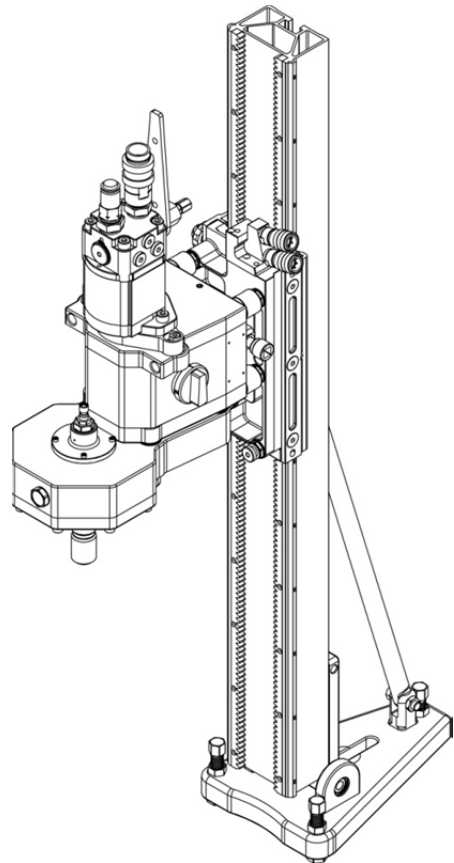
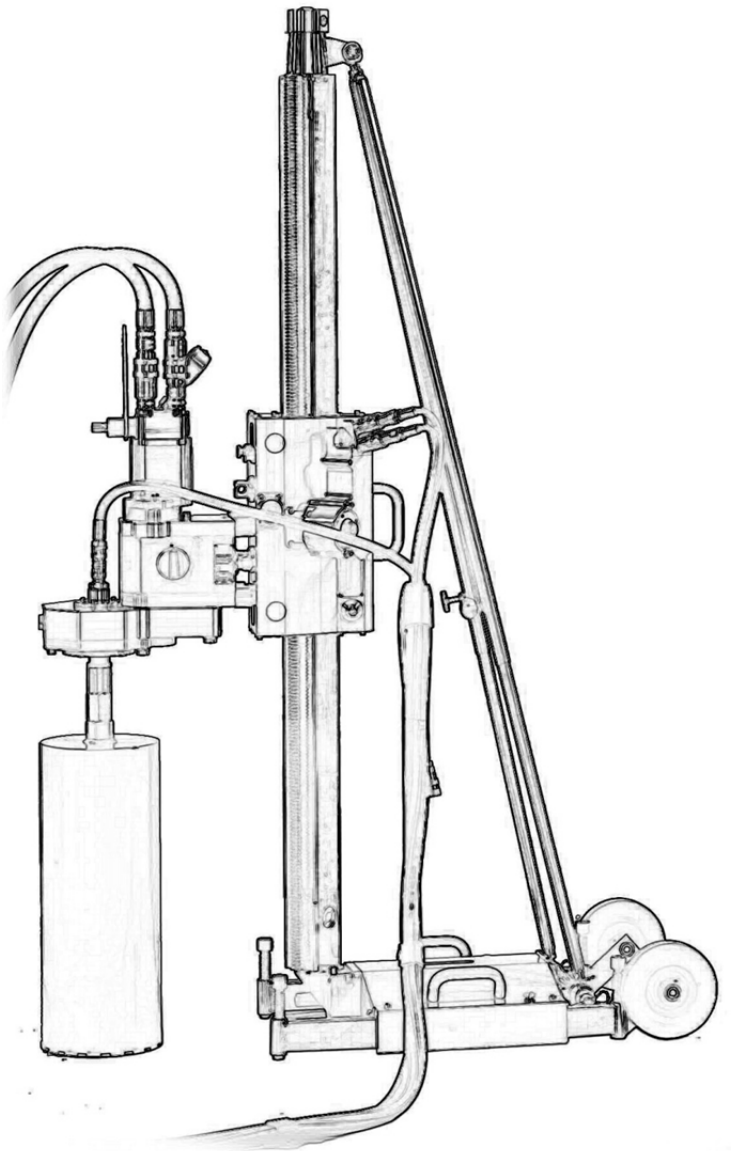


Operator's manual

Pentruder[®] MD1 Modular Drill System Hydraulic Drive System



Pentruder[®]

by **TRACTIVE**

**Operator's manual for
Pentrunder® MD1 Modular Drilling System
Hydraulic drive**



**Version: 1.6 Date: 2012-09-28
Support & Service document
Original instructions**



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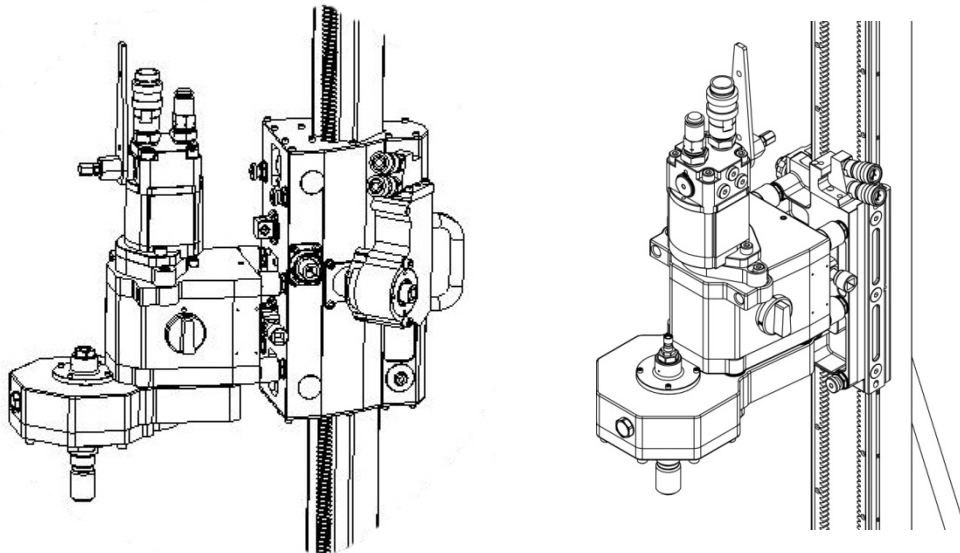
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1 Introduction

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 Modular Drill System has been developed based on 25 years of experience in this specialized field. With correct handling it offers outstanding performance, safety and reliability.

It is essential that all personnel working with or in close proximity to the drilling machine 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 Modular Drill 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:

Pentruder MD1 Hydraulic Modular Drill Machine

Power source: directly from Pentpak 15, 20 or Pentpak 25 alternatively with electric HF-motor. A flow divider must be used with the Pentpak 25 when smaller motors than 25 cc is mounted on the gearbox.

There are two choices for the drill stand, namely the 70 mm column system and the Pentruder Modular Concrete Cutting System (MCCS) based on the saw track.

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2 Description

2.1 Features

The Pentruder Modular Drill System MD1 is a versatile and powerful drilling system. It allows you to drill in any angle and the 4-speed MG41 gearbox gives the system a very smooth and efficient run.

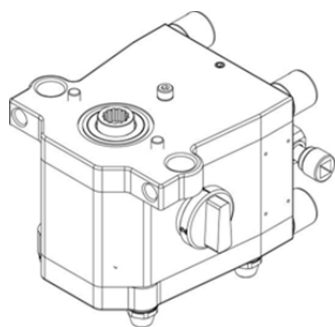
Quick disconnect couplings reduce the set up time. Small and big drill bits can be drilled in a shorter time than anyone thought possible. Drills an 800 mm hole like other systems drills a 200 mm hole.

Pentruder MD1 hydraulic drill system can be driven by a 16 or 25 cc hydraulic motor. Together with the MG41 gearbox and a ST2 or ST3 spindle unit and one of the hydraulic power packs Pentpak 15, 20 eller 25, up to 1200 mm big holes can be drilled easily and efficiently.

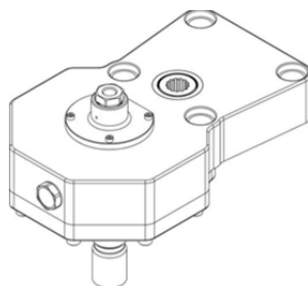
Pentruder MD1 hydraulic drilling machine can either be built on the wall saw track (MCCS) or on the 70 mm column system.

2.2 Modules MD1

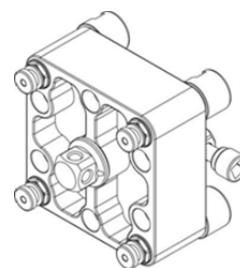
- MG41 4-speed gearbox
- ST2 / ST3 Spindle unit for MG41 (quick disconnect coupling for drill bit optional)
- ERMD1 Extension Adapter for MD1 (Extends capacity by Ø 190 mm per adapter)



MG41



ST2/ST3



ERMD1

2.2.1 MG41 Gearbox

The Pentruder drill system has a 4-speed gearbox to offer a wide speed range for various drill bit diameters. Performance and safety is increased as the spindle speed cannot be increased over the adjusted speed during drilling.

2.2.2 ST2 / ST3 Spindle unit

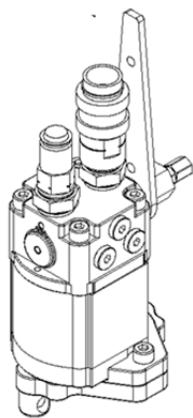
The concept with exchangeable spindle units makes it possible to get a very wide spindle speed range with only one drilling machine. The ST2 spindle unit gives lower spindle speeds than the ST3 spindle unit. See chart on page 28 for spindle speeds.

2.2.3 ERMD1 Extension adapter MD1

When drilling big diameter holes over Ø 600 mm (23.6") an extension adapter must be used to extend the distance between drill column and spindle, giving more clearance for bigger diameter drills. Each adapter extends the drill unit 90 mm (3.5") further away from the column, i.e. gives additional clearance for a 180 mm (7") bigger drill bit.

2.3 Hydraulic feed units

- HR16R-MG41, Hydraulic motor, reversible, 16 cc. For MG41 gearbox with PP15/PP20. (42 Liter / min)
- HR25R-MG41, Hydraulic motor, reversible, 25 cc. For MG41 gearbox with PP15/PP20. (42 Liter / min)

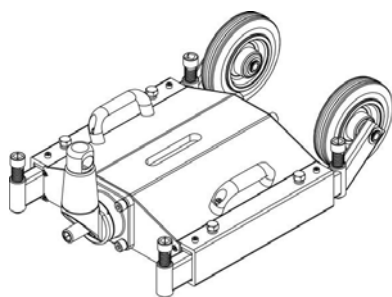


HR16R-MG41 / HR25R-MG41

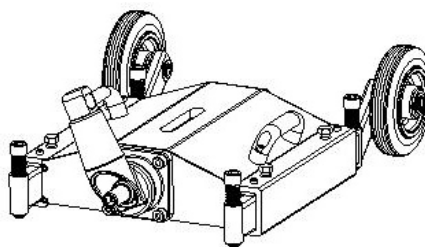
2.4 Rig for MD1 drilling machine with 70 mm column system

2.4.1 Standard modules for hydraulic MD1 drill rig with 70 mm column system

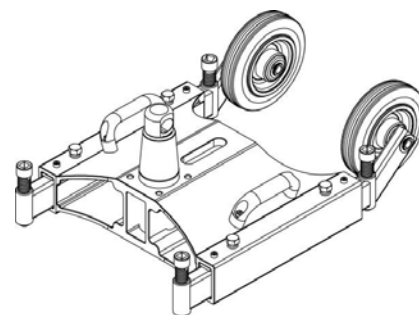
- BE1 Base plate fixed / BE2 adjustable quick disconnect coupling
- BETC Base plate w top mount fixed quick disconnect coupling
- CN Columns F/M-70 Female / Male coupling, extendable, 0.5 / 1.2 / 1.5 m
- CN Columns F/J-70 Female / Jack screw, 0.5 / 1.2 / 1.5 m
- CN Column Female / plastic cap, 2 m (only extendable at the bottom)
- RST-CN-M Rear support for 70 mm column with male coupling, 2.1-3.2 m
- RST-CN-U Rear support for 70 mm column universal, fastened directly on the column, 2.1-3.2 m
- CE1 Carriage for 70 mm columns with
- PT-HY12.5/20 Hydraulic feed unit for MD1
- ET70 Eccentric bolt for TTFF and JTFF/JTFM tracks



BE1



BE2 with swiveled column coupling



BETC

2.4.2 Base plates for CN columns and TTFF/JTFF tracks

The BE1, BE2 and BETC base plates are used with CN columns, TTFF or JTFF tracks.

On BE2 the conical quick coupling can be swivelled sideways in increments of 5° for angular drilling operations. The conical quick coupling on BE1 is fixed. The base plate BETC has a top mount fixed conical quick coupling.

The columns fitted on the conical quick release coupling can be swivelled around its own axis, and great flexibility is offered to simplify set-up.

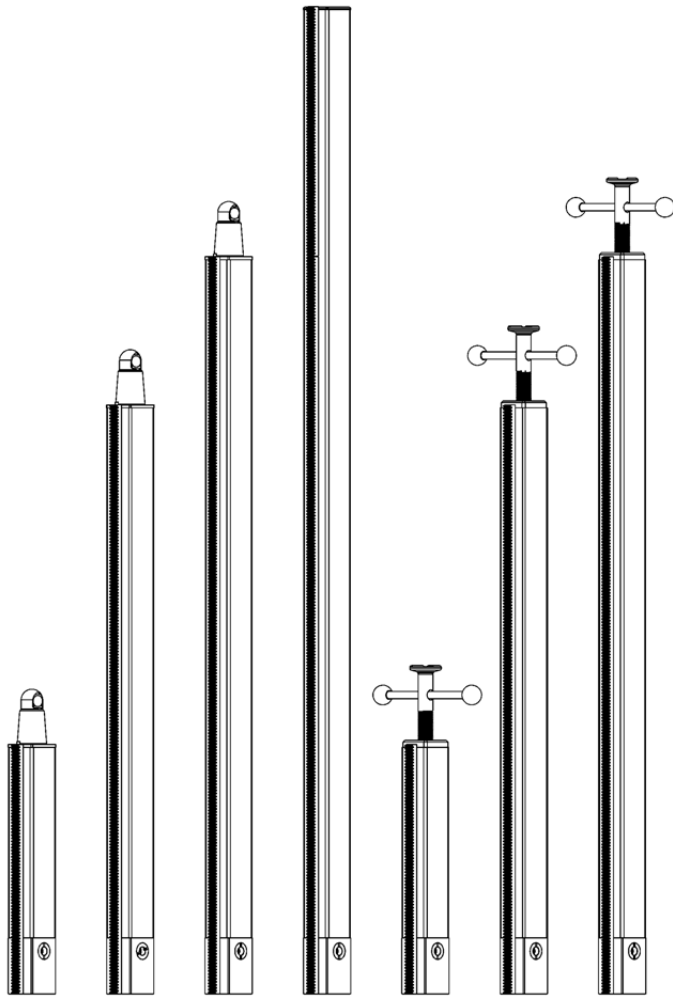
2.4.3 CN Columns

There are three types of 70 mm columns. Extendable columns CN F/M-70 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.

Columns CN F/J-70 with a Jack Screw in one end, where the male coupling sits on an extendable column, are used to jack the machine against ceiling or wall.

There is also a column CN-3P8 with a female coupling in one end and a blanking plug in the other end. This column is 2.0 meters and mostly used for the Pentruder 3P8 wire saw.

The CN F/M and CN F/J columns are available in three lengths, 0.5 m, 1.2 m and 1.5 m.



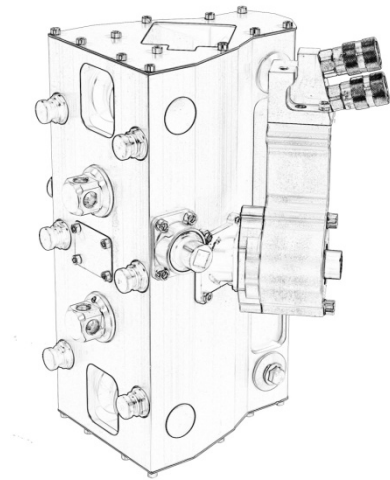
CN 0.5 F/M, CN1.2 F/M, CN1.5 F/M, CN 2.0-3P8, CN 0.5 F/J, CN 1.2 F/J, CN 1.5 F/J

2.4.4 RST-CN Rear support

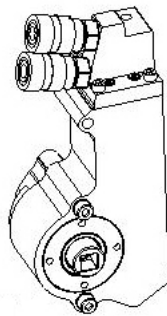
There are two rear supports for the CN-columns. The RST-CN-M is fastened on the male cone at the top of the column. The RST-CN-U is fastened directly on the column and can be fitted on any side of the column as there are two openings for the rack and the clamp can be turned upside down as well. The rear supports are 2.1 meter long when fully pushed in and can be pulled out to a length of 3.2 meters.

2.4.5 CE1 carriage and PTHY hydraulic feed unit / FE1 Friction clutch

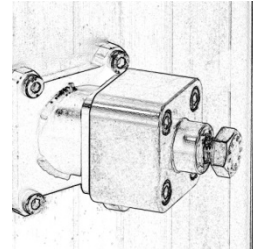
The MD1 hydraulic drilling machine can be used with or without automatic feed unit. If the hydraulic feed unit is not used, there is a friction clutch instead, to prevent the carriage from sliding on the column.



CE1 with PT-HY12.5/20



PT-HY12.5/20



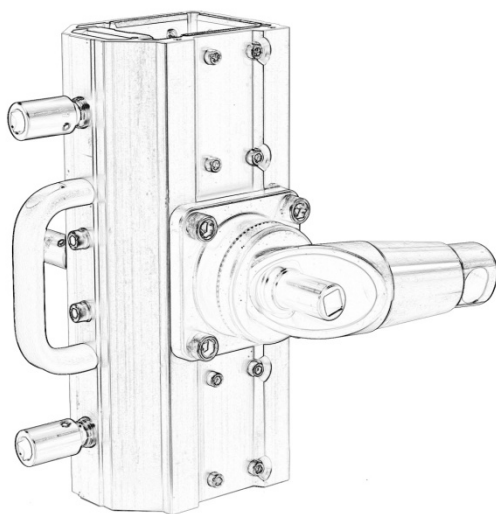
FE1 Friction clutch

2.4.5 Other modules for hydraulic MD1 70 mm column system

- CT1 Column support
- PD1/PD2 Pivoting head
- TTFF Twin track
- JTFF Jacking track JTFF

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

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

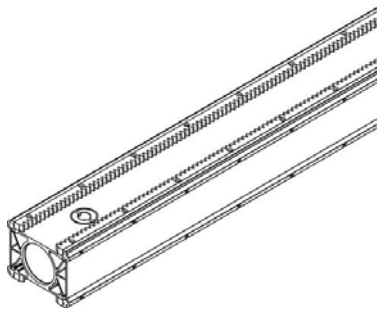


PD1/PD2

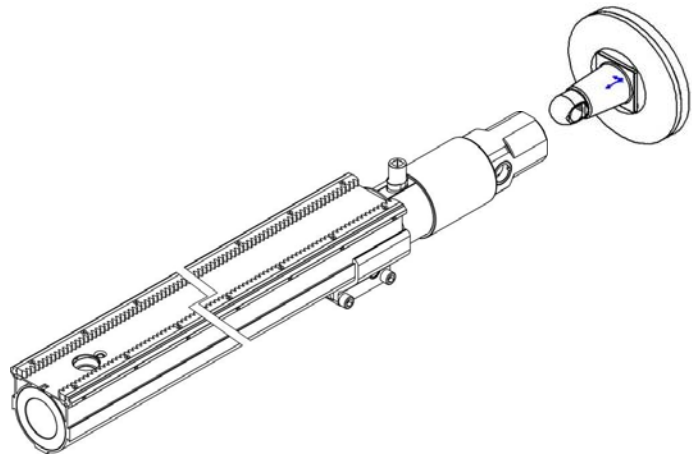
2.4.6 TTFF and JTFF track

TTFF Twin track with two female Quick Disconnect Couplings fits base plates BE1, BE2 and BETC. Available lengths are 1.15, 2.0 and 2.3 meters. The twin track can account for special needs both for drilling and wall sawing.

JTFF Jacking Track with internal rapid feed jacking tube fits on BE1, BE2 and BETC. It is a development to make it possible to jack a track between floor and ceiling or any two parallel walls for example. The column contains a rapid feed and a mechanical screw jack with some tons of clamping force.



TTFF Twin track



Jacking track JTFF with SDM200 support pad with male cone.

2.5 Rig for MD1 drilling machine with saw track (MCCS)

2.5.1 Standard modules for hydraulic MD1 drill rig with saw track (MCCS)

- BTS3 Base plate for TS type tracks, triangular, 220 x 320 mm
- BTS4 Base plate for TS type tracks, rectangular, 220 x 320 mm
- TS T-slot type track, 0.85 / 1.15 / 1.7 / 2.0 / 2.3 / 3.45 m
- RST-TS1 Rear support for TS-track, 2.1-3.2 m
- CEG-HY12.5 Carriage, gliding, MD1 QDC coupling. Automatic feed. Max feed speed 2.7 m/min.
- CEG-HY20 Carriage, gliding, MD1 QDC coupling. Automatic feed. Max feed speed 1.7 m/min.
- CEG-M25 Carriage, gliding. Manual feed. Reduction 25:1
- CER-M3-MD1 Carriage, roller type, MD1 QDC coupling. Manual feed, reduction 3:1
- HK-1 Hand crank for CER and CEG carriages

2.5.2 Base plates BTS3/BTS4 - MCCS



Base plate-BTS3 and BTS4.

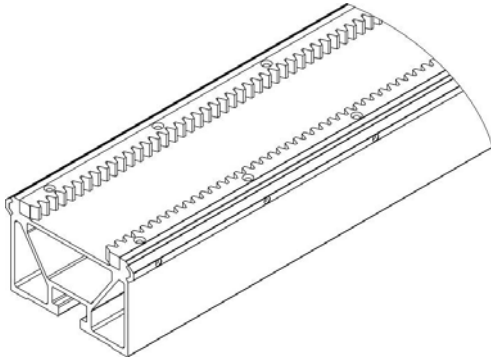
There are two different base plates for the TS track, the BTS3 and BTS4.

The BTS3 with only three leveling screws is not recommended for heavy drilling and for drilling with the drill spindle turned to one side. It is excellent for light duty drilling and in several other applications where side loads do not occur.

2.5.3 TS T-slot type track - MCCS

The Modular Concrete Cutting System (MCCS) builds on the t-slot type track which has been used for the Pentruder wall saw since 1997. The TS track is very light weight, yet offers great stiffness and stability to the system.

The TS tracks are available in the lengths 0.85, 1.15, 2, 2.3 and 3.45 m and the weight is 6.95 kg per meter.

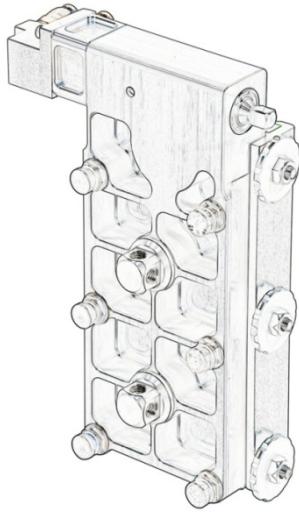


2.5.4 RT-TS1 Rear support

The RT-TS1 rear support is fastened on TS track with a . The RT-CN-U is fastened directly on the column with a t-slot profile (which also is used together with the track feet for the Pentruder wall saws). The rear support is 2.1 meter long when fully pushed in and can be pulled out to a length of 3.2 meters.

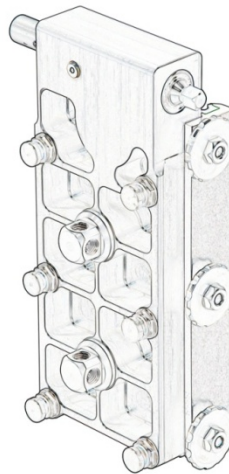
2.5.4 CEG/CER Carriages - MCCS

The MG41 gearbox and ST spindle units can be used either with a CEG gliding carriage or a CER roller carriage. If automatic feed is required, then there are two different carriages to choose from, CEG-HY12.5 and CEG-HY20, depending on what size of drill bit and what feed rate is needed.



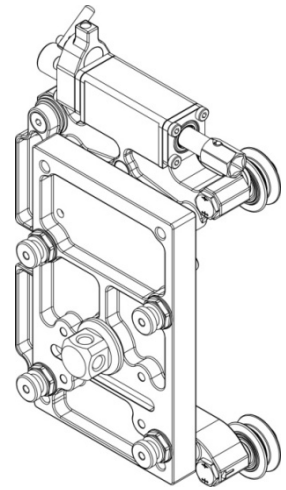
CEG-HY12.5 / CEG-HY20 with hydraulic feed

Carriage which glides on the track with teflon liners.
For drilling with hydraulic MD1 and for chain sawing.
Hydraulic automatic feed.
Use with PP15, PP20 or PP25.
Max feed speed 2.7 / 1.7 m/min.



CEG-M25 with manual feed

Carriage which glides on the track with teflon liners.
Manual feed. Lower carriage for 3P8 wire saw. Suitable for heavy drilling with big drill bits, chain sawing and more applications to come.

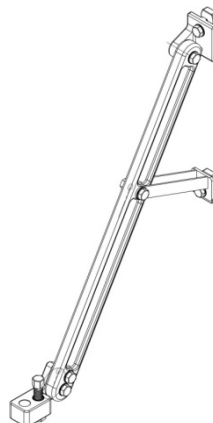
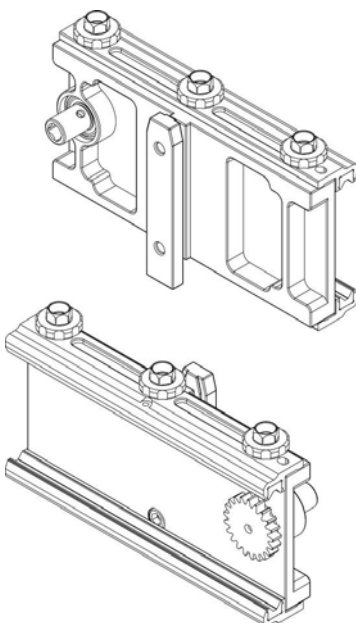


CER-M3-MD1 with manual feed

Carriage with tapered rollers like on the wall saws.
Manual feed.
Coupling for MD1 drilling machine.
Gear ratio 3:1

Overview CEG and CER carriages for Pentruder MD1 hydraulic drilling machine

2.5.6 CELTS Carriage for line and corner drilling with TS type tracks



CEL-TS Carriage from two different views CT-CEL Back support for CEL-TS

3 Safety instructions

3.1 Safety instructions which are used in this operator's manual



Note!

This sign indicates technical specifics and methods which will facilitate the job.



Important!

Here we inform about risks connected with use of the machine, and, if the safety precautions are not respected, can result in damage to property and persons in close proximity to the machine.



WARNING!

In these we inform about risks connected with use of the machine, and, if the safety precautions are not respected, can result in serious injury and even to fatal injuries to persons in close proximity to the machine.

3.2 Intended use of the drill rig



WARNING!

The drill rig may only be used for core drilling in concrete, masonry or similar materials. Other use is non intended and therefore to refrain from. For maximum drill bit size, see Technical Data.



WARNING!

Before drilling is commenced, make sure that;

- there are no power lines, gas or oil pipes in the way.
- the statics of the building are not imperiled because of the drilled holes.
- No damage is done on other side of the wall when drilling through the wall.

Other use is non intended and therefore to refrain from. For maximum drill bit size, see Technical Data.

This drilling machine may not be used before the operator is fully educated by our sales distributor in handling the machine. It is the obligation of the buyer 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.

3.3 Not intended use of the drill rig

This drill rig may not be used for:

- any kind of stirring jobs, for instance stirring of paint of similar.
- drilling in soil, for instance drilling holes for poles.
- free hand drilling.



WARNING!

The drill rig may not be used on loose masonry as the anchors may come loose.

3.4 General safety instructions

WARNING - DANGER OF LIFE!



It is potentially fatal to drill in a power line which is energized. The drill rig can get energized.

A circuit breaker doesn't protect against this danger.



WARNING!

- The drill rig is state of the art and follows the present regulations. However, incorrect handling of the machine can lead to serious or even fatal injury to the operator and persons in proximity to the machine.
 - 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 damages occurring as a result of use of non original parts.
 - All persons which are operating or in any way working on the drill rig has to read and understand the whole operator's manual and especially the safety instructions, before any work is commenced. It is the obligation of the buyer 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.
 - The drill rig may only be operated and serviced by authorized and trained personnel. This personnel should be trained by personnel which is authorized by the manufacturer.
 - No work should be commenced which cannot be judged to be safe.
 - The operator is obligated to immediately inform about changes on the drill rig which can impair the safety of the machine.
 - The user is liable that the drill rig is in faultless condition and that all functions are in order before work is commenced.
 - Modifications or changes on the drill rig which might impair the safety of the machine are not allowed.
 - Before any kind of service or mounting on the drill rig is commenced, the drill motor must always be switched off and the 32/63 Amp plug and cable disconnected from the drill motor.
 - 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.
 - Safety regulations at the work place must be followed as well as the safety regulations of the operator's manual for the drill motor used.
 - The drilling machine may not be used in an environment where explosion protected equipment is demanded.
-

3.5 Safety precautions at site



WARNING!

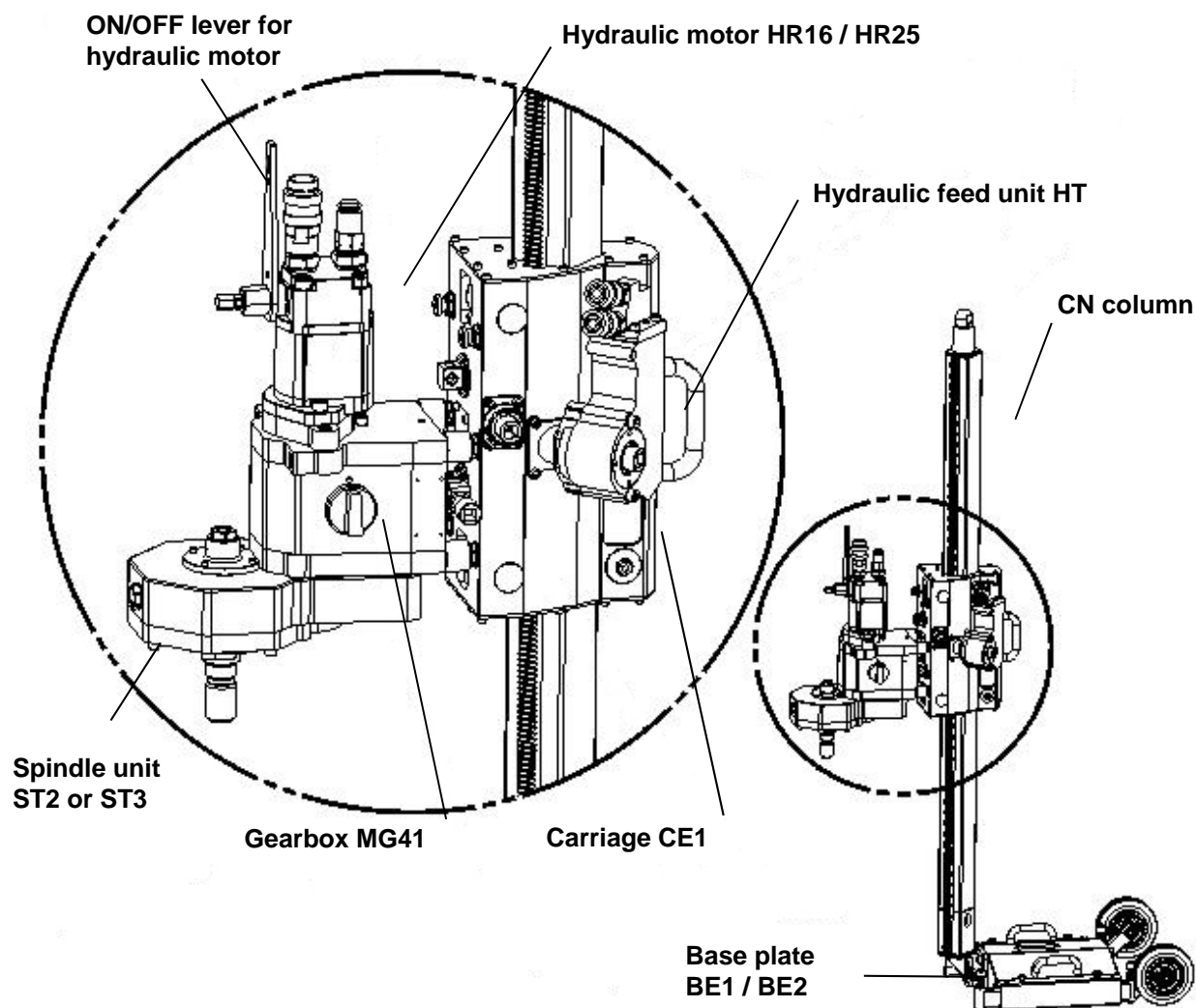
- Always check that the equipment is in faultless condition and that all functions are in order before work is commenced.
 - No mounting, for instance change of drill bit, may be performed on the drill rig unless it is disconnected electrically from the mains.
 - Safety regulations at the work place must be followed as well as the safety regulations of the operator's manual for the drill motor used.
 - All persons working with, or in the proximity to the drilling rig 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 at drilling might lead to permanent hearing disorders if not ear guards are worn.
 - The operator should have good supervision over the drill system and inform passing persons about possible risks.
 - Unauthorized persons shall not be within the risk area (the area around the drill unit).
 - The drill bit may not be touched when the drill motor is in operation.
 - Never connect the hydraulic hoses to either drill unit or power pack while the power pack is running. The power pack must be disconnected from the power supply by removing the 32 or 63 Amp plug and cable from the power pack before any hydraulic connections are made.
 - The power pack must always be switched off and the 32/63 Amp plug and cable disconnected from the power pack before any kind of service is commenced, for example filling of oil, oil change and filter replacement.
 - Mounting and dismounting of the drilling unit and drill bit may only take place when the drill motor is disconnected from the power pack by removing the two large hydraulic hoses from the drill unit.
 - 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.
 - The electric motor of the power pack is water cooled and the water pressure must therefore be limited to max 5 bar. The incoming water supply may only be connected to the lower connection on the power pack. The quick disconnect couplings may not be replaced with couplings that are not fully open when disconnected.
 - Always lift the drill unit ergonomically correct. The Pentpak is not provided with hooks for lifting. Should this unit need to be lifted with a crane, this should only be done after permission and instructions have been given by a person responsible for safety on the site. Contact your sales agent for instructions on how the lifting can be done in the best way.
 - The base plate must always be securely anchored to perform safe drilling.
 - Never run the drill unit without water cooling. The seals are quickly worn and water leak can occur. Should the cooling water cease to function, stop the machine immediately.
 - Before drilling is commenced all persons involved must know how the emergency stop button is working.
 - Remember always to cover drilled holes so that no person falls down and hurts himself.
-

-
- Only connect the power pack to the Pentruder drill system or such equipment which has been manufactured or approved by Tractive AB.
 - Should the drilling machine fall down from the ceiling it could cause severe injuries. Keep away from the working area of the drilling machine.
 - Don't use any extension or lever to get a higher feeding power.
 - A heavy core in a drill bit which rotates outside of the drilled hole can lead to heavy vibrations so that the drilling machine can come loose from the anchor. Stop the drill bit shortly before it comes out of the drilled hole.
 - Re-bars which have been cut off can be stuck between the core and the drill bit and block and/or damage the drill bit. Before the drilling is commenced, make sure that no segments are left in the drilled hole.
 - Should the drill bit get stuck, turn off the drill motor and unplug it. Use a wrench to move the drill bit forwards and backwards until it is disengaged and can be pulled out of the hole.
 - When drilling upwards, make sure the core cannot fall down by securing it properly. Rope off the working area.
 - Only change gear when the drill motor is stopped.
 - The power pack must only be operated when in an upright position.
 - Remember always to cover drilled holes so that no person falls down and hurts himself.
-

4 Getting started

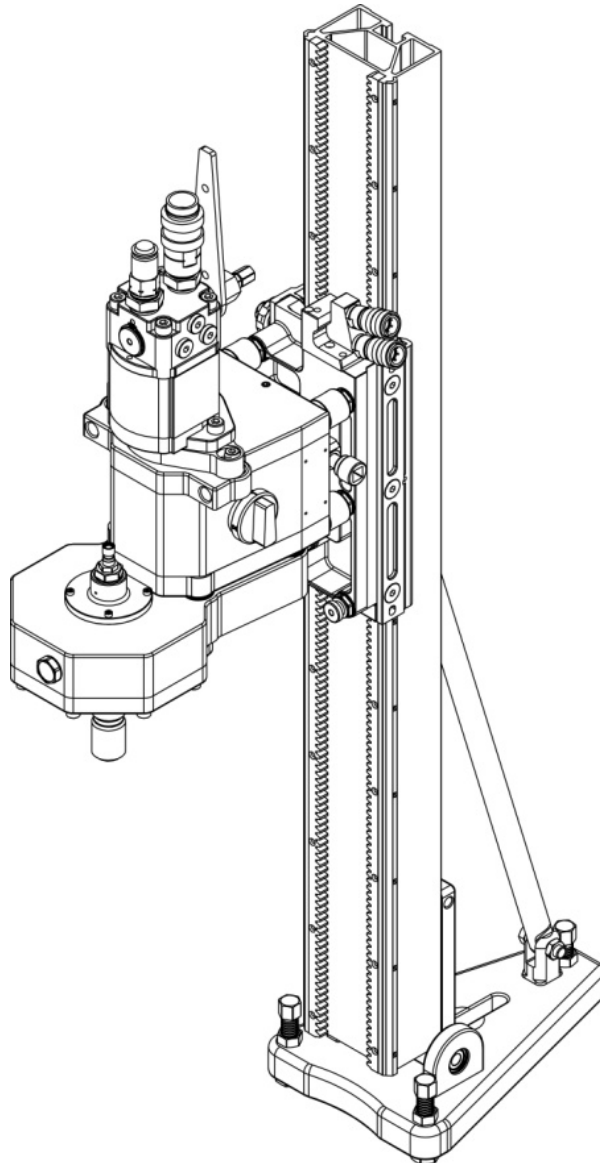
Before drilling with the MD1 drilling machine, it is essential that all personnel working with or in close proximity to the drill stand have read and understood the contents of this operator's manual. By reading and understanding the manual the operator will be able to take advantage of the many features and benefits of the Pentruder MD1 drilling machine.

4.1 Overview Pentruder MD1 with 70 mm column system



Picture 1: MD1 Drill unit and 70 mm column system drill stand with the MD1 drill unit enlarged

4.2 Overview Pentruder MD1 with TS track (MCCS)



Picture 2: MD1 Drill unit and MCCS drill stand.

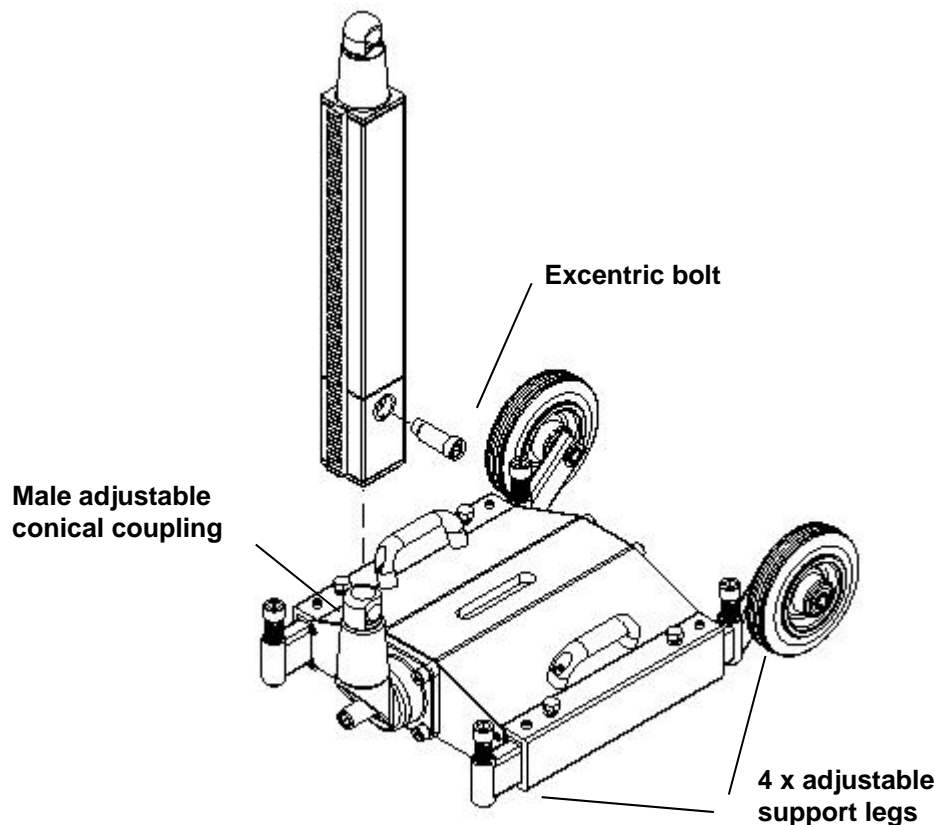
4.3 Equipment needed for drilling

The operator should have the following material at hand:

- **Hammer drill:** Used to drill holes to secure the base plate.
- **Hammer:** Securing anchors.
- **Anchors and bolts:** Mounting the base plate and removal of drilled cores.
- **Tools for mounting the drill stand and adjustments:** Tool set
- **Level:** To mount the column correctly at set up and control during drilling.
- **Measuring tape:** Positioning of base plate in relation to cored hole.
- **Extension adapter:** Used when drilling big diameter holes to increase the distance between drill bit and spindle.
- **Hoses and electrical plugs:** When needed, extension hoses for the power pack and hydraulic motor can be used.
- **Industrial vacuum cleaner:** Collection of concrete slurry and water retention.
- **Water collector ring:** To avoid spreading the water around the drill hole during drilling.
- **Equipment for safe removal of drilled cores:** Small cores can be removed by hand, big diameter cores must be removed with a crane or other lifting equipment.
- **Helmet, eye- and ear protection, dust guards in dusty environments, protective clothes, shoes and gloves.**

4.4 Mounting of drill stand 70 mm column system

4.4.1 Assembly of BE base plate- and CN F/M-70 column



Picture 3: Assembly of BE2 base plate- och CN 0.5 F/M-70 column.

1. Secure the base plate to the floor or wall with an expanding anchor and minimum 12 mm (1/2") bolt. Be observant on what material the base plate will be mounted on. For safety it is important that the base plate is properly secured. If mounted on brick or light concrete we recommend to secure the base plate with through bolts.
2. When drilling with large drill bits we recommend to use two anchors of M16 size to fasten the base plate.
3. Fit the column on the base plate (see picture 3).
4. Pull out the support legs (see picture 3) and check with the level to see that the column stands vertical and steady. If not, adjust with the screws on the support legs until the column stands correctly.
5. To mount the column on the base plate, or a pivoting head, or to join two columns, an eccentric bolt is inserted in the hole in the column, and tightened clockwise with an 1/2" knuckle bar or ratchet.
6. The column is locked by turning the eccentric bolt Clockwise.
7. To release the column, the eccentric bolt is turned Counter Clockwise until it lifts from the cone, the eccentric bolt is removed and the column can be removed.



WARNING!

- The base plate must be securely fastened to perform safe drilling
- Be careful to clean the mounting hole for the base plate with water or air before fitting an expander bolt.



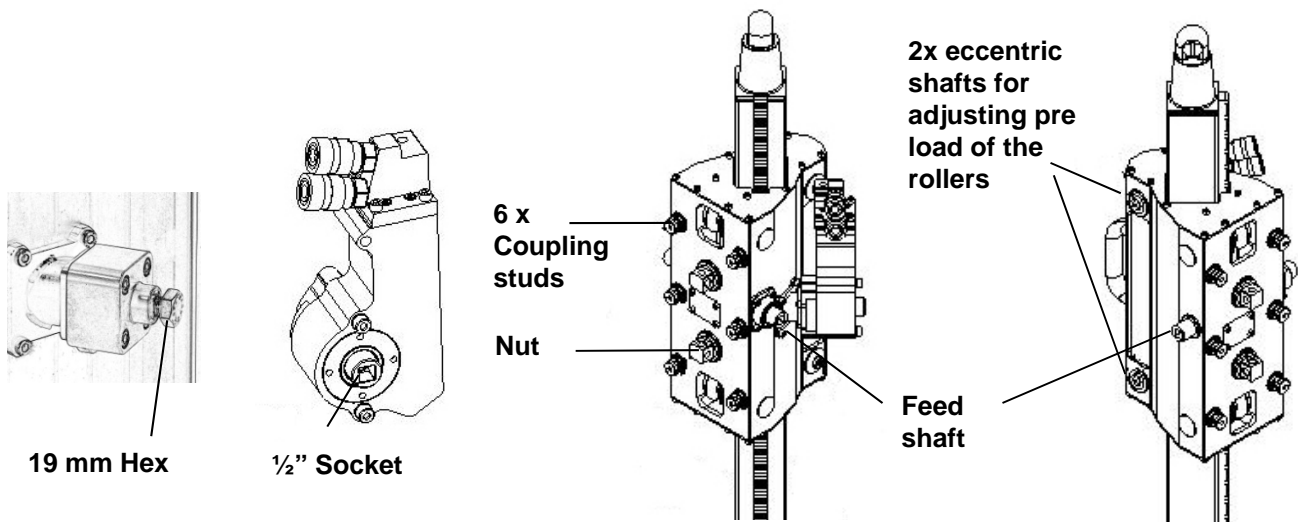
Important!

- Never hit the column into position with a hammer or the like.

4.4.2 Back support for 70 mm column

For most drill operations a back support is needed to give greater stability, for example when drilling with high pressure and high load. The back support should always be used to stabilize the column, especially where circumstances are hard and demanding.

4.4.3 Mounting of carriage CE1 on 70 mm column



Picture 4: Hydraulic feed unit HD and carriage CE1 on the column.

1. Loosen the socket on the hydraulic feed unit or the 19 mm Hex on the friction brake.
2. Put the carriage on the column.
3. Adjust the height of the carriage by turning the feed shaft with a knuckle bar.
4. Tighten the socket on the feed unit or the hex bolt on the friction brake until the carriage doesn't slide down the column.
5. For optimum preload of the rollers on the column, the rear rollers should be adjusted using a 1/2" spanner and a 15 mm wrench. Adjusted correctly, this eliminates all play between the carriage and the column. Do not set the rollers too hard. The result will be premature wear of the column.
6. Lock the eccentric shafts for correct pre load of the rollers, by tightening the screw with a 15 mm wrench.

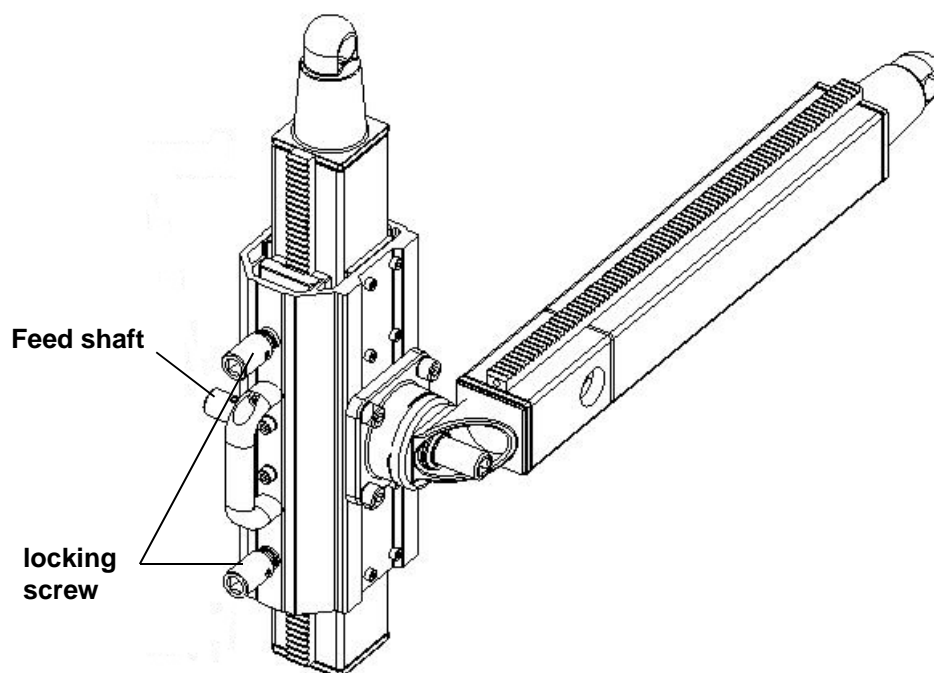
The drill unit (gearbox, spindle unit and hydraulic motor) can be mounted on the carriage with the drill spindle pointing in both directions along the column. Note that the drill unit can be mounted in two positions along the carriage.



Important!

- Be careful when mounting the carriage on the column. Make sure the socket / hex bolt is tightened to avoid clamp injuries. Do not overtighten!

4.4.4 Mounting of pivoting head for 70 mm column



Picture 5: Pivoting head-PD1 with assembled column.

1. Mount the pivoting head on the column (see pic. 5)
2. Tighten the locking screws to that the pivoting head doesn't glide on the column.
3. Use the ratchet to move the pivoting head to the desired position on the column.
4. Lock the pivoting head with the locking screws on the desired height. (see pic. 5)
5. To mount the column on the pivoting head, an eccentric bolt is inserted in the hole in the column, and tightened Clockwise with a ½" handle or ratchet.
6. Now you can mount the carriage on the horizontal column, see mounting of carriage CE1 on page 20.

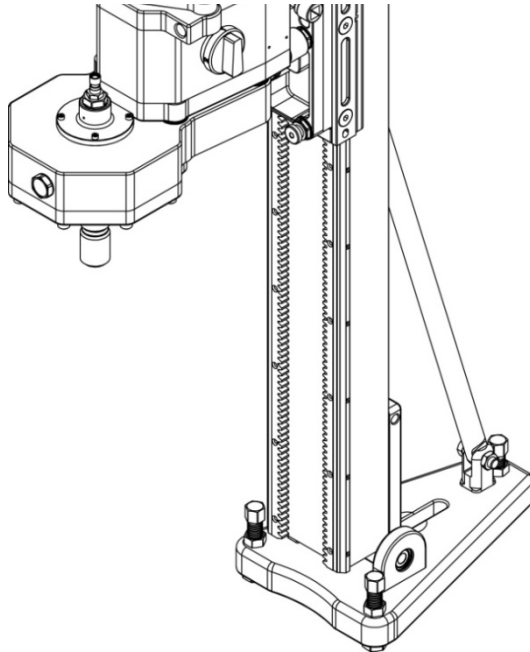


Important!

- Be observant so that the eccentric bolt doesn't slip out of the column when the column is put on the pivoting head. It MUST be completely flush with the column side face.
 - When the adjustable male-coupling shall be adjusted please make sure the teeth are correctly in mesh.
 - 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.
-

4.5 Standard mounting sequency of MCCS drill stand

1. Track on base plate
2. Base plate on concrete
3. Carriage on track



Picture 6: BTS3 Base plate and TS track

4.5.1 Mounting the track on the base plate

We recommend to assemble the base plate on the track first, and then fastening the assembled rig on the concrete.



a. Slide the upper clamp in to the track. Older tracks with only one rack can be used. In this case make sure the rack is on the left side seen from the rack side of the track.



b. Slide the lower clamp in to the track.



c. Tighten the two bolts on the lower clamp.



d. Tighten the upper bolt loosely.



e. When the track is in the right position, tighten the bolt properly.



f. Next tighten the upper bolt on the back brace.



g. Tighten the lower bolt on the back brace.

Pictures 7 a-h: Mounting track on base plate

4.5.2 Mounting of base plate on concrete

1. Secure the base plate to the floor or wall with an expanding anchor and minimum 12 mm (1/2") bolt. Be observant on what material the base plate will be mounted on. For safety it is important that the base plate is properly secured. If mounted on brick or light concrete we recommend to secure the base plate with through bolts.
2. When drilling with large or long drill bits we recommend to use two anchors of M16 size to fasten the base plate. The base plate BTS-3 is not recommended for drilling with large drill bits.



WARNING!

- The base plate must be securely fastened to perform safe drilling.
 - Be careful to clean the mounting hole for the base plate with water or air before fitting an expander bolt.
-



Important!

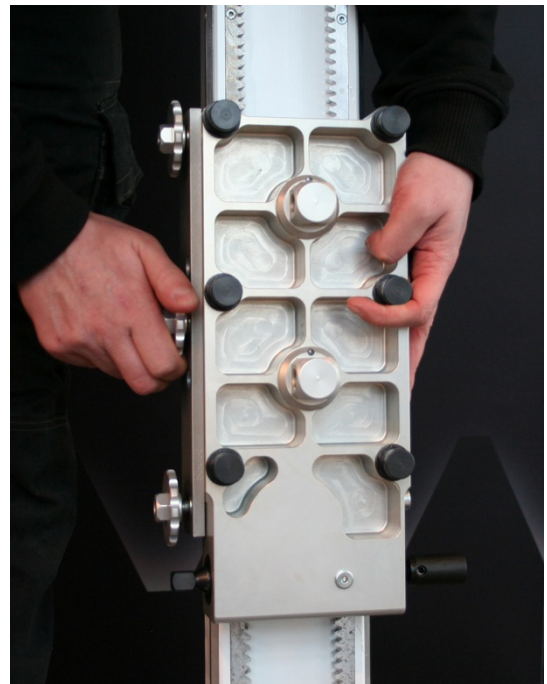
- The MD1 can use very high torque on the spindle and if the base plate is not fastened according to the recommendations above, the base can twist under load and cause misalignment between drill bit and hole
 - Never hit the column into position with a hammer or the like.
-

4.5.3 Mounting of CEG carriage, gliding type carriage with hydraulic feed

1. Open the three clamp nuts.
2. Put the carriage on the track as shown in the picture and align the feed gear with the rack on the track.
3. Tighten all three clamp nuts firmly first by hand and then with a 19 mm spanner to be firmly tightened, but not solid.



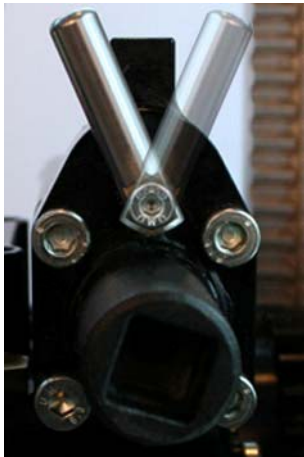
Note! Tighten firmly, but do not over tighten!



Picture 8: Mounting of CEG carriage

4.5.4 Mounting of CER carriage, roller type carriage with manual feed

1. There is a latch on the CER carriage which prevents it from sliding along the track.



a. Locked position, in either direction.

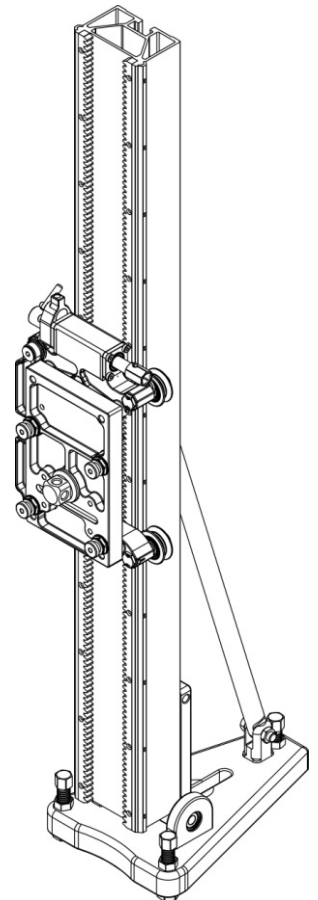


b. Neutral position, used when drilling.

Picture 9 a-b

! Important! When mounting the CER carriage on the track it is important to don't let go of it until you are sure the latch is in a position so the drill motor cannot unintentionally slide along the track, see pictures 9 a-b.

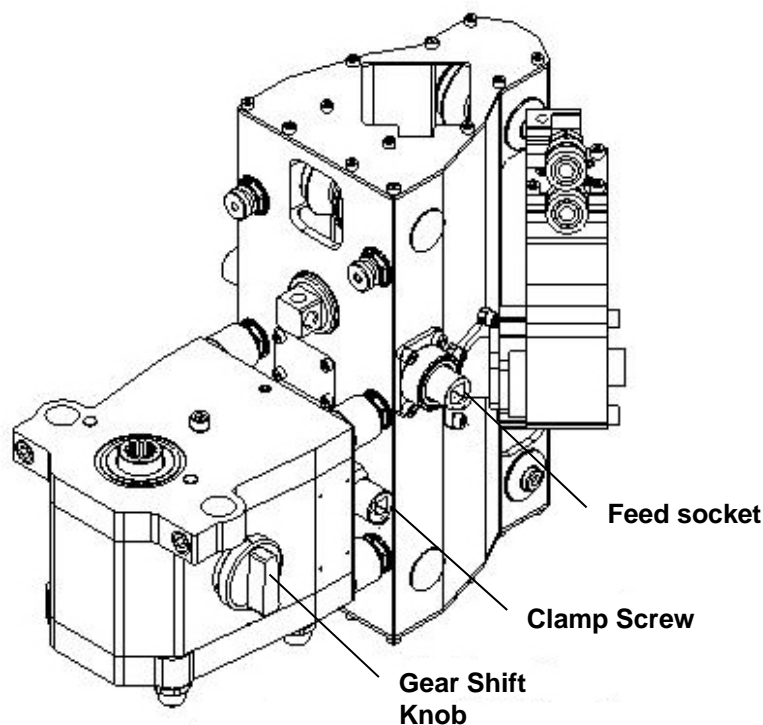
2. Open the handles.
3. Fold the carriage CER on to the track with the side without handles first.
4. Fold on the other side of the drill motor and close the handles. First the lower handle.
5. Adjust the carriage CER along the track so that the feed gear fits the rack on the track, then, close the upper handle.
6. Put the latch so that it cannot unintentionally be moved downwards (picture 9 a), when the drill rig is mounted for vertical drilling downwards.



Picture 9 c: Pentruder MD1 with CER-M3-MD1 roller type carriage with manual feed

4.6 Mounting of MD1 modules

4.6.1 Mounting of MG41 4-speed Gearbox



Picture 10: Gearbox - MG41 mounted on the carriage - CE1

Mounting the gearbox on the carriage or extension adapter

1. Mount the gearbox on the quick release couplings on the carriage or the extension adapter. The quick release couplings makes mounting and demounting easy and quick.
2. The Drill Motor assembly can be fitted in two positions for height, and upside down, without having to turn the carriage on the column.
3. Screw the clamp screw into the nut on the carriage. Do not over tighten the clamp bolt or the nut will be damaged.
4. Adjust the height of the carriage by turning the feed socket with a knuckle bar or with the hydraulic feed unit.



WARNING! • Do not change speed when the power pack is running. Before changing between different speeds the two 5/8" or 3/4" hoses on the hydraulic motor must be disconnected from the power pack. Otherwise the operator might not have full control over the machine. The power pack can for instance be in a position out of sight from the operator or even on another floor and be accidentally operated by someone else.



Important! • Do not over tighten the clamp bolt or the nut will be damaged.

4.6.2 Gear change

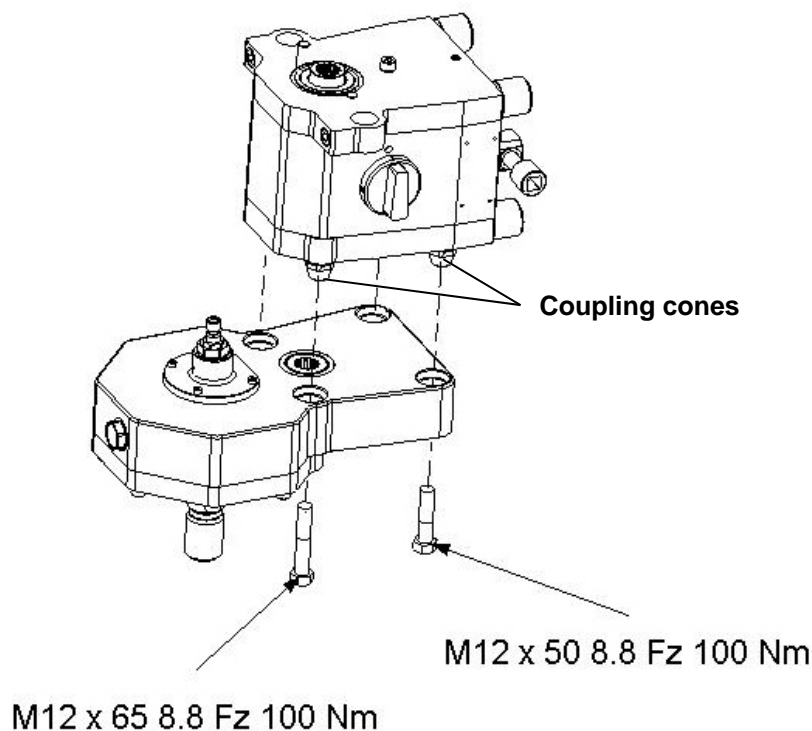
1. Turn the lever on the hydraulic motor to the OFF position (see pic. 12) to stop the drill unit. If the operator doesn't have supervision over the power pack, the power pack should be switched off and the two 5/8" hydraulic hoses disconnected from the hydraulic motor.
2. Push and turn the gear shift knob (see picture 10) to desired gear position. To make the gear engagement dogs mesh, turn the drill bit at the same time as the index knob is turned.
3. If you have disconnected the hydraulic hose, connect these again and start the power pack. Turn the ON/OFF lever on the hydraulic motor to ON to start the drill unit.



Important!

- Make sure the gear change knob is in the correct position before drilling is commenced. The gear position number should be aligned with the spot adjacent to the knob on the gearbox casing. Should drilling be started with the gear in the wrong position, the gearbox may be damaged.
- To avoid uncontrolled movement of the drill bit, remember to always have the lever on the hydraulic motor on **OFF** when the power pack is started.

4.6.2 Mounting of Spindle unit - ST2/ST3



Picture 11: Spindle unit ST2 and gearbox MG41.

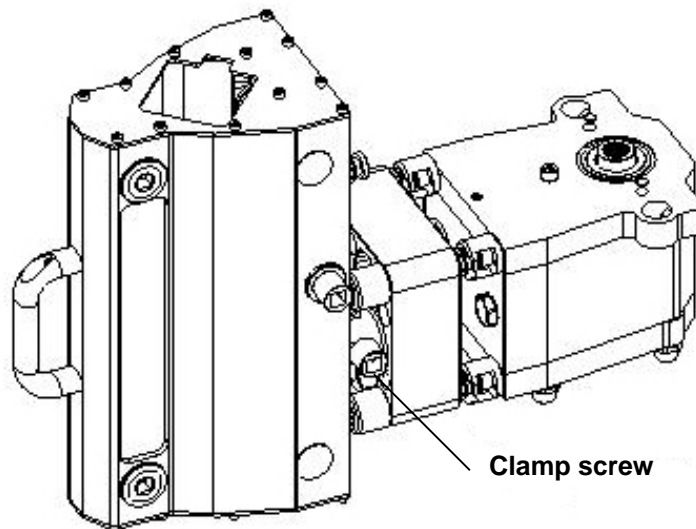
Two different spindle units are available to give a very wide speed range still using the same gearbox. The spindle unit can be exchanged and the speed can be adapted to what the work requires.

1. Clean the coupling cones thoroughly.
2. Mount the spindle unit on the gearbox (see picture 11) and tighten the screws to 100Nm.

4.6.3 Mounting of extension adapter

1. Mount the extension adapter on the quick couplings on the carriage. (see picture 12)
2. Screw the clamp screw into the nut on the carriage. Don't overtighten as the thread in the nut can be damaged.
3. Fit the gearbox.

Note: The adapter can be mounted in two positions. In the picture below the adapter is mounted in the "lower position".



Picture 12: Extension adapter ERMD1 mounted on carriage CE1

4.6.4 Spindle speeds and torque

The chart below describes the spindle speeds and torque of ST2 and ST3 with different hydraulic motors and Pentpak 15/20 or 25.

Spindle rpm with spindle units ST2 and ST3

| Pentpak 25 | 1:st gear | 2:nd gear | 3:rd gear | 4:th gear |
|--------------------|-----------|-----------|-----------|-----------|
| 25 cc motor + ST2: | 120 rpm | 195 rpm | 335 rpm | 530 rpm |
| 25 cc motor + ST3: | 250 rpm | 395 rpm | 680 rpm | 1080 rpm |

| Pentpak 20/15 | 1:st gear | 2:nd gear | 3:rd gear | 4:th gear |
|--------------------|-----------|-----------|-----------|-----------|
| 25 cc motor + ST2: | 65 rpm | 100 rpm | 175 rpm | 280 rpm |
| 25 cc motor + ST3: | 130 rpm | 210 rpm | 360 rpm | 570 rpm |
| 16 cc motor + ST2: | 100 rpm | 160 rpm | 275 rpm | 435 rpm |
| 16 cc motor + ST3: | 205 rpm | 325 rpm | 560 rpm | 890 rpm |

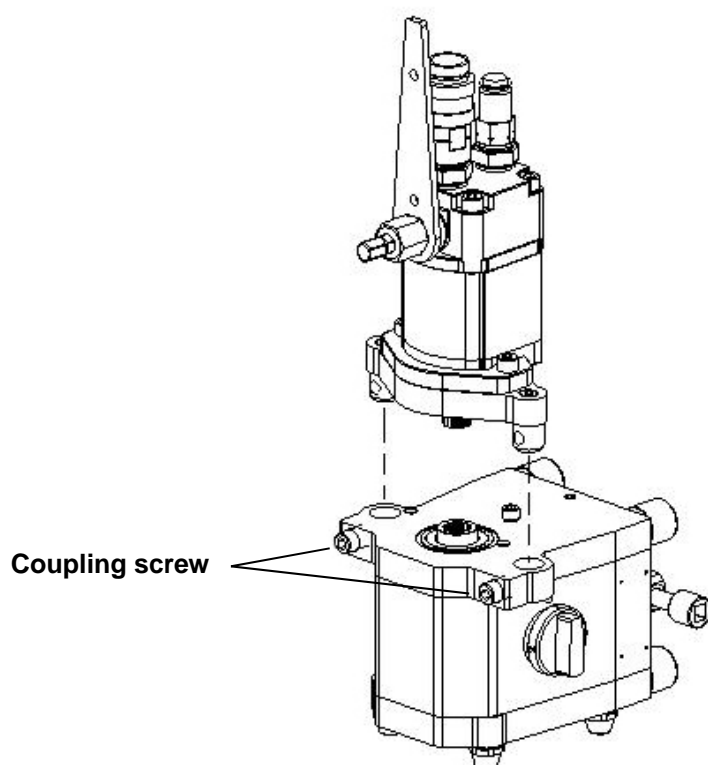
4.6.5 Peripheral speed

The peripheral speed (peripheral surface speed on the drill bit) is changed due to the diameter of the drill bit. A big diameter drill bit has a higher peripheral speed and a small drill bit has less speed at the same rotational speed. As a general rule, when choosing speed we can say:

- The harder the material to drill, the lower the peripheral speed should be.
- The more steel in the material to drill, the lower the peripheral speed should be.
- Porous material can be drilled with a higher peripheral speed.

Ask your Pentruder distributor for a chart with m/second for the spindle unit, hydraulic motor and power pack you have.

4.7 Hydraulic motor HR16 and HR25



Picture 13: Positioning of hydraulic motor-HR on gearbox -MG41 at assembly.

4.7.1 Mounting of the hydraulic motor on the gearbox

1. Clean the hydraulic motor and gearbox before they are joined. Lubricate the splines lightly with grease.
2. Assemble the motor on top of the gearbox. Tighten the coupling screws with an 8-mm allen key.
3. Make sure the screws are carefully tightened.
4. Remove and grease the coupling screws once a month.

4.7.2 Lever on hydraulic motor

The hydraulic motor is OFF when the lever is upright as in picture 13. Pull the lever to the right or to the left and the drill bit will rotate clockwise or anti-clockwise.

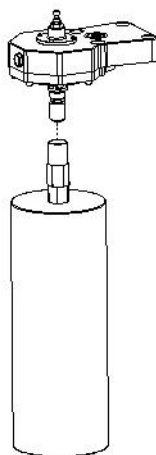
See also 6.2 Starting the Pentruder MD1 hydraulic drilling machine on page 41.



Important!

- To avoid uncontrolled movement of the drill bit, remember to always have the lever on the hydraulic motor on **OFF** when the power pack is started.
-

4.8 Drill bit



Picture 14: Drill bit positioned to be fitted on the spindle unit - ST2/ST3

4.8.1 Mounting of the drill bit through threading

1. Clean the thread and lubricate with grease.
2. Thread the drill bit onto the spindle unit.
3. Check that the drill bit is correctly fastened.
4. If a "Slider" is used, be careful to check its condition prior to use. The ST1 and ST2 spindle units produce torque levels high enough to destroy the "Slider".



Important!

- Don't use tools directly on the drill bit tube when mounting it.
-

4.8.2 Mounting of the drill bit using the Quick Disconnect Coupling (QDC) (if Spindle unit with QDC is used)

1. Before attempting to attach a drill bit to the spindle, make sure the drive motor, hydraulic or HF, is disconnected from its power source. If the spindle unit is equipped with a quick disconnect coupling, make sure the mating surfaces, the two slightly different diameters on the spindle, are clean and lightly lubricated with grease.
2. Make sure the mating surfaces inside the drill bit adapter are clean and lightly lubricated with grease.
3. Lightly tighten the lock screw on the spindle in a Clock Wise direction.
4. Attach the drill bit adapter, with drill bit, to the spindle, engaging the drive dogs with each other.
5. Firmly tighten the lock screw on the spindle in a Counter Clock Wise direction.
6. The drill bit is now ready to use.

4.8.3 Removing the drill bit using the Quick Disconnect Coupling

1. Before attempting to remove a drill bit from the spindle, make sure the drive motor, hydraulic or HF, is disconnected from its power source.
2. Turn the lock screw on the spindle in an anti Clock Wise direction until stop.
3. Remove the drill bit, carrying its weight with one hand, or get help from another operator if the drill bit is too heavy for one operator to handle safely.
4. Clean off any slurry on the spindle and inside the drill bit adapter after work is completed.
- 5.



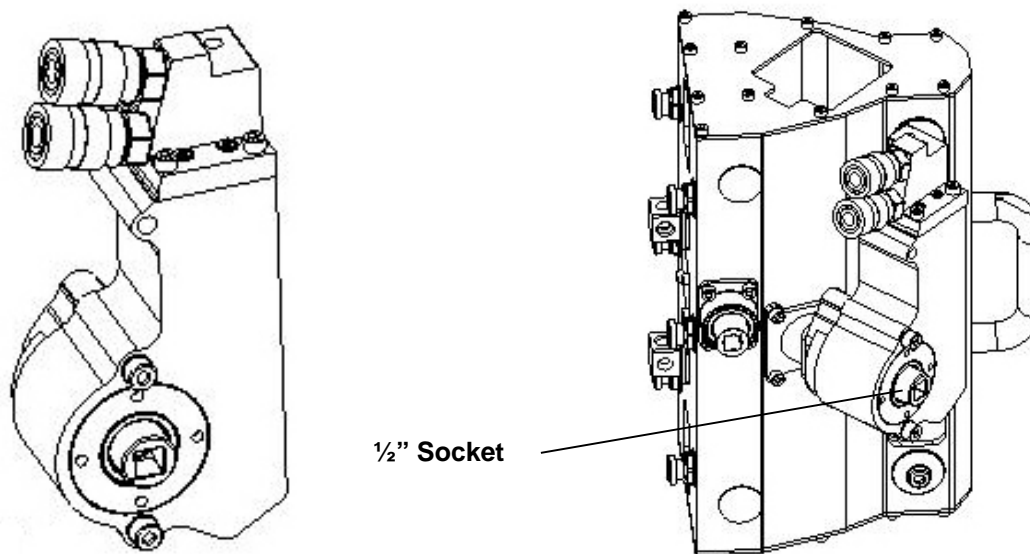
Warning!

- The torque on the spindle is very high and careless handling of tools and an accidental start of the drive motor could cause severe or fatal injury to the operator.
-

4.8.4 Water cooling of the drill bit

The drill bit is cooled by water with first has been used to cool the electric motor and the hydraulic oil. The water is fed through the power pack and then to the drill unit through the hoses.

4.9 Hydraulic Feed – PT-HY32



Picture 15: Hydraulic feed unit-PT-HY32 and carriage-CE1 with the hydraulic feed unit mounted

A hydraulic feed unit for automatic feed is available. The feed unit is controlled by the remote control from the Pentpak 15, 20 or 25 or from a hydraulic remote control valve block (Accessory).

4.9.1 Mounting of feed unit

1. Remove the carriage from the column.
2. Loosen the $\frac{1}{2}$ " socket.
3. Assemble the hydraulic feed unit according to fig above.
4. There is an allen screw inside a punched hole in the lower right corner on the power pack. Completely tighten and then turn this screw 3 – 4 turns CCW before starting to drill with the hydraulic feed.
5. Tighten the socket on the hydraulic feed unit before hydraulic feeding is started. **Do not overtighten the socket!**
6. For manual feed with a knuckle bar, loosen the socket on the hydraulic feed unit and operate the LH or RH socket on the carriage.



Important!

- Very important! Do NOT over tighten the "1/2" Socket". If over tightened, the screw that the socket attaches to will fail and the friction coupling driving the carriage will not work.

4.9.3 Feed regulation using the hydraulic feed unit PT-HY32

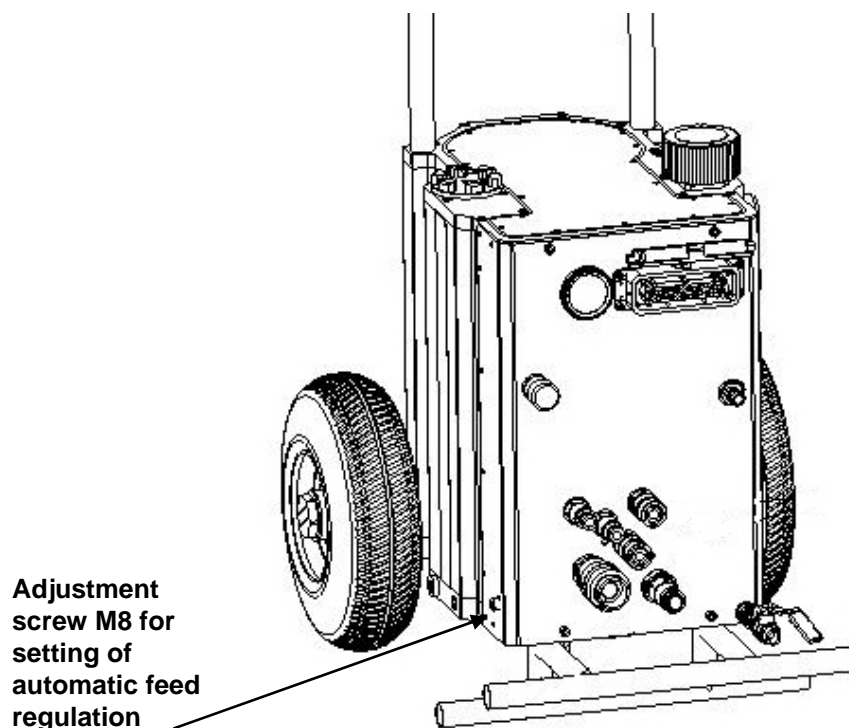
The Pentruder drill system and Pentpak 15/20/25 are equipped with a semi-automatic control which senses differences in type of concrete, the drill bits ability to cut the concrete in question, and re-bars. A fairly constant power application is ensured by a special valve, which senses the working pressure to the drill motor and regulates the feed motors until the system is in balance and an even power application is achieved.

The maximum level of power application can be set to suit a certain condition or drill bit, power supply etc., by adjusting the screw at the bottom right corner of the Pentpak 15/20/25. See figure below. Insert a 6 mm Allen key into the hole in the front panel to do this adjustment and unscrew to decrease maximum working pressure and tighten to increase. For wall sawing, the screw is normally set at $\frac{3}{4}$ turn out from bottom at the factory. This setting represents the correct setting for achieving maximum performance with max output from the electric motor.

For drilling, turn the screw 4 – 5 turns out to start with, set the desired maximum penetration speed with the potentiometer, and then adjust the allen screw on the power pack until the desired working pressure is achieved.

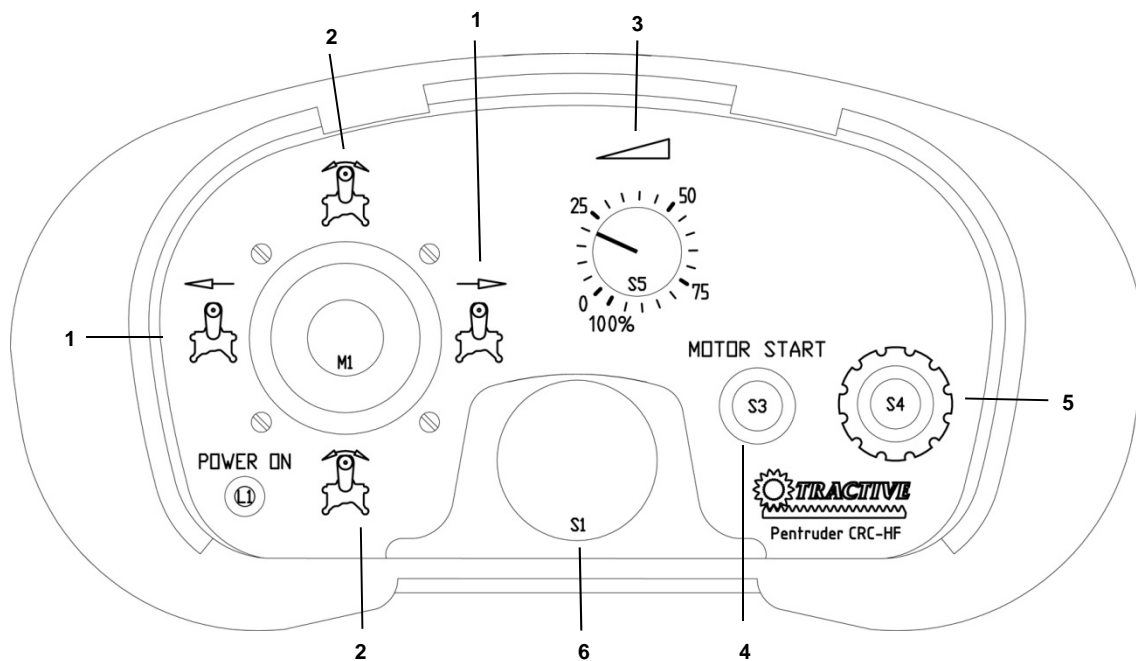
4.9.4 Rapid traverse

When the Pentpak 15/20 is used together with the hydraulic feed unit a rapid traverse of about 1 m/minute along the column can be reached. When the Pentpak 25 is used together with the hydraulic feed unit a rapid traverse of about 2 m/minute can be reached. When the potentiometer (Remote control - "Potentiometer for feeding speed") is turned clockwise to the max, the feeding speed is at its highest. If the knob is turn anti-clockwise the feeding movements stops completely.



Picture 16: Adjustment of automatic feed on Pentpak 15, 20 and 25.

5 Hydraulic power pack Pentpak 15 / Pentpak 20 / Pentpak 25



Picture 17: Remote control

1. Feed movement on the column
 2. No function for the drill system
 3. Potentiometer for feeding speed
 4. Electric motor start
 5. Start/Stop blade (Hydraulic circuit on)
- For operation of the drill unit, press Start/Stop blade, hold, and push the Electric motor start once to start the drill bit rotation.**
6. Emergency STOP button

5.1 Remote control

The Pentpak power pack is conveniently controlled by means of a hand held remote control unit where all functions are gathered. When using the hydraulic feed unit the feeding movement is also controlled with the help of the remote control.

This solution enhances safety as the operator can have a full and unrestricted overview and control of the machine.

The remote control unit is connected to the Pentpak 15, 20 or 25 power pack with a multi-pin connector. All functions are reset as soon as at least one of the phases of the power supply is disconnected, or as soon as at least one of the emergency stop buttons are depressed. No functions remain and the power pack must be restarted after a stop is caused by any of the above mentioned reasons.

5.1.1 Remote control - Extension of cable

The cable for the remote control unit can be extended by using 10 m extension cables. A maximum of 2 extension cables may be used.

5.1.2 Starting the operation of the drill unit

To start the operation of the drill unit, press the Start/Stop button for operation of the drill unit and keep it pressed, then press the Start/Stop power pack button. See also 6.2 Starting the Pentruder MD1 hydraulic drilling machine on page 41.

5.1.3 Positioning the power pack

The power pack should be positioned away from where the drilling takes place and should be kept dry at all times. It should preferably be placed on a flat surface. If this is not possible the power pack should be positioned so that the black filler cap is on the highest level possible to avoid oil leakage when the hydraulic oil warms up and expands during running of the machine.

Avoid leaving the power pack outside in the rain. The unit is fully sealed and correctly ventilated but to prevent possible damage to electronic components we recommend that it is kept dry to prevent condensation forming.

5.1.4 Connecting to mains

The power pack should be connected to a 230 or 400 V 50 Hz power supply (depending on version) with at least 16 (25) Amp fuses. For the US market version the voltage is 480V 60Hz. The power pack is equipped with a 63 Amp socket. An adaptor must be fitted when other cables or supplies are to be used.



WARNING!

- The power pack may not be electrically connected when the hydraulic hoses are connected.
 - Never connect the hydraulic hoses to either power pack or hydraulic motor when the power pack is running. The power pack must be switched off and disconnected from the mains by removing the 63 Amp plug before any of the hydraulic hoses are connected.
 - Be sure to lock the 3/4" hydraulic couplings by turning the sleeves on the female couplings after they are connected.
-

5.1.5 Y/D-start (Pentpak 15 or Pentpak 20)

To be able to use the power pack where the power supply is limited, an Y/D-start is used to protect the fuses in the start-up moment. Despite the powerful electric motor the Pentpak 15 can be started when connected to 20 automatic fuses or at the least 16 Amp resistance fuses. For the highest performance the power pack should be connected to 25 - 32 Amp fuses.

5.1.6 Soft start on Pentpak 25 (or Pentpak 20)

The Pentpak 25 has an electronic soft start to facilitate start of the powerful 25 kW motor even on 25 Amp fuses.

5.1.7 Shutting off the electrical motor of the power pack

The electrical motor is started and stopped electrically via the remote control unit. It is important to stop the drill bit completely before turning off the electric motor in the power pack, especially when using large diameter bits.

5.1.8 Emergency stop button

The Pentpak 15/20/25 is equipped with 2 emergency stop buttons, one on the remote control unit, and one on the power pack front panel. By depressing at least one of the emergency stop buttons, all functions will be reset. No functions will remain and the power pack must be restarted after the emergency stop button is released.

The drill bit, if in rotation, and in a cut, will continue to rotate because of its inertia, but will coast to a stop after a few seconds. If the drill bit is rotating and not in a cut, it will take longer before the drill bit stops.

5.1.9 Transportation of the power pack

Whenever the power pack is transported in a vehicle, it is important that it is securely strapped down and well protected. The power pack should preferably be transported standing on its wheel and foot, but can be laid down resting on its handles. We can not guarantee that no oil leaks out but generally there is no problem.

5.1.10 Transport, wheels

The Pentpak 15/20/25 is equipped with two wheels for transportation. The tyre pressure should be 2 bar / cm².

5.1.11 Thermal protection relay

The Pentpak 15/20/25 is equipped with a thermal switch to protect the electric motor from overheating and damage to the electric motor. The temperature of the electric motor can rise to a dangerous level if too little cooling water is run through the system. It can also happen that too warm or dirty water is run through the system, which will reduce the cooling capacity. A special thermal switch therefore monitors the temperature of the electric motor windings and shuts down all functions when the temperature has risen over the allowed value. The thermal temperature relay function can only be reset by removing the 63 Amp plug from the power pack. If the relay has shut down the power pack, do not shut off the cooling water, but let it continue to flow to cool the motor down to a healthy temperature again.



Important!

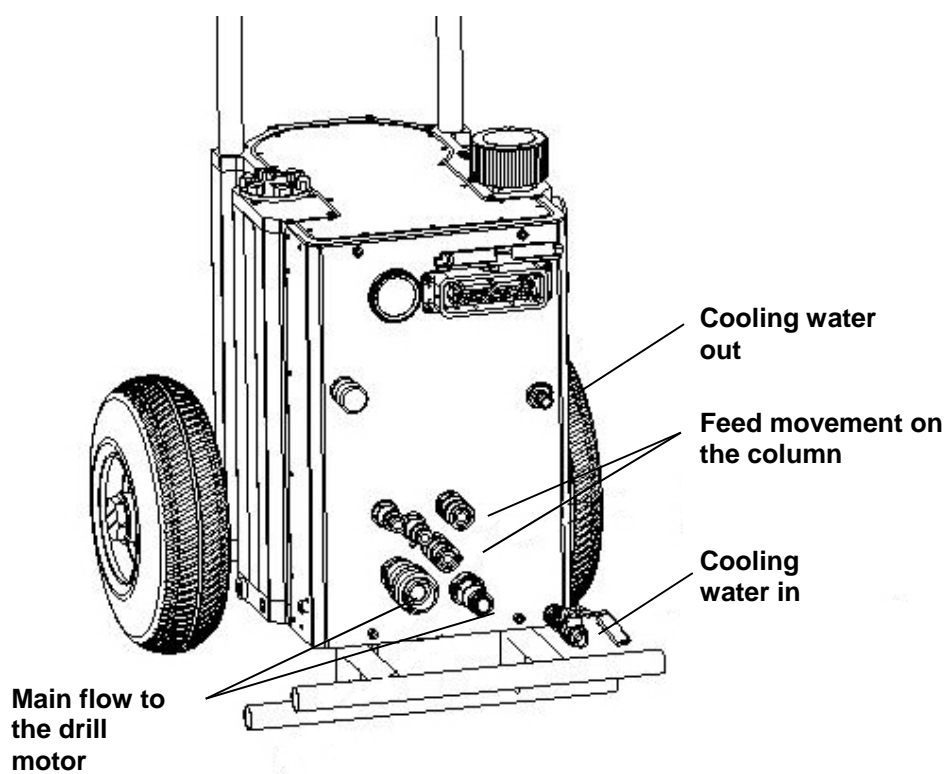
Repeated starting attempts of an overheated power pack, running with too little or too warm cooling water will damage the electric motor beyond repair. If the power pack shuts down because of overheating, i.e. it cannot be started using the normal starting procedure, the cooling water must be left flowing to the power pack to cool down the motor.

5.1.12 Oil vent

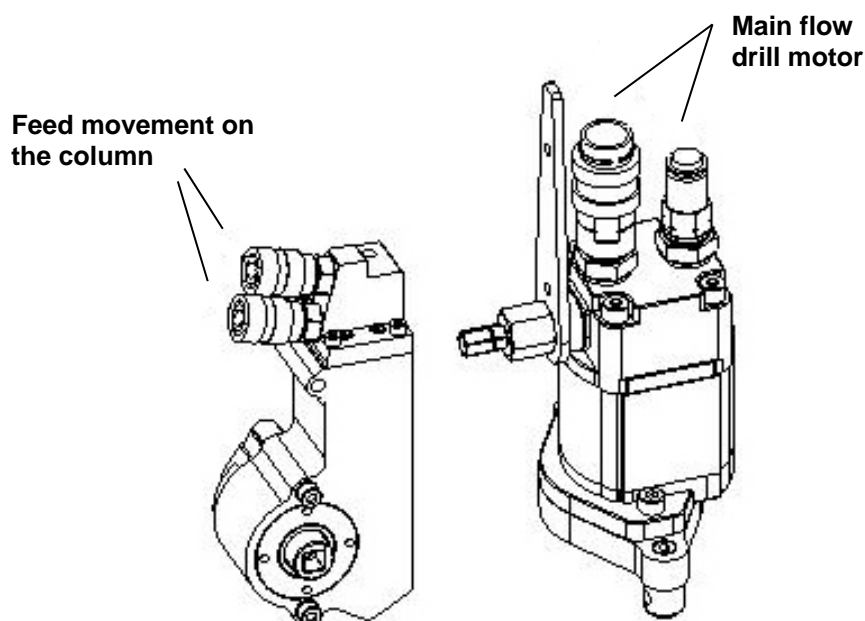
To reduce the weight and dimensions of the power pack, the Pentpak 15/20/25 uses a very small amount of oil. Consequently, there is no big oil tank to take care of air bubbles and let them slowly rise to the surface and disappear. In the Pentpak 12/20/25 the problem with air bubbles is instead eliminated by use of a special "turbo charger" which feeds the main pump with pressurized oil. The result is that much less air bubbles are produced and there is no need for a big oil tank.

5.1.13 Couplings/hoses

Check the hoses for before connecting them to the drill unit and power pack. All hydraulic couplings are arranged in such a way that they can only be connected in the correct way. Should a hose break and leak during operation, immediately turn off the power pack and replace the hoses.



Picture 18: Connections on the power pack Pentpak 15/20/25.



Picture 19: Connections on hydraulic feed unit-HD and motor-HR.

Hydraulic power to the hydraulic motor is supplied by two identical 5/8" 6 m long or 3/4" x 8 m hoses. When using a hydraulic feed unit two 1/4" hoses with the same length are used, strapped together with a 10 mm water hose.

5.1.14 Mounting the hydraulic hoses

1. Connect the two 5/8" / 3/4" hydraulic hoses to the Male and female 1/2" or 3/4" couplings on the hydraulic motor (see fig. 15) and on the power pack see fig. 17).
2. *Connect the two 1/4" hydraulic hoses to the couplings 1/4" on the hydraulic feed unit (see fig. 18) and the power pack (see fig. 17).*

5.1.15 Hoses, extension

As far as is possible the hoses should not be extended to avoid pressure drop and power losses. If the hoses must be extended we recommend a maximum total length of 30 m from power pack to drill motor. After the extension hoses have been connected the power pack should be left running for a minute operating the movements and starting the blade motor. Then check the oil level and top up if necessary.

Note: If the extension hoses are not pre-filled with oil, the oil will foam and the power pack will not operate correctly. The power pack must be bled and oil level re-established. Contact your sales agent for advice before using extension hoses.

5.1.16 Oil level

On the 76 mm level indicator the oil should be up to 1/3 of the glass when the power pack is switched off, with the new 127 mm level indicator the oil should be up to 2/3 of the glass when the power pack is switched off. See also "Pressure drop" and "Shutting off the electrical motor of the power pack".

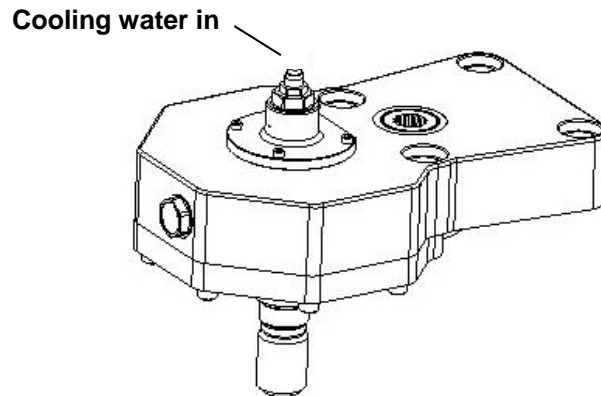
5.1.17 Pressure drop

To avoid unnecessary power losses the system should be run with as short hoses as possible. The standard equipment contains 6 or 8 m long hoses and provide low pressure drop and excellent efficiency.

5.1.18 Water cooled electric motor

The Pentpak 15/20/25 is equipped with a special high efficiency electric motor for highest output at lowest possible power consumption. In spite of its diminutive dimensions, the electric motor maintains a very high efficiency even under maximum output. This is possible only because of adoption of a specially designed cooling system the motor.

5.1.19 Water cooling



Picture 20 Coupling for cooling water on Spindle unit - ST2.

The 10mm cooling water hose must be connected between the power pack and the spindle unit. **The power pack is water cooled and needs a minimum of 8 litres of cool water per minute at full power output.** As for drilling less water is normally used, be careful to not overheat the power pack. The water pressure should be at least 1 bar. The water supply may only be connected to the lower connection on the power pack, never to the upper one. The upper connection is connected to the water hose running up to the drill.



Important!

The water couplings may never be substituted for coupling with a closing valve when disconnected as water then will remain in the oil cooler and in the electric motor cooling jacket. Leaving water in the power pack will destroy these components in sub zero temperatures.

5.1.20 Mounting the cooling water hoses

1. Connect the water hose between the power pack (see picture 17) and spindle unit (see picture 19).
2. Connect the water hose between the power pack and (see picture 17) and water post (not delivered by Tractive).

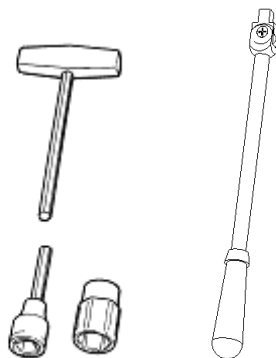
6 Drilling

6.1 Preparations before commencing work.

Cleaning: The machine should be carefully cleaned and all functions checked and be found normal before use of the machine.

Base plate: Be sure to mount the base plate as securely as possible.

Tools: Use only those tools that are intended to be used to operate the machine: Knuckle bar 400 mm 1/2" and an extension 1/2" L = 125 mm (not shown in the picture. 15 mm wrench to adjust carriage rollers.



Picture 21: Tool kit.

Quick disconnects: Check all quick disconnect couplings for correct function and cleanliness.

Remote Control unit: Check the remote control unit for correct function and that the multi-pin-plug is free from dirt and undamaged.

Water feed: Check that the machine can be supplied with clean cold water.

Hoses: Check that all hoses are the correct type, R2 for the main 3/4" hoses, and that they are in faultless condition.

Oil level in the power pack: On the 76 mm level indicator the oil should be up to 1/3 of the glass when the power pack is switched off, with the new 127 mm level indicator the oil should be up to 2/3 of the glass when the power pack is switched off.

Power supply: Check if sufficient power is available on the site. The machine must be connected to a 5-pin 400/230 (depending on version) V 3-phase supply with minimum 25 (16) Amp fuses.

| | Pentpak 25 | Pentpak 20 | Pentpak 15 |
|------------------|-------------------|-------------------|-------------------|
| Current idling | 11 Amp | 9 Amp | 9 Amp |
| Current at 8 kW | | | 16 Amp |
| Current at 15 kW | 26 Amp | | 30 Amp |
| Current at 20 kW | 36 Amp | 38 Amp | |
| Current at 25 kW | 45 Amp | | |

Safety precautions on the 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 a responsible person before work is commenced.

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

6.2 Starting the Pentruder MD1 hydraulic drilling machine

All preparations above should be finished before starting the machine.

6.2.1 Starting sequence

1. **Make sure** that the drill bit runs true and is not damaged, for instance that no segment is missing.
2. **Make sure** that correct RPM is used for the drill bit diameter.
3. **Check** if something is embedded in the concrete, for instance re-bars, and adjust the drilling thereafter.
4. **Check** that the lever on the hydraulic motor is in the OFF position.
5. **Check** oil level in the power pack.
6. **Check** that the potentiometer on the power pack is in its OFF (max CCW) position.
7. **Check** that the cooling water to the power pack is on and that water feeds to the drill bit through the spindle unit.
8. **Check** that there is enough power to the power pack.
9. **Start the power pack:** Push "Start/Stop power pack" on the remote control. Start the power pack during ca. 10 seconds and then stop it again. Check the oil level and fill up if needed. See "oil level".
10. **Starting operation of the drill unit:** To start the operation of the drill unit, press the Start/Stop button for operation of the drill unit and keep it pressed, then press the EI. Motor button once.
11. **Start drill bit:** Pull the lever on the hydraulic motor to **ON**. A "slow start", i.e. slowly pulling the lever until the drill bit starts rotating, can be used. This facilitates making the first groove in the concrete.
12. **Start feeding:** Feeding of the drill bit into the concrete is either done per hand by using a knuckle bar on the carriage or with the help of the hydraulic feed unit. A "slow start" with reduced speed of the drill bit can be done by just slowly pulling the lever on the hydraulic motor until the drill bit starts rotating.
When using the **hydraulic feed unit**, turn the knob "Feed movement on the column" on the remote control to the left or right to move the carriage either upwards or downwards on the column.
13. **By first, slowly cutting a groove, the drilling is facilitated.** When using the hydraulic feed unit the feeding speed is controlled with a potentiometer on the remote control (see page 34).
14. **Adjust the feeding speed:** When using the hydraulic feed unit, turn the potentiometer until an even, continuous cutting pace is reached. .

***Important!** Don't increase the feeding pressure/speed of the drill bit when drilling in re-bars. Decrease the feeding speed instead until the re-bars are drilled through. The spindle speed can be held constant.*
15. **Gear change:** Shut off the operation of the drill unit with the remote control. Turn the lever on the hydraulic motor to **OFF**. If the operator doesn't have overview of the power pack it should be shut off and the hydraulic hoses should be disconnected. Push the index knob when changing gear. The change of gear is facilitated if the drill bit is turned at the same time as the index knob.



Important! Never change the gear while the drill bit or the hydraulic motor is running.

16. **Re-start after gear change:** If you have disconnected the hydraulic hoses, connect these again and **start the power pack**. Pull the lever on the hydraulic motor to ON to start the drill unit.



Important!

Make sure the gear is in the correct position before drilling is commenced. Should drilling be started with the gear in the wrong position, the gearbox may be damaged.

17. **Change of drill bit:** See also page 31 Drill bit. Shut off the operation of the drill unit with the remote control. Turn the lever on the hydraulic motor to **OFF**. If the operator doesn't have overview of the power pack it should be shut off and the hydraulic hoses should be disconnected. Remove the drill bit. Mount the new drill bit by threading it on to the spindle unit.
18. **Start after change of drill bit:** See pos 15.
19. **Drilling is finished:** Shut of the operation of the drill unit and then the power pack. Turn the lever on the hydraulic motor to **OFF**. If there is a risk of temperatures below zero, the water should be drained from the power pack. This is done by disconnection the two water hoses from the power pack. The valve on the power pack is open and the water can be drained.
-



Important!

- If material should get stuck between the drill bit and the wall of the drill hole, shut off the spindle, the power pack and try to remove the bit.
 - Remember to cover drilled holes.
 - If the drill core should get stuck in the drill bit when removing it, increase the water flow if possible and tap lightly on the drill bit until the drill core gets loose.
 - Never leave the drill core in the drill bit when taking the drill bit out after drilling a hole in a wall. The drill core can weigh a lot and make the drill spindle break and the drill column fall down due to overload of the pivoting head and its couplings. First remove the drill bit from the drill spindle, then remove the drill bit with the drill core from the wall using a crane or other device.
 - Inspect the drill bit before drilling is commenced to see if the drill bit runs true or if segments are missing. Never use a faulty drill bit!
 - Never try to stop a rotating drill bit with feet or hands.
-



Warning!

- If there is a possibility that Drill CORES 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 unauthorized persons.
-

6.2.2 Drilling with a big or long drill bit

When drilling with a big or long drill bit a big and heavy body is in movement which contains a lot of energy when rotating. Therefore it is crucial to assemble the drilling machine following the instructions given in this operator's manual. The following are steps which are extra important when drilling with a big or long drill bit.

1. **Fasten the base plate securely with two anchors** of preferable M16 size, or minimum M12. Otherwise the base can twist under load and cause misalignment between drill bit and hole.
2. **Tighten all bolts** on the base plate, the back brace and the track. Do not overtighten the two bolts that clamps the track to the base plate. If over tightened, the track T-slot can be deformed, and then the base-to-track stability is compromised.
3. **Clean and lubricate the green plastic liners**, on the CEG drill carriage, with some grease. Tighten the adjustment nuts on the drill carriage so that any play is eliminated. The CER-carriage with rollers should not be used for drill bits bigger than 600 mm.
4. **Clean and lightly grease** the QDC quick disconnect coupling (if a QDC is used), both the spindle on the ST2 or ST3 spindle unit and the internal part of the drill bit adapter, and the lock screw. If a fixed spindle is used this should also be cleaned and lightly greased as well as the thread on the drill bit.
5. **Start approaching the wall with the drill bit, with a much reduced speed of the drill bit** by positioning the ON/OFF lever in an intermediate position. Do not use full speed. It is necessary to be very gentle when the drill bit is fed into the wall. The first 10 mm are crucial for successful drilling when the drill bit plunges further in. If the drill bit starts with a misalignment, than this misalignment will grow the deeper the drill goes, ending up in a lot of friction between the drill bit inside and outside wall, and the hole. It is crucial to get a very good alignment from the start. If the alignment is good, then the friction between the drill bit and the hole will be greatly reduced, and the torque needed to drill the hole will be much lower. This will minimize problems with twisting.
6. **Drill gently for at least the first 10 – 20 mm, or more**, then full speed can be applied. When the drill bit has penetrated about 10 - 20 mm into the wall, full speed can be applied.



Important!

- Please remember that the MG41 and ST2 (even more than the ST3) puts out enormous torque, and with an operator which is not used to this high torque, there will be problems with twisting of the track/column.
 - The motor will not stop because of the high drill pressure, it will drive the drill bit with very high torque and the result will be a twist in the track, and misalignment of drill bit in relation to the hole.
-



Warning!

- The operator must understand that the feed is very powerful too. It is driven by a really slow worm gear transmission, and very little effort is needed on the feed handle to give an enormous feed force on the drill bit. With only one M12 anchor, the anchor can actually be pulled out of the concrete.
-

7 MAINTENANCE

For the Pentruder modular drill system / Pentpak 15/20/25 to remain in a condition which is safe for operation at all times, 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 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.
 - No service or maintenance may be performed on the saw head unless it is disconnected hydraulically from the power pack.
-

REMOTE CONTROL

Remote Control unit: Check the remote control unit for correct function and that the multi-pin-plug is free from dirt and undamaged.

POWER PACK

Oil level in the power pack:

Check the oil level in the power pack. On the 76 mm level indicator the oil should be up to 1/3 of the glass when the power pack is switched off, with the new 127 mm level indicator the oil should be up to 2/3 of the glass when the power pack is switched off. See also "Pressure drop" and "Shutting off the electrical motor of the power pack".

Under operation the oil level may seem to be lower. This is normal and not an indication that something is wrong.

Oil change in the power pack:

Renew the oil at regular intervals, preferably every month. To renew the oil, unscrew the black filler cap and the filter cap. Then unscrew the plug in front of the left wheel and drain the oil. Take out the oil filter and replace with a new cartridge.

Fill again with approximately 7 litres of hydraulic oil, quality HLP 46 or equivalent, until the level is 1/3 (2/3 see below) up on the level indicator. Wait for a few minutes until the level has equalised between the two tanks and fit the black filler cap. Now fill the filter tank completely and fit and tighten the filter cap.

Important! Do not start the power pack when oil level is low, and never with the oil filter cap removed.

Start the power pack and let it run for approximately 10 seconds and shut it off again. Control the oil level and top up if necessary. On the 76 mm level indicator the oil should be up to 1/3 of the glass when the power pack is switched off, with the new 127 mm level indicator the oil should be up to 2/3 of the glass when the power pack is switched off.

Oil filter:

The new filters can be ordered from your dealer on Part. No. 60 13 01 00.

Oil change in the power p. gear transmission:

To change oil, put the power pack on the back, unscrew the oil-plug and drain the housing completely. Refill with 0.3 L of GL5 specification gearbox oil, preferably synthetic oil with 75W/90 viscosity. Clean the magnetic plug, fit it and tighten firmly again.

GEARBOX**Oil change in Gearbox MD41:**

The Pentruder drill system has a separate 4-speed gearbox which is lubricated in a separate oil bath. To change oil, unscrew the oil-plug and drain completely. Refill with 0.4 L of GL5 specification gearbox oil, preferably synthetic oil with 75W/90 viscosity. Clean the magnetic plug, fit it and tighten firmly again.

SPINDLE UNIT**Oil change in the Spindle unit**

The Pentruder drill system has a separate output gearbox or spindle unit which is lubricated in a separate oil bath. To change oil, unscrew the oil-plug and drain completely. Refill with 0.2 L of GL5 specification gearbox oil, preferably synthetic oil with 75W/90 viscosity. Clean the magnetic plug, fit it and tighten firmly again.

Cleaning:

The machine should be carefully cleaned and all functions checked and be found normal before use of the machine.

Hoses:

Check that all hoses are the correct type, R2 for the main $\frac{3}{4}$ " hoses, and that they are in faultless condition.

Quick disconnect hydraulic couplings:

Check all couplings for proper function and replace when necessary.

8 Technical Data

Pentruder MD1 - Hydraulic Modular Drilling Machine

4-speed gearbox- MG41

Technical data for 4-speed gearbox MG41

| | MG41 |
|--|---------------|
| Max power throughput: | 12 kW (16 HP) |
| Number of speeds: | 4 |
| Width including gear shift knob mm / inch: | 192 / 7.6 |
| Height mm / inch: | 142 / 5.6 |
| Depth mm / inch: | 213 / 8.4 |
| Weight kg / lbs: | 7.1 / 15.7 |

Spindle units - ST2 and ST3

Technical data for spindle units ST2 and ST3

| | ST2 | ST3 |
|------------------|----------------|----------------|
| Spindle thread: | 1-1/4" – 7 UNC | 1-1/4" – 7 UNC |
| Weight kg / lbs: | 7.0 / 3.1 | 7.0 / 3.1 |
| Lubrication: | Oil | Oil |

Spindle rpm with spindle units ST2 and ST3

| Pentpak 25 | 1:st gear | 2:nd gear | 3:rd gear | 4:th gear |
|--------------------|-----------|-----------|-----------|-----------|
| 25 cc motor + ST2: | 120 rpm | 195 rpm | 335 rpm | 530 rpm |
| 25 cc motor + ST3: | 250 rpm | 395 rpm | 680 rpm | 1080 rpm |

| Pentpak 20/15 | 1:st gear | 2:nd gear | 3:rd gear | 4:th gear |
|--------------------|-----------|-----------|-----------|-----------|
| 25 cc motor + ST2: | 175 rpm | 280 rpm | 65 rpm | 100 rpm |
| 25 cc motor + ST3: | 130 rpm | 210 rpm | 360 rpm | 570 rpm |
| 16 cc motor + ST2: | 100 rpm | 160 rpm | 275 rpm | 435 rpm |
| 16 cc motor + ST3: | 205 rpm | 325 rpm | 560 rpm | 890 rpm |

Torque with spindle units ST2 and ST3

| Pentpak 25 | 1:st gear | 2:nd gear | 3:rd gear | 4:th gear |
|--------------------|-----------|-----------|-----------|-----------|
| 25 cc motor + ST2: | 1010 Nm | 630 Nm | 370 Nm | 230 Nm |
| 25 cc motor + ST3: | 490 Nm | 310 Nm | 180 Nm | 115 Nm |

| Pentpak 20/15 | 1:st gear | 2:nd gear | 3:rd gear | 4:th gear |
|--------------------|-----------|-----------|-----------|-----------|
| 25 cc motor + ST2: | 1010 Nm | 630 Nm | 370 Nm | 230 Nm |
| 25 cc motor + ST3: | 490 Nm | 310 Nm | 180 Nm | 115 Nm |
| 16 cc motor + ST2: | 865 Nm | 540 Nm | 315 Nm | 200 Nm |
| 16 cc motor + ST3: | 420 Nm | 265 Nm | 155 Nm | 100 Nm |

Extension adapter – ERMD1:*Technical data for extension adapter ERMD1*

| | ERMD1 |
|---|-----------|
| Extends distance between column and spindle mm / inch: | 90 / 3.5 |
| Weight kg / lbs: | 3.3 / 7.3 |

Max drill bits with and without Extension adapter ERMD1

| Max Ø drill bit with: (mm / inch) | Track (MCCS) | 70 mm Column |
|--|--------------|--------------|
| Spindle unit ST2/ST3 (w/o ERMD1): | 630 / 24.8 | 600 / 23.6 |
| Spindle unit ST2 + 1 x ERMD1: | 820 / 32.3 | 790 / 31.1 |
| Spindle unit ST2 + 2 x ERMD1: | 1010 / 39.7 | 980 / 38.5 |
| Spindle unit ST2 (3 x ERMD1): | 1200 / 47.2 | 1170 / 46 |

Base plates – 70 mm column system:*Technical data for Base plates BE1, BE2 and BETC*

| | BE1 | BE2 | BETC |
|--|-------------------------------|-------------------------------|-------------------------------|
| Width including wheels mm / inch: | 492 / 19.4 | 492 / 19.4 | 492 / 19.4 |
| Width less wheels mm / inch: | 380 / 15 | 380 / 15 | 380 / 15 |
| Length including support legs and wheels mm / inch: | 610 / 24 with support legs in | 610 / 24 with support legs in | 610 / 24 with support legs in |
| Length less wheels, front and rear legs mm / inch: | 426 / 16.7 | 426 / 16.7 | 426 / 16.7 |
| Height not including coupling cone mm / inch: | 111 / 4.4 | 111 / 4.4 | 111 / 4.4 |
| Length / width of slot for anchoring mm / inch: | 100 x 22 / 4 x 0.9 | 100 x 22 / 4 x 0.9 | 100 x 22 / 4 x 0.9 |
| Size of wheels mm / inch: | Ø 160 / 6.3 | Ø 160 / 6.3 | Ø 160 / 6.3 |
| Weight including wheels and support legs kg / lbs: | 18.5 / 40.7 | 19.5 / 43 | 14.8 / 32.6 |
| Weight less wheels and support legs kg / lbs: | 12.8 / 28.2 | 13.8 / 30.4 | 9.1 / 20 |
| Coupling | Fixed, front mounted | Swivelling, front mounted | Fixed, top mounted |

Columns – CN – 70 mm:*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 |
|--------------------------|----------------|----------------|----------------|---------------------|---------------------|---------------------|
| Length mm / inch: | 508 / 20 | 1200 / 47.2 | 1500 / 59 | 508 / 20 | 1200 / 47.2 | 1500 / 59 |
| Weight kg / lbs: | 6.4 / 14.1 | 11.9 / 26.2 | 14.3 / 31.5 | 6.6 / 14.5 | 12.1 / 26.6 | 14.5 / 32 |
| Coupling: | Female/Male | Female/Male | Female/Male | Female / Jack screw | Female / Jack screw | Female / Jack screw |
| Extendable: | Yes | Yes | Yes | No | No | No |
| Fits base plates: | BE1, BE2, BETC | BE1, BE2, BETC | BE1, BE2, BETC | BE1, BE2, BETC | BE1, BE2, BETC | BE1, BE2, BETC |

CE1 carriage and PTHY hydraulic feed unit– 70 mm column system:*Technical data for CE1 carriage and PTHY hydraulic feed unit*

| | CE1 |
|------------------------------|------------|
| Width incl ½" socket mm/inch | 219 / 8.6 |
| Width housing mm / inch: | 150 / 5.9 |
| Length mm / inch: | 376 / 14.8 |
| Depth mm / inch | 228 / 9 |
| Weight l kg / lbs: | 9.3 / 20.5 |

Pivoting head - PD1 – 70 mm column system:*Technical data for pivoting head PD1*

| | PD1 |
|---|------------|
| Width including coupling and ½" drive socket mm / inch: | 236 / 9.3 |
| Width housing mm / inch: | 106 / 4.2 |
| Length mm / inch: | 320 / 12.6 |
| Depth incl. clamp screws mm / inch: | 170 / 6.7 |
| Weight kg / lbs: | 7.7 / 17 |

Base plate – BTS3/BTS4 – MCCS:*Technical data for base plates BTS3 and BTS4*

| | BTS3 | BTS4 |
|-------------------|-------------|------------|
| Width mm / inch: | 492 / 19.4 | 492 / 19.4 |
| Length mm / inch: | 610 / 24 | 610 / 24 |
| Weight kg / lbs: | 18.5 / 40.7 | 19.5 / 43 |

Tracks TS:*Technical data for track TS*

| | TS0.85 | TS1.15 | TS2.0 | TS2.3 | TS3.45 |
|------------------|------------|------------|-------------|-------------|-------------|
| Length mm / inch | 850 / 33.5 | 1150 / 45 | 2000 / 79 | 2300 / 90 | 3450 / 136 |
| Weight kg / lbs | 5.9 / 13 | 8.0 / 17.6 | 13.9 / 30.6 | 16.0 / 35.3 | 24.0 / 52.9 |
| Fits base plates | BTS3, BTS4 | BTS3, BTS4 | BTS3, BTS4 | BTS3, BTS4 | BTS3, BTS4 |

Carriages CEG/CER - MCCS:*Technical data for CEG and CER carriages*

| | CEG-HY12.5 | CEG-HY20.5 | CEG-M25 | CER-M3-MD1 |
|-------|---------------------|---------------------|--------------|-------------|
| Type: | Gliding | Gliding | Gliding | Rollers |
| Feed: | Hydraulic automatic | Hydraulic automatic | Manual, 1:25 | Manual, 1:3 |

Pentpak hydraulic power packs 15 / 20 / 25*Technical data for Pentpak 15, 20 and 25*

| | Pentpak 15 | Pentpak 20 | Pentpak 25 |
|-------------------------------|-------------------|-------------------|-------------------|
| Oil flow and pressure: | 42 L/min @175 bar | 42 L/min @200 bar | 80 L/min @140 bar |
| Input voltage: | 400 V | 400 V | 400 V |
| Input frequency: | 50 Hz | 50 Hz | 50 Hz |
| Minimum fuse: | 16 | 25 | 32 |
| Recommended fuse: | 32 | 32 | 63 |
| Weight kg / lbs: | 102 / 46.3 | 125 / 56.7 | 139 / 306.4 |

Declaration of conformity

We, Tractive AB declare that the machine

Manufacturer: Tractive AB
Gjutargatan 54
78170 Borlänge
Sweden

Category: Hydraulic Drilling System

Type: Pentruder MD1 Hydraulic Drilling Machine

Is in conformity with the provisions of the Machinery Directive 2006/42/EC.

Is in conformity with the provisions of the following other EC-directives:

- Low Voltage Directive 2006/95/EC
- EMC-Directive 2004/108/EC

In accordance with the EC-declaration of conformity, the product must not be modified without the manufacturer's permission. If this occurs, this documented EC-declaration ceases to apply and the modifier is considered to be the manufacturer and must verify and draw up an addendum to the EC-declaration and file technical data for the inspection authority.

Borlänge 21st of February, 2011



Anders Johnsen

Technical Director

Declaration of conformity

We, **Tractive AB** declare that the machine

Manufacturer: Tractive AB

Gjutargatan 54
78170 Borlänge
Sweden

Category: Hydraulic power pack
Make and type: Pentpak 15 / 20 / 25

Is in conformity with the provisions of the Machinery Directive 2006/42/EC.

Is in conformity with the provisions of the following other EC-directives:

- Low Voltage Directive 2006/95/EC
- EMC-Directive 2004/108/EC

We also declare that it is in conformity with directive 2000/14/EC on the noise emission in the environment by equipment for use outdoors (amended by Directive 2005/88/EC and the Regulation EC 219/2009), 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

Noise related value: 15 / 20 / 25 kW

Measured sound power level: Lwa: 97 dB(A) for Pentpak 15 and 20, 101 dB(A) for Pentpak 25

Guaranteed sound power level: Lwa: 104 dB(A)

Alderbäcken, Borlänge, 2nd of january 2008



Anders Johnsen
Technical Director