amp</b> (note 3)	<b>P/N 18231</b> <b>30 Amp</b> (note 3)		
Description	P/N (Qty)	P/N (Qty)		
Heat Shield	20282 (3)	20282 (2)		
Nozzle	20079 (5)	18866 (4)		
Electrode	19683 (5)	18205 (4)		
Seat	0558000510	0558000510		
	(19679) (1)	(19679) (1)		
O-Ring	0558000514	0558000514		
	(950790) (5)	(950790) (5)		
Swirl Baffle	0558000506	18785 (1)		
	(20463) (3)			
Lubricant				
(1 oz.)	0558000443	0558000443		
	(17672) (1)	(17672) (1)		
Plunger	—	—		

Table 5-2 Contents of PT-31XL and PT-31XLPC Standard Consumables Spare Parts Kits

	"XT" Consumables Kits						
	<b>P/N 21051</b> <b>50 Amp</b> (note 3)	<b>P/N 21052</b> <b>40 Amp</b> (note 3)	<b>P/N 21980</b> <b>35 / 40 Amp</b> (note 2)	<b>P/N 0558003301</b> <b>30/40 Amp</b> (note 1)	<b>P/N 0558003464</b> <b>50 Amp</b> (note 4)	<b>P/N 0558003462</b> <b>35 Amp</b> (note 5)	<b>P/N 0558005392</b> <b>40 Amp (CE)</b> (note 1)
Description	P/N (Qty)	P/N (Qty)	P/N (Qty)	P/N (Qty)	P/N (Qty)	P/N (Qty)	P/N (Qty)
Heat Shield	20282 (2)	20282 (2)	20282 (1)	20282 (1)	0558000509 (36284) (1)	0558000509 (36284) (1)	0558000509 (36284) (1)
Nozzle	0558000513 (20861) (4)	0558000508 (21008) (4)	0558000508 (21008) (3)	0558000512 (20860) (3)	0558000513 (20861) (3)	0558000508 (21008) (3)	0558000512 (20860) (3)
Electrode	0558000507 (20862) (3)	0558000507 (20862) (3)	0558000507 (20862) (2)	0558000507 (20862) (2)	0558000507 (20862) (3)	0558000507 (20862) (2)	0558000507 (20862) (2)
Seat	—	—	_		—	—	_
O-Ring	—	—	—	—	0558000514 (950790) (1)	_	_
Swirl Baffle	0558000506 (20463)(1)	0558000506 (20463) (1)	0558000506 (20463) (1)	0558000506 (20463) (1)	0558000506 (20463) (1)	0558000506 (20463) (1)	0558000506 (20463) (1)
Lubricant (1 oz.)	_	_	_	0558000443 (17672) (1)			0558000443 (17672) (1)
Plunger	0558000511 (20324) (2)	0558000511 (20324) (2)	_	0558000511 (20324) (2)	_	_	

#### Table 5-3 Contents of PT-31XL and PT-31XLPC "XT" Consumables Spare Parts Kits

note 1 - for PCM-500i, PowerCut-650, HandyPlasma 550 and HandyPlasma 380

note 2 - for PCM-500i ONLY and as an option on HandyPlasma 550

note 3 - for older produced machines.

note 4 - HandyPlasma-50 for Europe

note 5 - Caddycut for Europe