

Operators Manual for Pentruder[®] 3P8 Wire Saw Drill System



Version: 2.0

Subject: Pentruder[®] 3P8 Wire Saw System

Support & Service
document

Manual Pentruder 3P8 Wire Saw
V2.0.doc

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Introduction

Thank you very much for your confidence in our product! You have chosen to invest in a product which will give you many years of efficient and profitable production. The Pentruder 3P8 Wire Saw System has been developed based on over 30 years of experience in this specialised field. With correct handling it offers outstanding performance, safety and reliability.

The diamond wire cutting technique has been employed advantageously since many years especially for jobs where the objects have been difficult to reach to, or too big to be cut with circular saws, or other methods. Stitch drilling has been popular for many years, but due to its low overall efficiency, wire cutting has more or less taken over from stitch drilling. With wire cutting, one is not limited by depth of cut. The technique can be used to make cuts through huge objects without damaging the adjacent concrete structures. Big sections can be removed reducing cost for splitting block in several pieces. Wire cutting is a relatively quiet method, and very little vibration is produced.

It is essential that all personnel working with or in close proximity to the wire saw have read and understood the contents of this manual before commencing operations. By reading and understanding the manual the operator will be able to take advantage of the many features and benefits of the Pentruder 3P8 Wire Saw System. Should questions arise, please contact our sales agent.

We are confident that your investment in this equipment and its many design features will enhance your business competitive edge and profitability!

Product:

3P8 Wire Saw System - High frequency motor driven.

Power source: directly from Pentpak 418, 422 or 427.

Manufacturer:

Tractive AB

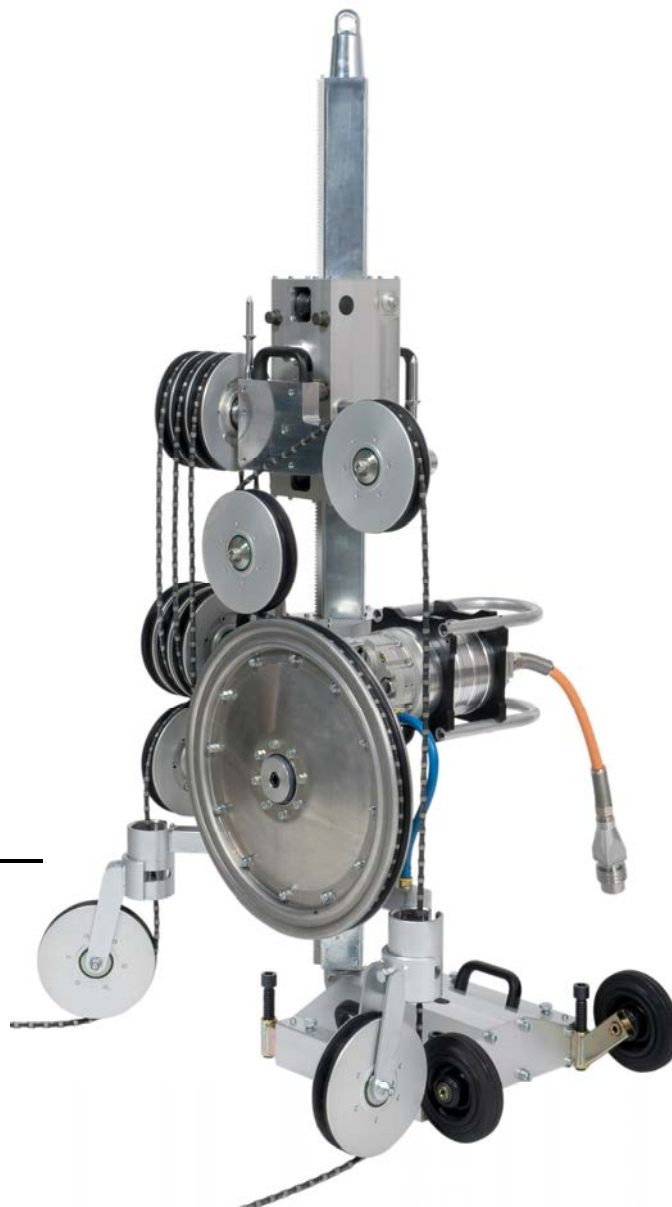
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Strong features of the 3P8 wire saw

- The 3P8 wire saw can be driven by either one of the powerful 18, 22 or 27 kW HF-motors.
- Wire tensioning is fully automatic, with some exceptions. The tensioning of the wire is governed by software and a microprocessor / digital servo amplifier driven electric feed motor.
- The main drive pulley has a diameter of Ø 500 mm. It has a rubber drive ring with a specially designed type of rubber compound giving very good traction wire to rubber, even when wet. The wire wraps around the main drive pulley over 270°, which gives superb traction.



Strong features of the 3P8 wire saw, continued

- The cutting speed is continuously variable from 0 to 22 m/second, 4330 sft/min, when driven by the 18, (25HP) and 22 kW (30HP) motors, and up to 25m/s, 4920 sft/min. for the 27 kW (37HP) motor.
- The wire magazine stores 8 m of wire per 1 m of stroke of the tensioning carriage (the upper carriage). The magazine can store (pull in) over 20 m of wire if the total column length is 3.0 m or more. A combination of 0.5, 1.2, 1.5 and 2.0 m columns can be used.
- The wire can be run over all wheels on the machine without opening the wire.
- A patent pending system allows the wire to be run also over the adjustable swivelling wheels, without having to cut the wire.
- All swivelling wheel assemblies can easily be removed from their holders for easy cleaning and maintenance, by just removing one screw.
- Fully enclosing guards protect the operator(s) and keep all expensive parts (reasonably) clean, like the carriages, main pulley drive system, column, etc.
- All pulleys can easily be removed from their mountings. All bearings are sealed with external seals.
- The main drive pulley is driven by a Gates toothed high torque Carbon cog belt. The belt transmission is hidden behind guards and protected from concrete slurry. The belt can be replaced using only a set of standard 6, 8 and 14 mm Allen keys.
- The magazine and idler wheels are Ø 198 mm O.D., 7,8" and the wire is running on "pitch" Ø 180, 7.1".
- The magazine and idler wheels have a rubber ring with a specially designed type of rubber compound giving very good wear resistance. There are totally eleven such wheels on the 3P8, including six wheels in the magazine.
- All pulleys are a two piece design, and are bolted together. All rubber liners (rings) can easily be replaced using standard tools.
- When the rubber liners / rings are new, the groove width for the wire, in all wheels, is 10 mm, 0,3930", meaning that it's suitable for a Ø 11 mm, 7/16" wire. Ø 8 mm, 5/16" wire also works well.

Strong features of the 3P8 wire saw, continued

- Normally, corners will NOT have to be broken off or chamfered before commencing a cut. Maximum torque is available from 0 motor speed, and the wire can be started smoothly. Note, a new wire with sharp bead edges is much harder to start over sharp corners than only an ever so slightly used wire. With a new wire, it may be necessary to chamfer edges on the object to be cut.
- The 3P8's design allows for direct cuts to be made, and satellite wheels can mostly be omitted. A direct cut means that the machine is fitted directly on the object to be cut, or very close to it, eliminating the need for extra satellite wheels.
- Due to the high tractive force of the drive system, even big cuts can be done without need for satellite wheels that lifts the wire off from the cut object. The 3P8 is powerful enough to pull the wire with sufficient force also when the wire is contact with the cut object over a long distance.
- Most makes and types of sintered wire works well, but electroplated wires can not be used on the 3P8. This type of wire can be destroyed in just a few minutes if attempted to be used on the 3P8.
- Normal results in concrete, using a wire that is well adapted to the high power of the 3P8 wire saw:
 - Expect to cut between 3 – 6 m² 32 – 64 sq ft per hour in reinforced concrete containing “normal” aggregate.
 - Expect to cut between 1.5 – 3 m², 16 – 32 sq ft per hour in reinforced concrete containing flint or river gravel aggregate.
 - Lifetime of wire: 1.5 – 3 m² / meter of wire, 5 to 10 sq ft per linear ft of wire.
 - depending on type of aggregate, content of steel, cutting speed, and quality of wire.
 - Lifetime of bearings and rubber rings in magazine and idler rollers: 200 – 400 m², 2200 – 4400 sq ft. The magazine rollers closest to the main drive pulley are the ones that is exposed to the highest stress, and will need replacement of rubber rings more frequently than all other rollers.
 - Lifetime of cog belt: 200 - 400 m², 2200 – 4400 sq ft
 - Lifetime of cog belt pulleys: 200 - 600 m², 2200 – 6600 sq ft.

Why does the 3P8 use so many rollers in the wire magazine?

There are four loops of wire being tensioned, three in the magazine, and one on the return or slack side, this means that if the upper carriage moves 1.0 m, 3,3 ft you have stored eight meters in the magazine. Objects 2.2 x 10 m, 7,2 x 33 ft., has been cut without shortening the wire, and then the carriage was moved over 2.5 meters, 8.2 ft up, taking in over 20 meters, 65 ft. of wire!

All 3 + 3 rollers in the magazine are used, always. The feed regulation parameters are based on the resistance and force needed to tension the wire when it runs over all rollers.



General safety instructions

This wire saw may not be used before the operator is fully educated by our sales agent in handling the machine. Adequately trained personnel are required for planning and cutting. It is the obligation of the buyer / owner of the equipment to make sure that the operator really has received the information necessary to operate and take care of the machine in a correct and safe way. Incorrect handling can lead to serious or even fatal injury to the operator and persons in proximity to the machine.

Tractive AB is not responsible for damage on property or persons whether they originate from incorrect handling or deficient maintenance or as a consequence from not checking the machine for damage and/or defects before taking it into use.

The following safety instructions are important to know and follow:

- General safety precautions means that all persons working with, or in the proximity to the wire sawing machine should wear safety equipment, i.e. protection helmet, protection shoes, gloves, eye and ear protectors. Other safety regulations at the work place must be followed. The noise level when sawing might lead to permanent hearing disorders if not ear guards are worn.
- Always check that the equipment is in faultless condition and that all functions are in order before work is commenced.
- Warning! The power pack must be disconnected from the power supply by removing the 32 (red) or 63 Amp (blue) plug and cable from the power pack before any other electric connections on the power pack are made.
- The power pack must always be switched off and the 32 (red) or 63 Amp (blue) plug and cable disconnected from the power pack before any kind of service is commenced.
- Mounting and dismounting of the wire saw may only take place when the power to the main pulley drive motor is disconnected from the power pack by removing the electric connector on the HF-motor or on the power pack.
- To maintain the level of safety inherent in the design of this machine, only Tractive original spare parts may be fitted. Tractive AB disclaims all responsibility for damage occurring as a result of use of non original parts.
- The power pack must only be operated when it is standing on its rubber feet.
- The power pack is water cooled and must be drained from water when the ambient temperature is in the proximity of or below 0 degrees Celsius, or 32°F.
- The electric power transistor units are water cooled and the water pressure must be limited to max 5 bar or 70 PSI. The incoming water supply may only be connected to the lower right hand connector on the power pack. The quick disconnect couplings may not be replaced with couplings that are not fully open when disconnected.

General safety instructions, continued

- *The operator should have good supervision over the wire saw and inform passing persons about possible risks.* Unauthorized persons shall not be within the risk area (the area around the wire saw).
- Always lift modules of the wire saw ergonomically correct. The Pentpak is not provided with handles for lifting.
- The base plate must always be securely anchored to perform sawing.
- Never run the wire saw without water cooling to the water pack and HF-motor. Should the cooling water seeze to function, stop the machine immediately.
- Before sawing is commenced all persons involved must know how the emergency stop buttons are working.
- Only connect the Pentpak 418, 422 or 427 power packs to Pentruder HF-motors or other HF-equipment which has been manufactured or approved by Tractive AB .

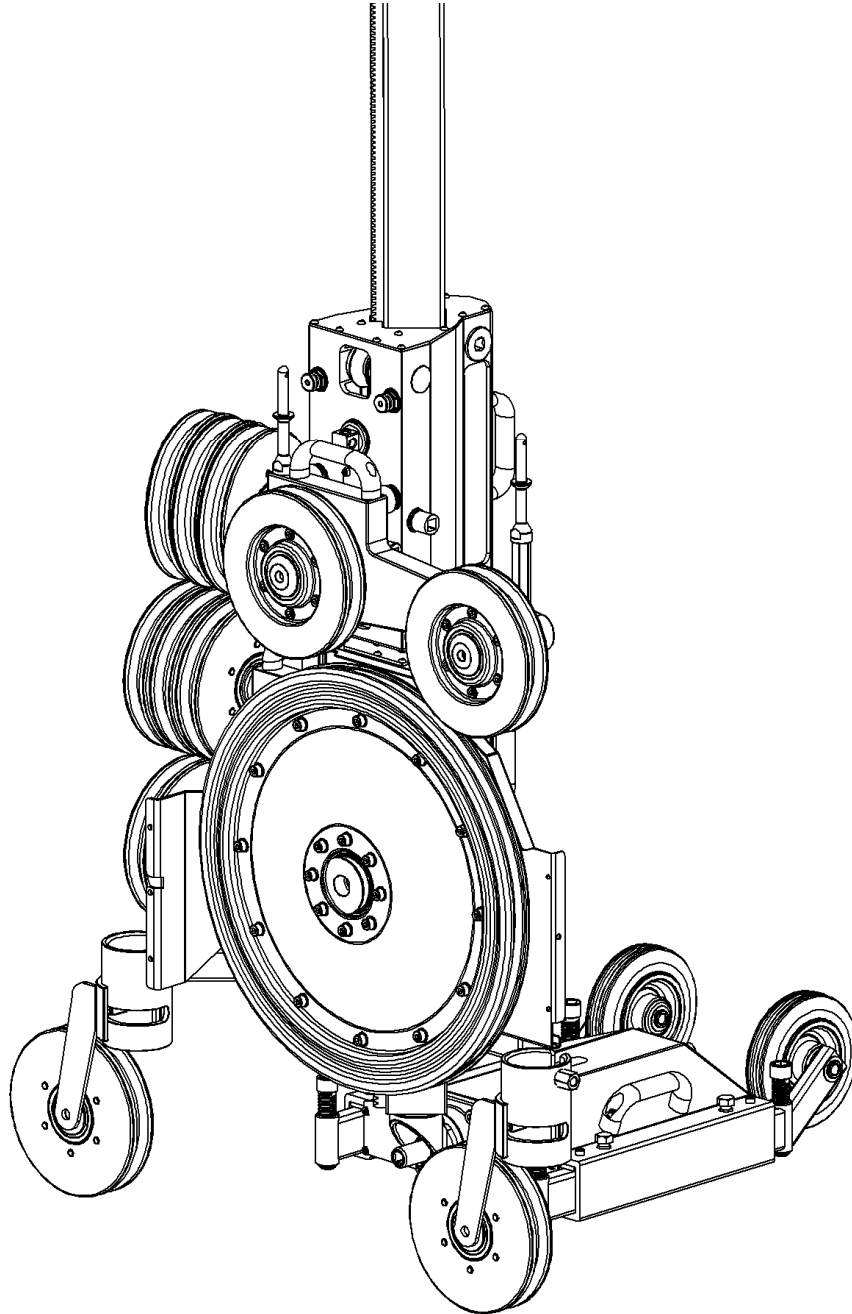
Safety precautions on site

Check with the foreman responsible that all necessary precautions have been performed before commencing work. Await the approval of the safety precautions and mounting position of the machine from the responsible person before work is commenced.

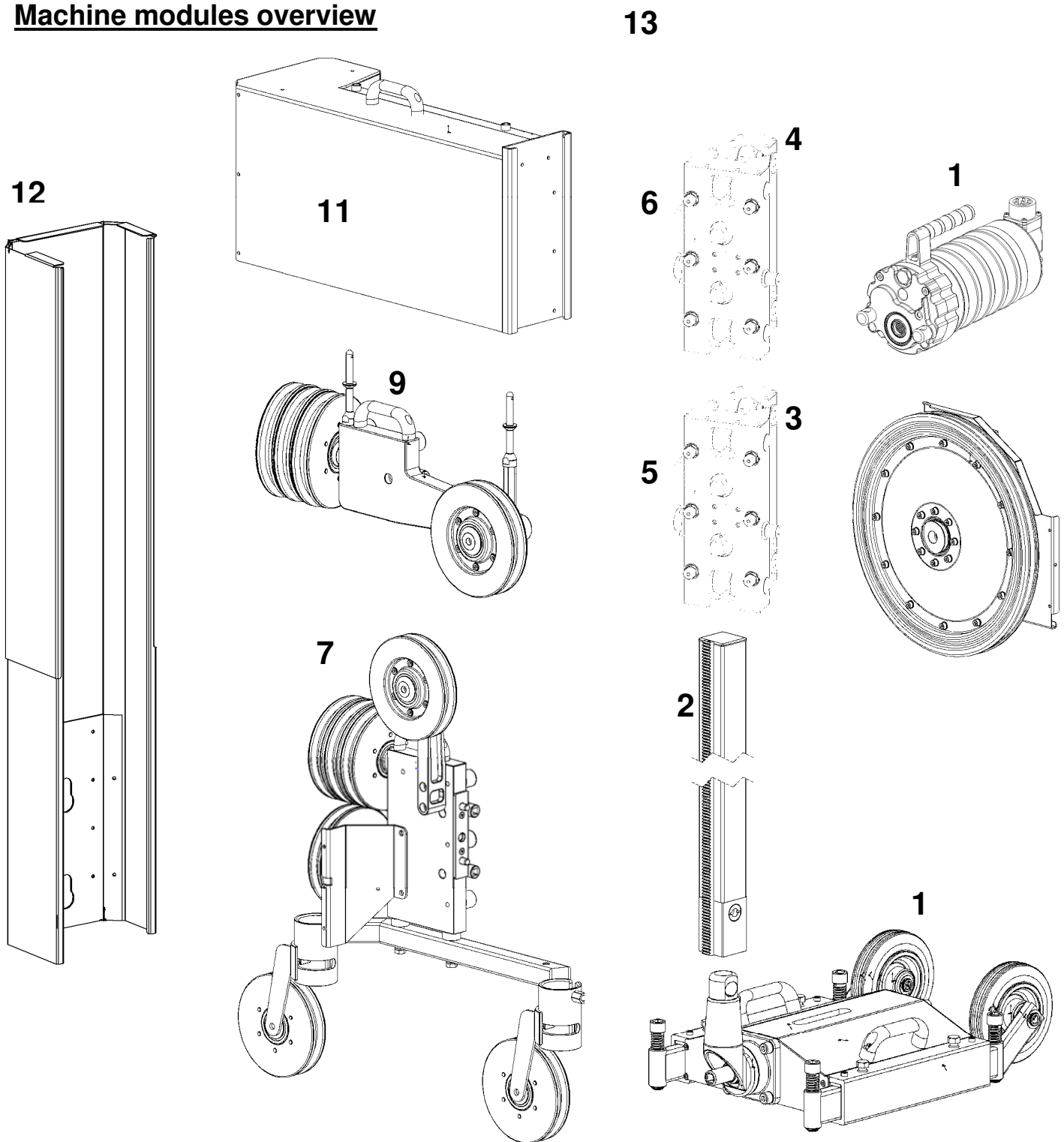
Emergency stop

Show all persons involved in the job how the emergency stop on the machine is working.

Warning! If there is a possibility that pieces of material cut away when wire sawing may fall causing injury or damage to persons or property then they must be secured before starting work. The risk area must be roped off and a responsible person left in charge, in a safe place, to prevent entry of unauthorised persons.



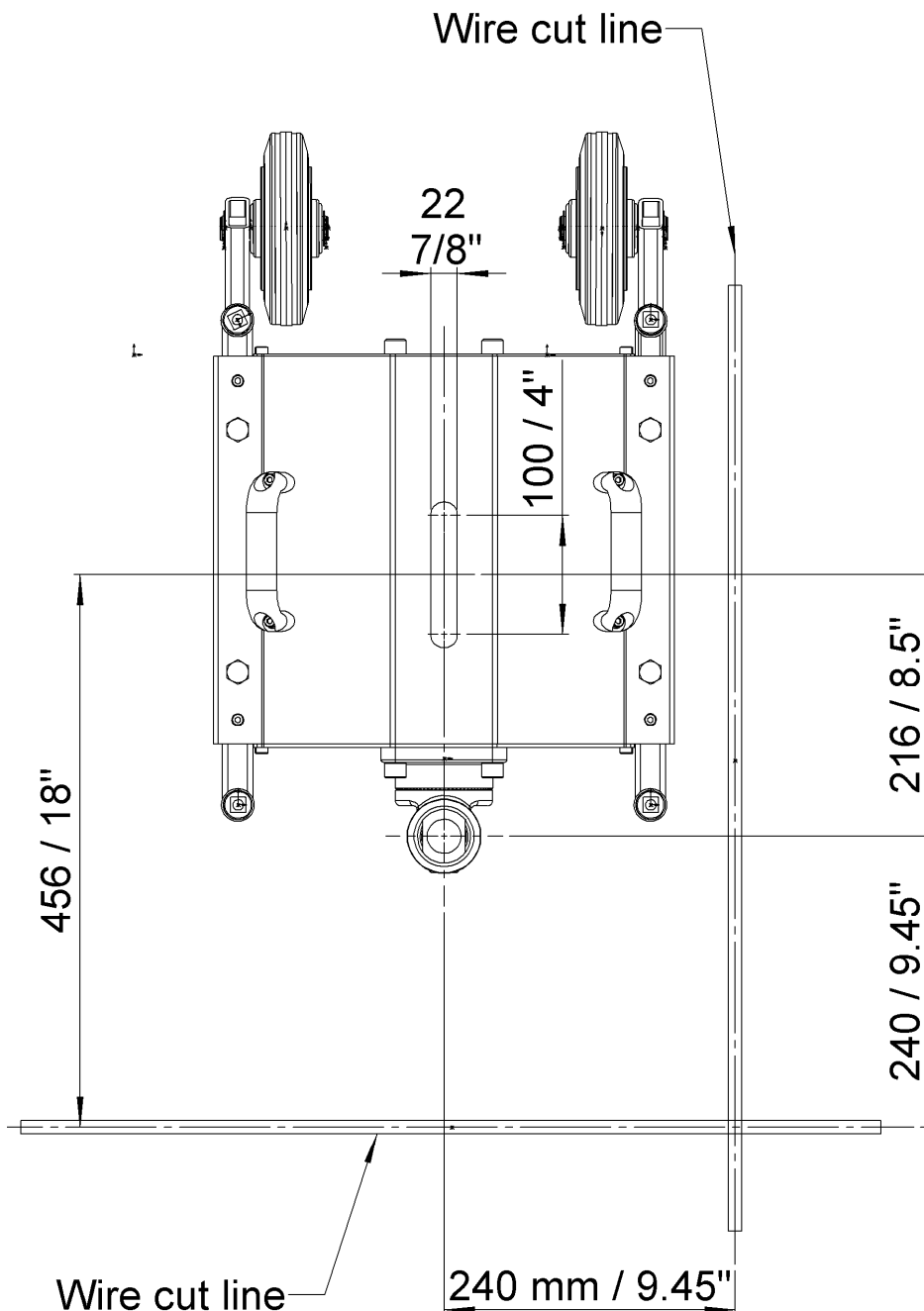
Machine modules overview



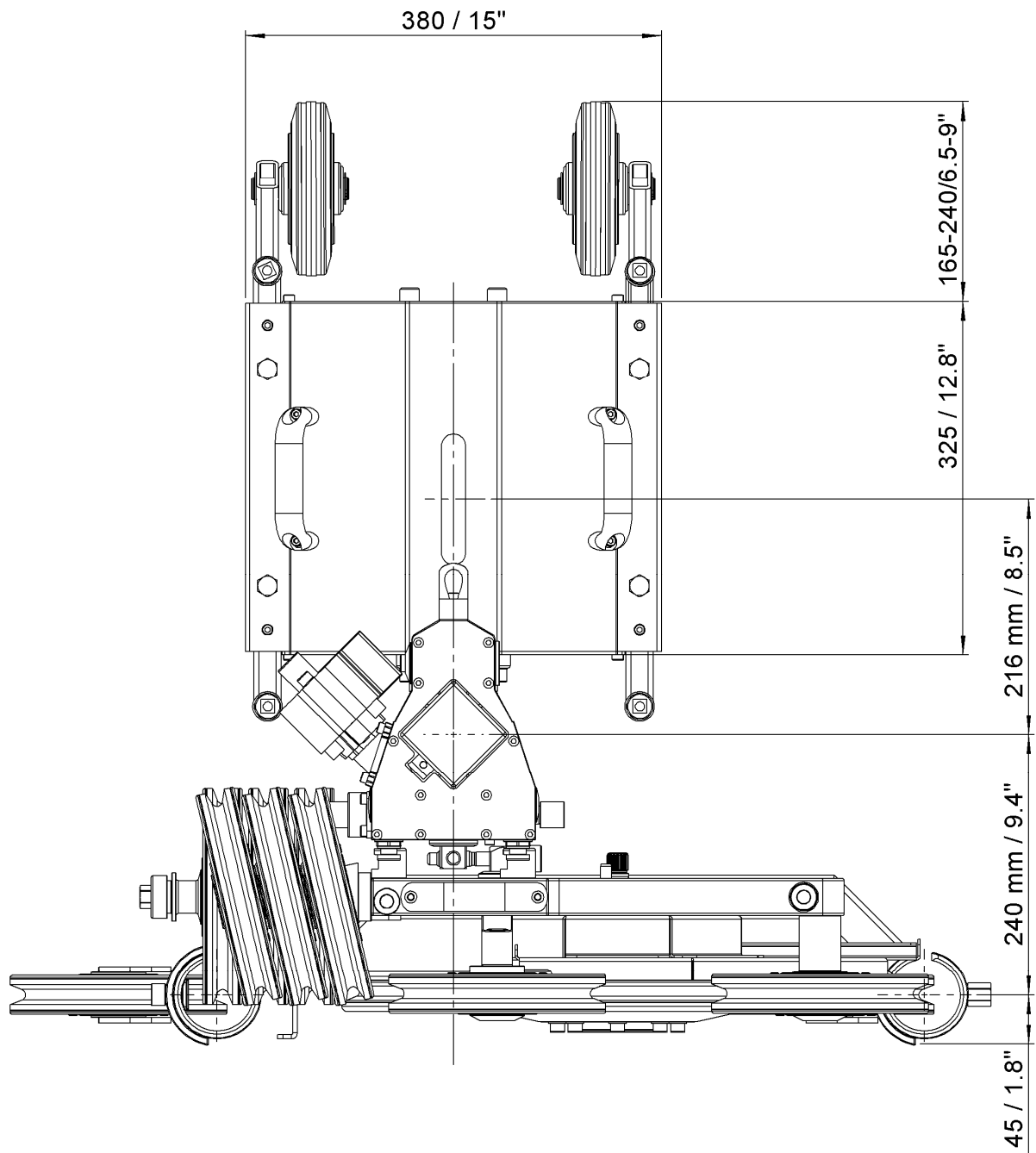
- 1. Base plate BE1 with fixed cone coupling or BE2 with swiveling cone coupling
- 2. Column 0.5-1.2-1.5-2.0m
- 3. Lower carriage with feed unit
- 4. Upper carriage
- 5. Friction brake
- 6. Electric feed unit
- 7. Lower assembly
- 8. Main drive pulley
- 9. Upper assembly
- 10. Guard, main drive pulley
- 11. Guard, upper assembly,
- 12. Telescopic guard, magazine rollers
- 13. Telescopic guard, slack side

How to position the base plate

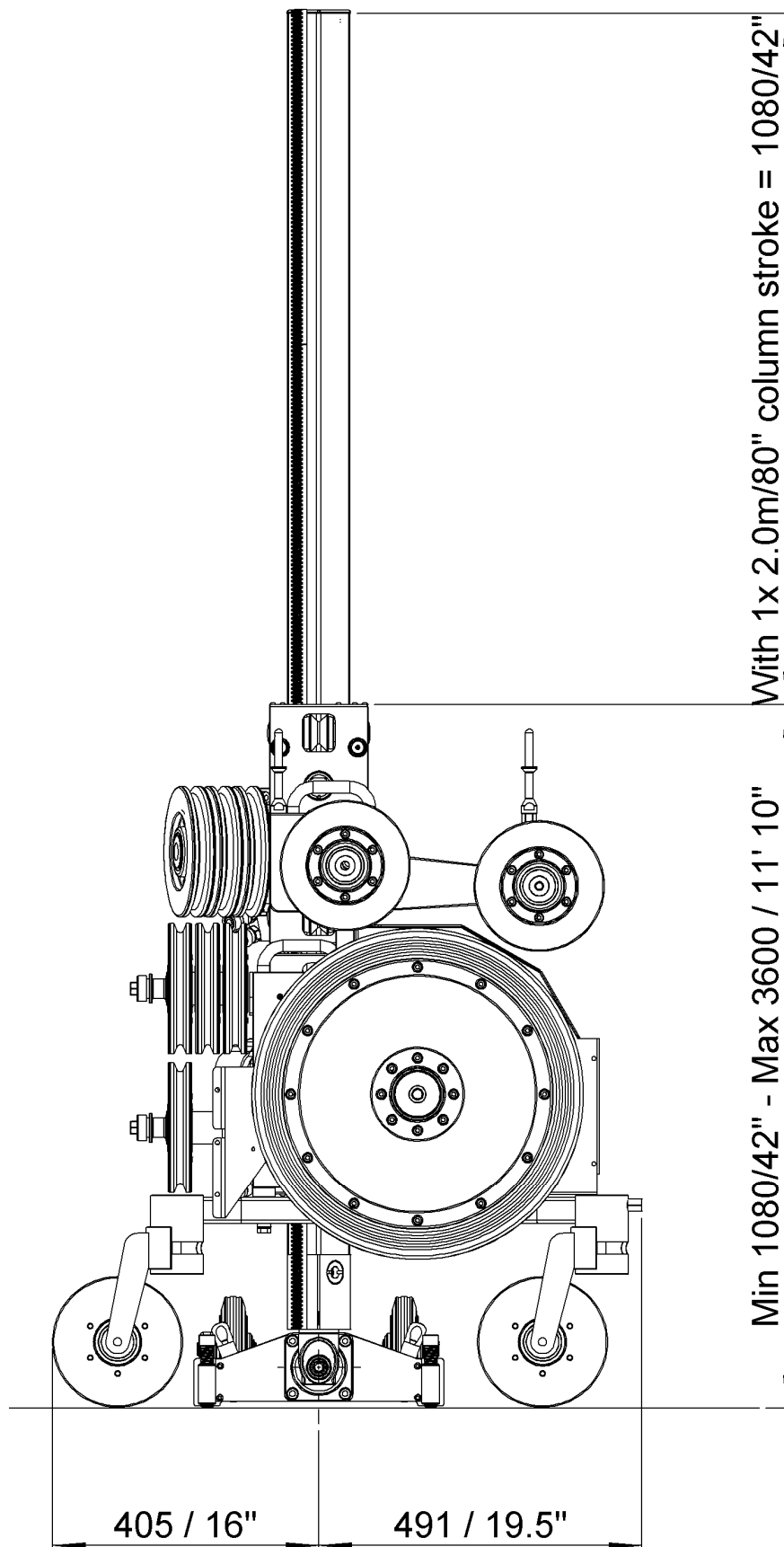
1. Be observant on what material the base plate will be mounted on. For safety reasons it is very important that the base plate is properly fastened. If mounted on brick or porous concrete we recommend to fasten the base plate with M16 / 5/8" through bolts.
2. The wire cut line will be as shown in the drawing below. Please note: The column can rotate around its own axis, and be locked in any position. Therefore you may prefer to measure your anchor position from the center of the column.



Overview cut lines – view from top



Stroke of carriage



Standard mounting sequence

1. Base plate
2. Column or columns
3. Lower carriage
4. Upper carriage
5. Lower assembly
6. Main drive pulley
7. HF-motor
8. Upper assembly
9. Electric cables to HF-motor and feed unit
10. Cooling water hoses to power pack and HF-motor
11. Guards

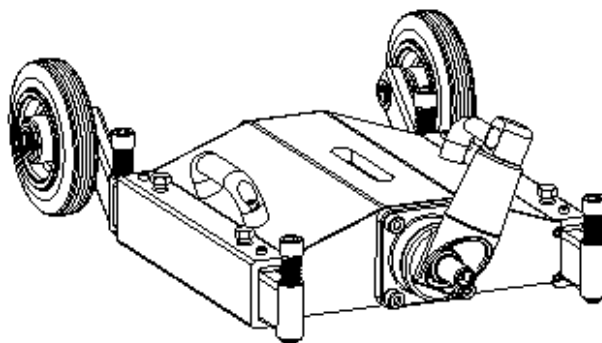


Fig. . Base plate-BE2 with swivelling quick coupling.

On BE2 the conical quick coupling can be swivelled sideways in increments of 5°.

We strongly recommend the BA1 base plate for wire sawing. It has a fixed coupling, and is more rigid than the BA2 type of swivelling coupling,

Columns

Three types of columns are available:

- a) Columns with a female / male configuration, meaning that each column is fitted with a female conical quick release coupling at one end, and a male coupling at the other end. It can be extended in each end.
- b) Columns with a female coupling in one end, and a Jack Screw in the other end. It can be extended only in the end with the female coupling.
- c) Columns with a female coupling in one end, and a blanking plug in the other end. It can be extended only in the end with the female coupling.

The columns are available in four lengths, 0.5 m, 1.2 m, 1.5 m and 2.0 m, 20", 47.2" 59" and 79".

The columns, with the conical quick release coupling unlocked, can rotate around its own axis, and great flexibility is offered to simplify set-up.

1. Mount the base plate

Bolt the base plate to a solid object using an M16 / 5/8" anchor bolt. Use only high quality anchors and bolts. Adjust the support legs (see fig. 2). Level the base plate using the four leveling screws.

2. Mount the columns or columns

The column is locked by turning the eccentric bolt **Clockwise**.

To release the column, the eccentric is turned **Counter Clockwise** until it lifts from the cone. To remove the eccentric bolt, turn it slightly **Clockwise** again until the load on the bolt is gone, and then pull out the bolt, and then the column can be removed. Do not insert your fingers in the bolt hole!!

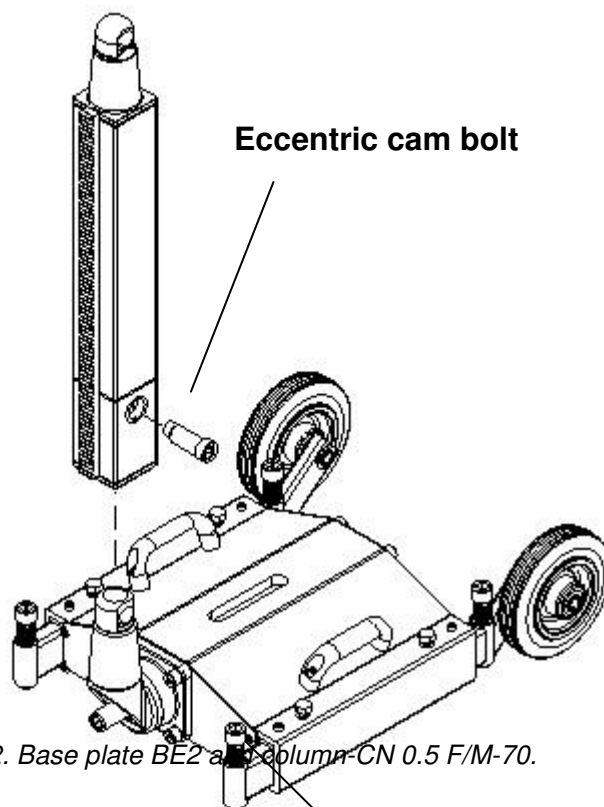
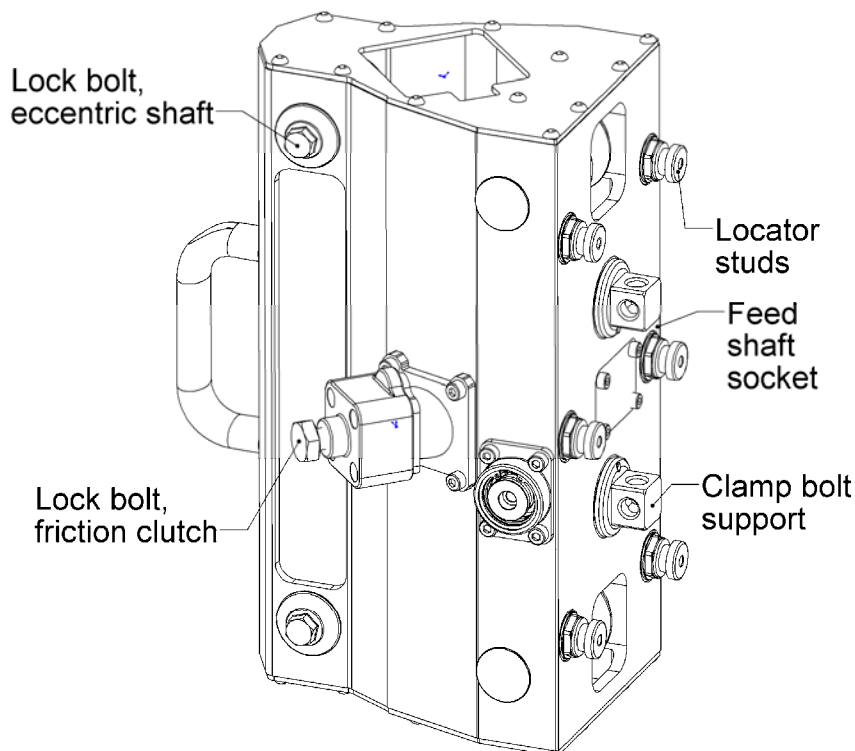


Fig. 2. Base plate BE2 and column-CN 0.5 F/M-70.

Fig. 2. Base plate BE2 and column-CN 0.5 F/M-70.
Fig. 2. Base plate BE2 and column-CN 0.5 F/M-70.

3. Mount the lower carriage on the column

1. Loosen the socket on the friction clutch one turn. (19 mm / 3/4" spanner)
2. Slide the carriage over the column
3. Adjust the height of the carriage by turning the feed shaft socket with a ratchet or knuckle bar.
4. Tighten the friction clutch socket. Tighten firmly, but do not over tighten!



4. Mount the upper carriage on the column

1. Loosen the socket on the friction clutch one turn. (19 mm / 3/4" spanner)
2. Slide the carriage over the column
3. Adjust the height of the carriage by turning the feed shaft socket with a ratchet or knuckle bar.
4. Tighten the friction clutch socket.
Tighten firmly, but do not over tighten!

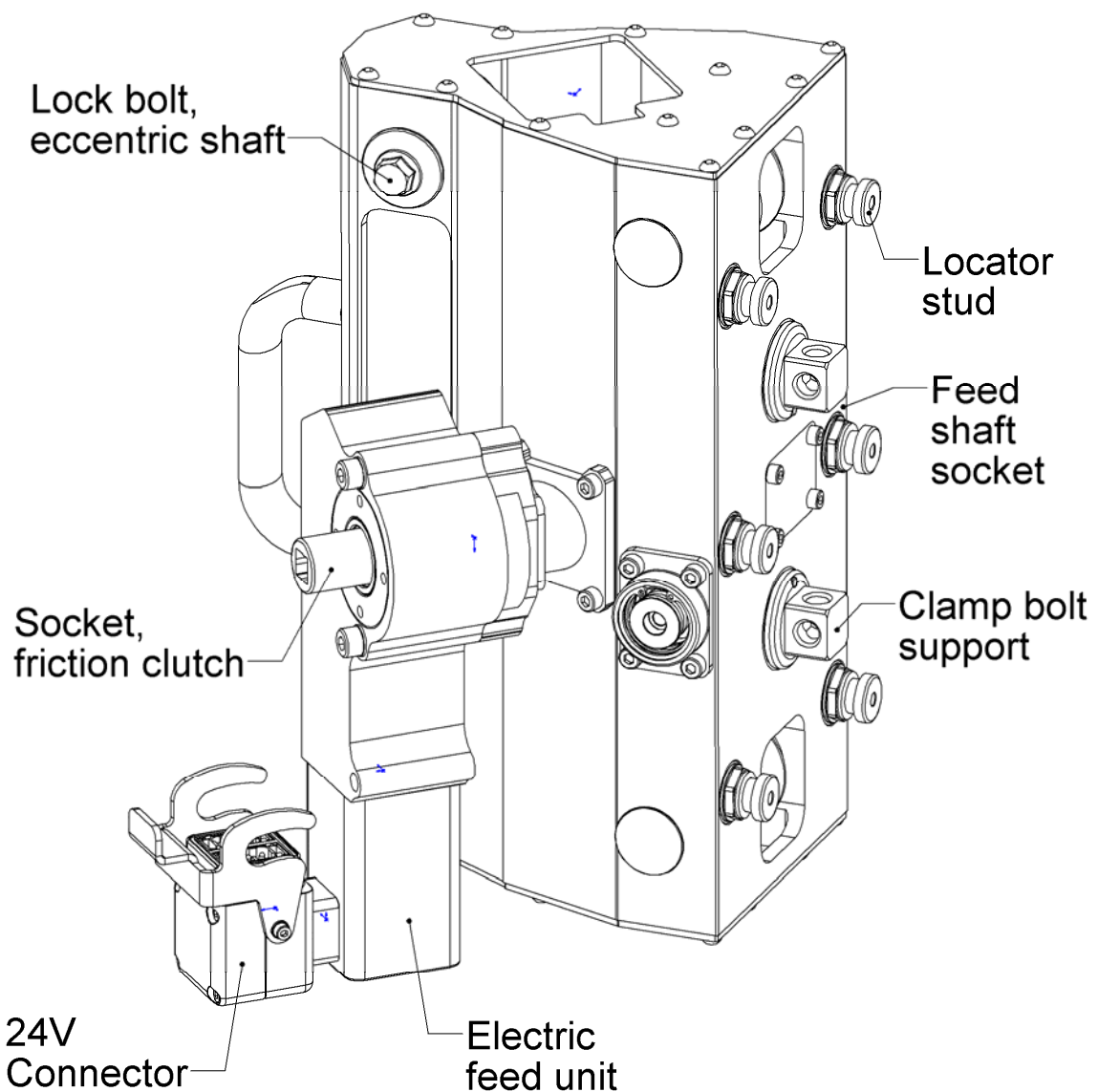


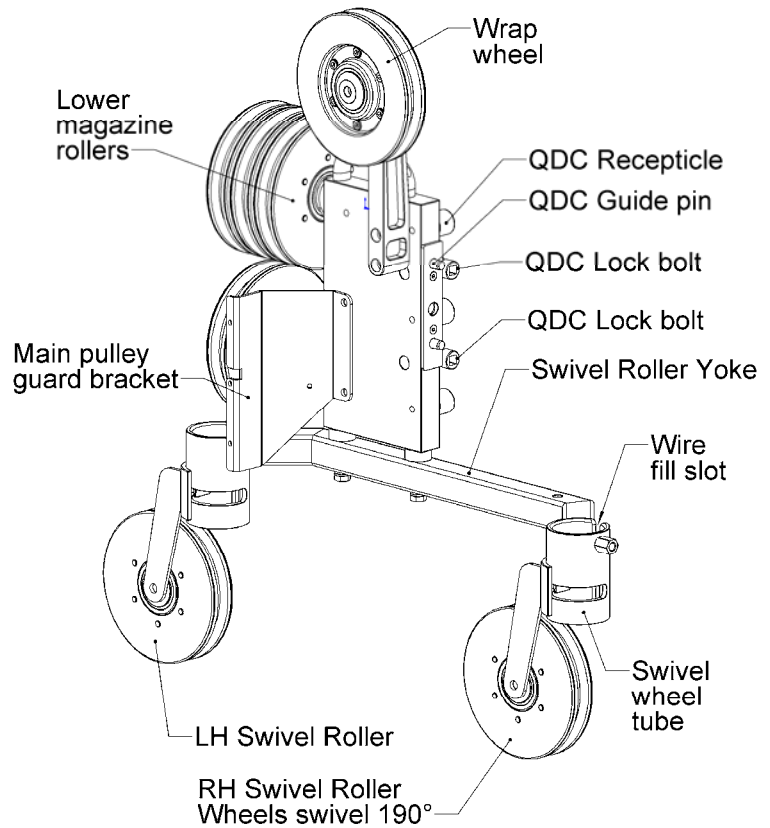
Fig. 4. Carriage CE1 with Electric feed unit ET100.

5. Attach the lower magazine and swivel roller assembly

Normally the lower assembly unit is mounted on the carriage with the swiveling rollers pointing towards the surface the base plate is mounted on.

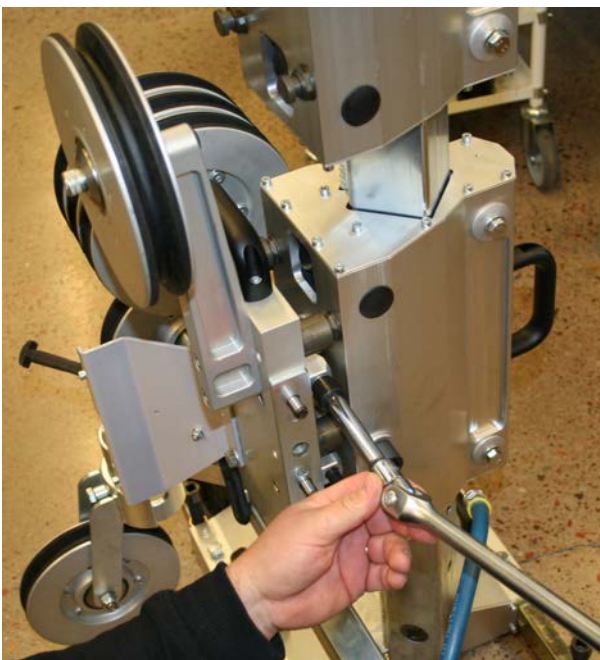
Warning: Be careful after having mounted the carriages on the column.

Make sure the friction couplings are tightened to avoid injuries, this applies to both carriages. Do not over tighten the clamp socket!



Slide the complete lower assy sideways with the Quick Disconnect Coupling recepticles engaging with the locator studs on the carriage.

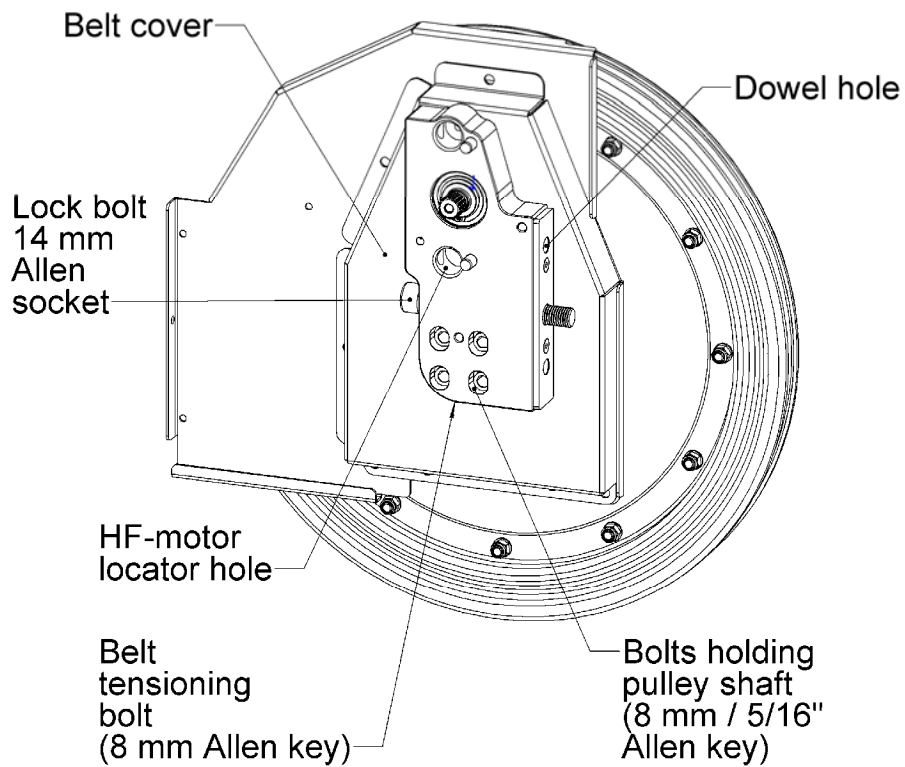
Tighten the QDC lock bolts firmly, but do NOT over tighten!



6. Attach the main drive pulley assembly

Attach the main drive pulley assembly on the lower magazine assembly by mating the two dowel pins to the dowel holes in the magazine plate.

Tighten the lock bolt with a 14 mm Allen key socket and a long 1/2" extension.

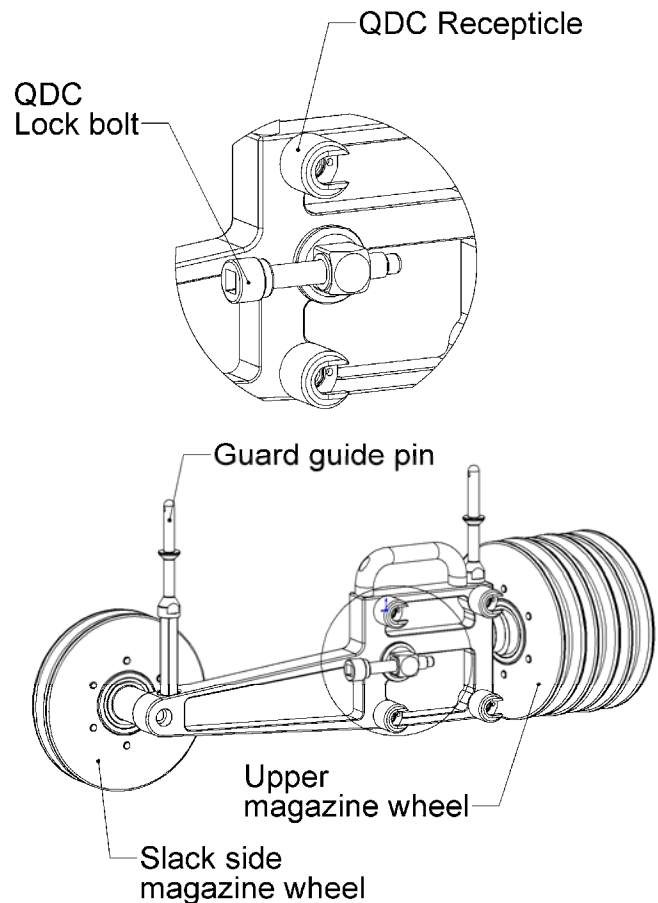


7. Attach the main drive HF-motor to the pulley assembly

Attach the HF-motor to the pulley assembly by entering the locator dowels in to the holes in the pulley assembly plate. Tighten the lock screws with an 8 mm allen key / 5/16". Rock the main drive pulley slightly back and forth to make the spline shaft mesh with the hF-motor.

8. Attach the upper magazine assembly

Attach the upper magazine assembly by sliding the assembly sideways onto the locator studs on the upper carriage. Use the lower four studs. Tighten the QDC lock bolts firmly, but do NOT over tighten!



9. Attach HF-motor cord and the 24V feed motor cord

Attach the main drive HF-motor cord, and the 24V feed motor cord.

10. Attach water hoses

Attach the water hoses to the power pack, the HF-motor and connect the hose from the motor bracket plate to the swivel wheel yoke.

11. Attach guards

After the wire has been started, very slowly, and has cut a shallow groove, the guards can be fitted. The start up procedure is described on page 27.





Guidelines on how to operate the Pentruder 3P8 wire saw.

First of all you have to accept you may need some time to get used to the machine. It is a little like driving a car for the first time. The systems controlling the 3P8 wire saw are automated and well refined, but some functions can not be completely automated, and in some circumstances you have to trust your ear, and help the control a little, to get the best result.

Once the safety issues have been dealt with, and the operator has understood that these requirements must be respected and the instructions followed, he can start enjoying the extraordinary qualities of the Pentruder 3P8 wire saw. He will notice that the bigger the object is, the better the 3P8 will perform. Not even heavily reinforced objects represent a problem.

General guidelines

Wire sawing can be a very dangerous exercise! All possible safety precautions must be taken to avoid accidents from happening.

- All guards must be fitted on the machine while it is running, and the wire must be protected over its whole free length, as well as from and to the cut object.
- The wire can break at any time, and it is rather impossible to predict when it will break.
- When it breaks, it will most likely be in the worst possible way, and a bead may be torn off the core wire and thrown off the wire trajectory at enormous speed.
- When the wire breaks, the wire speed will most likely be much higher than the wire speed used when cutting, as it is compounded by the whip lash effect and can reach speeds over 100 m/second. **Such a “bead bullet” can kill anyone that is hit by this bullet, so all possible safety precautions must be taken to prevent a bead from flying freely around in the air.**
- Be sure to lock all guards, cover the wire where it is free, and cover the cut left after the wire.
- Never stand in line with the cut line.
- Wear all safety equipment as stipulated by the authorities.
- The power or force applied on the wire in the 3P8 is higher than on any other commercially available electrically driven compact (non quarry type) type wire saw. Therefore it is important to splice the wire carefully.

Guidelines on how to operate the Pentruder 3P8 wire saw, continued.

- When setting up the base plate, pay attention to the positioning of the wire going out from and back to the machine. Try to plan the set-up so that satellite wheels are not needed.
- The 3P8 can most often be mounted directly on the cut object. If this is possible, it is called a direct cut. A direct cut is preferable as extra satellite pulleys steal power. The high start up torque, and the high traction between wire and main drive pulley rubber drive ring allow start up over several corners, without use of extra satellite wheels to lift the wire off the cut object.
- Naturally, in some instances satellite wheels must be used. If this is the case, try to avoid using satellite on the slack side. This is where the wire goes out from the machine and where the RH swivel wheel is. The RH side if you stand in front of the main drive pulley.
- Try to position the base plate so that the wire goes back in to the concrete or the cut object with the wire running over the RH swivel wheel when cutting starts.
- What we are after with these recommendations is to create as little friction as possible on the slack side. Then the cutting will go faster and the feed regulation will work best.
- To use all the power which is available, the control tries to maintain a tension in the wire that creates the resistance needed to use the power requirement set on the Remote Control Unit (RCU).
- The power consumption the "feed control" or rather "power / tension system" tries to achieve is set on the right hand potentiometer on the RCU.
- If the required (or desired) power is set to 100%, the control tries to use all the 27, 22 or 18 kW available from the HF-motor.
- **If it is a small object, with a short contact length for the wire, a setting of 100% power means that the wire must be tensioned very hard to use all the power as very few beads are in contact with the cut object, (which doesn't create enough friction) This means high wire wear and risk for premature wire joint failure.**
- If the wire is working over many meters contact length with the cut object, many beads are in contact with the cut object, and the wire tension will be less, to create the friction needed, and then the power can be turned up to 100% and the wire life will still be good.
- **This means the smaller the cut object is, the harder it is to use all the power, and to achieve high cutting rates, or cut square metres per hour.**
- It also means the bigger the object is, (up to a certain size, of course) the easier it is to use all the power, and to achieve high cutting rates, or cut square metres per hour.

Prepare before cutting commences:

Apart from the 3P8 machine itself, the operator should have the following material at hand:

Safety equipment as helmet, eye- and ear protection, dust extraction equipment sensitive environments, protective clothes, shoes and gloves.

An 18 (25 HP), 22 (30HP) or 27 kW (37 HP) Pentruder HF-motor.

A suitable power pack, PP418, PP422 or PP427 with cables and Remote Control Unit.

Electrical plugs, 32 or 63 Amp, when needed, extension cables for the power pack

Hammer drill to drill holes to secure the base plate.

M16 HKD type or other anchors and anchor bolts to fasten the base plate.

Hammer and mandrel for setting HKD type anchors.

Measuring tape for positioning of base plate in relation to wire cut line.

7 meters, 23ft, of wire, plus what is needed to reach around the object to cut.

Several high quality steel crimp sleeves, for the wire. Universal joints doesn't work well with this machine.

Hydraulic crimp tool for steel crimp sleeves.

Water hoses and extensions for power pack and soft thin hose for supplying water to one or several positions along the wire trajectory. Soft, flexible garden hose, 1/2" inside works well.

T-manifolds to split water flow to several hoses.

Industrial vacuum cleaner for collection of concrete slurry and water retention.

Some thin spray on oil or WD40 to spray on the machine before cutting starts.

Tools normally used to set up and operate the 3P8:

1/2" knuckle bar or 1/2" ratchet

19 mm x 1/2" socket

6 mm allen key (for belt change)

8 mm x 1/2" Allen key

14 mm x 1/2" Allen key

1 x long 1/2" extension (or two short ones)

Jobsite spare parts

2 x Spare cog belts. Use only a Gates Polychain GT Carbon belt 720-8M GT2.

Tractive Part No 378107202108.

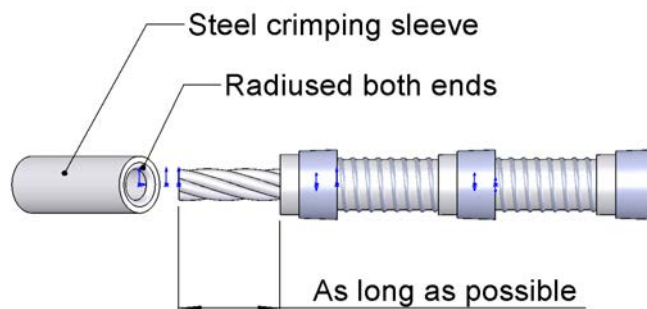
2 x 15090100 Lock nut, guard, 3P8

Preparing and splicing the diamond wire

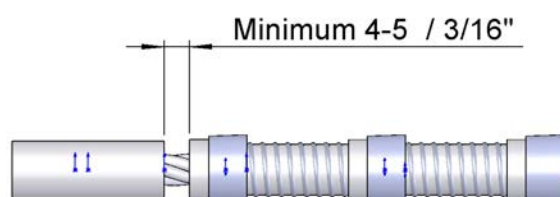
If it is the first time you splice a wire, you have a good chance to make a few mistakes.

As the 3P8 is very powerful, it will also tension the wire considerably more than a “normal” machine will. To make it work for you, we prefer and recommend this procedure:

1. Cut the wire to give maximum length of bare core wire, the part of the wire that is later crimped in the steel crimping sleeve.



2. Cut the wire gently with an angle grinder with a thin disc, rather than with the cutting jaws supplied with your crimp tool. Thereby you can cut close to the adjacent bead, and leave as much free core wire as possible.
3. Use a plier to pull off the spring, which usually is embedded in plastic or rubber, between the beads, by standing on the wire, and pull the spring off the wire end.
4. Clean the core wire by scraping it with a knife. If you have a cigarette lighter at hand, heat the core wire to burn or soften the plastic or rubber, then clean by scraping the wire with a sharp knife edge.
5. If residue from the plastic or rubber coating is left on the wire, the friction between the core wire and the joining sleeve may be substantially reduced, and the splice will fail prematurely.
6. Use only joining sleeves that have a smooth inside radius at each end. Sleeves having a sharp or chamfered (no radius) edge in the hole should not be used.
7. Please note: Do not use universal joint type (U-joint) of wire slicers. Every type we have tested has been too weak for the 3P8.
8. If the steel crimp sleeve is crimped with its end close up towards a bead, the wire can not flex, and will fail prematurely.



9. Crimp the sleeve using the correct size of crimping dies.
10. Crimp the sleeve over the wire and leave about 1 – 2 mm un-crimped sleeve at each end of the sleeve. In any case the end of the wire must be “inside” the crimp. If the sleeve is crimped all the way to the end, the inside radius in the sleeve will be crushed and the wire will instead rub against a sharp edge and fail prematurely.
11. Before joining the wire ends, the wire should be twisted about 0.5 – 1 turn per meter of wire.
12. Run the wire through any pilot holes that may be required. If the object to be cut requires one or more pilot holes, then, naturally, the wire must be open and crimped once the wire has been run through the pilot holes.
13. Make a short loop at one end of the wire, clamp the other end or stand on it, hold the short loop in your hands and turn the wire **counter clockwise** the correct amount of turns.
14. Crimp the steel sleeve and you are ready to fit the wire over the pulley and wheels on the 3P8.
15. The design of the 3P8 allows the wire to be fitted around the drive pulley and all other wheels even with a closed wire.
16. If you plan to use several lengths of wire for the same cut, you must first use the wire with the least wear. The wire diameter will be reduced over time due to wear, so you must always start with the wire that has the biggest diameter and then progressively use the thinner wires.
17. Always keep a few extra wire joining sleeves in your pocket. Then the wire will not be so prone to break. (Tip from company Bluegrass, wire sawing experts in the US.)

Guidelines to follow when commencing a cut

1. Check that both swivelling guide wheels are tight (19 mm socket). Check their alignment with the desired cut line.
2. With the wire on the machine, and no guards mounted, and water nozzles or hoses adjusted, please pay attention to the wire tension. On the slack side there should be some slack before attempting to start the wire. Check that the wire is run over all wheels correct and has not jumped off during the set-up procedure.

Test the tension by hand by moving the wire on the slack side, that is the RH side when standing in front of the main drive pulley, HF-motor pointing away from you. You should be able to move the wire sideways 10 cm or so.

3. Turn both potentiometers on the RCU back to their Zero position.
4. With the speed potentiometer, the LH one, at Zero, start the main drive motor by holding the blue switch forward and at the same time pressing the red switch forward. The water will start to flow and the wire will be started. (We have chosen to let the cooling water from the HF-motor clean the wire before it goes into the magazine, as traction is improved when the wire is as clean as possible.)
5. If needed, the direction the wire is running in can be reversed during start up. Flick the blue switch forward once, and the direction will be reversed. Flick it again and it will go the other (correct) way again. This feature is there to make it easier to cut a shallow groove on the slack side, before the real cutting starts. This function is disabled over XX% wire speed.
6. As the initial cutting progresses, and if you see slack, (not enough tension in the wire, please move Joystick UPWARDS manually, some short movements at a time, to "override" the automatic tensioning by the software.
7. Set the RH pot to 25%, and gradually increase the speed up to just a few %. Let the wire cut a shallow groove in the cut object. If everything goes well, and the wire is running smoothly at VERY slow speed, **the machine can be stopped and the guards can be mounted.**
8. **Mount all guards and lock them with their respective nuts and bolts. The upper guard is held in position with the two R-clips,**
9. Start the wire again by returning both potentiometers to ZERO, and push the blue switch forward, hold it there and push the red switch forward. The wire will start again at low speed.
10. Turn the RH potentiometer slowly up to 50%. Now increase RH power pot setting to 80%.
11. Again, if you see excessive slack on the slack side, move Joystick UPWARDS manually, some short movements at a time, to "override" the automatic tensioning which is controlled by the software.

12. When you consider the wire to be running smoothly, set speed and power pots pot to 100%, unless the cut object is small, then you must reduce the setting for the RH pot to 25 % – max 75%.
13. Experience from running different types of wires, in different types of aggregate, steel, rock, or whatever you are cutting, will be very helpful to achieve good results. If you knew everything from the start it would be easy but less fun!
14. Pay attention to water flowing to the wire. If dry smoke appears the wire can overheat and may be damaged after a short while. Readjust the hoses and / or increase water flow. Use soft garden hose and press the free end into the cut groove. Use as many hoses as possible to cool and clean the wire. A good flow of water to the wire is needed for most plastic or rubber injected wires to make them last and feel well.

When a deep section is to be cut, most often pilot holes must be drilled. The pilot holes must then be aligned so that the cutting planes will be tapered, or the block will bind and can not be removed.

Removal of concrete containing contaminated or hazardous materials may require containment of the cooling water.

When cutting soft concrete, or concrete mixed with soft materials

Here are some tricks that can be useful in cutting soft material:

- If you see slack, (not enough tension in the wire, please move Joystick UPWARDS manually, some short movements at a time, to "override" the automatic tensioning which normally is done by the software.
- To explain the same thing with other words: If you cut very soft materials, the automatic tensioning of the wire may need some "help" from the operator, to take up excessive slack in the wire. So then you may need to keep control of the wire tensioning manually, by moving the Joystick UPWARDS some short moments at a time. If there is too much slack, you have a risk that the wire will jump off the wheels.
- Use the feed potentiometer, the one to the right on the Remote Control Unit (RCU) to reduce the tension in the wire. If you reduce down to 25% - 50%, it will still cut quickly enough in soft material.
- Most of the time you can run full wire speed, the left hand potentiometer, in soft material, but use your "feeling" also. After some time practising, you will get the "feel" for the machine. The first few days using a new machine are always a bit difficult for the operator.
- If the wire is cutting too quickly, you can have pinching of the wire, it means that the material is removed too fast, and that the wire may jam all the time. Then you must reduce the %-age on the right hand potentiometer on the RCU.
- The automatic control always tries to use the power you set the potentiometer to. Please note, if you use the 22 or 27 kW kW motors, most other compact (non quarry type) wire saws have less than half the power, so you can reduce a lot, to below 50% and still have plenty of power available.

When cutting with wire under water

- Running the wire in water will cause considerable drag, and that is why a much lower wire speed normally is used under water, unless you have a very powerful machine at hand.
- On the RCU, you can set a lower speed just by turning the LH speed potentiometer down. The torque is the same from 0 rpm's and this is the key to have a good result when cutting under water. We recommend you to use no higher than around 70% of the maximum speed when cutting under water.
- The 3P8 machine has very good traction wire to drive pulley, and this eliminates time consuming under water preparation work to chamfer corners and edges the wire has to run over during start-up.
- Also, the automatic feed control adjusts itself to various conditions, it doesn't care if you run the wire fast or slow. This is a big advantage over air cylinder tension type wire saws, especially when cutting under water.
- To cut with acceptable performance under water, we strongly recommend to use at least an 18 kW (25HP) motor. For best start up and overall performance, we recommend to use the 22 kW (30HP) motor.
- If the cut is far under the water surface, the wire can be run in tubes into which air is blown, to reduce drag. Otherwise the performance will be very poor, as all power is used just to overcome drag.

Pivoting head - PD1

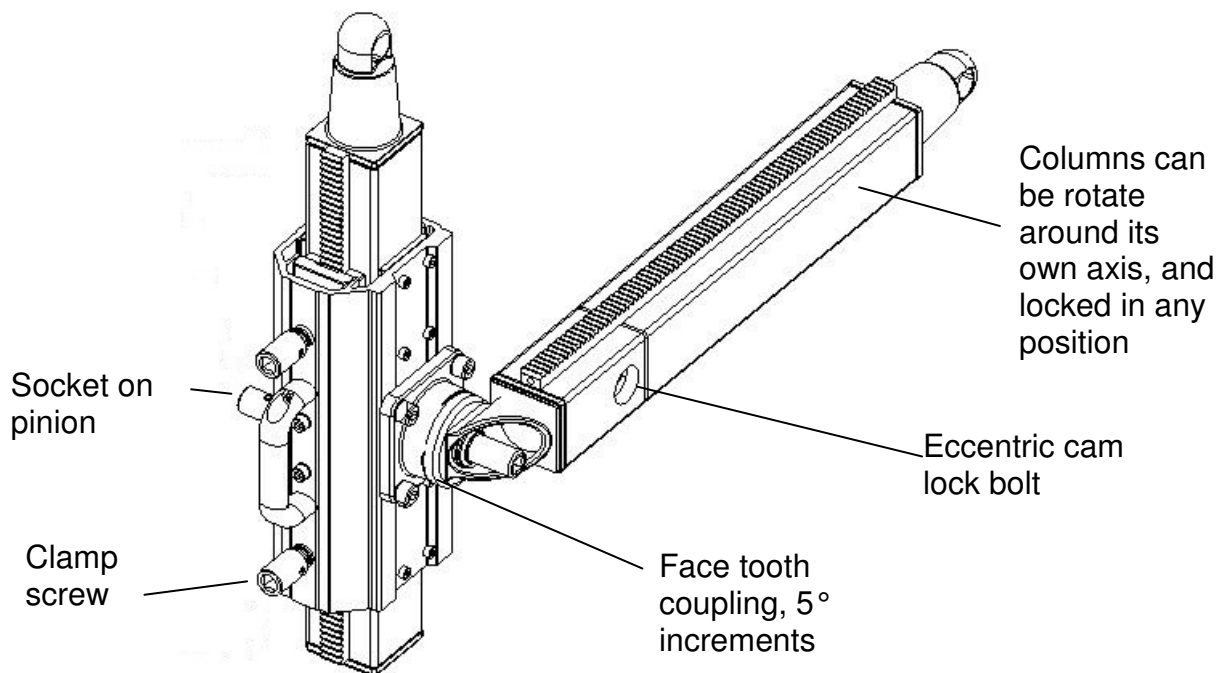


Fig. 5. Pivoting head-PD1 with column.

In many cases an universal pivoting head can be used to simplify set-up and to add versatility to the system. The Pivoting Head can for example be fitted on a vertical column and a horizontal column fitted to the Pivoting Head conical quick coupling.

To use the pivoting head

1. Mount the pivoting head on the column (see fig. 5)
2. Adjust height and tighten the clamp screws slightly.
3. Use a ratchet or knuckle bar to move the pivoting head to the desired position on the column.
4. Lock the pivoting head with the clamp screws.
5. To mount the second column on the pivoting head, align bolt hole with pull stud hole in the male conical coupling, insert an eccentric bolt and tighten hard, clockwise, with a 1/2" knuckle bar or ratchet.
6. Now you can mount the carriages on the horizontal column, see mounting of carriage.

The column quick coupling is of the same type as on Base Plate BE2, with a swivelling face tooth coupling allowing for adjustment of drill angle in 5° increments.

Important! Be observant so that the eccentric bolt doesn't slip out of the column when the column is mounted on the conical coupling on the pivoting head. It **MUST** be completely flush with the column side face.

Important! Before tightening the adjustable male-coupling please make sure the face teeth are correctly in mesh.

Important! *When the eccentric bolt is removed, do not put your fingers in the bolt hole to push the bolt out.*

Important! *When the pivoting head is mounted, be sure that the locking screws are tightened to give enough friction between column and pivoting head, to keep the pivoting head from sliding down the column in an uncontrolled way.*

MAINTENANCE

The Pentruder 3P8 wire sawing system must remain in a condition which is safe for operation at all times, and therefore certain maintenance is needed. Please read the instructions below carefully before any service work is commenced.

For safe and uninterrupted operation of the machine, we strongly recommend that the complete machine is brought back to your dealer for service at least once a year. At this service the machine is checked for proper function and all components critical for safe and reliable operation are checked and replaced if necessary.

Please respect the following maintenance instructions:

Warning! *No service or maintenance may be performed on the power pack unless it is disconnected electrically from the mains.*

Warning! *No service or maintenance may be performed on the HF-motor unless it is disconnected from the power pack.*

Wire sawing can be a dirty job! To keep the equipment clean will take a lot of effort, certainly if the machine is running for prolonged periods and cleaning is not possible or allowed due to time pressure.

- Try to clean the machine as well as possible, especially directing your attention to the carriages, their internal taper rollers, and the columns. The machine will not work well if the upper tensioning carriage does not run smoothly on the column.
- If a high pressure cleaner is used, you must NOT point the nozzle at the seals over the bearings on any of the wheels or the main drive pulley. Water will be injected and the bearings will fail prematurely.
- The cog belt that drives the main drive pulley is a Gates Polychain GT Carbon belt. Its length is 720 mm, width 21 mm, Gates denomination 720-8M GT2.
- The cog belt will last for at least 100 hours, in most cases well over 150 hours. The lifetime will depend greatly on how many times the wire jams in the cut.
- Try to avoid using wires with different sizes of beads. Differently sized beads and sections of wire will cause jamming and will shorten the life of the cog belt.
- The cog belt can be replaced in about 10 minutes, after some practice. Please see the workshop manual for instructions how to replace the belt.
- Preload on rollers: The roller carriage has four conical rollers to guide the carriage on the column without any play at all. Check the preload now and then. The conical rollers do not need a high preload on the column. The rear rollers can be adjusted using a ½" spanner and a 15 mm wrench.

- Do not set the rollers too hard. If set too hard, the result will be premature wear of the column. Hold the eccentric shafts with a 1/2 " tool and tighten lock bolts with a 15 mm wrench. With correct preload on the rollers the carriage will run smoothly and give a very rigid support for the wire saw modules.

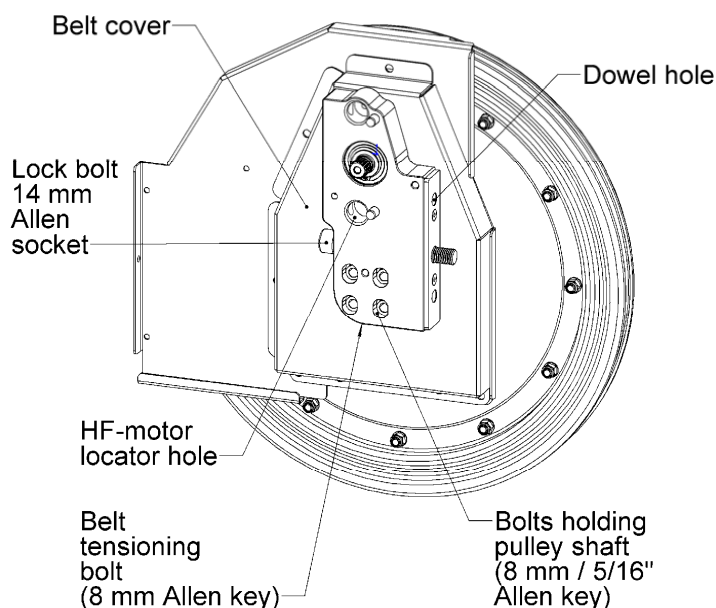
How to replace the cog belt

Disassembly

1. Remove the center bolt holding the pulley. 14 mm allen key.
2. Remove bearing cap and seal.
3. Remove all M6 bolts holding belt cover to back cover. 5 mm allen key.
4. Remove the belt tensioning bolt. 6 mm allen key.
5. Loosen the bolts holding pulley shaft. 8 mm or 5/16" allen key
6. Lift main drive pulley and slide it off the pulley shaft while holding back the cog belt

Assembly

1. Put a new belt on the small cog wheel.
2. Slide the main drive pulley on to the pulley shaft while at the same time lifting the pulley and putting the belt over the big cog wheel pulley.
3. Push the pulley inwards while at the same time turning it to make the belt line up.
4. Tighten the pulley shaft bolts slightly.
5. Tighten the belt tensioning bolt firmly.
6. Tighten the pulley shaft bolts firmly. (60 Nm)
7. Fit and tighten bolts holding rear cover to belt cover.



Technical Data Pentruder Modular Rig System

Base plate - BE1/BE2:

Part No:	
Width including wheels:	492 mm
Width less wheels:	380 mm
Length including support legs and wheels:	610 mm support legs pushed in
Length less wheels, front and rear legs:	426 mm
Height not including coupling cone:	111 mm
Length / width of slot for anchoring:	100 x 22 mm
Size of wheels:	Ø 160 mm
Weight including wheels and support legs:	18.5/19.5 kg
Weight less wheels and support legs:	12.8/13.8 kg

Columns - CN:

Chart 2: Technical data for column CN.

	CN 0.5 F/M - 70	CN 1.2 F/M - 70	CN 1.5 F/M - 70	CN 0.5 F/J - 70	CN 1.2 F/J - 70	CN 1.5 F/J - 70	CN 2.0 F/P - 70
Part No							
Length (mm)	508	1200	1500	508	1200	1500	2000
Length inch	20"	47.2"	59"	20"	47.2"	59"	79"
Weight (kg)	6.4	11.9	14.3	6.6	12.1	14.5	17.0
Weight (lbs)	14.0	26.2	31.5	14.5	26.5	32.0	37.5
Coupling	Female/Male	Female/Male	Female/Male	Female / Jack screw	Female / Jack screw	Female / Jack screw	Female / Plug
Extendable	Yes, in both ends	Yes, in both ends	Yes, in both ends	Yes, in one end	Yes, in one end	Yes, in one end	Yes, in one end

Carriage - CE1:

Part No:	
Width including 1/2" feed sockets	219 mm
Width housing:	150 mm
Length:	376 mm
Depth:	228 mm
Weight:	9 kg

Pivoting head - PD1:

Part No:

Width including coupling and 1/2" drive socket: 236 mm

Width housing: 106 mm

Length: 320 mm

Depth incl. clamp screws: 170 mm

Weight: 7.7 kg

Pentruder 3P8 wire sawing, inside out

Looking at it from the outside, as we in the Tractive wire saw development group forced ourselves to do, wire sawing seemed to have been treated by many as something of a black art, where no one really cares about what happens when the wire is running over the surface at a very high speed. At least that was our impression when we studied designs available on the market. Naturally, our own ignorance in the field of wire sawing has helped us to look with fresh eyes on the task we had to solve, namely to build the most compact and most efficient wire saw to be offered to the specialist drilling and sawing contractors.

Our first experience in wire saw was when we designed and built a simple type of wire saw back in the 1980's. It was the Gearmec WS1 wire saw, sold in a rather small quantity of about 100 machines during a few years time. We learned a lot about wire sawing back then, and Swedish concrete drilling and sawing pioneer PG Lindgren who was the man that pushed for this development to take place, was the first to build up a simple wire saw on one of the work benches in Gearmec's workshop in 1987, from mostly drill rig modules from the Gearmec FCS drill system. With some special wire saw specific parts here and there this machine worked quite well and was capable of surprising efficiency in spite of its small size a low weight, at least compared to the enormous machines offered by some competitors at that time.

When we started development work on our new Pentruder 3P8 Wire Saw, we thought that we had to offer a reasonable package cost wise, as wire saws traditionally have been cheaper to buy than wall saw systems. So our first designs were designed down to a bottom line cost, rather than up to a specification. As always, shit in means shit out, and the performance of the first machine was not brilliant or even encouraging, while the production cost certainly was as expected, low.

So we changed back to the way we always have worked at Tractive, aim for the best possible performance, at a higher cost, but still not asking completely stupid prices.

To start with, we analyzed our own ignorance in this field, as we analyzed our perception of how we thought a diamond wire worked, and soon we found proof for our belief, that just like in grinding, material is removed by grinding away small particles from the material that is being cut. The fracturing of the rock seemed different from when cutting with today's powerful wall saws, and that's where we are the experts, and we also found that the shape of the object and the tension of the wire will play a very important role in the way the diamond edges will remove the material, and how quickly this will happen. We also found that the way different makes of diamond wires fractures the rock, and grinds the steel, has an influence on how the feed or tension regulation system should work. The speed and the force applied on each diamond, just like when drilling or sawing with a circular blade, will have a great influence of the performance of the system. We concluded all this was important to know when the feed or tension regulation system was going to be conceived and designed, so we tested, reworked the machine, built no less than seven versions of the machine, in prototype form. We tested over and over again, and then fine tuned and eventually all knowledge was compiled into a software package that controls the movement of those members of the hardware package, that provides and maintains the correct tension of the wire in all conditions, in all materials.

As most customers that have already used a Pentruder high frequency motor driven wall saw will know, there's nothing on the market that will beat these machines when it comes to pure performance. We couldn't aim for anything less with our new high spec wire saw, and the result of all our efforts is now present in the new Pentruder 3P8 Wire Saw from Tractive. The new 3P8 wire saw probably is, if not surely, the most efficient compact wire saw that ever has been offered on the market. A two fold increase in efficiency over all other existing wire saws, even the big two motor versions from well respected European manufactures, offered to the specialist drilling and sawing contractor, can nearly be guaranteed. In some cases it can cut four times as many square meters per hour as competing machines.

The 3P8 wire saw is the result of all our efforts to create the best and most efficient wire saw on the market. In its standard version, the 3P8 can pull in 12 m of wire out of the material being cut, and this happens completely automatic, without air cylinders or need for compressed air. With an extra idler / slack tensioning wheel, the machine can take up 20 m wire. The wire main pulley drive motor comes from our range of HF-motors with 18, 22 or 27 kW output. The tensioning of the wire is fully automatic and is controlled by advanced software and microprocessor control. The operator will just have to start the machine and it will run fully automatically until the tensioning carriage has hit its stop, or until the machine is halted by the operator.

Pentruder – Pentpak overview

The Pentpak family of HF-power packs consist of three different power packs:

- PP418 for 18 kW and 15 kW motors.
- PP422 for 22 kW, 18 and 15 kW motors.
- PP427 for 27 kW, 22, 18 and 15 kW motors.
- A PP418 can be upgraded to a PP422 or a PP427 power pack.
- A PP422 can be upgraded to a PP427 power pack.

These power packs can drive these HF-wall saws:

- 6-8HF
- 6-12HF Lean
- 6-12HF 2-speed
- 8-20HF
- 8-20iQ (for high torque, hard aggregate and / or big blades)
- Plus the imminent Pentruder CBK

And:

- The new wire saw, the 3P8

And:

- The MD1 HF-motor driven 4-speed MG41 gearbox high capacity drill rig for the really tough jobs.

And:

- Corner chain saw to be fitted on the wall saw track to cut the corners when over cutting is not allowed.

And:

- Floor saw driven by any of the 18, 22 or 27 kW motors. (October 2009)
- New (Un-named) drill system available next year, for small to very large size core bits.
- Other manufacturers HF-motors can be run from Pentruder Pentpak power packs, provided they are not 1000 Hz equipment. It can be US type chain saws, hand saws etc.

The three most important features of the system are:

- One HF-power pack can drive all his different machines an motors.
- The same HF-motor can power many different machines.
- The Pentpak HF power packs can identify what machine, and what motor it is connected to, and will use the correct software to do the job.

The Connector System Kit:

- Specially developed software using interference tolerant CAN-bus communication between machine(motor and power pack.
- Upgrade for the control card in the Pentpak HF power packs. (All existing control cards can be upgraded)
- Software to run various motors and machines. Any mix of motors and type of machine is now possible. (An 18 kW PP can not drive a stronger motor than 18 kW, and a PP422 can not drive the 27 kW motor, but a PP422 can drive the 22 kW motor and the 18 and 15 kW motors. The PP427 can drive all motors.)
- One HF-motor ID-chip that tells the power pack what motor it is.
- One chassis ID-chip that tells the power pack what type of machine it is.
- 4 new connectors for the 400V 400Hz power. All housed in very sturdy high grade thick wall alloy housings.
- 4 new connectors for the 24V DC feed and travel motors. Also these are very rugged items, designed to withstand the hard environment.
- 3 alloy adapter plates to upgrade existing power packs and HF-motors with new connectors.
- All equipment, tools, wires, fittings, seals, O-rings, grommets, spare parts, etc., needed to install the new system.

In addition to that, a SUD-unit, Software Upgrade Unit is needed to do future software upgrades. This is an electronic unit specially designed to easily upgrade any power pack with new FREE field upgradeable software versions (not functionality) without need for bringing it back to their dealer for service.

To upgrade existing power packs, and to do future upgrades with new software, a SUD unit is needed.

To add functionality for a certain type of machine, for example to add software for a wire saw, is not free, but upgrades with new program versions are. The salesman or technician can use the SUD device to plug into the Power pack, stick a USB-memory into the USB-port on the SUD, and the rest is automatic. New software is easily downloaded from the Tractive web-site. Unlock codes for new functionality will make it easy to unlock functions in the Power pack without returning the PP's to your dealer for service .

Why Pentruder?

The message we want to bring across from ourselves to our customers is that with the Pentruder machines it is possible to be very productive, and to make a good profit by finishing jobs much quicker than with other machines. Not every potential customer will realise that fact, and it can be hard to appreciate how efficient these machines really are, and to convince you to make the "right" choice.

We encourage our customers to ask themselves these questions:

1. Do you want to try to make profit by saving money on your investment in machinery and equipment (the difference between the Pentruder machines and the cheaper lower performance saws), which over a five year period accounts for approximately 5 - 10% of all costs associated with keeping an operator busy?

or:

2. Do you want to maximise the use of your operators time, every working day, by using all performance enhancing features on the Pentruder machines, so they can be be much more productive and MAKE money, rather than trying to SAVE you money?

After having seen a demo of the Pentruder HF-machines, and after having thought for a while about these two simple basic ways of trying to make a profit, very few chooses the cheaper competitor products. They most often go for a Pentruder of some kind. Even if it costs more.

If you have read this text, probably you decided to invest in a Pentruder machine, and we thank you for that! - I and my team have continued to build on our experience all the time since I designed and built the first 4-speed drill motor back in 1977. With today's state-of-the art, in-house manufacturing technology and our combined experience and skills put behind this product, you can be sure you have done a safe investment in a system designed and built to last.

Borlänge 5:th January 2009.

Anders Johnsen
General manager
Tractive AB
Sweden

Declaration of conformity

We, Tractive AB declare that the machine

Manufacturer: Tractive AB
Aldbäcken 35
78193 Borlänge
Sweden

Category: High frequency driven wire saw

Type: Pentruder 3P8 Wire saw

- Is in conformity with the provisions of the Machinery Directive 98/37/EC.
- Is in conformity with the provisions of the following other EC-directives:
Low Voltage Directive 73/23/EEC (amended by 93/68/EEC)
EMC-Directive 89/336/EEC (amended by 92/31/EEC and 93/68/EEC).

Borlänge 5 January, 2009



Anders Johnsen
General Manager

Declaration of conformity

We, Tractive AB declare that the machine

Manufacturer: Tractive AB
Gjutargatan 54
781 70 Borlänge
Sweden

Category: High Frequency Power Pack

Make: Pentpak

Type: PP418, PP422 and PP427

- Is in conformity with the provisions of the Machinery Directive 98/37/EC.
- Is in conformity with the provisions of the following other EC-directives:
Low Voltage Directive 73/23/EEC (amended by 93/68/EEC)
EMC-Directive 89/336/EEC (amended by 92/31/EEC and 93/68/EEC).

We also declare that it is in conformity with directive 2000/14/EC, measured in accordance to the Conformity Evaluation Method set out in Annex VI para.5 and evaluated during production as in Annex VI para.6, ^{2nd} procedure.

Notified Body: 0404 SMP Svensk Maskinprovning AB
Fyrisborgsgatan 3
75450 Uppsala
Sweden

Borlänge 5 January, 2009



Anders Johnsen
General Manager

The eccentric roller shafts can be adjusted using a ½” spanner and a 15 mm wrench to open and lock the eccenters.

