



Product Description

ProCutter 900

ProCutter 900

The PC 900 is a CNC pipe cutting machine that clamps and rotates the pipe in a chuck during cutting. This machine will give you high value, high precision and easy to use software for 3D profiling.

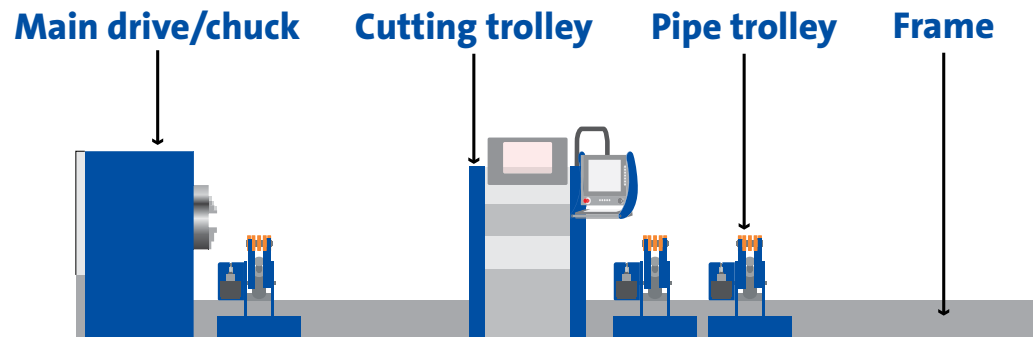
The PC 900 has options that offer their own individual benefits and advantages in versatility and productivity. The most suitable configuration will depend on the industry for which the machine is intended and the type of production that will run on the machine. The PC 900 is not designed for the offshore market, as its AWS profiling needs additional processing. Ask for more information regarding offshore profiling at high quality.

Pipe trolleys

Using the standard pipe trolleys as the support system allows highly versatile processing of smaller production series. A wide variety of pipe diameters, part lengths and cutting shapes can be processed. The pipe trolley is a multiple point support system which can easily be adjusted depending on the diameter, length and maximum weight of the pipe. The pipe trolleys allow the operator to select the best positions for supporting the pipe. This flexibility of the pipe support also allows compensation for bow shaped pipes by strategic trolley placement.



ProCutter 900



Characteristics

- Full software functionality from HGG high range machines
- 3D profiling
- Easy to use touch screen and software
- Maximum diameter of 910 mm
- High precision by use of a chuck
- Maximum safety due to the fully integrated closed action system
- Compact and simplified design

ProCutter 900

Introduction

- The Production Process

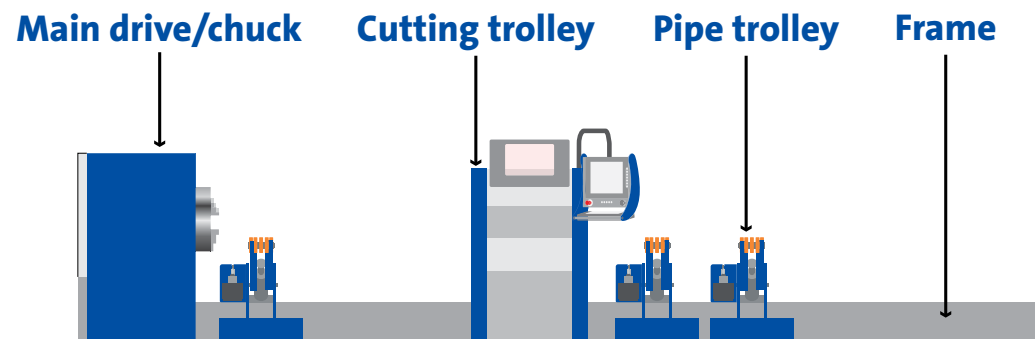
Hardware

- Foundation Frame
- Main Drive
- Cutting Trolley
- Pipe Trolley
- Cutting Technology
- Cutting Compensation
- Exhaust and Filtration
- Health and Safety

Software

- ProCAM Framework
- ProGram
- ProCAD; CAD/CAM Interface (if applicable)
- ProMIS (if applicable)

ProCutter 900



Foundation Frame

The entire frame will be mounted on top of a concrete floor by chemical anchors to create a solid foundation. The frame can be levelled using the nuts on the anchors. After levelling the frame, it needs to be grouted with shrink resistant, fast drying concrete to eliminate vibrations.

Components

This foundation remains aligned for years of production and is important to ensure the machine accuracy. The frame supports the main drive with chuck, cutting trolley with touch screen and pipe support. The rails on the frame allow longitudinal movement of the cutting trolley and pipe support.

Toothed Rack

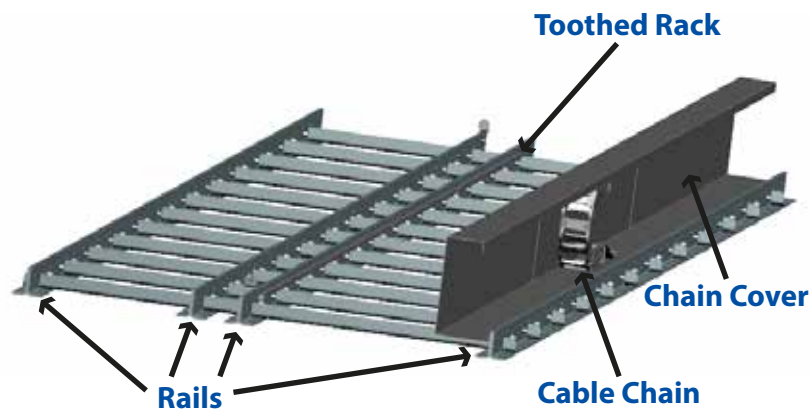
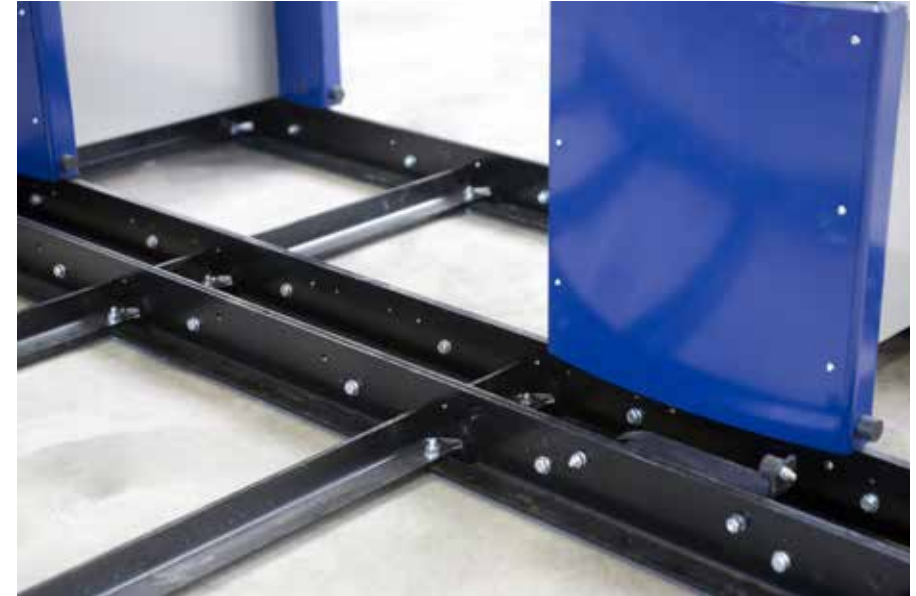
In the centre of the frame behind the third rail, a toothed rack is placed to move the cutting trolley along the rails. The trolley is driven by a brushless DC motor inside.

Linear Rails

The linear rails maintain a straight movement of the cutting trolley. There is an additional metal plate on the rails that supports the movement of pipe trolleys and positioning of rollerball gutters.

Cable Chain

To prevent friction between cables and hoses, a cable chain is placed behind the cutting trolley to lengthen the lifetime. The cable chain itself is protected by a cover.



Right, rear view of the foundation frame with the chain inside the cover.



Main Drive PC 900

In the configuration of the pipe cutting machine, the chuck plays an important role in the achievement of high quality cutting results. Because every pipe has some degree of distortion in the length (bow shaped) and roundness (ovality) the centreline is the only fixed reference point. The most important function of the main drive is to ensure the accuracy of the pipe cutting process. The self centring three jaw chuck achieves this accuracy by clamping the pipe securely, avoiding slip during rotation and creep (longitudinal movement).

Components

The major components of the main drive are the housing and the chuck. The solid self centring three jaw chuck clamps and centres the pipe and rotates with it. The housing containing the internal hardware: the gearing, the motor and electronics.

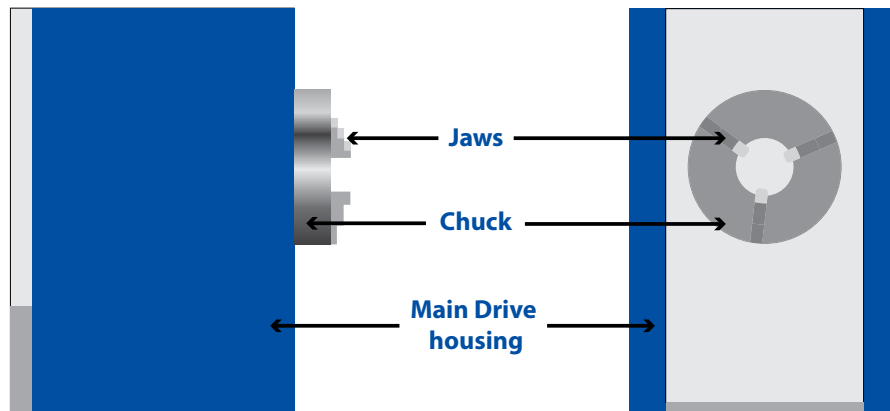
Solid self centring three jaw chuck

No pipe is perfectly round. By clamping the pipe in the chuck, the centreline of the pipe is defined making degrees of rotation around the centreline an accurate and

reliable measurement. Having three jaws ensures that all jaws are in contact with the pipe at all times. The centreline is the basis for the projection and processing of all cutting routines on the pipe. The pipe is manually clamped and can be unfastened using a wrench.

Housing and internal hardware

The steel housing is provided with linear guides to allow height movement of the chuck. The height movement is driven by



The Main Drive and the solid self centering 3 jaw chuck

one hydraulic cylinder to handle various pipe diameters. The chuck is powered by a low maintenance electronic motor and CNC controlled by the control unit.

Movement

Rotation

The main drive functions automatically during the cutting process and is CNC controlled. The rotation is powered by an electronic motor connected to a gearbox.

Clamping

Clamping is the process of holding and locking the pipe in position to ensure there

is no slipping when the pipe rotates. The applied force is controlled manually by a square key to adjust the jaws of the chuck. Manual control provides feeling for the applied force. The jaws can clamp both the inside and the outside of the pipe. This means that a large range of pipe diameters can be clamped, pipes with small diameters are clamped on the outside of the pipe, those with larger diameters on the inside.

Height adjustment

The main drive is adjustable in height with hydraulics. This allows the main drive to adapt to the different pipe diameters.



Cutting Trolley ProCutter

The cutting trolley is the command centre of pipe cutting, comprising the cutting wagon, the operator control panel and cutting head. Inside the cutting head the torch can roll and pitch for complex 3D profiling.

Components

The cutting trolley has two main components: the wagon and the cutting head. The cutting trolley runs on a rail along the length of the pipe. The cutting head is height adjustable and provides the roll and pitch movement necessary to cut complex three dimensional shapes. Gas valves are placed on the front of the cutting head, to fine tune the gas flow manually. The main valves are electrically operated.

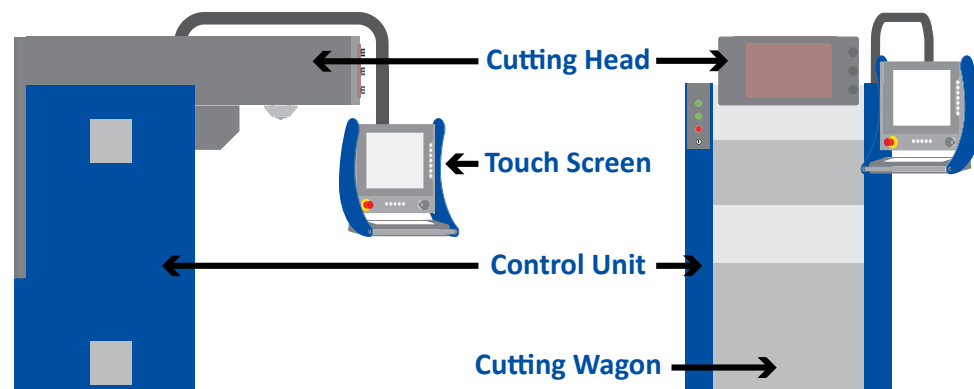
Cutting Wagon

The base of the cutting trolley is the cutting wagon. The wagon rolls on rails to ensure the cutting head runs perfectly in line with

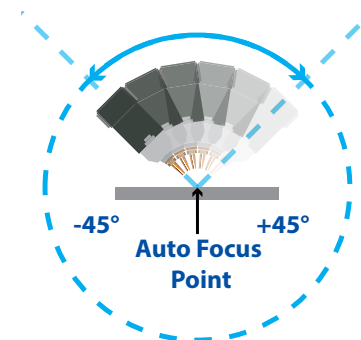
the centreline of the pipe. To ensure the accuracy of the CNC position along the pipe length, the brushless AC motor runs with a single gear along the toothed rack.

Cutting Head

The cutting head is pneumatically height adjustable and moves down until the sensor arms hit the surface of the pipe. These arms underneath the cutting head maintain a fixed distance between the torch and pipe. They press down on the material to keep good contact and position of the pipe while cutting. After every single cut the cutting head goes upwards to take away the pressure on the pipe.



Cutting Trolley and the basic components in side and front view.



Cutting Arm

The torch inside the cutting head is held by the pantograph. This mechanism can tilt the torch forwards, backwards and left or right with an angle of 45°. During cutting, the cutting head is connected with the pipe through the sensor arms.

Cutting Torch

The ProCutter always comes with oxyfuel cutting system modified for acetylene and/or propane. An electrical ignition unit operated from the machine's touch screen control panel guarantees safe and user friendly operation. For other cutting properties, the ProCutter can be supplied with a plasma torch optionally.

Sensor Arms

The very compact cutting arm allows a sensor system to be positioned within 295mm of the actual cutting process. This is critical because the closer the measurement is to the actual cutting, the more accurate the cut will be. The sensor arms are of mechanical design to provide maximum reliability of the sensor system which has to deal with distorted pipes (bow shaping or ovality). The sensor

arms safeguard an optimum torch-to-material distance at all times, resting on the pipe with a preset weight in order to compensate any deviations in roundness or height.

Auto Focus Point

Point around which the torch tip rotates. Software controlled to maintain an equal distance between torch and material even when cutting at angles. This ensures a high quality cutting result.

Touch Screen

A touch screen is mounted on the right side of the cutting trolley on a moveable arm. The main machine control system is also integrated within the cutting trolley and located on the left side of the cutting trolley. The complete machine can be controlled from the touch screen. Here the operator can select data files for cutting using ProCAM software. It is even possible to program cutting files. The operator can select or program cutting files. The operator control panel consists of a touch screen, manual control buttons, USB slot, emergency stop button and a keyboard with trackball.

Movement

Longitudinal movement

The longitudinal movement refers to the movement of the whole cutting trolley. This movement is CNC controlled and allows the trolley to move along the entire length of the pipe on the linear rails.

Height adjustment

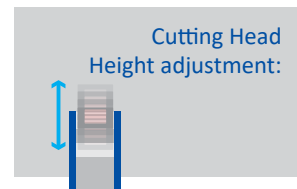
The height adjustment is controlled by a pneumatic cylinder and allows the cutting of different diameters while maintaining the exact torch-to-material distance. The sensor arms at each side of the cutting torch also push the pipe onto its support with a pre-set weight. Small diameter pipes in particular can be bent and must be straightened to avoid lift up from the support. No lift up will maintain high quality cuts.

Tilting backwards, forwards and sideways

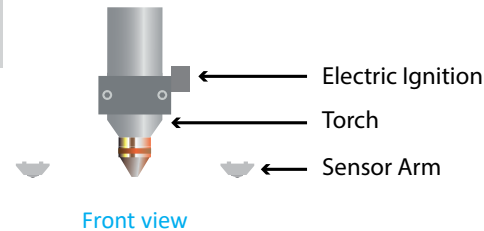
A backward, forward and sideways tilting motion is controlled by two brushless AC motors integrated into the cutting arm.



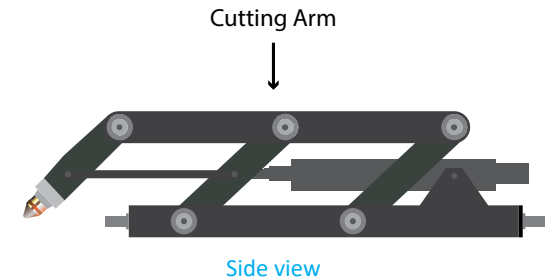
Sensor Arm on top of the pipe.



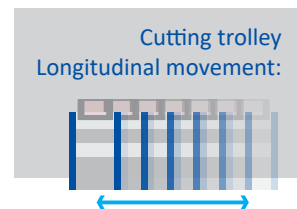
Cutting Head
Height adjustment:



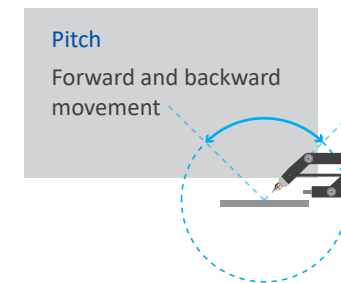
Front view



Side view

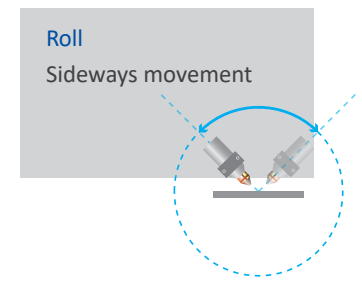


Cutting trolley
Longitudinal movement:



Pitch

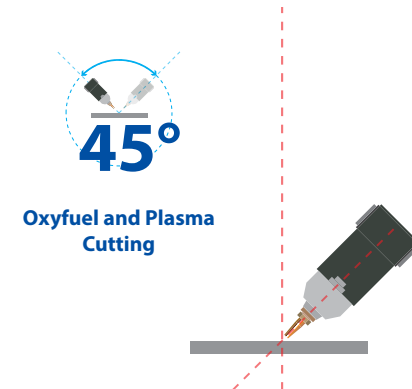
Forward and backward
movement



Roll

Sideways movement

Left; cutting trolley on rails. Right; cutting torch and cutting arm.



Oxyfuel and Plasma
Cutting

Maximum cutting angle.

“The automatically focussed cutting head is the part of the machine which enables full 3D profiling. Other components integrated along with this are the cutting torch and the sensor arms.”

Pipe Trolley (PT)

Pipe trolleys are local pipe supports that can be moved along the length of the pipe on rails. They are hydraulically height adjustable to support the full range of different diameters of pipe. Pipe trolleys can be strategically arranged to provide support where it is most needed or in order to avoid supporting a pipe where holes are cut. They can also be used to compensate for distortions in the length of the pipe (bow shaped) by placing trolleys at points where the actual and theoretical centrelines coincide. The pipe can then be cut as if it was straight, ensuring the correct part length and an accurate fit during assembly.

Components

The pipe trolley consists of a wagon equipped with a hydraulic pump and piston for height adjustment. A scissor mechanism with polyurethane coated wheels supports the pipe.

Movement

Trolleys can be placed anywhere along the length of the rails to efficiently support the pipe. The

number of trolleys usually depends on the length of the pipe and there are always trolleys arranged close to the position to be cut to provide maximum support and stability and ensure a high quality result.

Height adjustment

The height adjustment is realised by the hydraulic pump, raising or lowering the support wheels using a scissor mechanism.

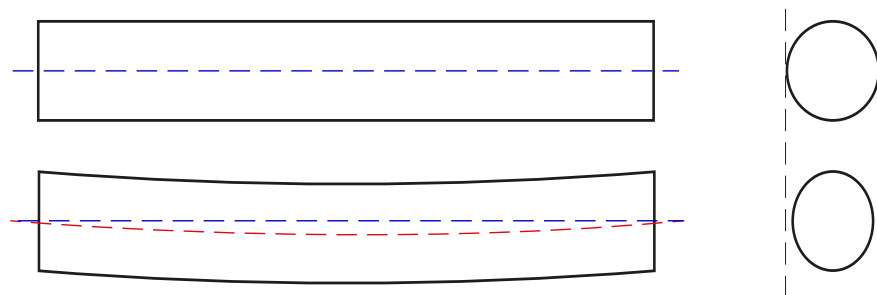


Fig. 7. Dealing with bow shaped pipes and ovality. The blue line represents the machine centreline and the red line represents the centreline of the bow shaped pipe. Accurate cutting is still possible by strategic positioning of the pipe trolley.

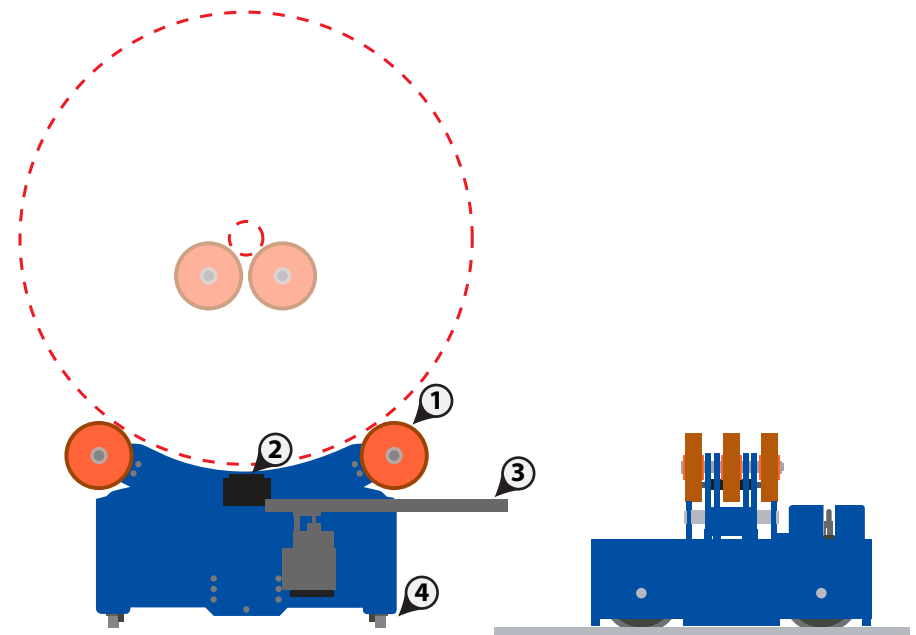


Fig. 8 Pipe trolley and its components.
1. Polyurethane coated support wheels, 2. Hydraulic piston, 3. Hydraulic pump with handle, 4. Wagon with wheel to move the trolley.

Rollerball Gutter (RG)

The rollerball Gutter supports the pipe along its entire length providing high stability. A Rollerball Gutter enables fast outfeed to achieve a high 'burner on' time. It can also easily be connected to a logistic system with infeed and outfeed conveyors. The Rollerball Gutter can be combined with pipe trolleys to extend the diameter range.

Components

The Rollerball Gutter support consists of a gutter on a support frame. The gutter is equipped with an array of steel rollerball units of varying sizes which fully support the pipe.

gutter by hand. When integrated into a linear production logistic, the infeed and outfeed conveyors connect directly with the gutter.

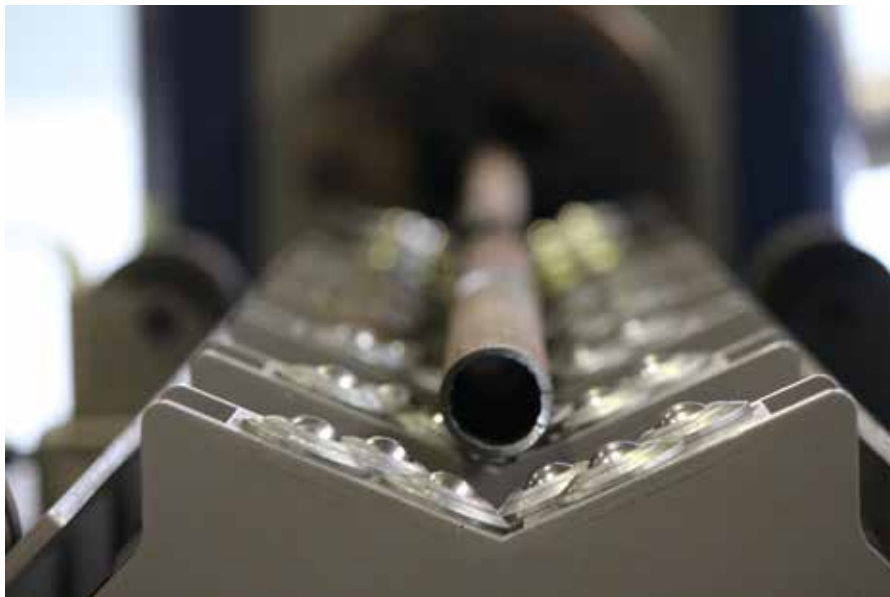
Rotational

Rotation occurs by clamping the pipe in the main drive, the rollerballs allow the pipe to rotate in the gutter while continuing to provide maximum support.

Movement

Longitudinal

When the pipe is not clamped in the main drive it can easily be moved along the



Advantages:

- Instantly horizontally levelled pipe.
- No repositioning of the pipe supports needed.
- High 'burner on' time.
- Finished parts can be collected on working height.
- Linear and rotational movement is done by one support system.

"HGG also delivers combination machines with both Pipe Trolleys and a Rollerball Gutter."

Oxyfuel cutting

Oxyfuel cutting is a reliable, accurate and competitive cutting technique used for the cutting of mild steel. The very first HGG machines 25 years ago were equipped with the oxyfuel cutting technique. For many applications this is still an excellent solution.

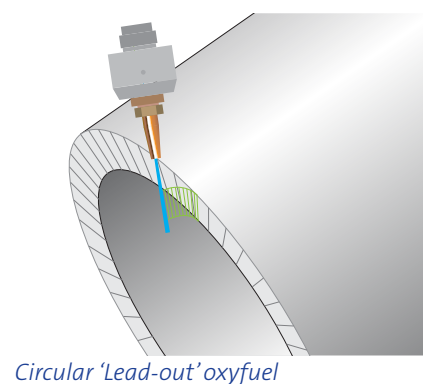
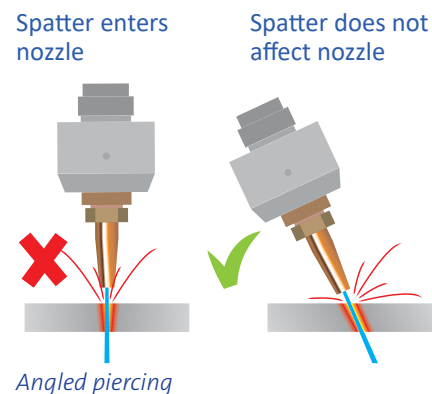
The process

Mild steel can be cut by preheating the surface to between 1000°C and 1800°C (bright red in colour). Preheating is done by an oxyfuel nozzle and a mixture of oxygen and gaseous fuel. After preheating, more oxygen is then directed through the nozzle at the heated area in a fine, high pressure stream. As the steel is oxidised and blown away to form a cavity, the heater and the oxygen stream move together to form a continuous cut. The oxidation process is an exothermic reaction. The released energy aids the process as the cut moves deeper into the material.

Piercing, 'lead-in' and 'lead-out'

Piercing is the initial penetration of the surface to be cut. Angled piercing is used for material with thin wall thicknesses

to protect the nozzle from spatter. The 'lead-in' is the approach to the cut. Cutting is started in the scrap area of the material and moves toward the start of the actual programmed cut. This prevents damage to the actual cut caused by the start up of the cutting process. The 'lead-out' is the exit from the cut. When the programmed cut has been completed, the torch moves away from the cut to prevent damage during the shutting down of the cutting process. Only metals whose oxides have a lower melting point than the base metal itself can be cut with this process. Otherwise as soon as the metal oxidizes it terminates the oxidation by forming a protective crust. Only mild steel and some low alloys meet the above conditions and can be cut effectively with the oxyfuel process.



*"Reliable cutting technique
combined with industry experience."*

Characteristics

Oxyfuel allows the cutting of thicker walls which is prohibited in the case of plasma cutting by the huge amounts of energy necessary to reach similar thicknesses. The ProCutter allows cutting angles up to 45°. Together with HGG's specific Profiling Shapes (macros), the ProCutter provides design freedom. Examples of these cuts are Partial Joint Penetration (PJP) Saddle and Chamfer.

Angled piercing

The angled piercing routine is carried out at an angle to maximize consumable

lifespan by protecting the nozzle from the spatter zone during piercing.

Lower costs

Oxyfuel is a more economical solution than plasma cutting. Initial investment costs, consumables and operating costs are all lower than plasma cutting.

Manual tweaking

The operator can control the flow of the cutting gasses at any time during the cutting process allowing fine tuning or tweaking of the programmed cut for maximum quality.



Plasma cutting

Plasma cutting is a high speed cutting technology developed to cut electrically conductive materials. Since 1994 HGG has distinguished itself as a pioneer in CNC plasma cutting. For almost two decades HGG has supplied plasma cutting technology incorporated into over 150 3D profiling machines worldwide. HGG is constantly innovating to stay on top of the latest developments in this technology.

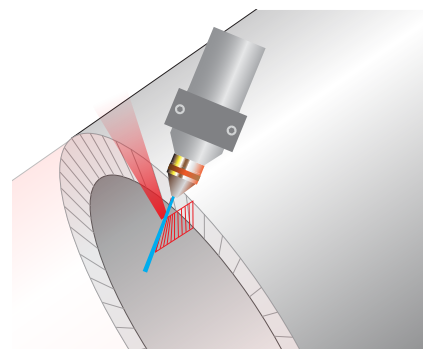
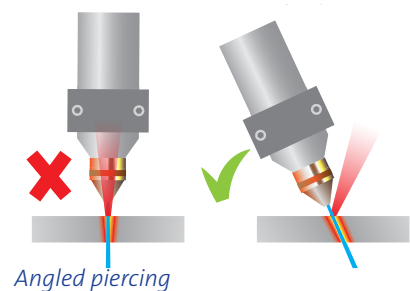
The basics

Plasma cutting can be used on any electrically conductive material. Materials such as stainless steel for example, can only be cut by plasma cutting because no oxidation occurs prohibiting the use of oxyfuel cutting. The pipe and chuck (in a chuck type machine) or the clamped pipe (in case of a roller bed type) are earthed. The gas that comes through the nozzle carries a charge. The plasma nozzle also emits a protective gas around the cutting gas which twists to concentrate the beam (fine focus), if the protective gas has a contra swirl to

the cutting gas it produces an even more concentrated beam (high focus). When the cutting gas beam approaches the earthed material it arcs forming ionised gas (plasma) which reaches extreme temperatures, vaporising the material rather than cutting it. Depending on the selected plasma equipment, the cutting gases can vary between air or optionally oxygen, hydrogen nitrogen or argon. Also dependent on the cutting gasses the shield gases can vary between air or optionally nitrogen.

Spatter enters nozzle

Spatter does not affect nozzle



3D view angled piercing

“HGG supports both Kjellberg as well as Hypertherm, two well experienced and industry leading choices.”



“Plasma is versatile, fast and gives a high quality result.”

Characteristics

Versatile

Plasma cuts through any electrically conductive material, allowing the cutting of a wide range of materials from mild steel to exotic alloys.

Fast

In the wall thickness range up to 25 mm, plasma cutting outperforms oxy fuel cutting. The exothermal process of oxy fuel cutting limits the cutting speed to between 350 and 800 mm/min. whereas plasma cutting can reach speeds of up to 3000 mm/min. with smaller wall thicknesses. Because plasma cutting requires no pre-heating, even more time is saved on each individual cut.

High quality

Plasma cutting delivers a superior surface result than oxy fuel when cutting thinner material. Plasma also has a smaller heat-affected zone resulting in less distortion of the material's microstructure.

Plasma costs

Initial investment costs are higher for plasma than for oxyfuel. This is because, apart from the plasma source, a complete exhaust system with filtering unit is required. The cost of monthly consumables is also more expensive than oxy fuel but this is compensated by the higher cutting speed increasing production.

HGG's plasma features

HGG's machines and software allows for the following compensations of plasma characteristics which are unique to the industry and only available with HGG's machinery, made possible due to the fact that all software is developed by HGG in-house:

Torch to material distance control

The dynamic, constant measurement of the distance between the torch and material (directly or using measuring routines). This helps to prevent cutting head collisions, deviation in the fit length and ensures a constant beam.

Angled piercing

The piercing routine is carried out at an angle to maximize consumable lifespan by protecting the nozzle from the spatter zone during piercing.

Kerf width compensation

Kerf width compensation is included in all CNC cutting routines, this compensates for the thickness of the beam ensuring that the cut is accurate.

Divergence compensation

The greater the wall thickness of the pipe, the more the divergence of the beam can influence the accuracy of the cut. This is an angular compensation to correct inaccuracies due to beam divergence.

Melting correction

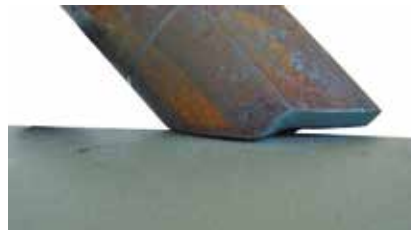
In the case of negative bevels there is a danger of rounding caused by melting of the fit line. This is a distance correction to compensate for the melting effect ensuring ease of fitting and welding.

Specific plasma profiling shapes

The maximum cutting angle is usually 45°. When a normal profiling shape requires a steeper cutting angle HGG offers a number of specific shapes that are adapted to overcome this restriction, regaining design freedom. These specific profiling shapes still maintain the constant, pre-set welding opening and therefore do not compromise welding accessibility or require additional grinding. Examples of these cuts are the Partial Joint Penetration (PJP) Saddle and Chamfer.



Stainless steel



PJP saddle



Aluminium



Exhaust and filtration

Plasma fumes can cause serious health problems and the fine particles decrease life span of the machine and its components. That is why all plasma cutting machines require an exhaust and filtration system.

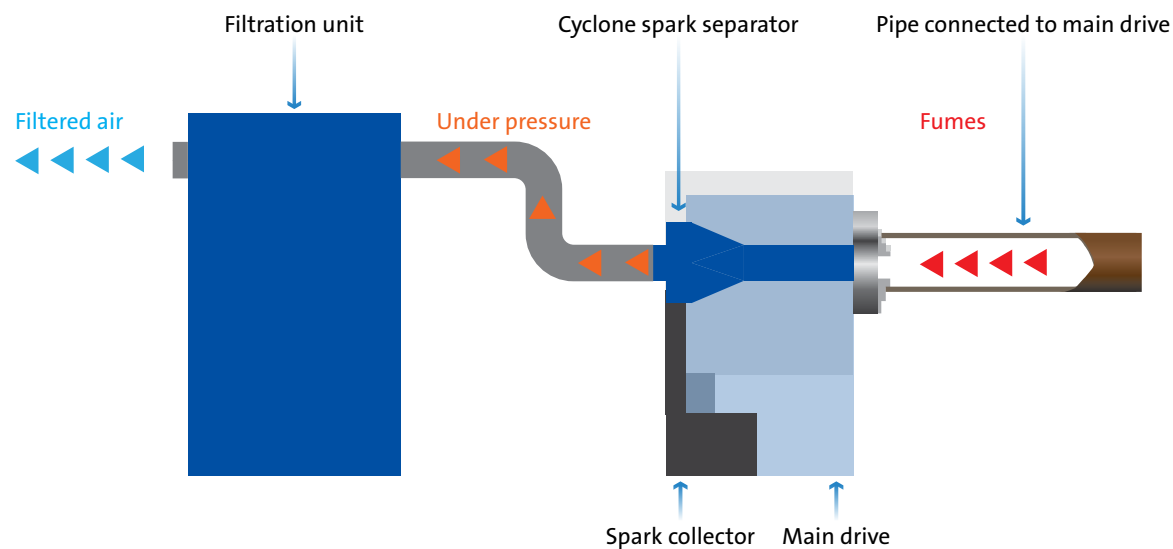
“A fume exhaust for extended technical life and operator safety”

Exhaust

The ProCutter is designed to extract fumes by suction through the pipe and main drive. The extracted fumes contain sparks and will be separated using a passive cyclone inside the main drive. This cyclone is created by the airflow through the main drive. The separated sparks will drop down into the spark collector. A vacuum is needed to extract fumes and to create air flow for the cyclone. This can be done by a filtration unit or a connection with the exhaust system of the production facilities.

Filtration

The filtration can be done by a separate filtration unit or, where possible, the exhaust can be directly connected to the production facilities main exhaust and filtration system. Use of a filtration unit is preferred because of the higher capacity compared with common main exhaust and filtration systems. This high capacity is needed to extract more toxic plasma fumes and to create a higher airflow for the cyclone separator. When using oxyfuel, the fumes are non-toxic.



Exhaust trough main drive (section view)



Main drive upper view open

Health and safety

Working with high voltages, explosive gasses and heavy steel means that safety precautions are an absolute necessity. All HGG's pipe profiling machines ensure that operator safety has the very highest priority while taking operator comfort into consideration.

Controls

The machine is operated from a central touch screen and industrial keyboard. This combination allows the operator to use the machine.

Protective glass

The machine is equipped with a protection screen preventing sparks from reaching the operator. This allows the operator to closely monitor the cutting process in complete safety.

Emergency stop

The machine is equipped with an emergency stop button, placed below the touch screen on the control panel.

Exhaust system

For all plasma cutting machines an exhaust system is highly advisable, for more details please refer to the chapter 'Exhaust and filtration'.

Ergonomics

The operation interfaces of the machine are designed with ease of use in mind. The height of the touch screen control panel, the remote control and the emergency stop buttons all being easily accessible to the operator. On top of all the aforementioned safety precautions, machine operators should always wear protective clothing, protective footwear, safety goggles and ear protection.

European Conformity (EC)

All machines are built in accordance with EU regulations following relevant EC directives and relevant provisions of the NEN harmonized standards. Every machine is supplied with an EC declaration according to;

- Machinery Directive 2006/42/EG
- Low Voltage Directive 2006/95/EG
- ElectroMagnetic Compatibility (EMC) Directive 2004/108/EG

"Comfort and safety have the highest priority"



Safety labels



Touch screen with emergency stop



Power switches

Label Printing

Material tracking is very useful for improving workflow speed and communication further downstream. Labeling provides a reliable, fast and cost effective method of tracking and communicates information in a consistent way.

Information

Labels can contain a variety of information that is useful in production to identify what part you are working with or what needs to happen with it further downstream. Information that you can print on the label consists of heat numbers, material specifications, customer, part ID's and custom fields amongst others. The information can be specified according to a label template beforehand. The data is retrieved from the properties panel in ProCAM, where the data can be adjusted and corrected if necessary.

Printing labels

Label printing can be done in two separate workflows. Either there is a printer at

work preparation and at the machine, or there's only one label printer at the machine. The label printer at the machine can be configured to print a label for the part that is finished, by reading this information from the cutting file or by manual data input. The label printer at work preparation can be configured to print stock labels which can be scanned by machine operators with a barcode/QR scanner to start with the correct files and eliminating paper.

Labels

The labels use a special adhesive that is optimized to stick to steel, even with corrosion and extreme temperatures. The data format is coherent to BIM and

STOCK NAME		HGG
Ømmmm x mmm		
L: xxxxx mm		
Ht: xxxxxxxx		
Mat: xxxxxxxx		
Client		

Stock label with QR code for the scanner

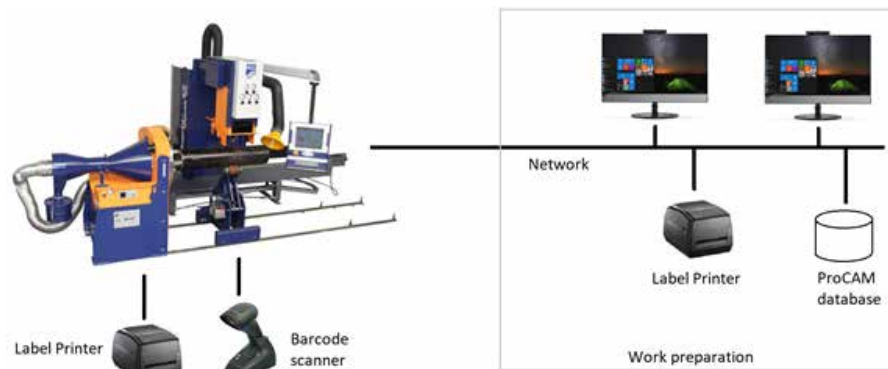
PART NAME		HGG
Ømmmm x mmm	L: xxxxx mm	
Group	Batch	
Ht: xxxxxxxx	Mat: xxxxxxxx	
Client	Projectnr	

Part label with part information

can be used downstream for location identification as well. Labels are available in two sizes that can be chosen to the companies preferences. Generally a smaller size is used for smaller parts and material and a larger size is used on bigger parts and material.

Scanner (optional)

Labels for stock material can be provided with a barcode or QR code. With a scanner at the remote control codes can be scanned and the correct cutting jobs are loaded from the ProCAM database automatically. Optimizing your workflow with labels and a scanner will speed up your production and reduce the risk of manual errors by selecting the wrong cutting file.



Overview of the hardware components used by label printing with scanner



Label printer in stand next to the machine

Advantages

- Track material throughout the cutting process and further downstream
- Cost effective method to track parts
- Fast workflow with printing and applying labels
- Automated label printing after scanning stock labels
- Work digitally and create a paperless workflow