DAVCO SUPACUT

Oxy-Petrol/Gasoline Cutting Systems

Overview

Thank you selecting a DAVCO SUPACUT

Oxy-Petrol/Gasoline system. Please note product range and models vary and development is ongoing thus items may vary slightly from that as illustrated or advertised.

www.davco.biz sales@davco.biz 61 466 980 909

Introduction

DAVCO SUPACUT Oxy-Petrol/Gasoline cutting tools is a patented product utilising unique and proprietary technologies with compressed oxygen and unpressurised petrol/gasoline thru a specially designed torch to form a high temperature flame for gas cutting or heating.

The Oxy-Petrol/Gasoline system is a powerful versatile product with numerous applications including the petrochemical industry, construction, shipbuilding, energy sector, machinery, metallurgy and mining industries plus police and emergency services (Fire, Ambulance, Rescue, disaster response), and rapid response repair organisations. Additionally SUPACUT offers specialized torches for mounting in CNC and profile cutting systems.

Performance and Characteristics

DAVCO SUPACUT Oxy-Petrol/Gasoline cutting system utilize's an alternative technology thru the use of petrol/gasoline as the combustible fuel. The Oxy-Petrol/Gasoline system has unparalleled cutting power (up to 300mm cutting depth!) and gives the ability to make cuts impossible with an oxy/acetylene system. Additionally the system has a massively reduced operating cost (typically about 1/10th the operating cost of an acetylene system).

Note that since the torch uses petrol/gasoline as a liquid fuel although a spark igniter can be used a flame igniter method of ignition is recommended.

A Safe Fuel

Petrol or Gasoline is readily available, it's price is substantially lower than acetylene, propane and other industrial cutting gases. Petrol/gasoline is liquid at room temperature, is stable and relatively easy to store and transport and is relatively safe to use (compared to acetylene) as shown by the fact petrol/gasoline is freely available and used extensively by automotive and marine users worldwide.

DAVCO's SUPACUT product is the safest cutting system possible with the design eliminating danger's associated with acetylene (or propane) use.

As a **liquid** petrol/gasoline cannot burn and as the petrol/gasoline remains liquid right up to the cutting tip the DAVCO torch cannot back flash up the fuel line, (so no back flash arrestor is required for the gasoline line) and it is not possible to have a fire in the fuel line.

As a liquid fuel any leaks can be easily detected. Fuel from any leak, pinhole, or open valve can be readily SEEN and then corrected.

ZERO pressure is needed in the tank for operation. As the liquid petrol/gasoline leaves the cutting tip the petrol/gasoline converts from liquid to vapor resulting in a volume expansion of around 160 times and allowing ignition of the cutting flame and also having a cooling effect on the tip.

Additionally the torch function is not impaired in low temperature such as in sub zero environment. The DAVCO SUPACUT Oxy-Petrol/Gasoline cutting systems are very tolerant to a wide range of adjustments (that are less than optimum) allowing rapid deployment to the field (such as rapid repair or rescue work) and with simple user training the tools can quickly be operated by relatively unskilled staff.

Product Technology

DAVCO SUPACUT Oxy-Petrol/Gasoline cutting system utilizes a unique technology to combine the petrol/gasoline and oxygen at the torch tip and as an exclusive design and safety measure a pressurized petrol/gasoline supply is NOT required from the tank.

As the petrol/gasoline supply is liquid and only evaporates at the tip which acts like a refrigerator drawing heat away from the actual tip the head (and tip) and so operates much cooler than any other torch so tips resist melting and have an extended life compared to an acetylene torch.

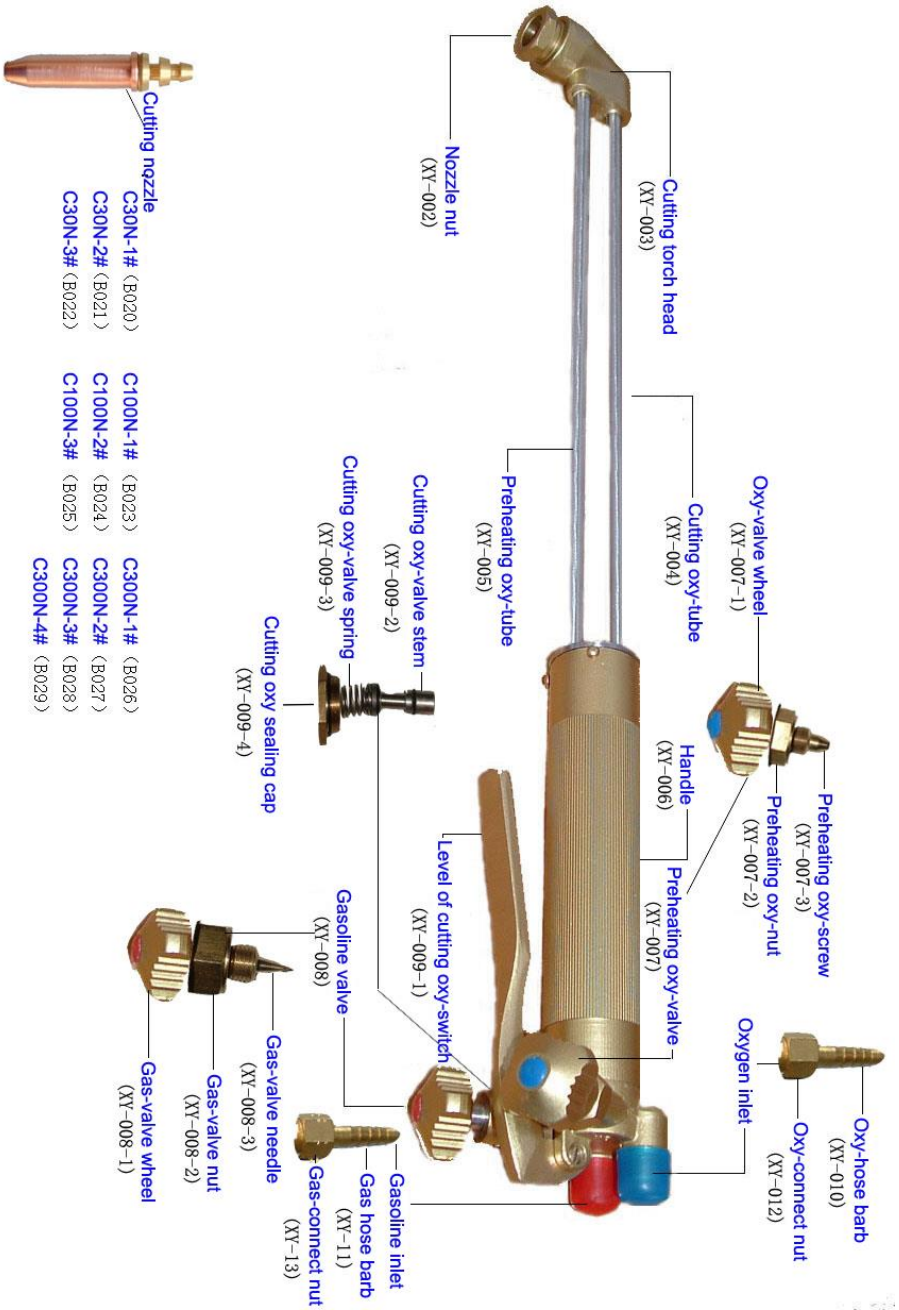
As Oxy-Petrol/Gasoline is 100% oxidizing to steel so the cut steel is completely burned out thus sparks are relatively cool and the sparks have little weight resulting in reduced hazard. This compares to acetylene with only 70% oxidization leaving 30% of the steel molten heavy and hot considerably increasing both operator and work site hazards.

A system is composed of dedicated Oxy-Petrol/Gasoline cutting torch (or alternative heating torch), and several models are available for cutting up to 300mm of solid steel, a oil resistant petrol/gasoline hose (or PU hose), explosion proof petrol/gasoline supply tank, oxygen hose (may not be included) and oxygen cylinder with regulator (may not be included).

Components of the Oxy-Petrol/Gasoline system

Torches

DAVCO torches are quality hand pieces manufactured from brass & stainless steel composed of cutting nozzle, injector tube assembly, cutting torch main body etc. The injector tube injection controls fuel delivery, fuel injection angles and so on to achieve uniform, accurate and adjustable delivery of fuel.



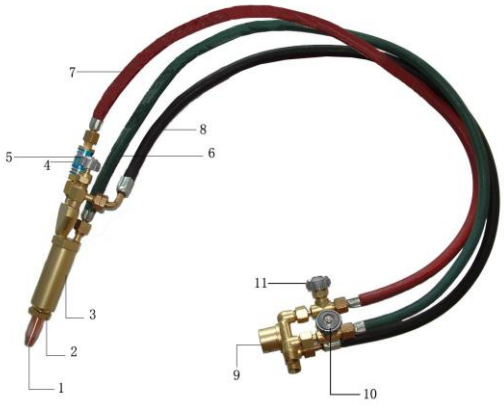


Fig.2.2 Semi-automatic Cutting Torch (CNC)

1-cutting nozzle
2-cutting nozzle nut
3-cutting torch main body
4-preheating oxygen adjustment
5-petrol/gasoline control valve
6-cutting oxygen hose
7-preheating oxygen hose
8-petrol/gasoline hose
9-distribution device
10-cutting oxygen control valve
11-preheating oxygen control valve

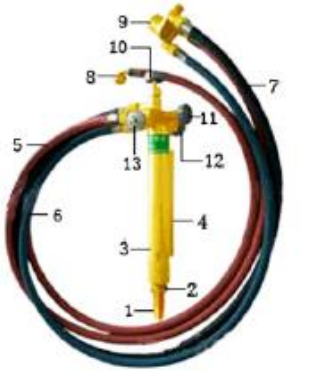


Fig.2.3 Semi-automatic Profile Cutting Torch (CNC)

1-cutting nozzle
2-cutting nozzle nut
3-cutting torch main body
4- Rack up and down adjustment
5-preheating oxygen hose
6-cutting oxygen hose
7-petrol/gasoline hose
8-pneumatic switch connector
9-distribution device
10-petrol/gasoline control valve
11-cutting oxygen control valve
12-pneumatic switch
13-preheating oxygen control valve

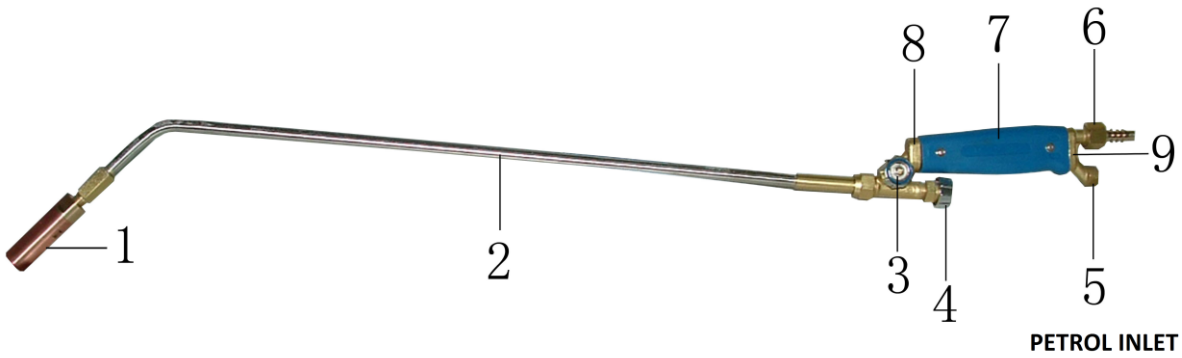


Fig.2.4 Heating Torch

1-heating nozzle
2-injection tube assembly
3-preheating oxygen control valve
4-petrol/gasoline control valve
5-petrol/gasoline inlet
6-oxygen connector
7-handgrip
8-middle body
9-rear body

Petrol/gasoline hose assembly

The petrol/gasoline hose assembly is composed of petrol/gasoline resistant high-quality PU hose, torch petrol/gasoline inlet connector nut, petrol/gasoline tank outlet valve connector nut etc. Cutting (heating) torch inlet connector nut is left-turn screw; petrol/gasoline outlet valve connector is right-turn screw nut.

Fig.3：Petrol/gasoline hose

Petrol/Gasoline tank – 1.5L, 4L or 10L （Design protected by Patent）

The Petrol/gasoline tank is composed of tank body, vent valve (fuel filling orifice cap), pressure gauge, outlet fuel valve etc.(Fig.4). Some tanks are pressurizable but is usually only manually pressurized in specialized application. No compressed air supply is required !

Fig.4：Petrol/gasoline tank

1-tank body
2-fuel outlet valve outlet port
3-valve body
4-outlet valve control
5-Fuel cap and vent
6-air pump
7-pressure gauge

SUPACUT

Oxy-Petrol/Gasoline System

Instruction Manual

Carefully read the manual before using this product & then file this document for future reference

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Method of Operation

1．Preparation <u>FIRST USE</u>

Place the petrol/gasoline tank and oxygen cylinder on a smooth level surface preferably 10m distant from the working area. (if the space is limited, you can reduce this to a 5m minimum distance). Ensure the work area is free of any possible hazards and is well ventilated. Lay out the petrol/gasoline and oxygen hoses with no kinks or tight loops.

According to the thickness, shape, material of the work piece to be cut select the appropriate model cutting torch and cutting nozzle (see reference tables). Connect the torch to hoses and then hoses to petrol/gasoline tank ensuring all connections, nuts and screws are tight.

Note: The Torch handpiece fuel hose has a LEFT HAND (reverse) thread and must be turned anticlockwise to connect the hose and torch. Note the hose ends are different

Close the regulating valve. Unscrew fuel filling Cap（Fig.6），pour in <u>clean regular automotive petrol/gasoline</u>

Fig.5： Petrol/gasoline tank

Fig.6：Unscrew filling cap & fill

Fill the tank to more than 2/3 of the tank volume and then close the vent valve and check tank fuel outlet valves are closed. Check all the connectors on the fuel hoses are screwed tight and form a reliable seal (leaks can potentially create a hazard and the torch will not perform at its optimum).

NOTE: *1.5L tank is designed to be worn at the hip with a belt (or with backpack system) and tank must be mounted UPSIDE DOWN.* ***Valve at bottom and filler at top****. System with 1.5L tank will not operate if tank is standing with fuel valve at the top*

STARTUP:

Fig.8 Priming Fuel Line

1. Select the appropriate model cutting torch and cutting nozzle and connect the fuel and oxygen hoses to the torch, fuel tank and Oxygen cylinder as per manual instructions.
2. Check BOTH Oxygen and Gasoline/petrol/Gasoline valves and controls are in the CLOSED/OFF position.
3. Fill the explosion proof fuel tank with clean REGULAR grade gasoline/petrol, replace and close the tank cap and vent valve
4. Now firstly turn on the Oxygen supply and adjust the Regulator pressure to between 10 and 40psi (varies depending on size of tip in use). This pressure may need to be increased when using larger torches and tips to cut thicker material
5. Open the fuel tank cap ¼ to ½ a turn and LEAVE as slightly open position. This is to prevent a vacuum forming in the fuel tank when the torch is in use.
6. Now ***while elevating the cutting torch*** (3-6ft or 1.5-1.8m) **open the tank fuel outlet valve AND then open the torch fuel control valve**.
7. While the tank AND torch valves are open ALSO open the preheating/Oxygen control valve of the torch and let the oxygen flow (for 10-15 seconds) or until fuel mist begins to spray from the torch tip.

Once fuel sprays from the torch tip promptly turn off torch fuel valve then the torch oxygen valve. The oxygen line should now be purged of AIR and the fuel line should now be full of fuel and “Ready For Use”

(If during initial setup and operation any air bubble is left in the fuel line the torch flame may self extinguish during operation due to an interruption in fuel flow [by an air bubble]. Simply reignite torch and continue.

8. Check system for any fuel leaks.
9. The torch is now ready to be ignited.
10. To ignite the torch **FIRST** slowly turn on preheating/**oxygen** control valve. Yes OXYGEN FIRST
11. **SECONDLY** turn on Gasoline/petrol control valve and then ignite the oxy/gasoline/petrol mist with an igniter. Note: If a spark igniter is used ignition can be

a little difficult as liquid gasoline/petrol won't burn! Gasoline/petrol needs to vaporise to ignite so if your source of ignition is too close to the nozzle and the gasoline/petrol is still liquid you cant light it… Try a little further away. (A naked flame can be easier to achieve ignition than spark igniters – BBQ flame gas lighter is quite good or pocket size mini butane torch or similar flame lighters)

12. Once lit…. for correct operation the cutting nozzle needs to be heated to a minimum of around 120-140F - 50-60℃ so the gasoline/petrol instantly vaporises on exiting the tip. To preheat the tip, adjust the controls for a small flame (**increase the fuel flow, reduce the preheating oxygen)** and maintain a small flame for 5-10 seconds. IF the tip is not hot enough OR the gasoline/petrol flow is too great some fuel may actually drip from the tip (even while the torch is ignited) Remember LIQUID gasoline/petrol wont burn…only the vapour will. Reduce fuel flow to allow adequate heating. (A tips full operating temperature is 750-930F - 400-500℃)
13. Once the tip has been preheated further open the oxygen valve to increase the flame cone size to about 3-5mm (or larger on larger torches and tips) and if the flame appears reddish…. reduce the Gasoline/petrol flow until the red flame disappears. Now the flame cone should be bright state. If not 'bright', you should slightly open the Gasoline/petrol control valve base until the flame cone brightness is at maximum brightness but before it turns reddish colour. The flame should now be long and have stable combustion. (Greater detail on flame adjustment follows below)
14. To cut… first preheat the start point of the work piece to the steel melting temperature then depress the torch cutting oxygen valve lever to ignite the steel and begin cutting.

SHUTDOWN:

- After finishing cutting or heating **first close the torch gasoline/petrol valve** until the flame is completely extinguished and then close torch oxygen valve and valve on the oxygen cylinder.
- Once finished the system can be left "as is" or in a "Ready For Use" state. (repriming is then not typically necessary to restart the torch). However **IF** the torch is not to be used again for some time it is recommended the operator drain the gasoline/petrol in the fuel hose back to the tank, turn off the fuel outlet valve, close the filling cap vent and oxygen cylinder valve, remove the oxygen regulator and cutting torch. Clean all items before storing ready for future use..

Cutting torch flame adjustment

First slowly turn on oxygen control valve on the torch and then turn on petrol/gasoline control valve and ignite the flow with any appropriate method (as is commonly used for igniting acetylene and propane torches).

Preheating

For correct combustion and operation the end of the cutting nozzle needs to be around 50-60℃ (about 120-140℉) so the fuel "flash" evaporates so it can ignite. Remember liquid petrol/gasoline will not burn…only the vapor will.. Thus on startup the nozzle needs preheating before actually commencing cutting. The preheating time will vary slightly according to the ambient temperature. To preheat the tip, adjust the controls for a small flame and maintain a small flame for several seconds. Normally just 3-5 seconds in summer, 5-10 seconds in winter (as Fig.9).

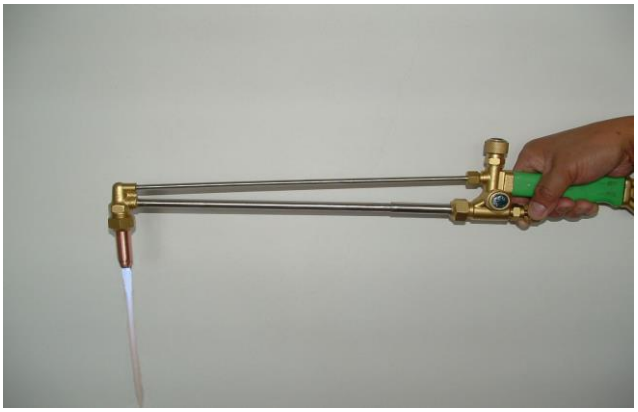

Fig. 9 Preheating Flame

Attention: To adjust the flame to preheating state (small flame), increase the petrol/gasoline flow, reduce the preheating oxygen**.**

Torch Adjustment

After preheating the nozzle further open the oxygen valve to increase the flame cone size to about 3-5mm If when turning up the oxygen, the flame appears reddish reduce the petrol/gasoline flow until the control valve red flame' disappears. Now the flame cone should be "bright". If not 'bright', you should slightly open the petrol/gasoline control valve base until the flame cone bright is at maximum brightness but before it turns reddish color. With careful adjustment and a little practice the optimum flame is achieved. The flame should now be long and, have stable combustion without turbulence. If a stable flame is not achieved consult the trouble shooting guide.

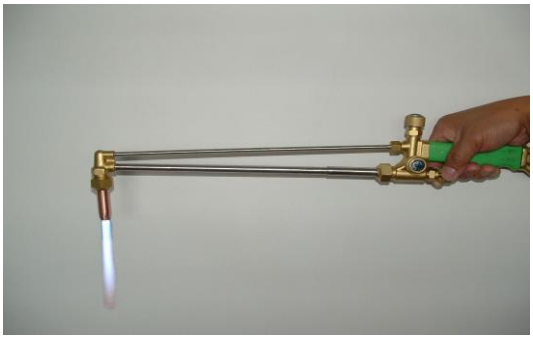

Fig. 10 Standard Cutting Flame

Ignition and adjustment of the semi-automatic (trolley and profile) cutting torch is the same as the hand cutting torch operation

Heating torch flame ignition and adjustment

The heating torch flame adjustment method is basically same as the cutting torch. First the oxygen supply regulator output pressure can not be less than 0.5Mpa During ignition the oxygen preheating valve should be opened FIRST with high flow, (If the Oxygen pressure or flow is too low, it is possible to damage the heating nozzle during ignition). Then secondly open the petrol/gasoline regulator valve. After the petrol/gasoline mist sprays out of the nozzle the torch can be ignited. After ignition, slightly close the oxygen valve (with no great 'red flame' is appropriate), waiting for 3-5 seconds, turn up the preheating oxygen valve and petrol/gasoline valve, that is ok that adjusted for a bright flame cone of about 20mm.

Cutting (or heating)

Petrol/gasoline cutting or (heating) is same as the acetylene and propane cutting (or heating) method: When cutting the operator should preheat the start point of the work piece to the burning temperature then quickly turn on the cutting oxygen valve to begin the cut. When heating, you should adjust the flame to a suitable level to directly heat the work piece to desired temperature.

Although not absolutely necessary where possible the material to be cut (or heated/welded) should be free from oil, water, rust and other contamination which can negatively influence the performance of the torch.

Closing Down the System

After finished the cutting (or heating) work first close the petrol/gasoline valve until the flame is completely extinguished, then close the oxygen valve. For heating torch, first close the petrol/gasoline valve, after the flame completely extinguished and then close the oxygen valve.

Unless the torch is to be daily, once finished you should drain the petrol/gasoline in the fuel hose back to the tank, turn off the fuel outlet valve, filling cap and oxygen cylinder valve, remove the oxygen regulator and cutting torch cleaning both before storing ready for future use..

Safety Matters

Always use the cutting or heating system with the care due to a precision piece of equipment ensuring it is kept clean and free of any damage. Protect the fuel tank from damage and ensure the workplace is kept clear and free of potential operating hazards.

Any gas cutting operation using an open flame should ALWAYS be used with great care. Petrol/gasoline leaks or improper tool operation can lead to accidents, Therefore, the persons concerned must pay careful attention to safety, formulate and strictly implement workplace safety practices related to a potentially hazardous working environment.

1) Operators should be familiar with the safe handling and use of petrol/gasoline and oxygen, especially the relevant provisions in case of fire or explosion. An open flame cutting/welding system MUST only be used in a well ventilated area and NEVER in close proximity to oxygen cylinders and petrol/gasoline tanks.
2) Any petrol/gasoline storage containers should be placed well away from any fire source and oxygen cylinders at least 10 meters away from torch operation.
3) Pay careful attention that the petrol/gasoline hose and oxygen hose are kept clean, free of grease or oil, and are protected from contact by melting or burning steel etc .
4) Periodically test for correct torch function. Before connecting petrol/gasoline hose check the injection power of the cutting (or heating) torch. This can be achieved by

connecting just the oxygen hose, opening the cutting (heating) preheating oxygen valve on the torch and petrol/gasoline valve (without the petrol/gasoline hose connected). Place a finger on the petrol/gasoline inlet of the torch and you should feel a suction that indicates the injection petrol/gasoline injection is functioning as designed. Should no suction be felt the torch may be in need of repair. To prevent accidents do not to continue operate.

5) After connecting and priming the petrol/gasoline hose carefully examine all joints of the tank, valves and petrol/gasoline hose, oxygen connectors, oxygen hose, and cutting (heating) torch for any possible sign of a petrol/gasoline or oxygen leaks, and for any system damage. If any of the preceding problems are found immediately cease use of the tool effect any needed system repair or if necessary send product in for repair.
6) Never pull on the petrol/gasoline hose and oxygen hose and protect the hose from heavy or sharp objects. Should there be any signs of cracking, softening or hardening phenomenon the hose should be immediately replaced.
7) When work is completed, each valve should be closed. There may be a small amount of residual petrol/gasoline in the cutting (heating) torch and this should be emptied, the torch should be wiped clean and with hoses should be hung up or placed in appropriate safe and secure storage ready for the next use.
8) NEVER heat, bake or damage the petrol/gasoline tank in any way.
9) The petrol/gasoline supply must be clean (to prevent fuel line or nozzle blockage).
10) NEVER use any fuel other than **regular** petrol/gasoline.
11) A cutting or (heating) torch should be carefully protected during storage or transportation and be kept clean and dry and avoid physical damage.
12) NEVER allow the cutting torch and various hoses and connectors accessories to come in contact with oil or grease in order to prevent oil-oxygen reaction, fire or explosion occurring.
13) Cutting nozzle fitting surface shall be protected from any damage to prevent a poor seal possibly causing a leak so affecting safe operation.
14) NEVER place a burning torch on the work piece or the ground.
15) NEVER block the cutting nozzle with anything so as to avoid oxygen reverse flow into the petrol/gasoline supply system, resulting in air resistance or possibly dangerous incidents.

Troubleshooting

Symptom	Possible Cause	Potential Solution
No petrol/gasoline at nozzle	1. Petrol/gasoline tank valve is not open. 2. Petrol/gasoline blockage, there is air in petrol/gasoline hose. 3. Did not open the tank pressure relief valve/cap after priming system	1, Open petrol/gasoline valve. 2, Check fuel line and exhaust air. 3, Loosen tank valve or cap.
Dripping (not spray mist) petrol/gasoline from cutting nozzle when ignited	Excessive petrol/gasoline setting, preheat oxygen is too small	Reduce petrol/gasoline flow and/or increase oxygen flow
Ignition problem and self extinguishing when first using after having filled an empty petrol/gasoline tank.	1. There is a mixture of unpurged air in the petrol/gasoline hose. 2.There is as leak point in the petrol/gasoline hose when using in non-pressurised operation.	1. Purge the petrol/gasoline hose of air.. 2. Investigate various join parts of whole petrol/gasoline supply and rectify any possible leakage fault. 3. Ensure the cap on the fuel tank is opened sufficiently to admit air and thus allow fuel to flow to the torch.
Flame unstable or flame self extinguishes	1. Out of fuel or kinked fuel hose 2. Low Oxygen pressure 3. Air in the fuel line hose	Check fuel supply. Increase oxygen pressure at regulator. (Ensure a large diameter Oxy hose is used and regulator has adequate flow capacity). Carefully purge fuel line
The cutting nozzle overheating or even burning out during cut. operation.	Flame is too small	Adjust the preheating oxygen and petrol/gasoline supply amount to let the flame be neutural, adjust the flame to a blue cone from the cutting nozzle (3-5mm) Bigger the tip the longer the flame needed.
No petrol/gasoline spray from the nozzle when the oxygen valve is open.	1, Cutting nozzle clogging 2, The inside of cutting nozzle has been destroyed. 3, Cutting torch has no injection power.	1, Clean out the blockage in the the cutting nozzle core to keep smooth. 2, Replace cutting tip. 3, If you have ruled out the cutting nozzle without question, please refer to the item 4 of chapter 5, check cutting torch, if no injection power, please return it to your supplier for repair or exchange.
The petrol/gasoline control valve has	1, The petrol/gasoline control valve has been worn or damaged.	1, Replace the petrol/gasoline control valve. 2, Open the preheating oxygen control

been closed, but the flame does not disappear or does not immediately extinguish.	2, There is residuary petrol/gasoline in the cutting (heating) torch.	valve to blow out the flame.
Occurring when close	The flame is not completely extinguished, and you had closed the preheating oxygen valve.	First close the petrol/gasoline control valve, and then close the preheating oxygen control valve after the flame is completely extinguished.
Occur a series of rings/pops/bangs when ignition occurs	1. Lack of oxygen; or fuel supply shortage 2. Inner Core of cutting nozzle loose. 3. Slag is being heated and exploding	1. Verify adequate oxygen pressure and flow capability. 1a..Appropriately adjust the preheating and petrol/gasoline. 2. Tighten the inner core. 3. Ensure slag is well removed from cutting area.
Beeline cutting incision is not straight	1. Cut material was not placed on a stable surface 2. Plate deformation 3. Flame line is incorrect 4. Straightening line is not right 5. Operator has limited experience.	1.Check cutting platform, and place even the material which to be cut; 2. Level plate before cutting, take measures to reduce distortion when cutting; 3.Check cutting oxygen core passage of the cutting nozzle, and amend or replace the cutting nozzle; 4.Align the pre-painted cutting line or base line; 5.Enhances the basic training of the operators.
The cutting incision is too wide	1, The oxygen press is too high; 2, Cutting No. of the nozzle is too large; 3, The cutting speed is too slow.	1, Adjust the oxygen press according to the parameters 2, Select the right nozzle No. according to the cutting thickness 3, Adjust the cutting speed
The upper edge was melting to the point of collapse	1, The preheating oxygen flow is too large; 2, The cutting oxygen press is too high; 3, The cutting speed is too slow; 4, The cutting nozzle height is too low or too high.	1, Adjust the flame to be neutural flame; 2, Adjust the oxygen pressure according to the parameters 3, Increase the cutting speed; 4, Adjust the cutting nozzle height to right position
There was concave in the central of the cut incision	1, The cutting oxygen press is too high; 2, The cutting speed is too fast.	1, Reduce the pressure to suitable value; 2, Suitably reduce the cutting speed.
There appears a trumpet-shape in the cut under the	1, The cutting speed is too slow; 2, Flame incorrect; 3,The incorrect cutting nozzle is	1, Speed up the cutting speed; 2,Amend the cutting oxygen passageway or replace the cutting nozzle;

plate.	selected.	3, Replace the appropriate cutting nozzle No,.
The cut face surface is rough	1． The oxygen press is too high； 2． The incorrect cutting nozzle； 3． The cutting speed is too fast； 4． The preheating flame is too large or too small； 5． The purity of oxygen is a little low； 6． The cutting machine accuracy is bad。	1． Suitably reduce the oxygen pressure； 2． Select the suitable cutting nozzle according to the plate thickness； 3． Suitably reduce the cutting speed； 4． Adjust the suitable flame power； 5． Use more than 99.5% purity oxygen； 6． Maintain, adjust or repair the machine
The cutting surface is tilted	1． The flame is not perpendicular to the steel surface； 2． The cutting oxygen pressure is low or cutting nozzle number is too small。	1． Adjust the cutting nozzle position or the steel plate position. Fishing cutting oxygen aperture or replace cutting nozzle; 2． Adjust the oxygen pressure or replace cutting nozzle.
There appears deep groove at lower face	The cutting speed is too slow	Adjust the cutting speed to suitable value.
There appears groove at cutting surface	1． There is a thick oxide surface or rust or other dirt on the steel plate； 2． The preheating flame power is short and temperature is low when cutting bevel； 3． The cutting machine vibrating.	1． Clean the oxide surface or rust, sweep the steel plate surface. 2． Increase the flame power. 3． Check the vibration cause and treat.
Slag adheres to the cutting surface	1． The cutting speed is too slow; 2． The preheating flame is too strong.	1． Adjust the cutting speed to suitable value. 2． Suitably reduce the flame power.
The cutting incision was bonded by slag	1． The preheating flame is too large when cutting thin plate; 2． The cutting speed is too slow; 3． The flame line is not good and the kinetic energy is not enough too remove the slag.	1． Reduce the flame power; 2． Speed up the cutting speed; 3． Finishing the cutting oxygen aperture or replace the cutting nozzle.
Residue sticks to the underside of the cut incision not easy to be removed	1． The purity of the oxygen is low; 2． The oxygen pressure is too low or too high; 3． The cutting speed is too fast or too slow; 4． The flame set incorrectly and there is a little of oxidizing flame.	1． Use more than 99.5% purity oxygen; 2． Adjust the oxygen pressure; 3． Adjust the cutting speed; 4． Adopt the neutral flame or adjust to reduce the flame power.
There is flaw in the work piece	Material defects. Carbon equivalent is too high, the work	According to the work piece material warm-up before cut and heat treatment

	piece thickness is high, ambient temperature is too low.	after cutting.

Note: Should trouble shooting fail to rectify the problem please contact the dealer or manufacturer directly to assist in solving the issue

Table Ⅰ: Model 30 cutting nozzles typical performance parameters

Cutting nozzle No.	Cutting oxygen aperture (mm)	Cutting thickness (mm)	Oxygen press (Mpa)	Oxygen consumption (m^3/h)	Petrol/gasoline consumption (L/hour)	Cutting speed (m/min)
1#	0.7	3-10	0.25	0.8-1.0	0.44-0.88	700-600
2#	0.9	10-20	0.30	1.2-1.4	0.55-0.99	650-500
3#	1.1	20-30	0.35	1.6-2.2	0.88-1.21	550-400

Table Ⅱ: Model 100 cutting nozzle typical performance parameters

Cutting nozzle No.	Cutting oxygen aperture (mm)	Cutting thickness (mm)	Oxygen press (Mpa)	Oxygen consumption (m^3/h)	Petrol/gasoline consumption (L/hour)	Cutting speed (mm/min)
1#	1.0	10-25	0.35	1.4-2.2	0.77-1.10	600-500
2#	1.3	25-50	0.40	2.4-4.0	0.99-1.32	450-340
3#	1.6	50-100	0.50	5.0-7.0	1.10-1.76	360-250

Table Ⅲ: Model 300 cutting nozzles typical performance parameters

Cutting nozzle No.	Cutting oxygen aperture (mm)	Cutting thickness (mm)	Oxygen press (Mpa)	Oxygen consumption (m^3/h)	Petrol/gasoline consumption (L/hour)	Cutting speed (mm/min)
1#	1.8	100-150	0.50	8-10	1.54-1.87	250-175
2#	2.2	150-200	0.65	11-14	1.65-1.98	175-130
3#	2.6	200-250	0.80	14-18	1.76-2.20	130-100
4#	3.0	250-300	1.0	18-32	1.87-2.53	110-80

Note: A model 300 torch can use model 100 nozzles with an optional 300/100 nozzle adapter nut. However oxygen and fuel consumption may be slightly higher when using 100 series nozzle in a 300 series torch.

Cutting condition of the above table(s) data is a guide only and is reliant on the following parameters. An oxygen purity≥99.5% The carbon content of steel cut≤0.45% The oxygen pressure is the inlet pressure of cutting torch. Due to numerous variables including the operating environment and the materials being cut/welded the above table is for reference only.

Flame Temperatures: This is a comparative list of flame temperatures for various fuels mainly to show that Petrol/gasoline and Acetylene are very similar in temperature however due to petrol/gasoline vapor being 4 times the density of acetylene the Pro Cut Oxy-Petrol/Gasoline torch has considerably more power than an acetylene system.

Fuel	**Approximate Flame Temperatures**
Acetylene	3,100 °C (oxygen), 2,400 °C (air)
Butane	1,970 °C (air)
Ethane	1,960 °C (air)
Gasoline (Petrol/gasoline)	3,000 °C (oxygen)
hydrogen	2,660 °C (oxygen), 2,045 °C (air)
MAPP	2,980 °C (oxygen)
Methane	2,810 °C (oxygen), 1,957 °C (air)
natural gas	2,770 °C (oxygen)
Oxyhydrogen	2,000 °C or more (3,600 °F, air)
Propane	2,820 °C (oxygen), 1,980 °C (air)
propane butane mix	1,970 °C (air)
Propylene	2870 °C (oxygen)
Blowtorch	1,300 °C (2,400 °F, air)
Bunsen burner	1,300-1,600 °C (2,400-2,900 °F, air)
Candle	1,000 °C (1,800 °F, air)

Metals Melting Point	(C)	(F)
Aluminum	660	1220
Brass, Yellow	930	1710
Cast Iron	1175-1290	2150-2360
Chromium	1860	3380
Copper	1084	1983
Iron, Wrought	1482-1593	2700-2900
Iron, Ductile	1149	2100
Lead	327.5	621
Manganese bronze	865-890	1590-1630
Nickel	1453	2647
Silver, Pure	961	1761
Steel, Carbon	1425-1540	2600-2800
Steel, Stainless	1510	2750

Tin	232	449.4
Titanium	1670	3040
Tungsten	3400	6150
Zinc	419.5	787

Densities of commonly used industrial gases VS gasoline vapour.

Gas density comparison to air (approximately)	
Hydrogen	0.06
Helium	0.1
Acetylene	0.9
(Air	*1.0)*
Oxygen	1.1
Propane	1.5
Gasoline (Vapour)	**3.9 #**

Higher density (weight) of a vapour equates to greater power or "punch" the flame carries. A simple example using the similar numbers as above but talking in KG….drop a 6 gram weight on your foot or a 3.9kg weight which has the greater effect ?

OXY FUEL CUTTING TIPS & TECHNIQUES

Although oxy fuel cutting is generally viewed as an uncomplicated process, those who work with it realize all too well that making it perform properly is no simple matter. Experienced operators can achieve a level of cut quality that rivals a machined surface, and do it in a fraction of the time and at a fraction of the cost of hard tooling. Consistently reaching that quality, however, requires an understanding of the many factors that are at work, their direct effect on quality, and their interaction with each other. For many operators that can only be achieved through an extended period of hands-on experience. The information presented in this document is intended to reduce the learning time for less experienced operators and new trainees by providing an understanding of the "how's" and "whys" of oxy fuel cutting. We will also show how some die hard habits, which are viewed by some to improve cut quality and performance actually do the opposite and produce inferior results.

Cutting Steel with a oxygenated gaseous flame may appear to be a simple process but it actually has very complex dynamics with the interaction between the steel, heat and gas flow variables. *Oxygen cutting may appear to simply be a melting of the metal however it is actually a chemical reaction.* Therefore a familiarity with the multitude of factors and adjusting to these variables as is necessary will make a huge difference in the success, speed and quality of any cut.

An **oxy-fuel cutting**, a torch is used to heat metal to its kindling temperature (the lowest temperature at which the metal ignites and burns) A stream of oxygen is then trained on the metal, causing a chemical reaction between the steel and the oxygen, generating more heat and melting the steel. This is called an exothermic reaction. The steel immediately

below the oxygen jet is converted to a metal oxide or slag, and is blown away by the jet. As the torch begins to move, more steel is preheated and the oxygen jet burns more of the steel, creating the cut. (An Oxy-Petrol/Gasoline flame is almost 100% oxidising producing minimal molten metal, whilst Oxy/Acetylene is only about 70% oxidising resulting in 30% of molten metal slag)

At this point when the jet of cold oxygen is passed through the centre of the nozzle onto the red-hot steel if the oxygen stream isn't powerful enough, or if the cutting speed is too quick, the slag will solidify in the cut, and a cut will not be achieved.

For a first cut, perhaps start with a piece of clean steel plate, about 12 mm (1/2 in.) thick and at least 250 mm (10 in.) wide. Rule a line with chalk or soapstone about 20 mm from one edge of the plate. Place the plate so that this line clears the far edge of your welding table by 25-50 mm. Make sure there is no combustible material nearby which could be ignited by sparks or hot slag. Place a shallow box of dry sand or a piece of sheet steel below the line of cut. If possible, position a piece of sheet metal to deflect sparks that might otherwise reach your pants or your shoes. Be sure to use a cutting nozzle of the size recommended for the thickness of steel to be cut. Adjust oxygen and fuel pressures to the specific levels recommended in the instructions supplied with your torch or cutting attachment. Then put on goggles, light the torch, and adjust the preheating flames to neutral.

The type of flame produced depends upon the ratio of oxygen to fuel in the gas mixture which leaves the torch tip.

- A **neutral** flame is produced when the ratio of oxygen to fuel, in the mixture leaving the torch, is almost exactly one-to-one. It's termed "neutral" because it will usually have no chemical effect on the metal being cut. It will not oxidize the weld metal; it will not cause an increase in the carbon content of the weld metal.
- An **excess fuel** flame (Fig. 4-2), as its name implies, is created when the proportion of fuel in the mixture is higher than that required to produce the neutral flame. Used on steel, it will cause an increase in the carbon content of the weld metal.
- An **oxidizing flame** (Fig. 4-3) results from burning a mixture which contains more oxygen than required for a neutral flame. Some oxygen will oxidize or "burn" some of the metal being welded but the surplus oxygen is wasted and increases oxygen use un necessarily

Hold the torch with one hand so that you will have easy control of the cutting oxygen valve lever. Use your other hand to steady the torch, perhaps by resting the torch tubes on top of your closed fist or a guide you can move the torch across to maintain an even distance from the surface and a smooth steady movement. (If you are using a long torch or the torch has an angled head (rather than the right-angle or 90 degree head), you may find it helpful to place a fire proof support under your hand supporting the front of the torch. Your objective is to position the cutting nozzle so that it is perpendicular (at 90 degrees) to the plate surface. If possible before you start cutting, move the torch along the full line of cut, perhaps two or three times, to make sure that you will be able to follow the line without difficulty during the cutting process .

To start cutting, hold the torch with the nozzle perpendicular to the surface of the plate and with the flame inner cones not quite touching the plate surface. Center the nozzle over the edge of the plate. As soon as a spot on the edge has been raised to bright red heat, **slowly** press the cutting oxygen valve lever. There should be a shower of sparks, and the cutting oxygen stream should rapidly pass all the way through the edge of the plate. Now squeeze the cutting lever to hold the valve wide open and start to move the nozzle down the line you marked on the plate. Your position should be such that you can actually watch the cutting action (top and underside if possible) to monitor the cut as the oxygen stream passes through the plate.

Try to move the torch steadily at a fixed height above the steel surface. Operator tendency during a first cut, will probably be to move it too slowly. Don't be afraid to speed up a bit just as long as the oxygen stream is passing completely through the steel. If you move the torch too slowly, the preheat flames will melt the top edges of the plate causing excessive surface melt, a rough cut and excessive slag. If you move it too fast, you will lose the cut; in other words, the reaction at the top surface of the plate will cease. If that happens, release the cutting oxygen valve lever, allow the preheating flames to bring the steel back to red heat at the point where the cut ceased, and restart the cut, remembering to open the cutting oxygen valve slowly. With a little practice reasonable cuts will be possible and the more cutting the better experienced you become and the quality of your work should continue to improve.

Note that the Oxy-Petrol/Gasoline torch is an Injector torch using high-pressure oxygen flow thru a small orifice inside the torch head so a venturi effect draws the fuel into the tip. The heated tip then assists in a rapid vaporising of the fuel on exiting the tip so the oxy/petrol/gasoline vapour can be readily ignited. (Liquid petrol/gasoline cannot burn, petrol/gasoline is only volatile when a vapor)

Petrol/gasoline storage and transportation requirements

Petrol/gasoline should be stored in an appropriate dangerous goods store away from any naked flame and heat sources. The temperature should not exceed 30℃. Keep the container out of direct sunlight sealed with pressure relief devices. Petrol/gasoline should NEVER be stored with oxygen.

An appropriate quantity of fire fighting equipment should always be kept nearby

In general the same storage and transport precautions are required as for many flammable gases and chemicals. Similar conditions as to acetylene storage and transportation requirements are suggested..

When filling a petrol/gasoline container the flow rate is not more than 3m / s, and there is grounding device to prevent the accumulation of static electricity. (Our company can supply explosion-proof type petrol/gasoline storage tanks up to 3000L or greater capacity by special order).

Maintenance

To ensure a safe reliable long life for your DAVCO petrol/gasoline cutting system pay careful attention to maintenance.

During use the cutting nozzle tip can suffer from carbon deposition and this should be removed on a regular basis . If the cutting flame becomes deformed it can indicate the nozzle needs cleaning. Turn off the system and clean the tip ensuring the mixing oxygen channel, the cutting oxygen aperture and petrol/gasoline apertures are clear of any obstruction.

Spare Parts

Cutting nozzle

Petrol/gasoline hose

Air pump cup

After-Sales Service Product Registration and Warranty.

In order to facilitate DAVCO after-sales service please complete the following system registration form (please use block letters) and return this card within 30 days of purchase. We maintain an “Owners” database to facilitate you any future service or support for your purchase of the DAVCO petrol/gasoline cutting machine series products.

PRODUCT REGISTRATION & WARRANTY CARD
(Please complete and return for support or any Warranty Claim)

NAME:			
Address:			
Telephone:	Land:	Mobile:	
Email:			
Purchase date:		Invoice No:	

SEND TO: DAVCO Pty Ltd, 17 Drews Rd, Tanah Merah, Queensland 4128

OR eMail to **sales@davco.biz**

We recommend after completing the above form make a copy and file with your personal records.

A 90 day warranty is provided on the system from the date of purchase. If this product displays any defect within three months from the date of purchase (based on the invoice date) a free warranty service is provided to repair or replace the product or product component. (cutting nozzle excluded) [Proof of purchase and warranty cards are needed for any claim validation]

Any product modification, misuse or abuse will invalidate any warranty claim. Additionally failure to follow operating procedures resulting in product damage will also nullify any warranty claim. Repair service charges will apply. Failure to follow operating instructions and/or any misuse or abuse will invalidate any warranty claim.

Packing List

(This list may vary slightly depending on product and model purchased)

Description	Quantity	Model	Comment
Cutting torch or heating torch	1 pc		
Cutting nozzle or heating nozzle	3 pcs	1#2#3# (4# on 300 torch)	Nozzle：1#、2#、3#
Manual	1 pc	Petrol/gasoline cutting machine	
Petrol/gasoline hose	1 pc	Oil-resistant high quality hose or PU hose	10m
Petrol/gasoline tank	1 pc	Either 1.5L/2.5L/10L	
Service registration card	1pc	Common	
Warranty Card	1pc	Common	