Product Description

SPC500-1200PT

Chuck-type Pipe Profiling Machine

The Company

With more than 35 years experience in the thermal cutting industry, HGG has grown into an international group that specializes in thermal cutting of 3D profiles. Two branches, concentrating on the development and production of 3D profiling machines and software or providing an extensive range of cutting services around the world. The unique combination of development and comprehensive use of 3D cutting machines, together with our passion to provide the perfect solution for all our customers, allows HGG to embrace all aspects of steel industries.

Through constant communication with our customers and innovative design initiatives, HGG is constantly evolving in order to offer a unique package of products and services. As specialists in 3D profiling, the design and fabrication of our machines incorporates the specific characteristics of the industry for which they are intended. This large product range and flexibility means that HGG can offer:

Extreme accuracy

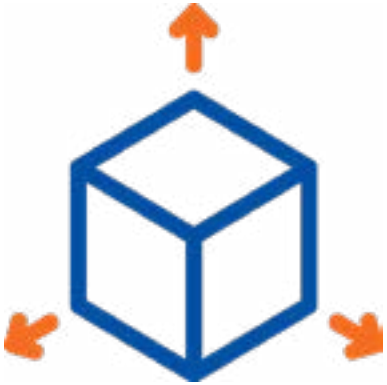
The key to a perfectly cut part is the combination of accurate torch positioning and an optimised cutting process. Any kind of misalignment or deformation can be detected to alter the calculated theoretical cutting path by actual measurements of the material. This combination offers the highest attainable accuracy and thus provides substantial savings on fitting and welding.

Freedom to create

Each industry is unique and fabrication requires different shapes for profiling. All of our parameter based shapes are developed within the company, allowing the delivery of industry specific subsets. A wide range of profiling shapes is available to cover every conceivable need. Free-form designs created by solid modelling are supported too and deliver the highest possible design freedom.

User Friendliness

HGG focuses on consistent, intuitive, easy-to-use interfaces for its products. As a supplier of highly advanced 3D profiling technology, design detailing, production planning and production are taken into account with profiling shapes or CAD interfaces, manual programming, nesting or production reports, and intuitive user interfaces and machine operation.



SPC 500-1200 Configurations

The SPC 500-1200 series is a CNC pipe cutting machine that clamps and rotates the pipe with a chuck during cutting. There are three distinct configurations available in this machine range. Each configuration offers individual benefits and advantages in versatility and productivity. The most suitable configuration depends on the intended industry and the type of production that the machine will run.

SPC 500-1200 PT

With Pipe Trolleys as the support system, a high versatility of processing in smaller production series is preferred. A wide variety of pipe diameters, part lengths and cutting shapes can be processed. Ideal for the production of spools, vessels, steel structures, offshore structures, etc.

- Highest versatility
- Wide range of pipe diameters
- Wide range of part lengths
- Wide variety of cutting shapes
- Compensate for bow shapes

SPC 300-500 RG

Using a Rollerball Gutter pipe support system allows efficient processing of large production series. Pipe diameters up to 300 mm or 510 mm can be processed with a wide variety of part lengths and cutting shapes. This versatility is ideal for the production of trusses, pipe work and steel structures, etc.

- Versatile and productive
- Wide variety of part lengths
- Wide variety of cutting shapes
- Increased productivity through minimal handling

SPC 660-1200 RB

A Roller Bed pipe support system gives the highest form of productivity with the processing of larger production series. Pipe diameters up to 660 mm or 1200 mm can be processed with a wide variety of part lengths and cutting shapes. Ideal for pipe work, steel structures, offshore structures, etc.

- Highest productivity
- Wide range of part lengths
- Wide variety of cutting shapes
- High productivity through minimal handling and efficient outfeed.

SPC 500-1200 PT

Introduction

- Pipe Trolley support
- The production process

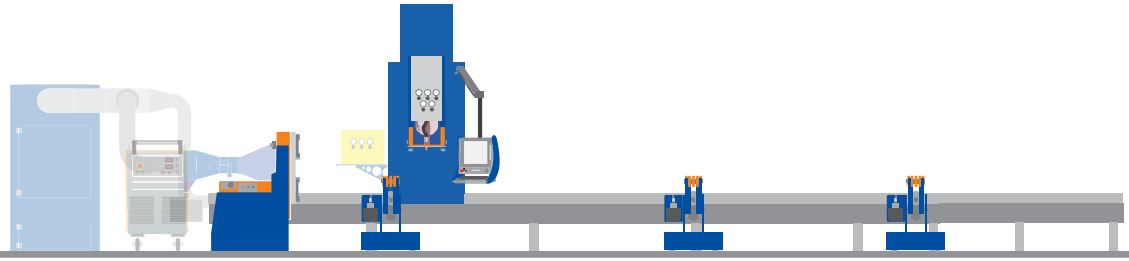
Hardware

- Foundation & Main frame
- Main Drive
- Cutting Trolley
- Support
- Rollerball Gutter (if applicable)
- Thermal cutting technology
- Fume extraction & Filtration
- Marking (if applicable)
- Health & Safety
- Customer support

Software

- ProCAM Suite
- Operator interface
- CAD/CAM Extensions (if applicable)

***SPC**500-1200 PT*

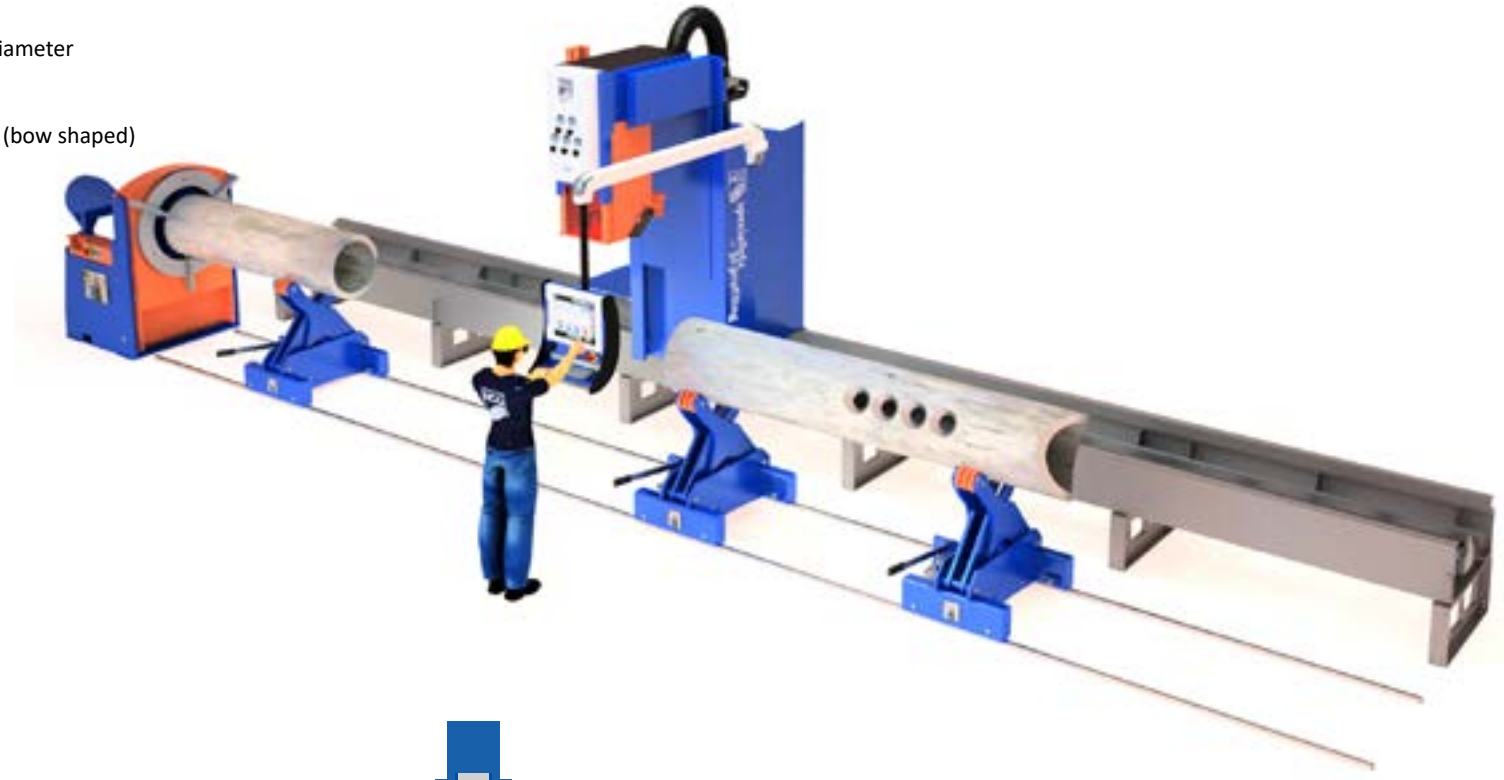


Pipe Trolley support

The PC Pipe Trolley is a multiple point support system that can easily be adjusted to cut a large variety of diameter, lengths and weight of the pipe. The pipe trolleys allow the operator to select the best positions for support and can compensate for bow shaped pipes with strategic trolley placement.

Characteristics

- Highly adaptive to pipe length and diameter
- Flexibility and ease of use
- Compensation for length distortions (bow shaped)



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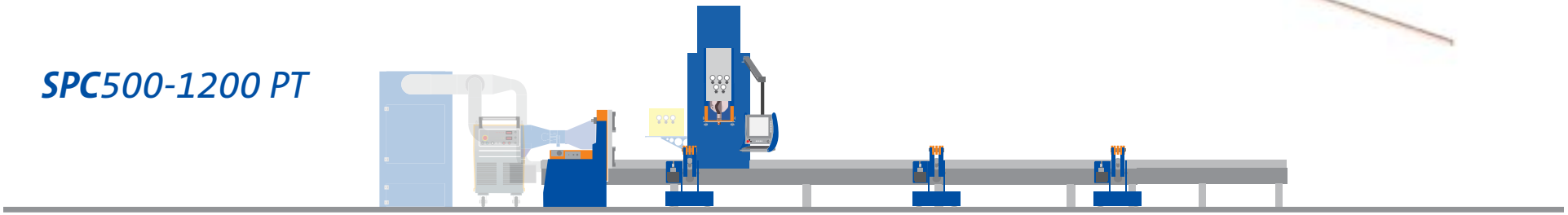
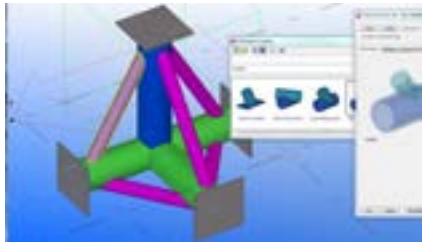


The Production Process

HGG's primary focus is the supply of production automation for the heavy steel industry. Thermal cutting machinery provides profiles and tubes with highly accurate 3D weld preparations for significant savings on fitting and welding costs. HGG is fully aware that cutting profiles is only a part of the manufacturing process which makes cooperation within the process essential, from the design phase, through work preparation, cutting and finally to fitting and welding.

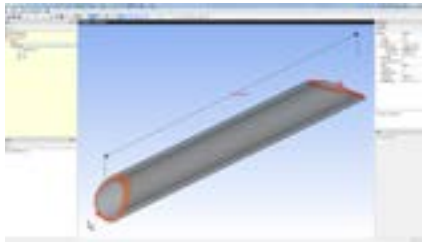
Design

HGG developed connections with several computer aided design (CAD) packages to provide fast and easy exports of complex designs, saving time and reducing the chance of errors. In addition to CAD connections, HGG's ProGram offers programming of parts with manual data input (MDI).



Work preparation

HGG's ProGram module, part of the ProCAM suite, can be installed on an independent workstation and linked to the cutting machine to send cutting files. In the absence of a database, cutting files can be copied to any USB-drive and read by the cutting machine directly.

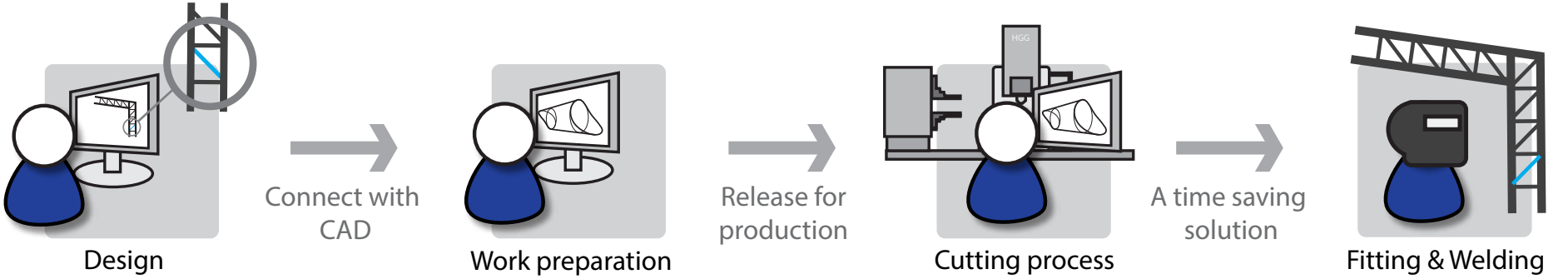


Cutting process

During the cutting process all HGG's machine intelligence unites to create a perfectly cut shape including weld preparation. Smart machine design and advanced controls of the cutting trolley result in high quality cuts. HGG's cutting machines utilise software based cutting compensations of material imperfections and tolerance discrepancies to achieve the most accurate cuts. Due to the intelligence of the machine, it is possible to achieve a minimum usage of consumables and high cutting speeds without compromising on quality.

Fitting and welding

When using alternatives such as hand cutting or less accurate machines, grinding is a costly, time and labour intensive job. The excellent quality and accuracy of HGG profiling machines reduce grinding to a minimum which results in shorter fitting and welding time and ultimately in higher quality fitted structures. HGG is constantly developing and supplying new cutting routines to clients through our continuing mission to eliminate the need for grinding and further reduce welding times and minimise the material waste for our clients.



Foundation and Main Frame

HGG supplies drawings of the foundation required for each machine. A correct placement of the foundation is important to ensure the machine's accuracy and alignment for many years of production. The cutting trolley is supported by a frame at the rear of the machine and is called the main frame.

Stationary foundation

The foundation frame is embedded in the concrete floor to provide a stable base for the machine. The rails for the pipe support (pipe trolleys, rollerball gutter or Roller bed) are welded to the frame (under supervision of HGG's technician) in the correct alignment to guarantee the tolerances of the machine. A foundation in conrecte is preferred because of minimized vibrations.

Transportable foundation

The foundation frame is placed on top the concrete floor. Ideal for project driven industries where the machine is sometimes repositioned in the fabrication area. The transportable frame can be moved to different sites with a minimal assembly time to get the machine up and running. The transportable frame is constructed from a steel H-beam that is bolted onto a level concrete floor.

Main Frame

The main frame supports the cutting trolley and is constructed with linear guides and a toothed rack that runs along the length of the frame. The main frame incorporates the cable track and fume extraction system. The fume extraction system consists of a mouthpiece and suction tube sealed with a rubber flap for a durable connection.

Main Drive

The main drive clamps and rotates the pipe during cutting. Secure clamping by means of a chuck is important to prevent slip and creep (uncontrolled longitudinal movement). The rotation of the pipe is an essential movement for 3D profiling. Additionally, fumes from the cutting process are extracted through the center of the chuck and main drive.

Housing

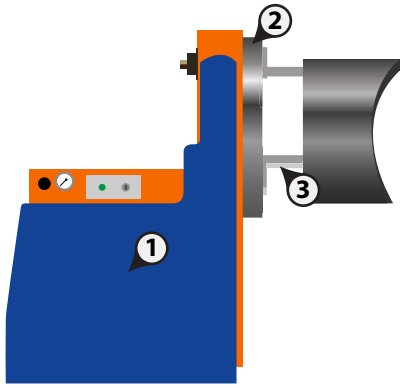
The main drive housing contains the gears, the motors, hydraulics and electronics to control the chuck that grips and rotates the pipe. A hydraulic unit powers the clamping of the jaws on the chuck and the pistons that control the height to level with the centerline of the pipe. A servo motor powers the rotation of the chuck. All movements are motorised.

Chuck

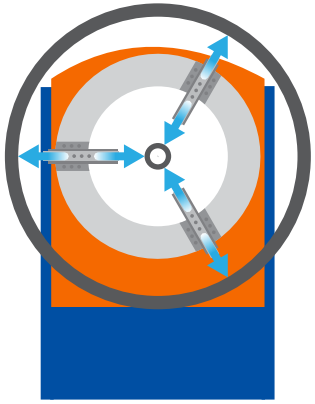
In reality, a perfectly round pipe does not exist. To cut accurately, HGG's main drives contain a chuck with jaws that clamp the pipe and rotates around the centerline of the pipe accordingly. The chuck makes degrees of rotation around the centreline to accurately and reliably position the pipe. The centerline is the basis for the projection and processing of all cutting routines on the pipe. A manual chuck release point ensures that the main drive can be opened at all times to release the pipe.

Clamping

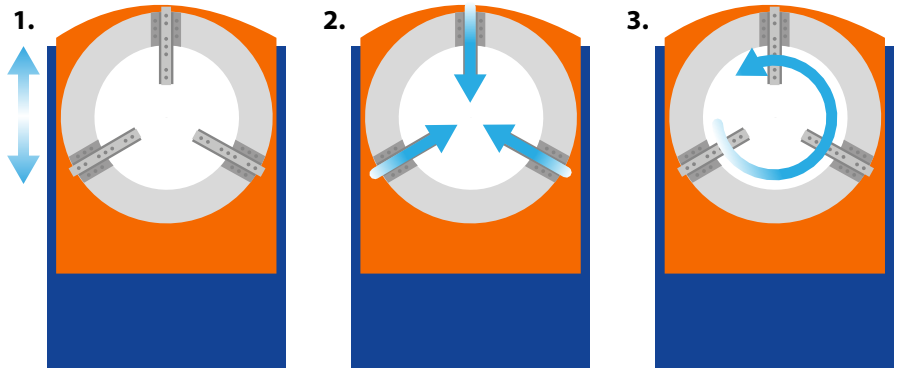
To prevent slip when the pipe is rotated, the jaws clamp onto the pipe, but the clamping force should not be too strong as to not deform the pipe. Hydraulic power clamps the jaws onto the pipe providing greater acurracy and control over the applied force.



1. Housing 2. Chuck 3. Jaws



Clamping range of the main drive



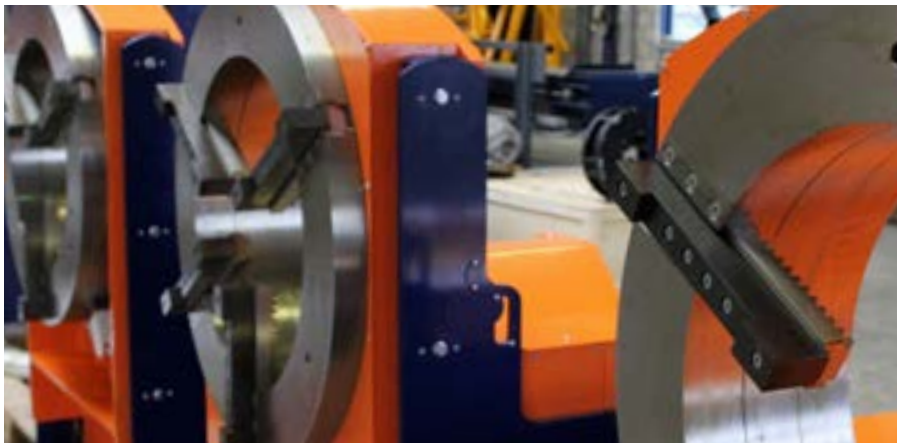
1. Height adjustment *2. Clamping* *3. Rotation*

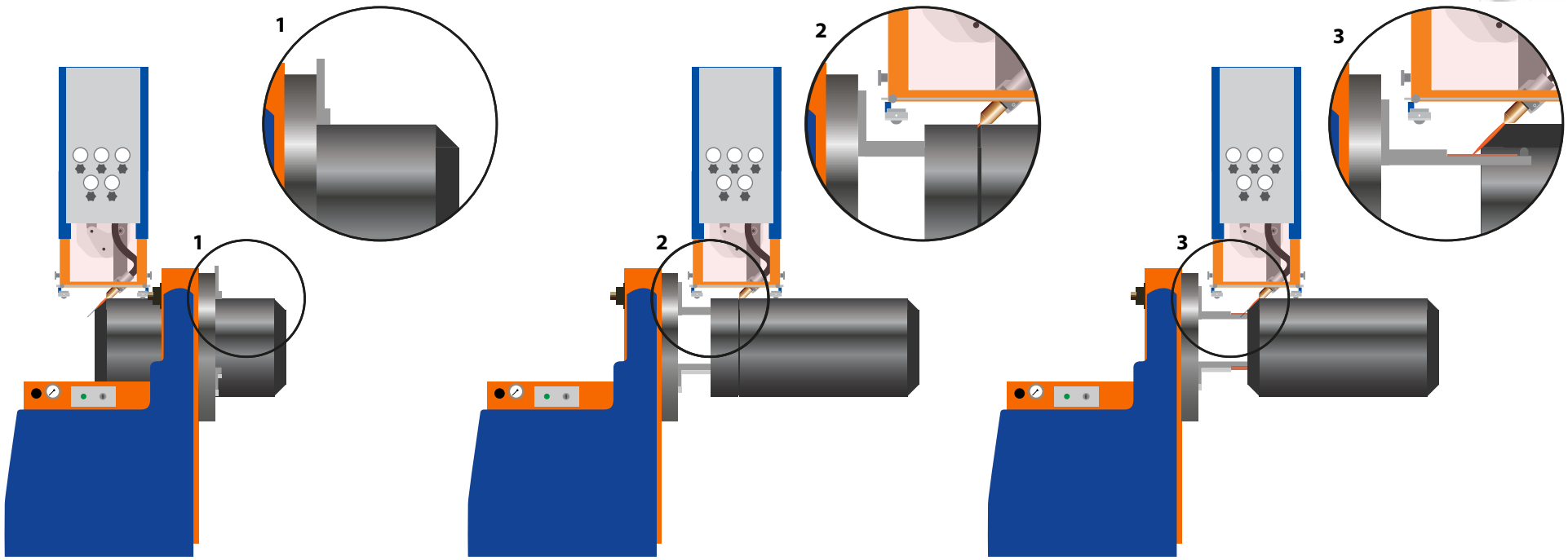
Rotation

During the cutting process the main drive rotates according to the cutting process corresponding with the programmed part. The rotation is powered by a servo motor connected to a gearbox.

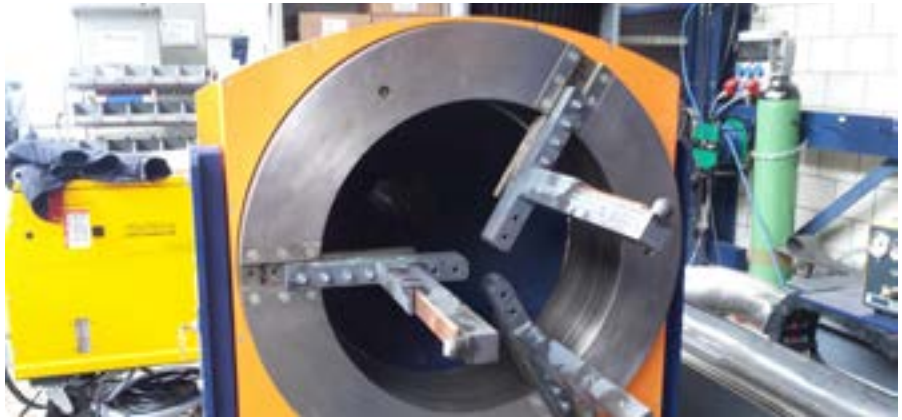
Transversal movement

In addition, some main drives (SPC Roller bed series) have transversal movement included. The additional movement provides improved logistics with roller bed machines, where continuous pipe cutting is performed and small deformations are corrected by the ability to move slightly.





Chuck Jaw types: 1. Standard Jaws 2. Long Jaws 3. Zero Scrap Jaws.



Jaws

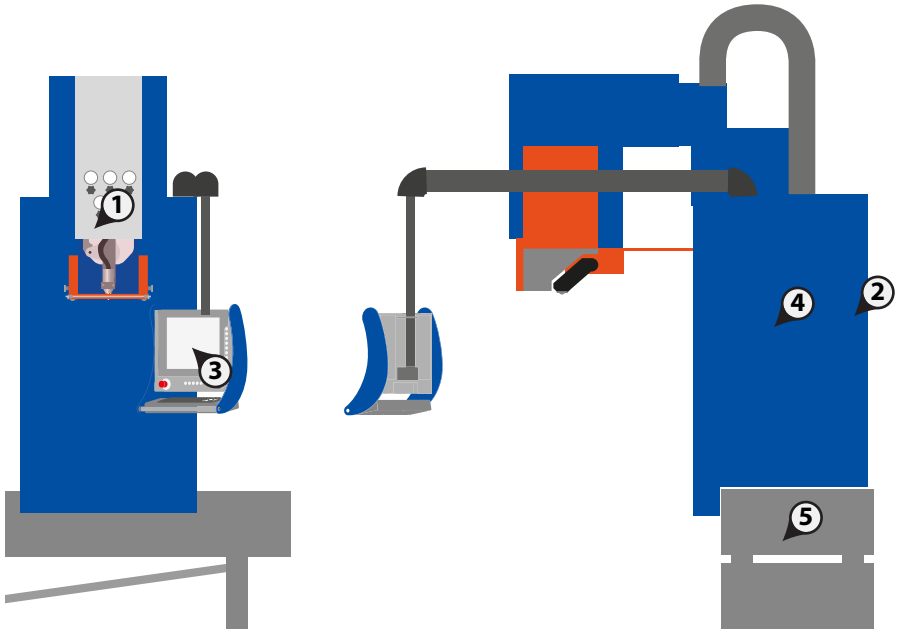
The chuck and the jaw mounts are designed by HGG. Being milled from a solid block of steel provides high material consistency and strength which contributes to excellent accuracy. The hole through the centre of the chuck can provide cutting on both sides of the main drive (dependant on the maximum diamter of the hole of the chuck). The 'Standard Jaws' are perfect for this purpose. The 'Long Jaws' can be used for cutting on the front side of the main drive to save on scrap length. With 'Standard Jaws' extra pipe length is needed to bridge the distance between the side of the cutting head and the effective cutting area. This cutting area of the cutting trolley is limited as to prevent collisions with the main drive. The 'Long Jaws' discard this issue by clamping the pipe at a larger distance from the main drive. 'Zero Scrap Jaws' go even further by avoiding the need of any extra material. These jaws, layered with copper plates to protect them, are perfect to cut (unsloped) chamfers with both X/K bevels and single cuts.

Cutting Trolley

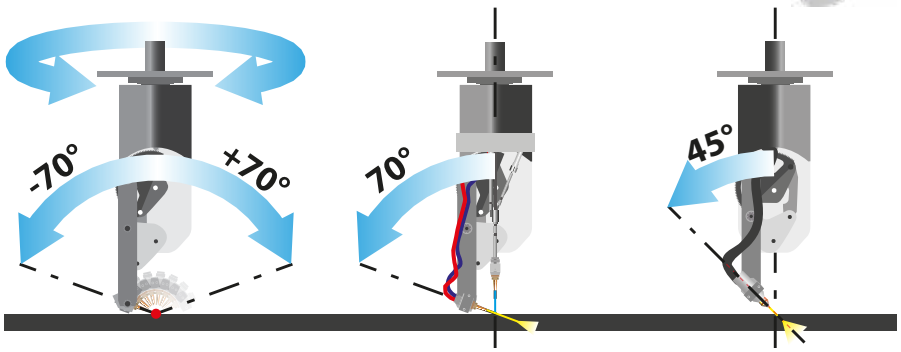
The cutting trolley is the command centre of pipe cutting, ensuring high quality results by incorporating internally developed hardware and software components. Complex three dimensional shapes are cut with maximum precision by utilizing a patented biaxial cutting head and providing utilities that adjust to pipe diameters and deviations.

Components

The cutting trolley is connected with two precision hardened linear guides that make sure the cutting head is perfectly aligned wiht the pipe and moves longitudinally along the rails in the main frame. The trolley is the basis that contains the control unit with all processing power of the machine, all connections for the cutting source, the necessary gasses, a cutting head and the remote control. To ensure the accuracy of the CNC position along the pipe length, the servo motor runs with a single gear along a toothed rack in the main frame.



1. Cutting head 2. Control unit 3. Remote control 4. Cutting trolley 5. Frame.



Rotation and pitch of the cutting head with maximum pitch of oxy-fuel and plasma.

Cutting precision

The cutting head puts HGG pipe cutting machines in a league of their own. The patented biaxial cutting head that moves up and down, rotates around its axis and tilts the cutting torch in the correct position provides an unmatched pipe cutting accuracy. Other components integrated into the cutting head are the sensor arms and the initialisation laser pointer.

The rotational and pitching movements of the biaxial cutting head together with the longitudinal movement of the cutting trolley and the height adjustment of the cutting head provide all necessary directions for outstanding 3D profiling. A virtually calculated line on the surface of the material is used as reference and all cuts (with or without wel preparation) are measured in accordance to this line. HGG uses this minimum amount of axes with high definition servo motors to keep the repeatability of torch positioning as high as possible. Less is more in the world of repeatability. Nevertheless the height axis is CNC controlled to save time preventing height repositioning after every single cut.

Prevent collisions

The cutting head includes sensor arms that rest on the pipe on a distance of 200 mm from the cutting process, that follows deviations of the pipe and prevents collisions between the cutting torch and the material. The mechanical design provides maximum reliability this close to the cutting process and immediately reacts to deformations (e.g. bow shape, ovality or welding seam) in the material. In addition, an optimal torch-to-material distance can be realized with mechanical precision.

Light and durable

The biaxial cutting head is dust and heat resistant which makes it virtually maintenance-free. The precision is maintained during high speed cutting thanks to its low mass inertia, compact size and powerful servo motors. The compact design results in a small cutting cell and minimises the remnant length of pipes when cutting close to the main drive. Finally, a compact robot makes it easier to withstand and extract harmful gasses, which is especially important with plasma cutting.

Calibration

Physically aligning the biaxial cutting head and using the calibration cutting routine ensures a machine that maintains precision over many years. A small test piece with a few measuring actions compares deviations between the programmed cut and the actual result and recalibrates itself accordingly.

Cutting Torch

The machine is always supplied with an oxy-fuel cutting system modified for the compatible cutting gasses that are locally available. An electric ignition unit operated from the machine's remote control guarantees a safe and user friendly operation. When cutting angles greater than 30º, a pre-heating torch is installed to maintain high quality cuts. In addition to the oxy-fuel torch, a plasma torch can be integrated to provide a dual cutting system, providing you with the best of both worlds. Changing from one cutting system to the other takes less than five minutes due to the universal torch mount.

Laser measurement

The sensor arms can't be used for vessel head cutting. An optical scanner in the cutting head is used to detect section distortions in vessel heads. A 360° scan will be performed to define the actual shape of the section and adapt the theoretical cutting paths to deformation to achieve accurate cuts.

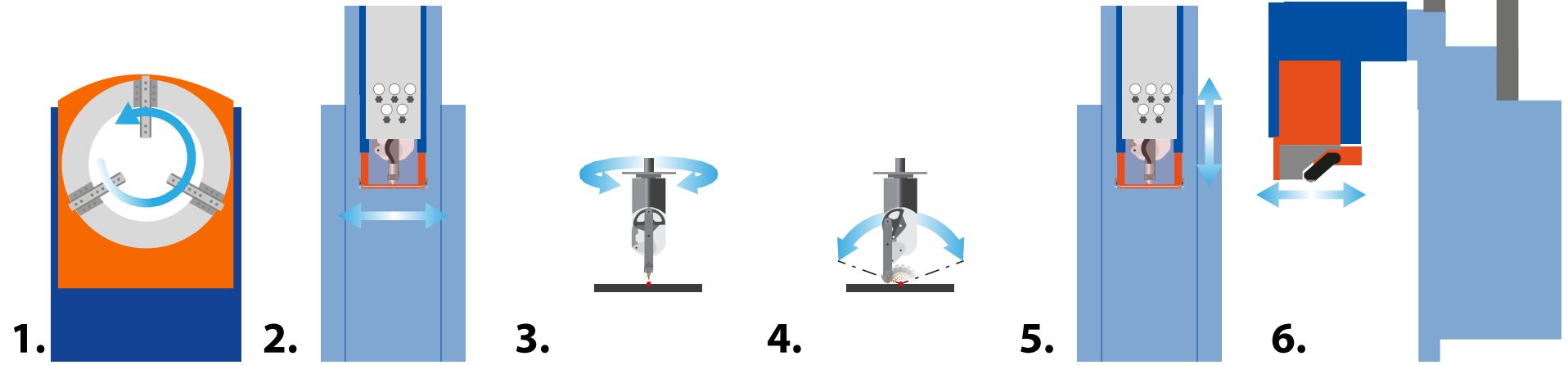
Initialisation laser pointer

The cutting trolley is equipped with an initialisation laser pointer which helps the operator to set an initialisation point on the pipe end as a correct and accurate reference for all cutting paths. This also allows the operator to position the weld seam.

Marking Unit (optional)

Marking is useful for tracking and tracing parts and simplifies fitting during assembly, contributing to an even more efficient production environment. There are multiple marking systems available.

3D pipe profiling movements



1. Main drive rotation 2. Longitudinal cutting trolley movement 3. Cutting head rotation 4. Cutting torch pitch by the cutting head 5. Cutting head height movement 6. Transversal movement of the cutting head (optional).

1. Rotation

Rotation of the pipe is performed by the main drive and CNC controlled chuck. Rotation of the pipe is necessary to cut all sides of the pipe. The chuck clamps the pipe to prevent slip and ensures accurate pipe rotation.

2. Longitudinal

The longitudinal movement refers to the movement of the whole cutting trolley. along the main frame. This movement is CNC controlled and allows the trolley to move along the full length of the pipe.

3. Cutting head rotation

This movement of the biaxial cutting head lines the torch up with the virtual line that is the origin of the cutting path. Rotating the cutting head is necessary to position the torch to cut accurate bevels perpendicular to the virtual line.

4. Cutting torch pitch

The pitch movements of the biaxial cutting head angle the torch in such a position that bevelled cuts can be created.

5. Height Adjustment

The height adjustment is controlled by a servo motor and provides the machine with the ability to cut different diameters but still maintaining a correct torch-to-material distance.

6. Transversal Movement (optional)

An additional transversal movement of the cutting head can be added to make hole cutting without pipe rotation, otherwise known as PerfectHole™ technology, available. Transversal movement of the cutting head is required for the optional vessel head and box section cutting of VHC and MPC machines respectively.

HGG's pipe cutting machines are highly accurate, however large pipe distortions and deviations, such as a bow shape and ovality, will influence the accuracy of (in particular) holes negatively. Together with pipe supports, the pipe can swing during rotation. At this moment there is no way of controlling the upwards and sideways movements which lead to inaccurate position of the pipe. By using the transversal axis, the inaccurate positioning is bypassed and PerfectHole™ technology is used to cut accurate holes.

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 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.

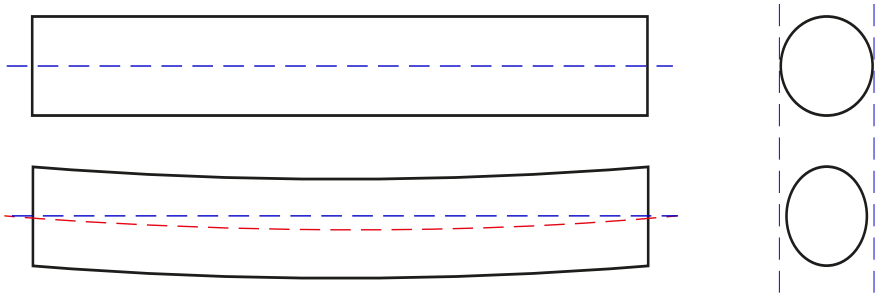


Fig. 7. Dealing with bow shaped pipes and ovality. The blue line represents the machine centreline and the red line represents the centreline of the bow shaped pipe. Accurate cutting is still possible by strategic positioning of the pipe trolley.

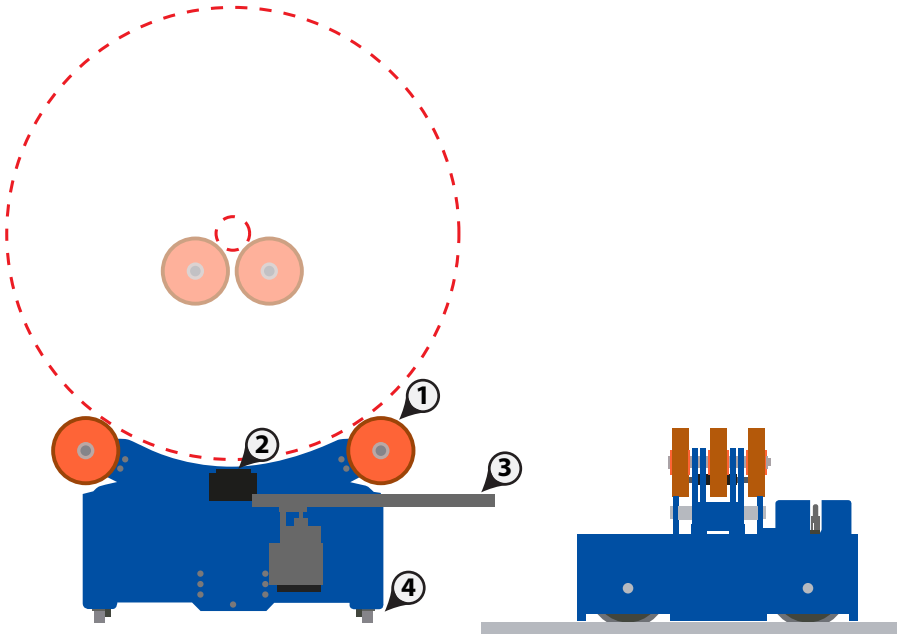


Fig. 8 Pipe trolley and its components.
1. Polyurethane coated support wheels, 2. Hydraulic piston,
3. Hydraulic pump with handle, 4. Wagon with wheel to move the trolley.

Rollerball Gutter (RG)

The Rollerball Gutter supports the pipe along its entire length providing high stability. A Rollerball Gutter enables fast outfeed of cut parts to achieve a high 'burner on' time. It can easily connect 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 consists of a gutter on a support frame. The gutter is equipped with an array of steel rollerballs of varying sizes which fully support the pipe on different positions. The diameter range and allowed weights differ from that of the pipe trolleys, but are compensated with the improved logistics.

Movement

Parts of the pipe that are not clamped by the main drive for rotation, can be moved along the gutter by hand. When integrated into a linear logistic production system, the infeed and outfeed conveyors connect directly with the gutter. 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.

Pipe on an end piece of the rollerball gutter.

A close up of rollerballs in the gutter.

Advantages

In comparison to pipe trolleys, the rollerball gutter has certain advantages. Pipes are instantly levelled in the rollerball gutter and the gutter does not have to be repositioned in height to support a variety of pipe diameters. With quick transport of cut parts and new pipes, the machine can achieve a high 'burner on' time. All finished parts are available at a working height for quick inspection and manual movement.

Fume extraction & filtration

A clean and safe work environment is essential for operator health and efficient production. An effective fume extraction and filtration system removes harmful gasses and keeps the work area clean. HGG provides multiple systems on machines to stay ahead of air and fume regulations.

Operator health

Plasma gasses can cause serious health problems and the fine particles decrease life span of the machine and its components. That is why an exhaust and filtration system is strongly recommended, especially in case the machine is equipped with plasma, to protect the operator from harm.

Filtration unit

The filtration unit creates under pressure with a high air flow to extract harmful fumes, sparks and gasses from the cutting area and guides them through several filters. Gasses cannot be filtered out by this unit. HGG strongly recommends these gasses are released outside the factory, especially when cutting stainless steel.

Spark separation

The filtration unit needs to be protected from sparks to prevent damage. The passive fan inside the cyclone spark separator together with the airflow generates a swirl. The swirl separates the sparks and drops them into a bin. Only the fumes and gases will pass through to the filtration unit.

Chuck extraction

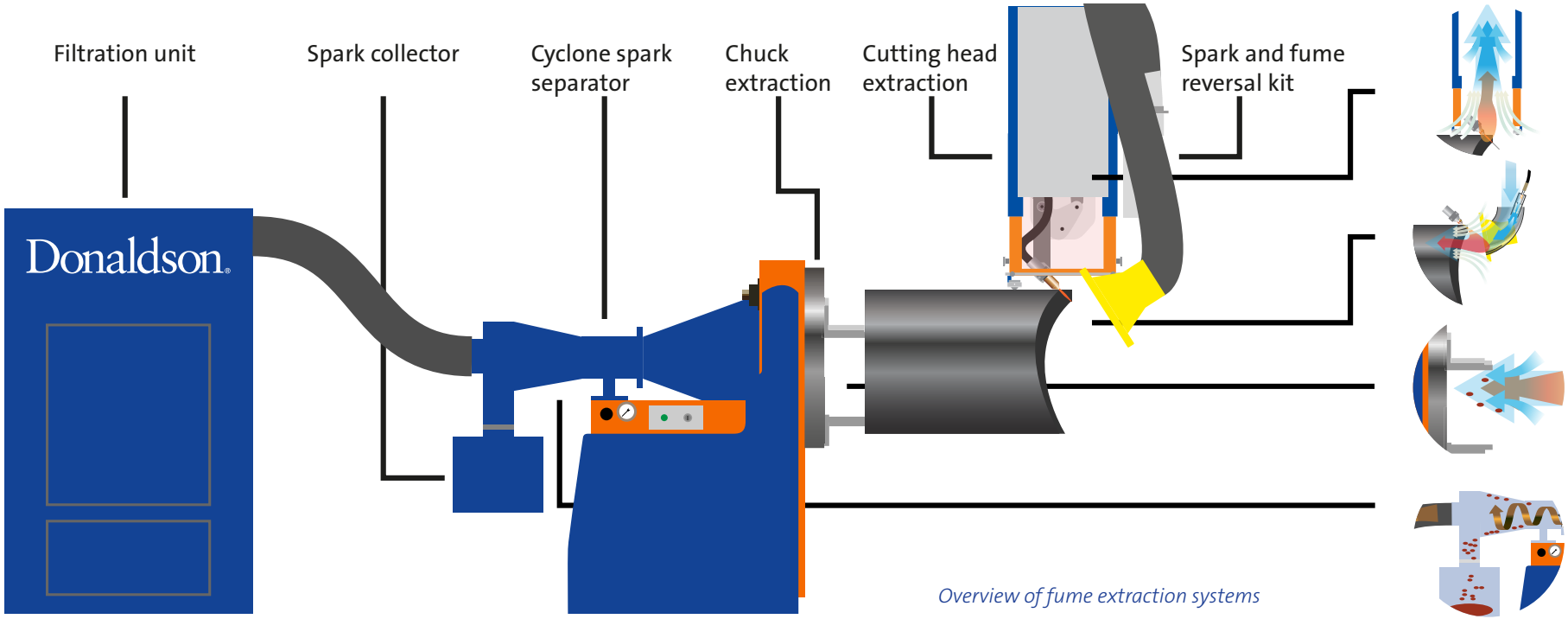
Fumes, sparks and gasses are extracted from the cutting area though the pipe. A funnel right behind the chuck guides airflow through the spark separator.

Reversal kit

A flexible arm on the side of the cutting trolley holds a nozzle and blows compressed air into the pipe being cut. This process deflects sparks and fumes into the pipe by the so-called Venturi effect, increasing the airflow. Channeling the smoke and fumes back into the pipe improves fume extraction.

Cutting head

A fume extraction point through the cutting head provides a fast and efficient way for all fume and smoke that rises upwards from the cutting process.



Overview of fume extraction systems

Health and safety

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

Controls

The machine is operated from a remote control with industrial keyboard + trackball and a touch screen with physical buttons. This combination allows operators to use the machine to their own preferences at a distance from the cutting process. The controls and cutting table are positioned at an ergonomically comfortable height for operators.

Protection

Plasma cutting is performed in a cutting cell and the operator can see the cutting process while being protected from radiation and sparks by a tinted screen. Operators should always wear the recommended Personal Protection Equipmen (PPE).

Machine status light

Fume extraction

The fume extraction system is placed close to the cutting process to optimally extract fumes and sparks from multiple places. To filter particles from the plasma fumes, a filtration unit is recommended and in some countries required.

European Conformity (EC)

All machines are built in accordance with EU regulations following relevant EC directives and relevant provisions of the NEN harmonised 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

Emergency stop button

Industry standard stickers

Customer support

We understand that everyone wants to keep their machine in mint condition throughout the years. The HGG's service department provides assistance, help or maintenance services to keep machines running throughout their lifetime to maintain a high level of productivity and ensure constant operator safety.

Maintenance

Our engineers and service partners are trained to perform annual maintenance and troubleshooting through experience of building and working with HGG machines. The machines are always ready for future upgrades to optimise the workflow of your company.

Customer portal

The HGG customer portal is a web-based environment with easy access to up-to-date information, 24 hours a day, 7 days a week. You will be able to download the latest software, consult instruction manuals, review service history, access the knowledge base or request consumables etc.

Technical assistance

HGG machines are online accessible by technical support allowing HGG's service coordinators to remotely solve errors and system malfunctions quickly, eliminating travelling time and minimising downtime. If the problem cannot be solved remotely, a service engineer will solve problems on site.

Training

During the installation and start-up phase of any HGG machine, a skilled HGG engineer will train and assist new operators in handling the machine with safety and proficiency. Additional maintenance and operator training is available for your staff at any time through the customer portal.

Oxyfuel Cutting

Oxyfuel cutting is a reliable, accurate and competitive cutting technique used for the cutting of mild steel. The very first HGG pipe profiling machines, made over 25 years ago, were equipped with oxyfuel cutting equipment. With state of the art improvements oxyfuel cutting is still an excellent solution for many applications.

The basics

The cutting torch has to pre-heat steel to ignition temperature at the starting point. At a temperature of around 960°C (depending on the type of alloy), the steel has lost protective properties against oxygen but is still solid. Pure oxygen is then directed through the nozzle at the heated area. This fine and high pressure oxygen stream changes pre-heated and unprotected steel into oxidised liquid steel by an exothermic reaction. This so-called slag has a lower melting point than steel, allowing the oxygen stream to blow the liquid slag out of the cavity without affecting the non-oxidised solid steel. This exothermic reaction is a continuous process and creates a cut as the torch moves. To keep the exothermic reaction going, the flame from the cutting torch keeps the steel heated during cutting. The downside of oxyfuel cutting is that only oxides with a lower melting point than the base metal itself can be cut with this process. Otherwise when the metal oxidises it terminates the oxidation by forming a protective crust. Mild steel and some low alloys meet the above conditions and can be cut effectively with oxyfuel.

Piercing process

Pre-heating during cutting

Automatic ignition before start

Automatic ignition after start

Automatic ignition

Instead of having an operator manually ignite the cutting torch, the automatic ignition is a safe and easy alternative. By pressing the ignition button on the operator screen a built in ignition blows a pilot flame to the oxyfuel torch igniting it making the torch ready for use.

Pre-heating

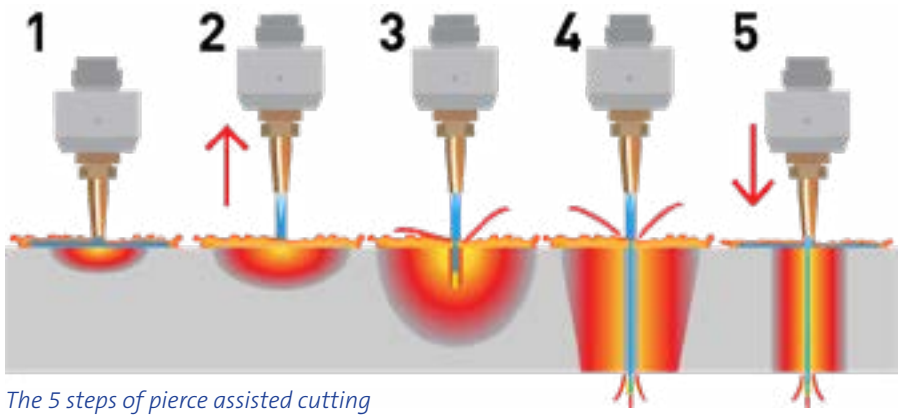
The shortest distance through the material is a cut perpendicular to the pipe wall. In many cases the cut will need a bevel. This is an angled cut with weld preparation for easy fitting. When the cutting torch is at an angle, the heat transfer to the material will be less optimal in relation to a perpendicular cut. Additionally, the steeper angle creates a deeper length of the cut. HGG's pipe profiling machines are equipped with automatic speed control, to fulfil the need of higher heat input. To achieve a higher cutting speed with the same accuracy, the machine is equipped with an additional perpendicular pre-heating torch. The pre-heater brings the material temperature above 960°C before piercing and keeps it at that temperature during cutting. Switching on automatically with cutting angles above 30° to increase the cutting speed and still provide a high quality cut.

Piercing

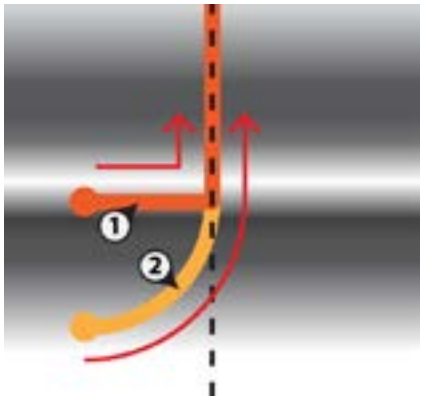
Piercing is the initial penetration of the flame through the material using the same exothermic process as normal cutting. After pre-heating the surface, pure oxygen will flow through the nozzle to change the solid pre-heated steel into liquid oxidised steel. The exothermic process continues until the material is pierced. The cutting process starts with the lead-in to approach the actual cutting path.

Pierce assist

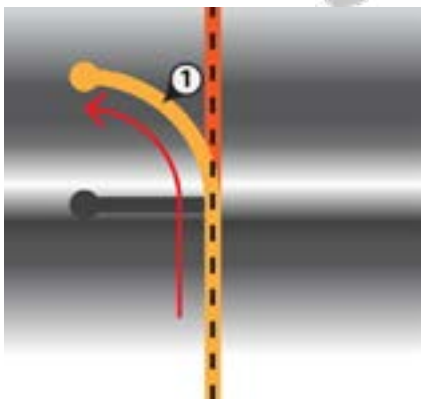
When thick walled material is pre-heated for slightly too long, the input of oxygen will cause a lot of spatter and create a large crater with an excess of liquid slag. This spatter will stick to the nozzle and negatively affect the gas flow and thus cutting process. Insufficient pre-heating will mean that the full wall thickness has not reached the ignition temperature to maintain the exothermic process. The process will stop half way and the operator will have to try again at another starting point resulting in damage to the part and will cause more time spent on grinding and welding. When cutting thick walled material, it is difficult to define the perfect time and temperature to preheat so that even the deepest part of the material is heated to the correct temperature. A pierce assist process guides the operator to achieve the best combination of torch position, gas mixture and pressure of the pre-heater and the cutting oxygen. Before piercing, the torch pre-heats the material shortly so only the surface has reached the ignition temperature (step 1). The torch moves upwards to protect the nozzle from spatter (step 2). Piercing commences at low oxygen pressure (step 3). To keep the exothermic process running and to pierce deeper, the oxygen pressure slowly increases to full pressure until the piercing is completed (step 4). The pierced hole is the starting point of the lead-in. The torch moves down for the perfect torch-to-material distance and starts the lead-in to approach the cutting path (step 5). Pierce assist safeguards fast piercing, protects expensive material, minimizes spatter for longer nozzle lifetime and guarantees a constant quality of the cut.



The 5 steps of pierce assisted cutting



1. Perpendicular lead-in 2. Radial lead-in



1. Radial lead-out

Lead-in and lead-out

The lead-in is the approach to the actual cutting path. After piercing in the scrap area of the material, the torch moves toward the programmed start position and angle. This prevents damage to the actual cut caused by piercing at the start of the cutting process. A lead-in can be performed perpendicular or with a radial approach.

When the programmed cut has been completed, the torch moves away from the cut and performs a lead-out. This radial movement prevents damage to the part during the termination of the cutting process.

Characteristics

Thicker walls and steeper angles

Oxyfuel can cut through thicker walls than plasma due to the necessary amount of energy for plasma. In addition, oxyfuel allows the cutting of steeper angles up to 70° (compared to 45°) because of the nozzle shape and the concentration of the oxygen beam. The plasma beam has the tendency to deflect at steeper angles.

Lower costs

Oxyfuel is more economical than plasma cutting in terms of initial investment, prices of consumables and operating costs.

Manual tweaking

The operator can control the flow of the cutting gasses at any time during the cutting process. This allows fine tuning or tweaking of the programmed cut for maximum quality. For example, corrosion can lower the heat transfer to the material. The pre-heating flame needs to deliver more heat to overcome this corrosion barrier, which can be achieved by tweaking the gas mixture through the remote control.

Plasma Cutting

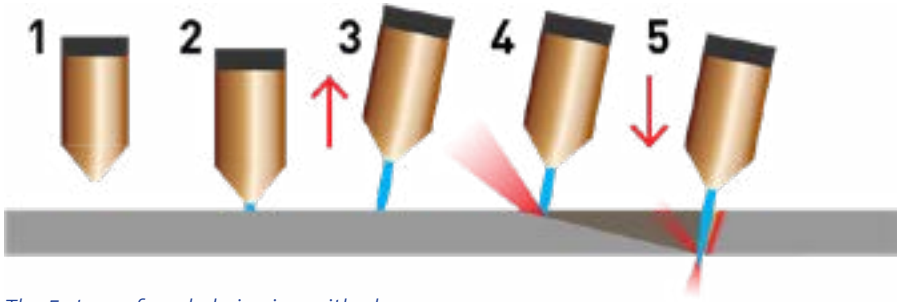
HGG has distinguished itself as a pioneer in CNC plasma cutting. Since 1994, HGG has supplied over 200 3D profiling machines with plasma cutting technology worldwide and keeps innovating with plasma cutting technology to stay on top of the latest developments.

Operation

Plasma cuts through electrically conductive material by an ionised arc that is blown out of a nozzle. This arc is formed between the electrode in the cutting torch and the material. Plasma delivers outstanding precision and cutting quality through torch design and a variety of cutting gasses that either protect or fuel the arc. The gasses can vary between compressed air, oxygen, hydrogen, nitrogen and argon, depending on cutting quality and type of material.

Characteristics

Plasma cuts through a wide range of conductive materials from mild steel to exotic alloys. In the range up to 25 mm, plasma cutting outperforms oxyfuel cutting with a speed of up to 3000 mm/min, faster individual cuts, superior surface results and a smaller heat-affected zone. HGG offers unique features that further improve the quality of plasma cutting by compensating for plasma characteristics and/or prolonging consumable lifetime.



The 5 steps of angled piercing with plasma.

Angled piercing

To protect the plasma consumables, HGG developed angled piercing. This procedure keeps the nozzle and other consumables out of harms way. The angled piercing sequence starts with positioning at the start of the lead-in (step 1), where it lowers to the correct height for the pilot arc to connect with the material to cut (step 2). After connecting and starting the lead-in with the main arc, the torch moves up and tilts (step 3) and together with a current ramp-up, starts piercing at an angle to prevent spatter from hitting the torch (step 4). Moving towards the initialisation point of the cut, the height, angle and movement of the torch are corrected to perform the full cut with the highest quality (step 5).

Costs

The initial investment costs of plasma cutting equipment are higher than for oxyfuel cutting equipment. The higher costs are a combination of the prices for consumables, energy and a mandatory fume extraction system with filtering unit. Mosts of these costs are compensated by the higher production that is achievable with plasma.

"HGG supports both Kjellberg and Hypertherm plasma sources. Two well experienced and industry leading choices."

Hypertherm®

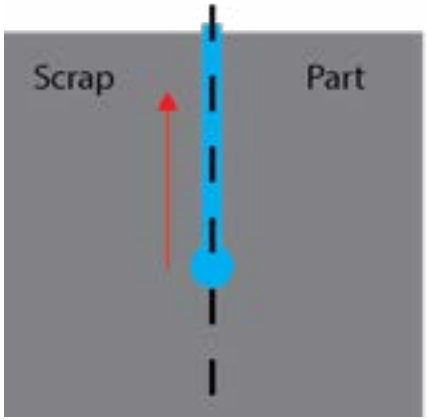
Kjellberg FINSTERWALDE

Lead-in for protection

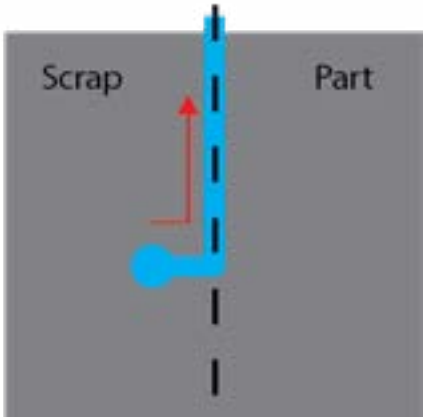
The lead-in is the approach to the actual cutting path. After piercing in the scrap area of the material, the torch moves toward the programmed start position and angle. This prevents damage to the actual cut caused by piercing at the start of the cutting process. A lead-in with plasma prefferably has a perpendicular approach. When the programmed cut has been completed, the torch moves away from the cut and performs a lead-out. This radial movement prevents damage to the part during the termination of the cutting process.

HGG's plasma features

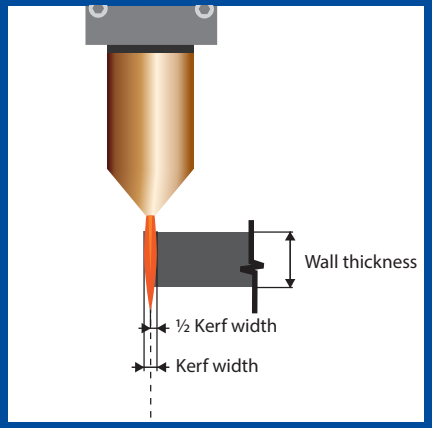
HGG's machines and software compensate for numerous plasma characteristics that are unique to the industry. HGG's Cutting compensation is where mechanical, software, and process knowledge come together to provide the highest quality with plasma cutting.



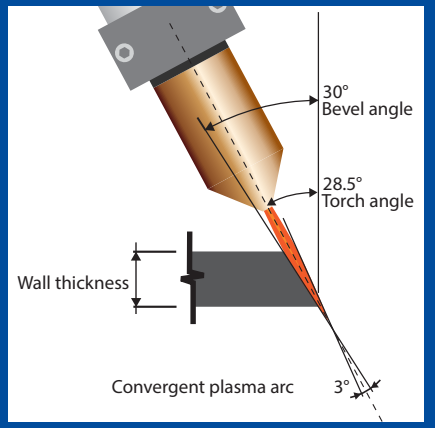
Without lead-in



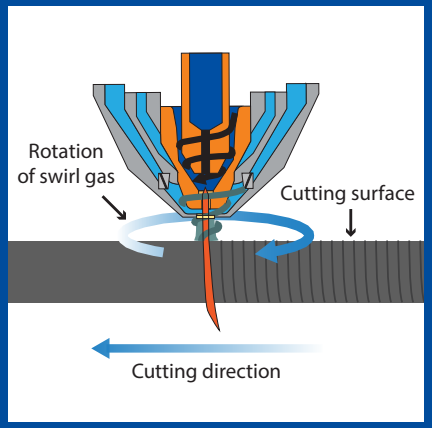
With lead-in



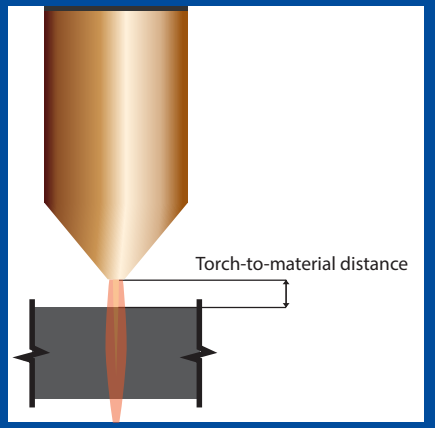
Kerf width compensation
for perfect accuracy on all sides of a part, independent of the wall thickness. The compensation is usually half the kerf width.



Arc shape compensation
for perfect straight and beveled cuts. The plasma arc cuts a convergent kerf which is corrected by changing the torch angle.



Optimised cutting direction
to deliver the good side of the arc to the part and the bad side to any remnant material increasing the accuracy of cuts.



Torch-to-material distance control
to maintain a constant distance that is perfect for plasma to keep the arc connected correctly

Marking

Cutting machines produce a collection of individual parts ready for assembly. The fitter has to assemble all parts based on drawings. It is necessary to distinguish between parts and know their distance and orientation relative to each other. HGG offers several marking solutions for identification and can convert layout and text marking from selected CAD packages in the cutting files.

Text marking

Some CAD systems can apply text to a part. For instance, Tekla Structures can add the text marking data to the NC1 file which can be imported by HGG's ProCAM for further processing.

Miscellaneous text marking for MDI

For marking of miscellaneous text like member names, projects, job numbers, etc., that are not member specific (e.g. 'This way up', weight or storage information). This feature is available as Manual Data Input.

Text marking by scripting (on request)

The unique 'ID name' used in CAD drawings can be marked on the member by a customer specific script. Additional information can also be marked if required (e.g. project title, job number, etc).

Permanent & non-permanent marking

HGG supports permanent plasma marking for part identification that needs to persist after conservation. Non-permanent marking is also available.

Layout marking

Some CAD systems such as Tekla Structures support the export of layout marking data. HGG supports several kinds of layout marking data from CAD.

Secondary contour marking

This marking indicates the footprint of a connecting secondary member on a main member for easy fitting. The footprint is also used to locate the surface to clean before welding.

Secondary name marking

ID marking of a secondary member on a main member fitting location. Preferably used together with secondary contour marking and text marking for marking of the member name.

Crosshair marking

Cross shaped reference point to mark the location of a drill hole for example.

Line marking

Reference lines are lines on the pipe that help to orientate, measure or assemble different parts of the assembly. This feature supports box sections as well (if applicable).

Cutting path marking

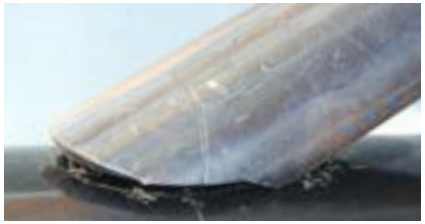
The machine feature 'Mark all cuts' marks all cutting paths as an additional checkpoint if all cuts are programmed correctly. Especially valuable with complex parts in expensive materials. This feature supports heads and box sections as well (if applicable).

Inkjet marker

Dedicated plasma marking torch

Inkjet double saddle footprint marking

Inkjet triple saddle footprint marking



Punch text and layout marking

HGG's marking solutions	Inkjet marking	Punch marking	Plasma marking (single torch)	Dedicated plasma marking torch
Affects material characteristics	*No*	*Minimal*	*Minimal thermally affected zone*	
Non permanent marking	*Yes*	*No*	*Yes*	
Permanent marking	*No*	*Yes*	*Yes*	
Combines with oxyfuel torch	*Yes*	*Yes*	*Yes*	*Yes*
Note	*Fast text marking Slower with layout*	*Loud scratching sound*	*Only with Hi Focus 160i or 280i*	

Available marking solutions and their characteristics

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

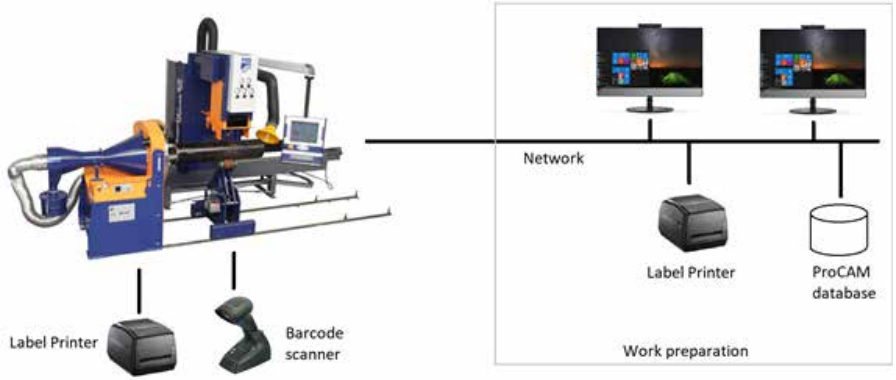
Labels can contain a variety of information that is useful in production to identify what part you are working with or what needs to happen with it further downstream. Information that you can print on the label consists of heat numbers, material specifications, customer, part ID's and custom fields 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.

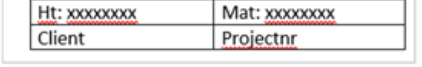
Labels

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 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.



Overview of the hardware components used by label printing with scanner

Stock label with QR code for the scanner



Part label with part information

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.

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