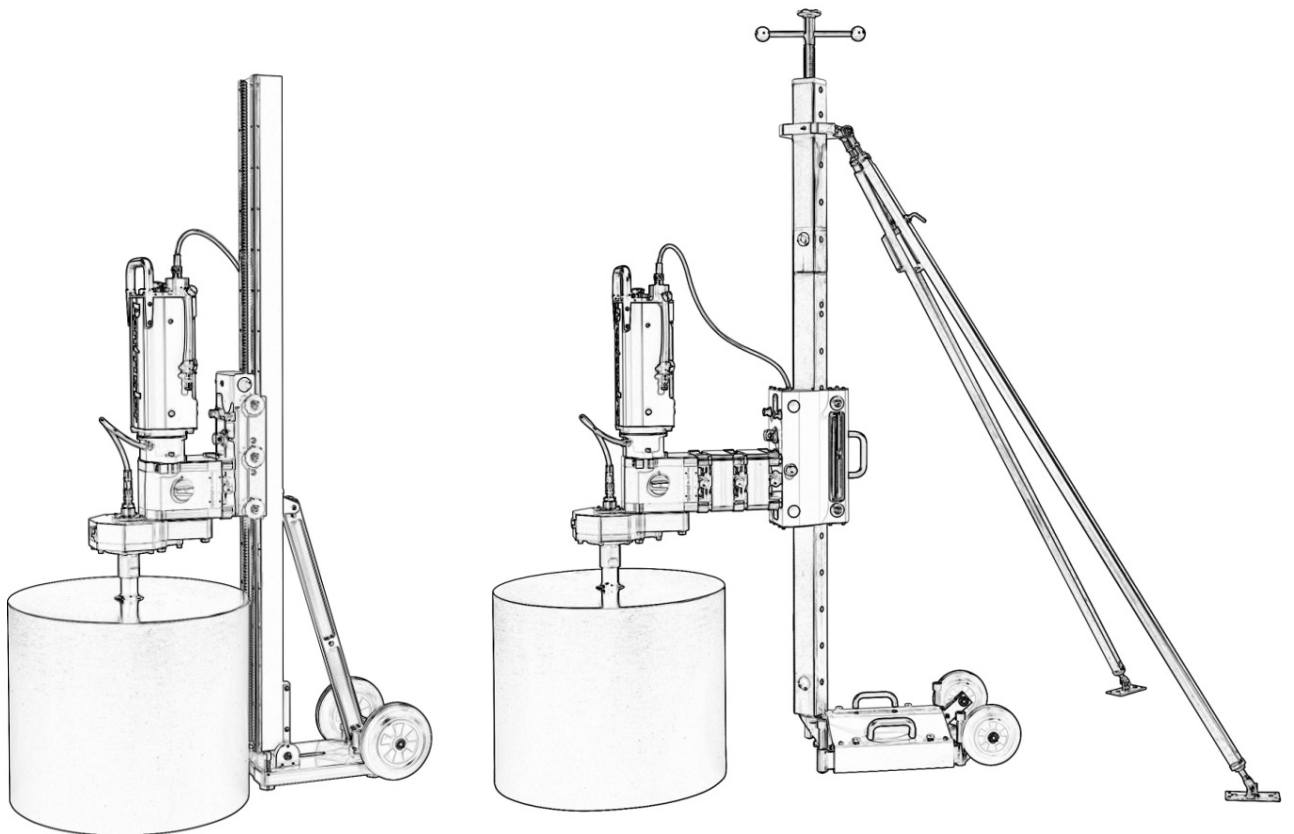


Operator's manual

Pentruder[®] MD1 Modular Drill System with MDU9 Drive Unit - NTGRA[®]



Pentrunder[®]

by **TRACTIVE**

Operator's manual for Pentruder® MD1 Modular Drill System with MDU9 Modular Drive Unit



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Support & Service document
Original instructions



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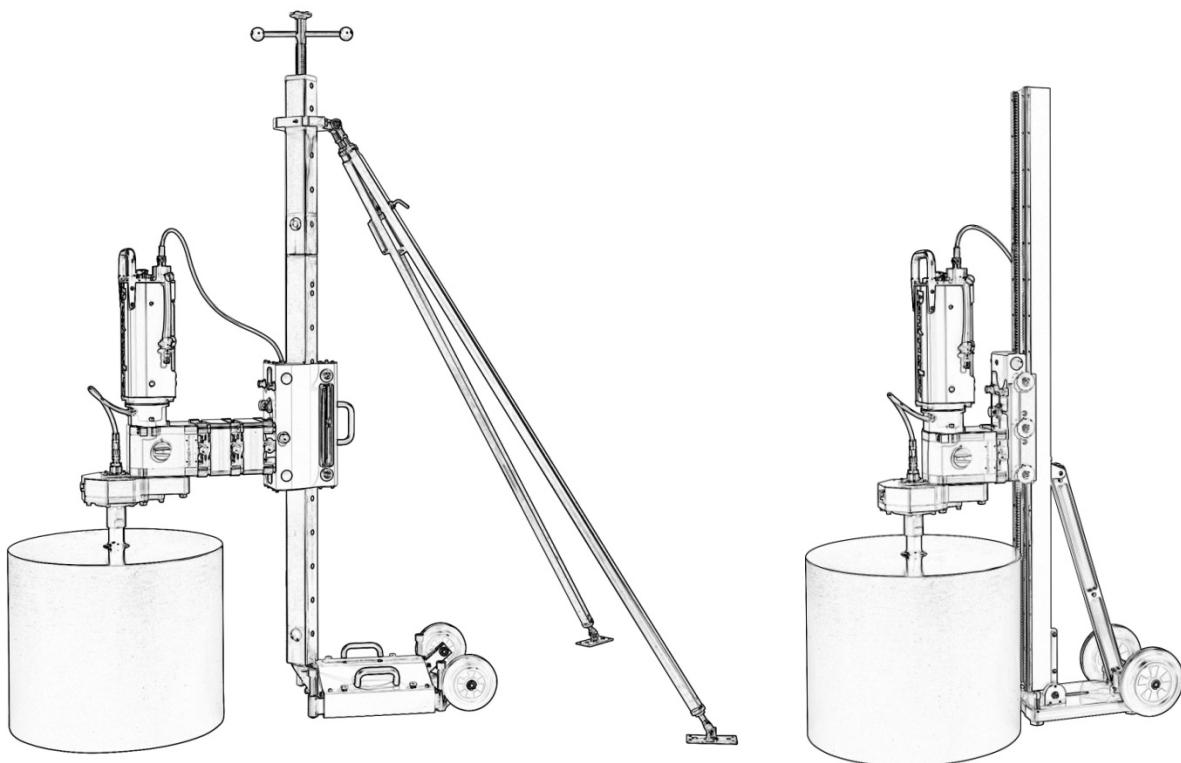
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1 Introduction

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. Please take careful note of the Safety Precautions.

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.



Product:

Pentruder® MD1 Modular Drill System with MDU9 Drive Unit

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. See description of the machine.

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2 Description of the machine

2.1 List of complete MD1 Modular Drill System with MDU9 Modular Drive Unit

A complete Pentruder CBK is comprised of at least

as described in this Operator's manual. Please note that a Pentruder MD1 Drill System with MDU9 Modular Drive Unit is not complete without the modules listed in this paragraph.

- One MG41 4-speed gearbox
- One ST3 (QDC-)Spindle unit for MG41
- One MDU9-HF-NTGRA® Modular Drive Unit
- One MDUMR-MG41 Adapter for MDU Modular Drive on MG41

Pentruder MD1 drilling machine can either be built on the wall saw track (MCCS) or on the 70 mm square column system. The drill rig systems cannot be combined.

Drill rig with 70 mm square column system

- One BE Base plate
- One CN Column
- One ET70 Eccentric bolt
- CE1-70 Carriage for 70 mm columns
- FE1 Friction clutch

Drill rig with wall saw track (MCCS)

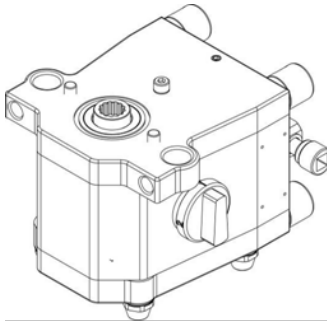
- One BTS Base plate
- One TS T-slot type Track
- CEG-M25 Carriage, gliding OR CER-M3-U Carriage, roller type

Accessories can and should be used for some jobs, especially when drilling with big diameter drill bits or when drilling deep holes.

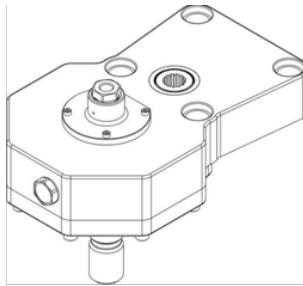
In the following operator's manual, "the machine", "drill system", "drilling machine" or MD1 is used to refer to the complete machine as listed in this chapter 2 Description of the machine.

2.2 Modules MD1

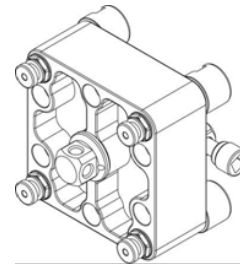
- MG41 4-speed gearbox
- ST3 (QDC-)Spindle unit for MG41 (quick disconnect coupling for drill bit optional)
- ERMD1 Extension Adapter for MD1 (Extends capacity by Ø 190 mm per adapter and up to 3 pcs can be used.) - Accessory



MG41



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 ST3 (QDC-)Spindle unit

The concept with exchangeable spindle units makes it possible to get a very wide spindle speed range with only one drilling machine. There is also a ST2 Spindle Unit with lower spindle speeds but it should not be used together with the MDU9 Drive Unit as the torque will be too high for the drill spindle. See chart on page 29 for spindle speeds with the MDU9 Drive Unit and ST3. The spindle units can be ordered with or without Quick Disconnect Coupling (QDC) for the drill bit.

2.2.3 ERMD1 Extension adapter MD1

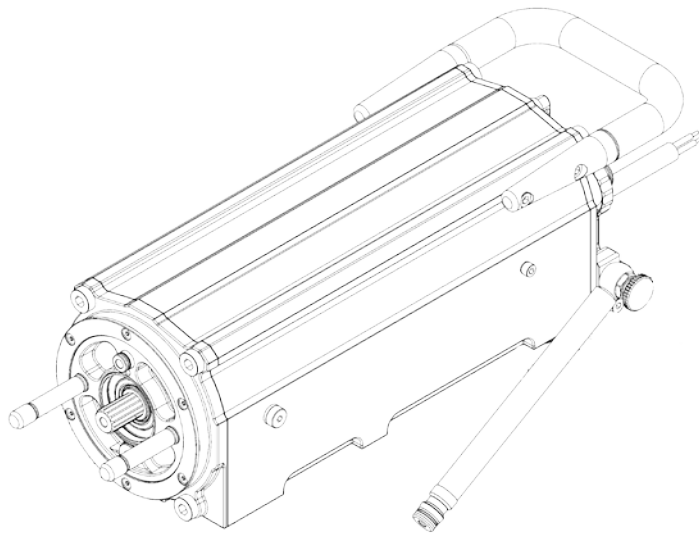
When drilling big diameter holes over Ø 600 mm (23.6") an extension adapter must be used to extend the distance between drill column and spindle, giving more clearance for bigger diameter drills. Each adapter extends the drill unit 90 mm (3.5") further away from the column, i.e. gives additional clearance for a 180 mm (7") bigger drill bit. Up to 3 pcs can be used together.

2.3 MDU9 Modular Drive Unit – NTGRA® and MDUMR-MG41

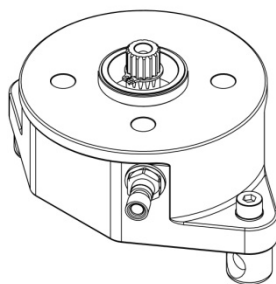
- MDU9-HF-NTGRA® Modular Drive Unit with up to 9 kW output power.
- MDUMR-MG41 Adapter for MDU Modular Drive on MG41.

The MDU9 Modular Drive Unit can either be used as “stand alone” unit which together with a spindle unit is bolted on any drill stand which is rigid enough to handle the high power of the MDU9.

The Modular Drive Unit accepts both a very wide input voltage range, 400-480 Volt 3-phase power and 230 – 250 Volt 1-phase power. To switch between 1-phase and 3-phase power all that is needed is an adapter cable. An adapter cable is used for 1-phase input.



MDU9-HV-NTGRA



MDUMR-MG41

2.4 Rig for MD1 Drill System with MDU9 - 70 mm column system

2.4.1 Standard modules for MD1 drill rig with MDU9 - 70 mm column system

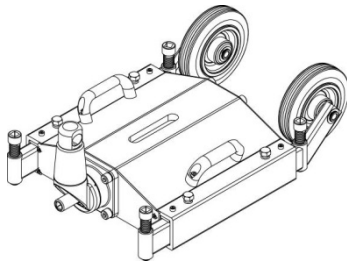
- BE1 Base plate fixed / BE2 adjustable quick disconnect coupling / BE6 Base plate with cut outs, fixed adjustable coupling
- CN Columns F/M-70 Female / Male coupling, extendable, 0.5 / 1.2 / 1.5 m
- CN Columns F/J-70 Female / Jack screw, 0.5 / 1.2 / 1.5 m
- CN Column Female / plastic cap, 2 m (only extendable at the bottom)
- ET70 Eccentric bolt for CN columns
- RST-CN-M Rear support for 70 mm column with male coupling, 2.1-3.2 m - accessory
- RST-CN-U Rear support for 70 mm column universal, fastened directly on the column, 2.1-3.2 m - accessory
- CE1-70 Carriage for 70 mm columns
- FE1 Friction clutch
- PD1/PD2 Pivoting head - accessory
- HK-1 Hand crank for CER and CEG carriages and MDU9 - accessory

2.4.2 Base plates for CN columns

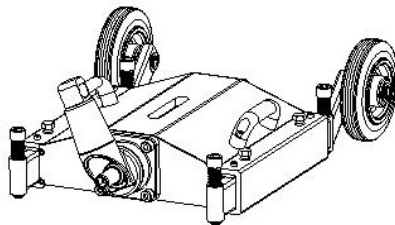
The BE1, BE2 and BE6 base plates are used with CN columns, TTFF or JTFF tracks.

On BE2 the conical quick coupling can be swiveled 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.

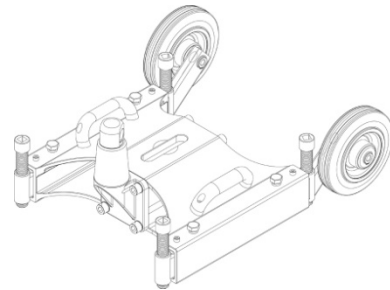
The columns fitted on the conical quick release coupling can be swiveled around its own axis, and great flexibility is offered to simplify set-up.



BE1



BE2 with swiveled column coupling



BE6

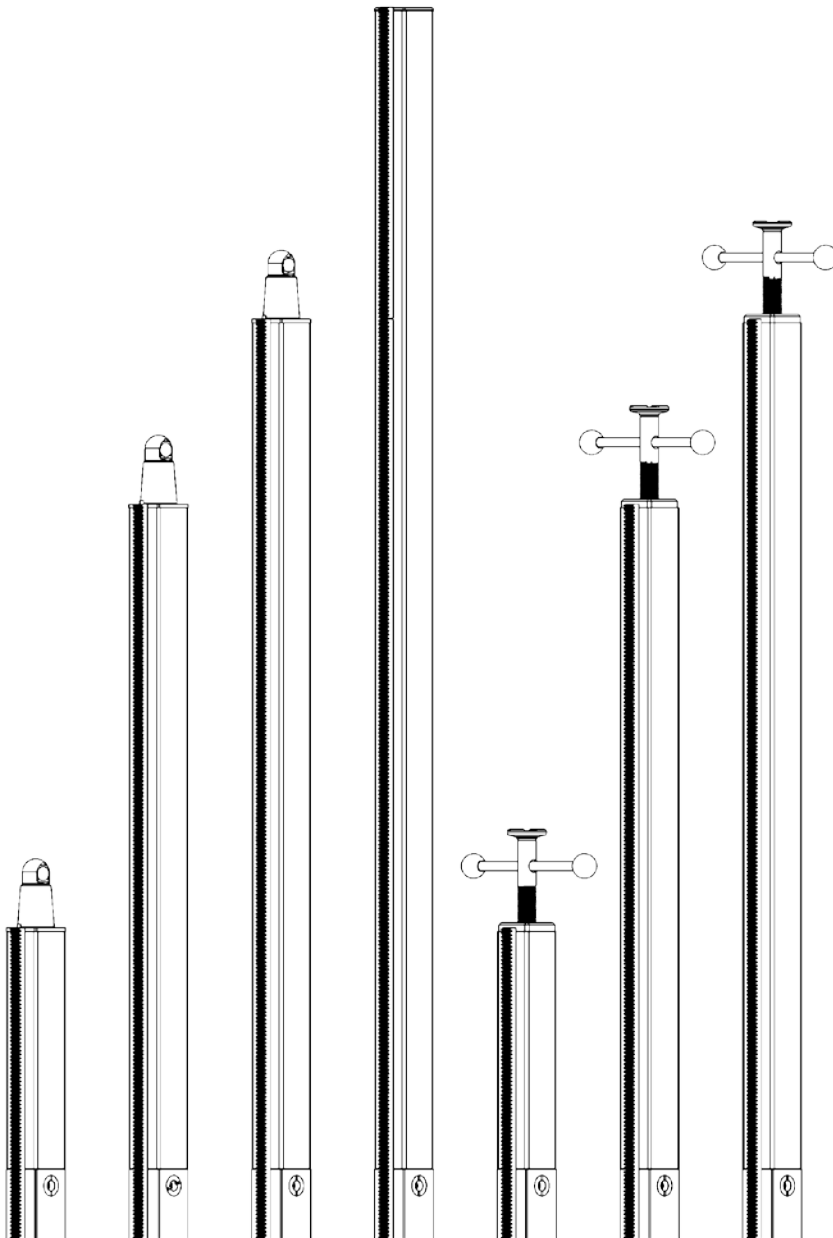
2.4.3 CN Columns

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.

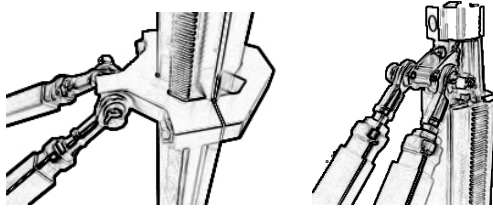
The CN F/M and CN F/J columns are available in three lengths, 0.5 m, 1.2 m and 1.5 m.



CN 0.5 F/M, CN 1.2 F/M, CN 1.5 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.

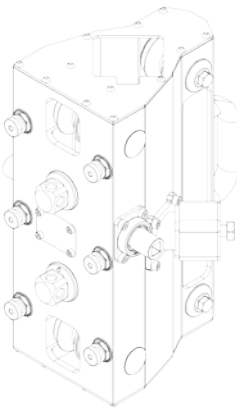


RST-CN-U

RST-CN-M

2.4.5 CE1-70 carriage and FE1 Friction clutch

The MD1 drill system with MDU9 Modular Drive Unit is fed manually. To prevent the carriage from sliding on the column there is a friction clutch fitted on the carriage.



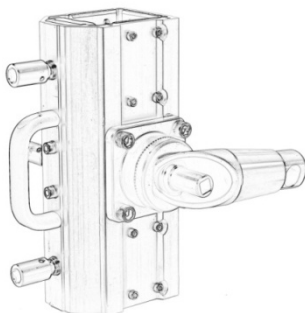
CE1 with FE1 Friction clutch

2.4.6 Pivoting head

- PD1/PD2 Pivoting head

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

2.5 Rig for MD1 Drill System with MDU9 - Saw Track (MCCS)

2.5.1 Standard modules for MD1 drill rig with MDU9 – Saw track (MCCS)

- BTS-3 Base plate for TS type tracks, triangular, 220 x 320 mm
- BTS-4 Base plate for TS type tracks, rectangular, 220 x 320 mm
- BTS-5 Base plate for TS type tracks, heavy duty, rectangular, 280 x 400 mm
- WT-BTS-4 Wheels for BTS-4 - accessory
- 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 - accessory
- CEG-M25 Carriage, gliding. Manual feed. Reduction 25:1
- CER-M3-U Carriage, roller type, MD1 QDC coupling. Manual feed, reduction 3:1
- HK-1 Hand crank for CER and CEG carriages - accessory

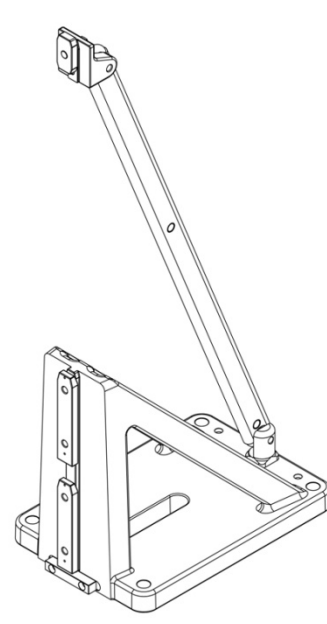
2.5.2 Base plates BTS-3 / BTS-4 / BTS-5 - MCCS



Base plate BTS3



Base plate BTS-4



Base plate BTS-5

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

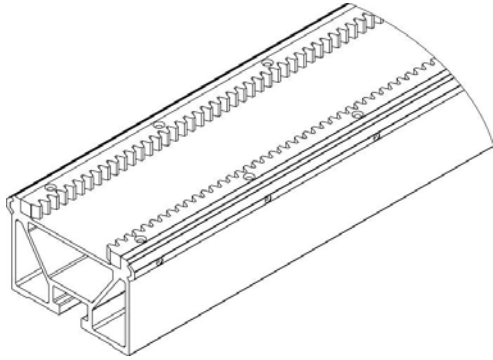
The BTS3 with only three leveling screws is not recommended for heavy drilling and for drilling with the drill spindle turned to one side. It is excellent for light duty drilling and in several other applications where side loads do not occur.

The BTS-5 is recommended for heavy duty drilling.

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.

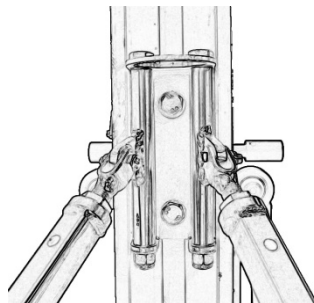
The TS tracks are available in the lengths 0.85, 1.15, 2, 2.3 and 3.45 m and the weight is 6.95 kg per meter.



TS Track

2.5.4 RST-TS1 Rear support

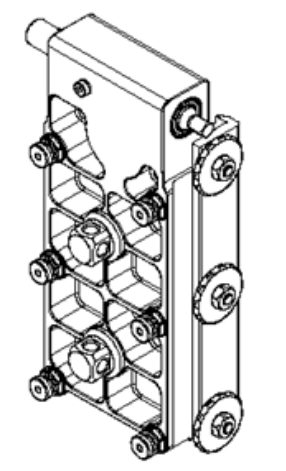
The RST-TS1 rear support is fastened on TS track with a t-slot profile (which also is used together with the track feet for the Pentruder wall saws). The rear support is 2.1 meter long when fully pushed in and can be pulled out to a length of 3.2 meters.



Rear support RST-TS1

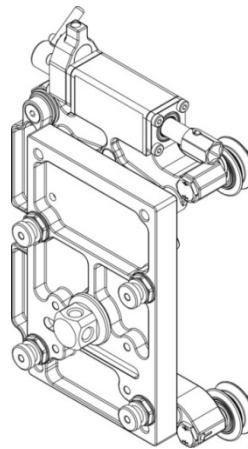
2.5.5 CEG/CER Carriages - MCCS

The MG41 gearbox and ST spindle units can be used either with a CEG gliding carriage or a CER roller carriage.



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.

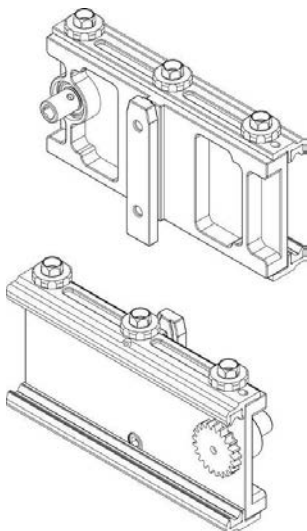


CER-M3-MD1 with manual feed

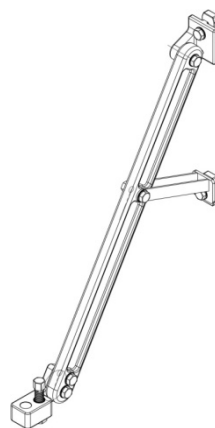
Carriage with tapered rollers like on the wall saws.
Manual feed.
Coupling for MD1 drilling machine.
Gear ratio 3:1

CEG and CER carriages for Pentruder MD1 drilling machine with MDU9 Modular Drive Unit

2.5.6 CEL-TS Carriage line and corner drilling



*CEL-TS Carriage line and corner drilling
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 drilling machine



WARNING!

The drilling machine may only be used for core drilling in concrete, masonry or similar materials. Other use is non-intended and therefore to refrain from.



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 or 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 MD1 Modular Drill System 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 drilling machine 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. The 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 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.
 - 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 400V power cable.
 - 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.
-

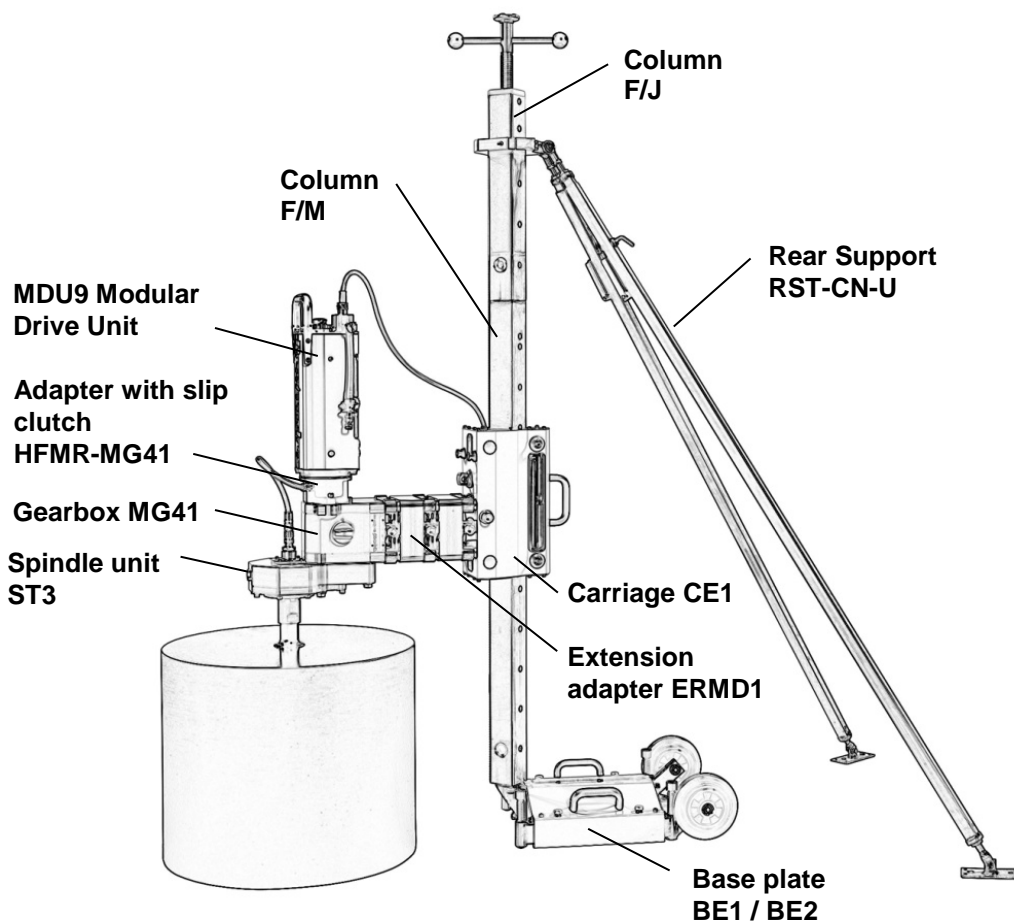
- Only connect the power pack to the Pentruder drill system or such equipment which has been manufactured or approved by Tractive AB.
 - Should the drilling machine fall down from the ceiling it could cause severe injuries. Keep away from the working area of the drilling machine.
 - Don't use any extension 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 main HF-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.

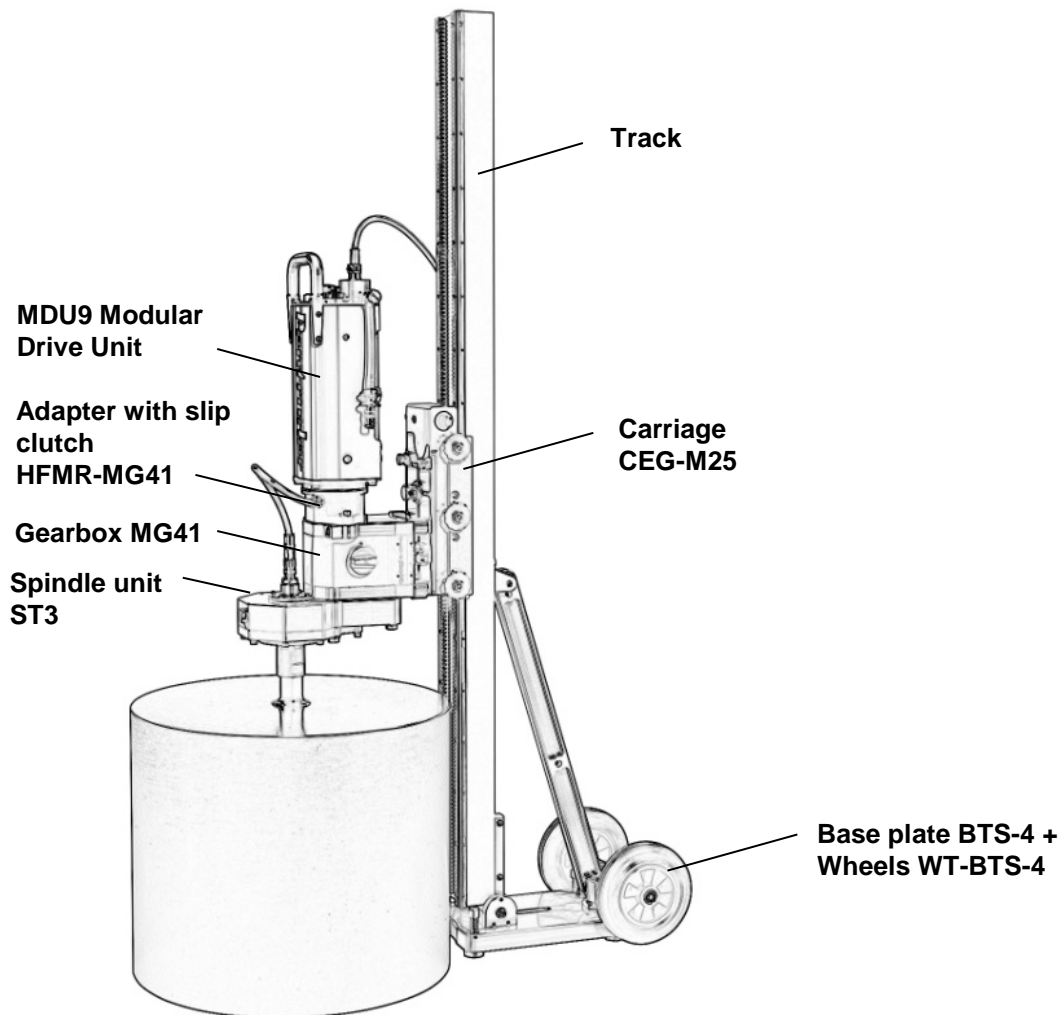
4.1 Overview Pentruder MD1 with MDU9 Modular Drive Unit and 70 mm column system

*MD1 drilling machine with MDU9 Modular Drive Unit and 70 mm column system drill stand.
Other combinations of modules are possible.*



4.2 Overview Pentruder MD1 with TS track (MCCS)

MD1 drilling machine with MDU9 Modular Drive Unit and MCCS drill stand.
Other combinations of modules are possible.



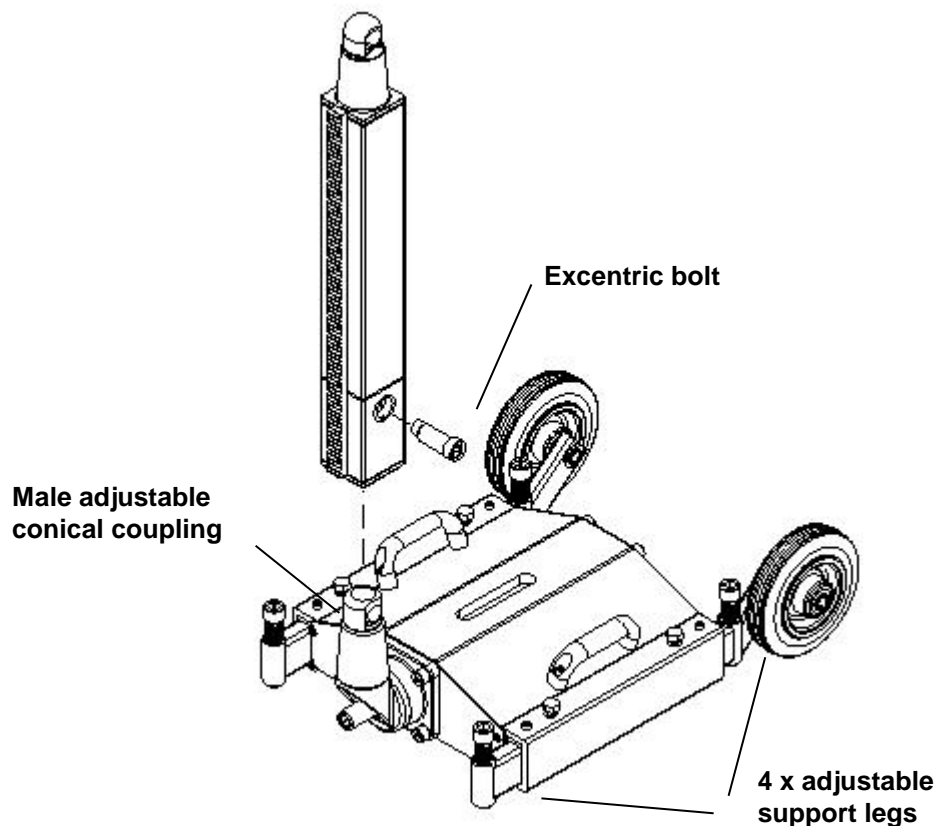
4.3 Equipment needed for drilling

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.
- **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



Assembly of BE base plate- and 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 using two anchors of M16 size to fasten the base plate.
3. Fit the column on the base plate.
4. Pull out the support legs 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.

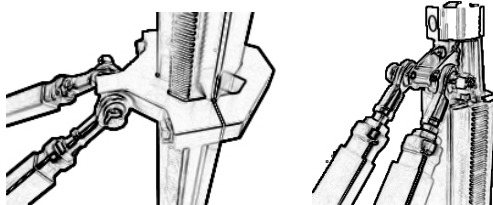


Important!

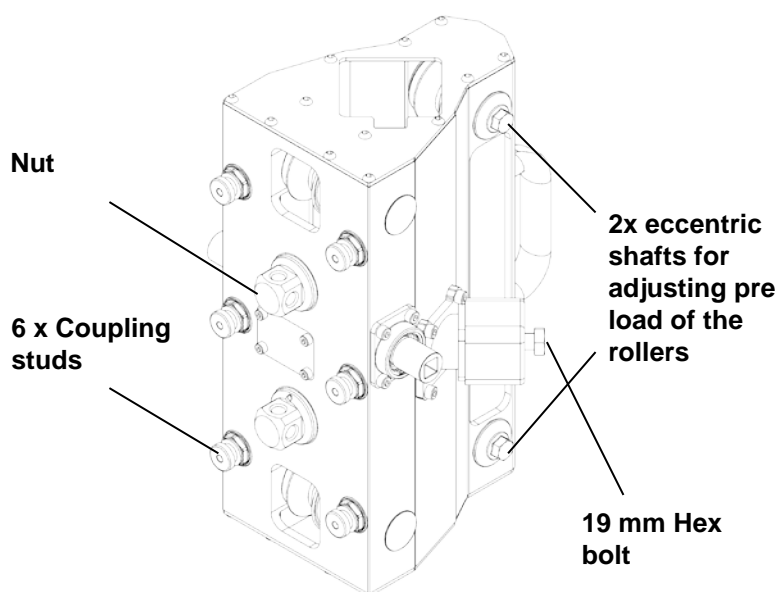
- Never hit the column into position with a hammer or the like.

4.4.2 Rear 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



CE1-70 carriage with friction brake

1. Loosen the socket on the hydraulic feed unit or the 19 mm Hex bolt 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 ½" 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.

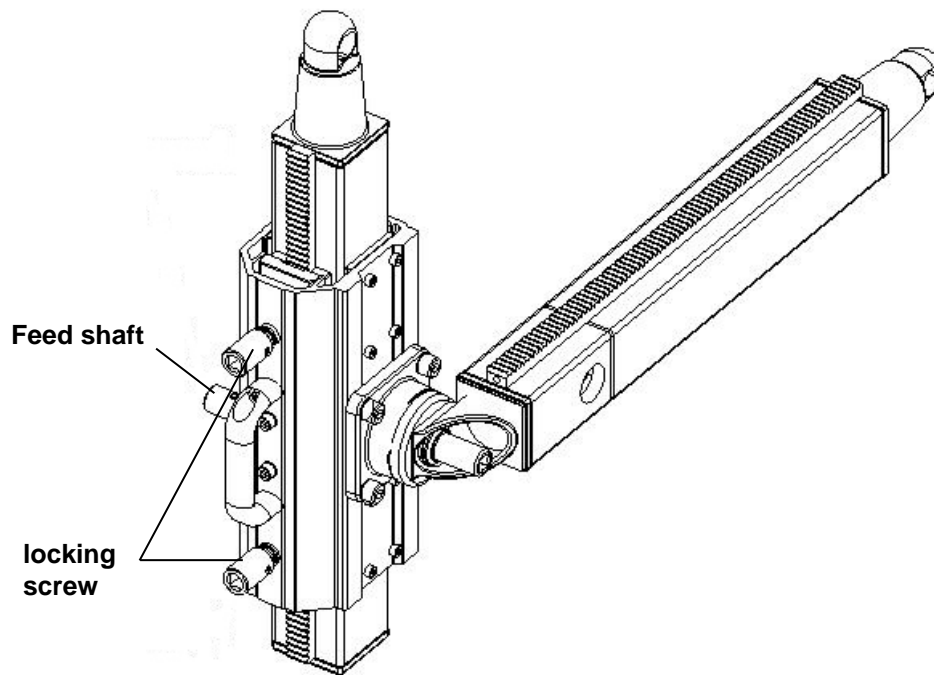
The drill unit (gearbox, spindle unit and hydraulic motor) can mounted on the carriage with the drill spindle pointing in both directions along the column. Note that the drill unit can be mounted in two positions along the carriage.



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



Pivoting head-PD1 with assembled column.

1. Mount the pivoting head on the column.
2. Tighten the locking screws so 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.
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 $\frac{1}{2}$ " handle or ratchet.
6. Now you can mount the carriage on the horizontal column, see mounting of carriage CE1 on page 21.



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 sequence of MCCS drill stand

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

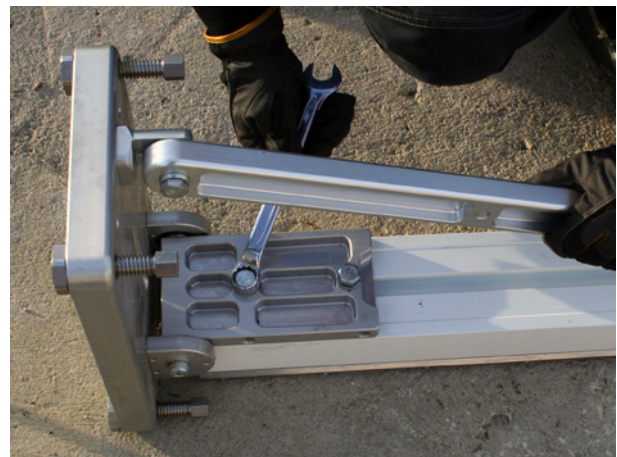
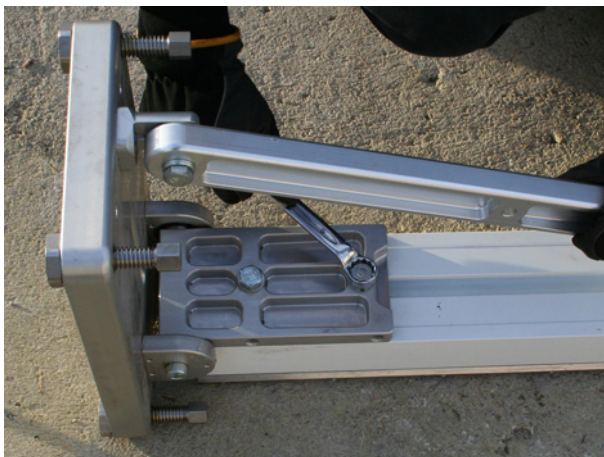
4.5.1 Mounting the track on the base plate

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 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 carriages, gliding type carriages

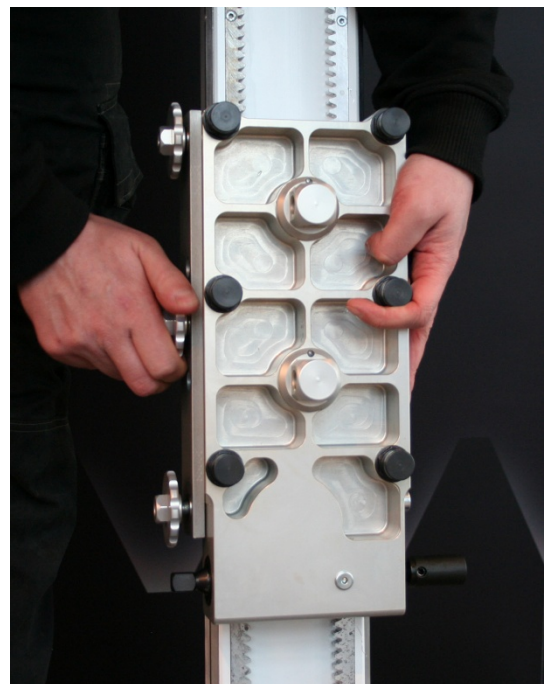
1. Open the three clamp nuts.
2. Put the carriage on the track as shown in the picture and align the feed gear with the rack on the track.
3. Tighten all three clamp nuts firmly first by hand and then with a 19 mm spanner to be firmly tightened, but not solid.



Note! Tighten firmly, but do not over tighten!



Note! The steel liner on the track and the green nylon slide on the carriage has to be clean before drilling is started. Lubricate the green nylon slides with some oil or fat.



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.

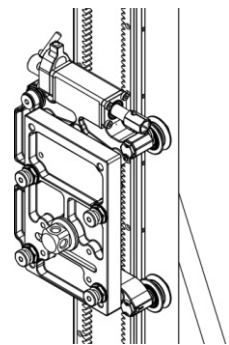


b. Neutral position, used when drilling.



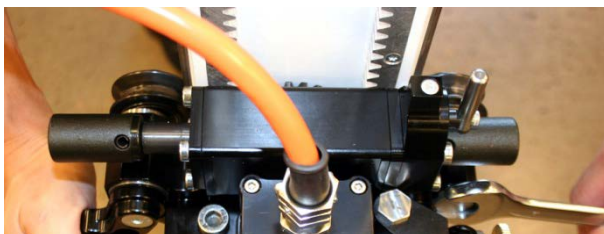
Important! When mounting the CER carriage on the track it is important to don't let go of it until you are sure the latch is in a position so the drill motor cannot unintentionally slide along the track, see pictures above.

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 CER-carriage 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 when the drill rig is mounted for vertical drilling downwards.

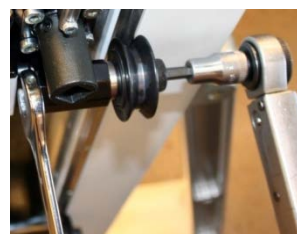


4.5.5 Adjusting the rollers on CER carriage

To avoid play between the carriage and the track, the eccentric rollers need to be adjusted at regular intervals.



- a. Open the upper handle. Then turn the handle inwards at the same time using a 19 mm wrench to tighten the screw for the eccentric roller on the other side. The rollers should be fairly hard adjusted on the track to remove all play.



- b. Use the 19 mm wrench and a torque wrench with a 6 mm hexagon to tighten the bolt to 38 Nm.
- c. Do the same procedure for the lower rollers.

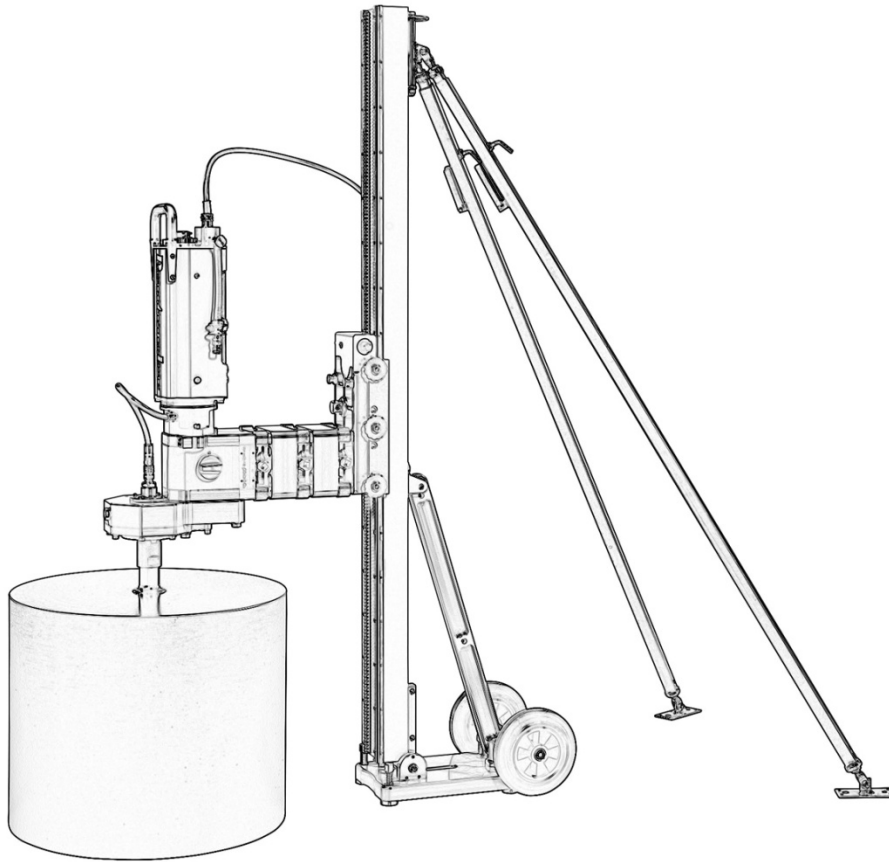


Important!

Do not over tighten the screws, as this may damage the thread.

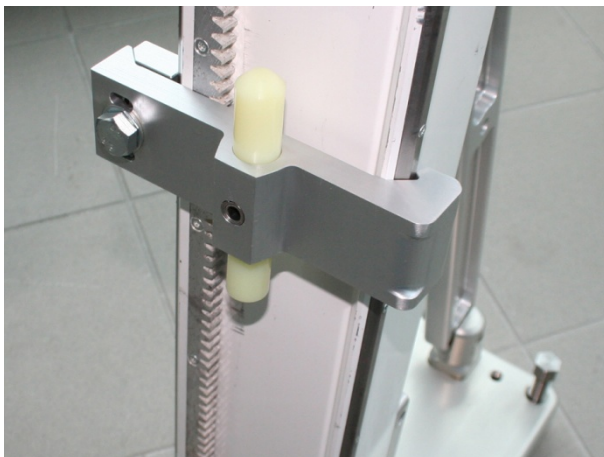
4.5.6 Rear support for TS Track

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.



Pentruder MD1 Drill System with two ERMD1 extension adapters, TS Track, BTS-4 Base plate with wheels and RST-TS1 Rear Support

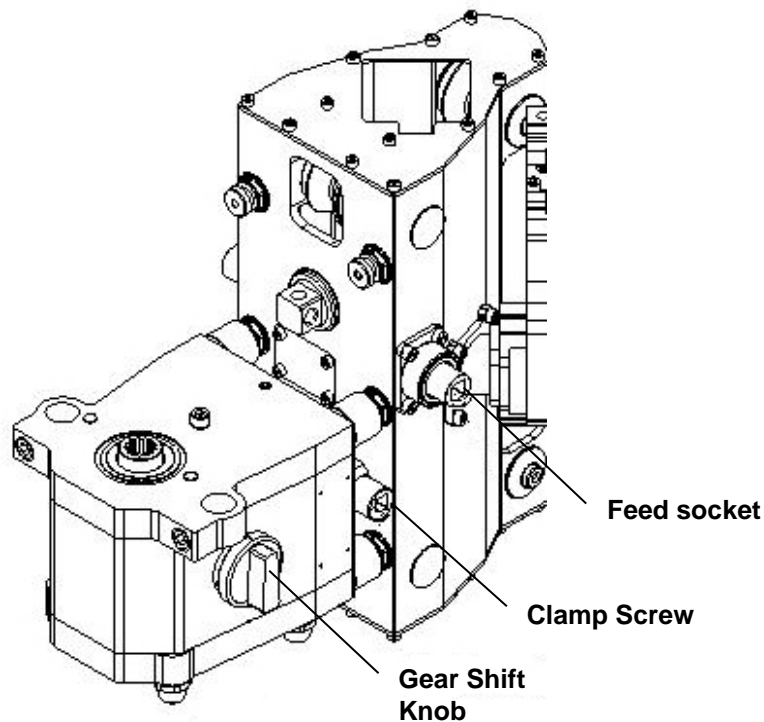
4.4.3 Track stop (accessory)



The track stop can be used as stop when setting the drill depth.

4.6 Mounting of MD1 modules

4.6.1 Mounting of MG41 4-speed Gearbox



Gearbox - MG41 mounted on the carriage - CE1-70

The Pentruder MD1 drill system has a 4-speed gearbox to offer a wide speed range for various drill bit diameters. Together with the MDU9 Drive Unit – NTGRA there is a very wide range of spindle speeds available. Please see the chart on page 49 for spindle speeds and page 50 for peripheral speeds with different sizes of drill bits.

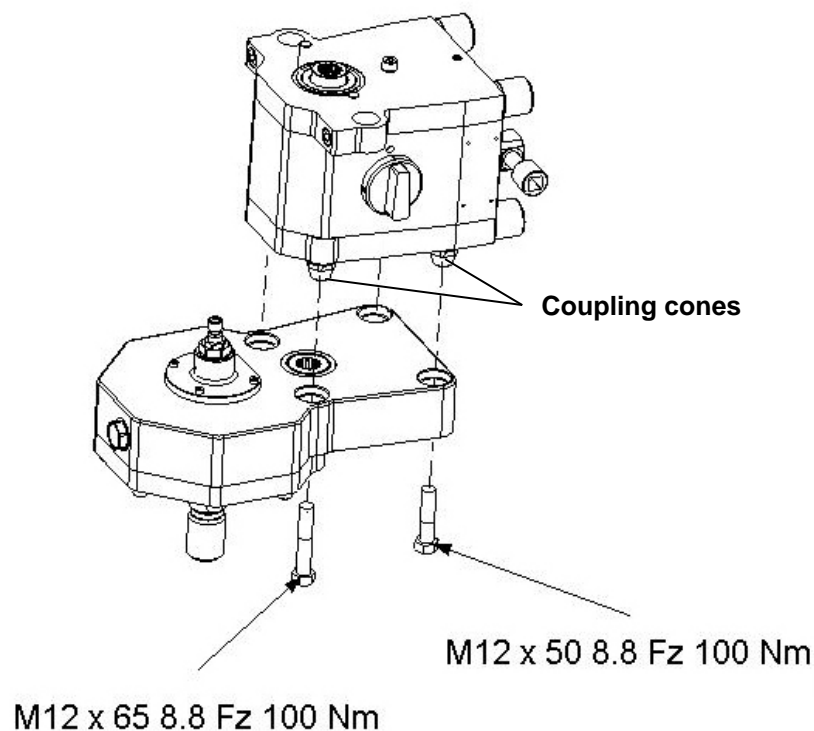
Mounting the gearbox on the carriage or extension adapter

1. Mount the gearbox on the quick release couplings on the carriage or the extension adapter. The quick release couplings make 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 feed unit.



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

4.6.3 Mounting of Spindle unit - ST3



Spindle unit ST3 and gearbox MG41.

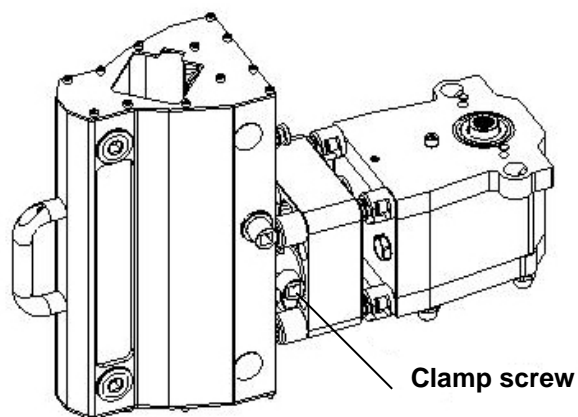
1. Clean the coupling cones thoroughly.
2. Mount the spindle unit on the gearbox and tighten the screws to 100Nm.

Please see the chart on page 49 for gears and spindle speeds and page 50 for peripheral speeds with different sizes of drill bits.

4.6.4 Mounting of extension adapter

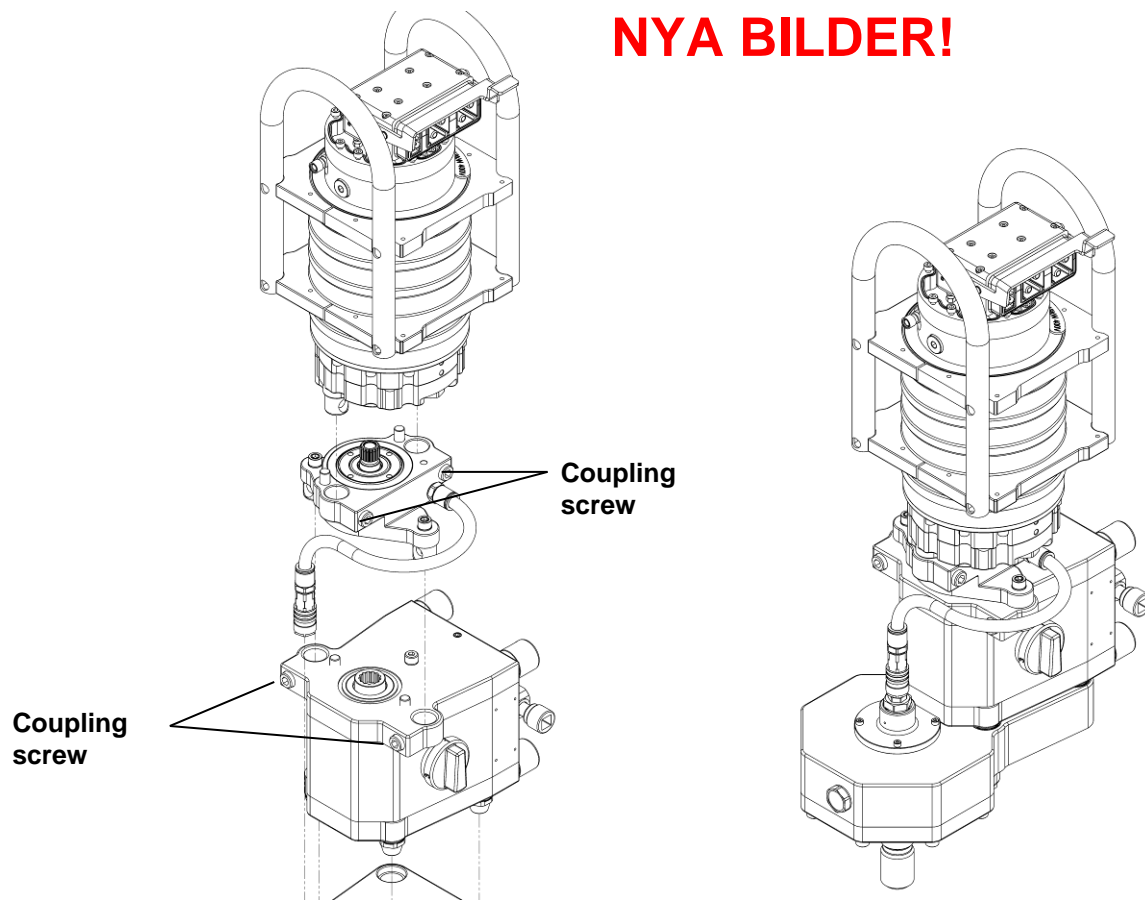
1. Mount the extension adapter on the quick couplings on the carriage. Screw the clamp screw into the nut on the carriage. Don't over tighten as the thread in the nut can be damaged.
2. Fit the gearbox.

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



Extension adapter ERMD1 mounted between carriage CE1 and gearbox MG41

4.7 Assembly of MDU9 and MDUMR-MG31 Adapter on MG41 Gearbox

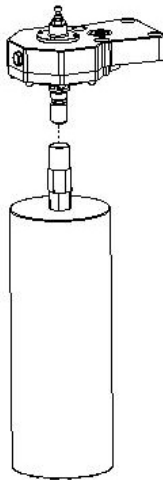


Positioning MDU9 Drive Unit on MDUMR-adapter

4.7.1 Mounting of MDU9 Modular Drive Unit and MDUMR-MG41 adapter on the gearbox

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

4.8 Drill bit



Drill bit positioned to be fitted on the spindle unit - 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 spindle unit produces 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.



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.
-

5 Drilling

5.1 Preparations before commencing work.

5.1.1 Checking the equipment

All functions should be checked and found normal before use of the machine. Don't use the machine if some part is damaged or if the operation control doesn't work properly.

Make sure that the drill bit runs true and is not damaged, for instance that no segment is missing.



Important! Check red STOP push button and Stop button cover

Check the STOP Button and Stop Button cover for damage, every time the machine is used. If there is any damage to the button or the cover, it must be replaced before the MDU9 Drive Unit is used again, or the warranty will be void. Please contact your service workshop for service.

5.1.2 Water feed

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

5.1.3 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: A 19 mm key is enough for normal set up
- Level: To mount the column correctly at set up and control during drilling.
- Measuring tape: Positioning of base plate in relation to cored hole.
- Cables and electrical plugs: When needed, extension cables 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.

5.1.4 Power supply

Check if sufficient power is available on the site. The machine must be connected AC 50Hz – 440Hz from 200V to 480V. Use the adapter cable to connect to 1-phase 200 V input power.



WARNING!

All the safety instructions in chapter 3 must be taken into account and followed.

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 red STOP button on the machine is working.



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.

5.2 How to operate the Pentruder MDU9 Drive Unit - NTGRA®



WARNING! All the safety instructions in chapter 3 must be taken into account and followed.



Note!

The Power and Motor LED's will help the operator to use the machine efficiently. Consult the MDU Drive Unit Indication chart on page 38.



5.2.1 Connect to input power

The Pentruder MDU9 Drive Unit - NTGRA® can be connected to both 1-phase and 3-phase power. The European and USA version of the MDU9 Drive Unit can operate in this voltage range: AC 50Hz – 440 Hz from 200V to 480V.



- To connect to 230 – 250 Volt 1-phase power input, use the adapter cable seen above.
- The motor will recognize what power it is connected to with one green flash on both LED's and 4 short beeps.
- Then, the P- and M-LED's will be blinking alternatively green for 230 – 250V 1-phase supply power and blue for 400-480V 3-phase supply power. This indicates that the input power is ok and that the motor is waiting for the start key to be inserted.

See MDU9 Drive Unit Indication chart on page 38 **How motor load is indicated on the Motor and Power LED** for more information on the LED's.

5.2.2 Start key

Each Pentruder MDU Core Drill - NTGRA® is delivered with 4 start keys with a serial number corresponding to the machine serial number.



- a. Insert the correct start key with a serial number corresponding to the machine serial number.
- b. When the key is identified as the right one, there will be 3 short beeps and both LED's will indicate a steady green light (supply voltage in 200-240V range) or steady blue light (supply voltage in 400-480V range).

If the key is already inserted when the power is connected, the LED's will first indicate for the power and then for the key.

See MDU Core Drill Indication chart on page 38 **How motor load is indicated on the Motor and Power LED** for more information on the LED's.

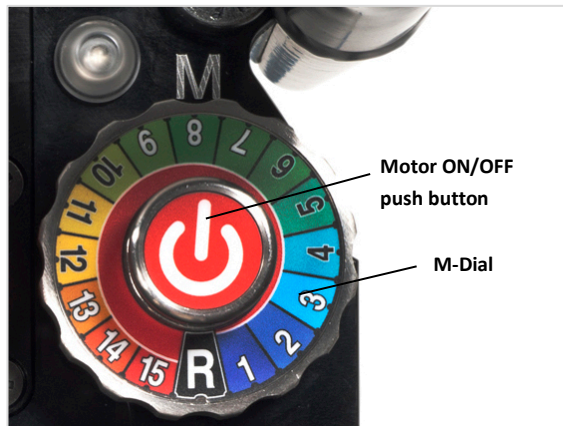


Note!

If the start key has been identified, it can be removed from key hole and the machine can still be started and stopped over and over again. If the supply power is removed, the unit is only operational again once the start key is inserted.

If the red Stop button has been pushed in and hasn't been released before the MDU core drill is connected to power, the LED's will both flash red.
Before the start key has been inserted and recognized, the red Stop button will have no function.

5.2.3 Changing gear - Spindle with Spindle Unit ST3 and MG41 Gearbox and different sizes of drill bits



Change gear/speed on the MDU9 Drive unit with the M-Dial. The suitable spindle speed varies with the drill bit, type of concrete and amount of rebar.

There are totally 29 electronic gears on the MDU9 Drive Unit – NTGRA. Combined with the 4-gears on the MG41 Gearbox there is a very wide spindle speed range available.



Note!

The spindle speed can be adjusted up and down during drilling. For optimal performance, try different spindle speeds until the core bit cuts well and the drilling goes fast and smooth without vibrations. A high spindle speed and peripheral speed can often be very efficient but it is important not to use too high feed power in steel.



Note!

The output power of the MDU9 Drive Unit - NTGRA® varies with the motor rpm. Take care to study the charts on page 49 and page 50 before starting to drill.



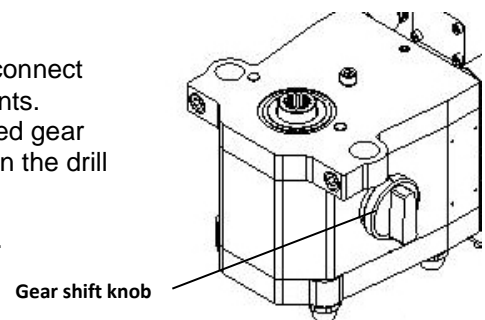
Note!

When in 1-phase mode, never directly start the spindle in speed position 11 or higher. Set the M-dial to position 10 and let the motor accelerate up to speed. Then set the desired spindle speed. This procedure will avoid weakened automatic fuses from tripping. Some automatic fuses have these problems, some don't.

Gear change MG41 Gearbox

Switch off the MDU9 Drive unit with the motor On/Off button. Disconnect the cable to the MDU9 Drive Unit to prevent unforeseen movements.

1. Push and turn the gear shift knob on the MG41 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.
2. Connect the cable again and start the MDU9 Drive 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.



WARNING!

- To avoid uncontrolled movement of the drill bit or carriage, always disconnect the cable to the MDU9 drive unit before changing drill bit.

5.2.4 Power restriction



To restrict the load/power, eg. when drilling with a small drill bit or a drill bit with too weak segments, set the Power Dial and push the Power ON/OFF push button to activate this function. The dial is graduated in the following steps: 15 / 30 / 45 / 60 / 75 / 90 / 100 % and R. R is only used when the drill motor is equipped with automatic feed.

The Power LED will show a pink/blue light when the power restriction is active.

Example: If the power dial is set at 50%, the drill motor will only have 50% of the maximum motor power available on the spindle.



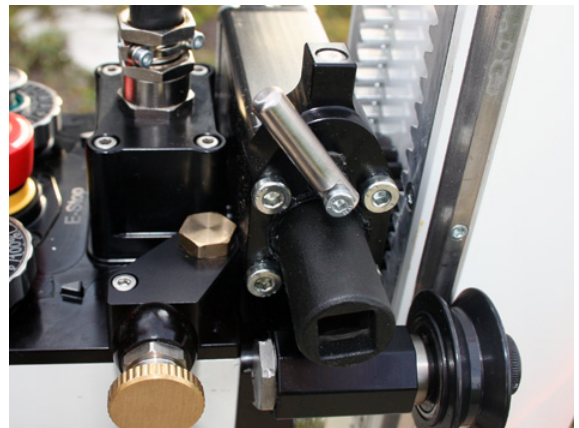
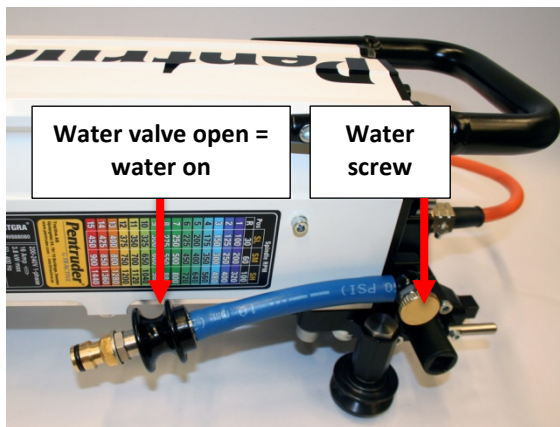
Note! In most cases, there is no need to use the Power Dial and power restriction at all. Use this function to protect smaller and more fragile drill bits from overload and resulting damage by decreasing the maximum available motor power.



Note!

The MDU9 can put up to 9 kW power on the drill bit in 3-phase mode, and overloading a small drill bit is easy and will inevitably destroy or damage the drill bit.

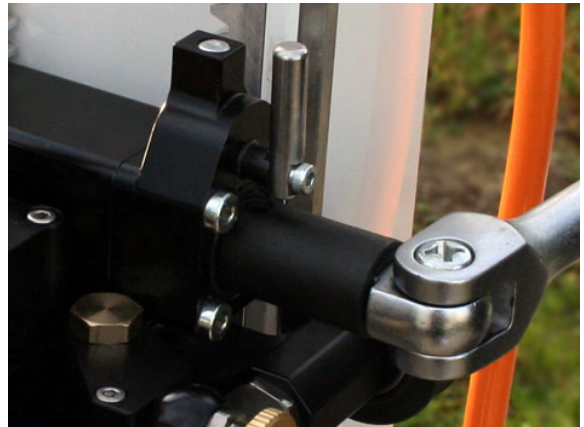
5.2.5 Starting the Pentruder MDU9 Drive Unit



a) Check that the water is on and that there is a sufficient water flow. The water flow can be adjusted with the water screw.

b. Make sure the drill bit runs true and is not damaged, for instance that no segment is missing.

c. When using the CER-M3-MD1 carriage, make sure that the latch is in the locked position, see page 26.



- c. Press the Motor ON/OFF button to start the spindle.
- d. When using the CER-M3-MD1 carriage, put the latch in neutral position to be able to move the drill motor both downwards and upwards.
- e. Use either the HK-1 hand crank or a Knuckle bar 400 mm 1/2" to move the MD1 Drill System downwards or upwards on the track or column.
- See 5.2.9 Drilling with a big or long drill bit for important advice on the drilling procedure.



WARNING! Danger of life!

To drill in to a power line can be lethal. The drill motor can be energized. A circuit breaker will not protect against this hazard.



WARNING! Danger of life!

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



Important!

- Don't use a ratchet for feed as it cannot be used in both directions. Feed the machine per hand. Don't use any lever or extension to get a higher feed power.
- If material should get stuck between the drill bit and the wall of the drill hole, shut off the drill motor 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 defective drill bit!

5.2.6 Monitoring the load when drilling using the LED's on the MDU9



a. When the Motor ON/OFF button is pushed and the spindle is started, the M-LED will help the operator to drill with optimal load, i.e. to apply optimal feeding power and utilize the full power of the drill motor. See chart below.



b. The drive unit can be run with red LED for some time and will shut off automatically if overloaded and both LED's will show a steady red light. Push the Motor ON/OFF button to start the motor again.

5.2.7 How motor load is indicated on the Motor and Power LED

LED-Indication	Power LED		Motor LED	
	Frequency	Color	Frequency	Color
3-phase mode 400V: Load is between 0 – 80% of maximum output power	-	-	Steady	Blue
3-phase mode 400V: Load is between 80-100% of maximum output power	-	-	Steady	Pink/Blue
3-phase mode 400V: Load is 100% or over maximum output power	-	-	Steady	Red
1-phase mode 230V: Load is between 0 – 80% of maximum output power	-	-	Steady	Green
1-phase mode 230V: Load is between 80-100% of maximum output power	-	-	Steady	Green/Yellow
1-phase mode 230V: Load is 100% or over maximum output power	-	-	Steady	Red
3-phase and 1-phase mode: MDU Drill motor is shut off due to overload	Steady	Red	Steady	Red
M-Dial is set at R - Reverse	Steady	Light blue	Steady	Light blue
Power restriction is active	Steady	Pink/Blue	Steady	Depending on what % is set, the Motor LED will indicate the load as above.

5.2.7 Drilling at an angle

When drilling at an angle it is important to only use a low feeding power until the whole drill bit diameter is in the drilled material. See also 5.2.9 Drilling with a big or long drill bit.

5.2.8 Drilling through iron

When hitting iron, we recommend keeping the spindle speed as it is or just turn it down a little and use less feeding power than in concrete. Make sure that the water flow is quite high when drilling in iron. By using less feeding power but relatively high speed and having enough water, the drill bit will not be overloaded.

5.2.9 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 rear support and the track / column.
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. **Make sure the carriage is properly adjusted to the track / column.** This will eliminate play.
CE1-70 carriage for square column: See page 21, 4.4.3 Mounting of carriage CE1 on 70 mm column.
CER-M3-MD1 roller carriage: See page 26, 4.5.4 Mounting of CER carriage, roller type carriage with manual feed.
CEG-M25 carriage, make sure the three clamp nuts are firmly tightened, but not solid. Clean and lubricate the steel liner on the track and the green nylon slide on the carriage before drilling is started.
4. **Clean and lightly grease** the Quick disconnect coupling on the ST3 Spindle Unit (if a QDC is used), both QDC-adapter and the threads in the drill bit thread adapter (if used). If a fixed spindle is used this should also be cleaned and lightly greased as well as the thread on the drill bit or thread adapter (if used).
5. **Start approaching the wall with the drill bit, with a much reduced speed of the drill bit** by using a low gear. Do not use full speed to start with. 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 of the track/column.
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 puts out enormous torque (see chart on page 46), 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.

5.2.10 Stopping the drill motor / spindle rotation



- a. To stop the drill motor, press the Motor ON/OFF button (M) once.



Note! If the Motor ON/OFF button is pressed again, when the motor is slowing down but still rotates, nothing happens. The Motor ON/OFF button has no influence on the motor operation until the motor has stopped completely.

The red Stop button can also be used to stop the motor operation. If the red Stop button has been pushed in, both LED's will flash red and there will at the same time be a beeping sound. Pull out the red STOP button and start the drill motor with the motor On/Off button.

5.2.11 Reverse gear

The reverse gear is practical to use to thread on and off the drill bit.



- a. To select Reverse Gear, first select "R" on the M-dial. If already running, the spindle will be stopped.



- b. When the spindle has stopped, push the motor ON/OFF button and the spindle slowly starts in reverse direction, with limited torque. Sometimes it happens that the reverse will not start when the start button is pressed. Then the drill spindle/drill bit must be turned slightly and then the push button is pressed again. If necessary repeat this procedure until reverse starts.

Both LED:s will be light blue.

5.2.12 Service Alert – Indication to operator that it is time to send the unit for service**Note!**

After every 180 running hours the machine should be brought to your authorized service workshop for service.

When the machine has been running for 180 hours, when power is connected, and after transponder key has been inserted and confirmed with green or blue color, both LED's will start flashing with 5HZ red color for 30 seconds and motor makes a 1 sec whistle.

5.2.13 MDU Drive Unit - NTGRA® - Indication chart - 3-phase input power

LED-Indication – 3-phase mode 400-480 V Input power	Sound	Power LED		Motor LED	
		Frequency	Color	Frequency	Color
Motor is connected to power but the key is not yet inserted	4 short beeps	1 flash	Green	1 flash	Green
3-phase mode 400-480 V Power ok, waiting for key	-	Alternatively flashing	Blue	Alternatively flashing	Blue
MDU is connected to power and key is inserted					
3-phase mode 400-480 V Power ok, Key is identified	3 short beeps	Steady light	Blue	Steady light	Blue
Key cannot be identified Power ok	1 sec beep	Steady light	Red	Steady light	Red
Supply voltage is less than 350V	-	One flash per second	Blue	One flash per second	Blue
One phase is missing	-	Alternatively flashing	Blue and Blue/Red	Alternatively flashing	Blue and Blue/Red
3-phase mode 400-480V: Motor ON/OFF push button has been pressed once and motor has started	-	-	-	Steady light	Blue
M-Dial is set at R - Reverse		Steady	Light blue	Steady	Light blue
Power restriction is active	-	Steady	Pink/Blue	Steady	Depending on what % is set, the Motor LED will indicate the load.
Motor has been shut off due to overload. See 4.3.6.	-	Steady	Red	Steady	Red
Motor has been shut off due to overheating	-	-	-	Steady	Red
Red Stop button has been pressed	Beep in pace with flash*	Flashing in pace	Red	Flashing in pace	Red
Internal drill motor test found a hardware problem. The drill motor cannot be started. Please contact your service workshop	1 second beep	Alternatively flashing	Red and Blue	Alternatively flashing	Red and Blue
Motor cannot start because of overheating					
Service alert. The drill motor has been running for 180 hours and should be sent to service.	1 second beep	Five flashes per second for 30 seconds	Red	Five flashes per second for 30 seconds	Red

*No beep if the red stop button was pressed before power was connected (programming mode).

MDU Core Drill NTGRA® - Indication chart - 1-phase input power

LED-Indication 1-phase mode 200-240 V Input power	Sound	Power LED		Motor LED	
		Frequency	Color	Frequency	Color
Motor is connected to power but the key is not yet inserted	4 short beeps	1 flash	Green	1 flash	Green
1-phase mode 200-240 V Power ok, waiting for key	-	Alternatively flashing	Green	Alternatively flashing	Green
MDU is connected to power and key is inserted					
1-phase mode 200-240 V Power ok, Key is identified	3 short beeps	Steady light	Green	Steady light	Green
Key cannot be identified Power ok	1 sec beep	Steady light	Red	Steady light	Red
Supply voltage is less than 205V	-	One flash per second	Green	One flash per second	Green
Supply voltage is less than 190V	-	Five flashes per second	Green	Five flashes per second	Green
1-phase mode 200-240V: Motor ON/OFF push button has been pressed once and motor has started	-	-	-	Steady light	Green
M-Dial is set at R - Reverse		Steady	Pink/Blue	Steady	Pink/Blue
Power restriction is active	-	Steady	Pink/Blue	Steady	Depending on what % is set, the Motor LED will indicate the load.
Motor has been shut off due to overload. See 4.3.6.	-	Steady	Red	Steady	Red
Motor has been shut off due to overheating	-	-	-	Steady	Red
Red Stop button has been pressed	Beep in pace with flash*	Flashing in pace	Red	Flashing in pace	Red
Internal drill motor test found a hardware problem. The drill motor cannot be started. Please contact your service workshop	1 second beep	Alternatively flashing	Red and Blue	Alternatively flashing	Red and Blue
Service alert. The drill motor has been running for 180 hours and should be sent to service.	1 second beep	Five flashes per second for 30 seconds	Red	Five flashes per second for 30 seconds	Red

*No beep if the red stop button was pressed before power was connected (programming mode)

7 Maintenance

For the machine to remain in a condition which is safe for operation at all times, certain maintenance is needed. Please also see 7.3 for storage of the machine.

The Everyday maintenance in chapter 7.1 **Every day maintenance** should be performed every day by the operator or a service technician.

The maintenance in chapter 7.2 **Maintenance which should be performed by trained mechanic** should be performed every 200 running hours or at least once per year. . There is a service alarm which starts indicating at 180 running hours. If the MDU9 Modular Drive Unit is not serviced within 200 running hours the manufacturer's warranty will be void.

For safe and uninterrupted operation of the machine, the complete machine should be brought back to your Pentruder authorized sales and service company for service and oil change every 200 running hours or at least once per year or as agreed in the purchase contract.

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.

If you plan to perform some maintenance yourself, please contact your Pentruder authorized sales and service company to get spare parts lists and more instructions.



Warning!

- No service or maintenance may be performed on the machine unless it is disconnected electrically from the power supply.
-

7.1 After drilling

7.1.1 Check red Stop push button and Stop button cover of MDU9 Drive Unit



Important!

Check the red Stop Button and Stop Button cover for damage every time the machine is used. If there is any damage to the button or the cover, it must be replaced before the MDU9 is used again, or the warranty will be void. Please contact your service workshop for service.

7.1.2 Check all functions

All functions should be checked and found normal before use of the machine. Don't use the machine if some part is damaged or if the operation control doesn't work properly.

7.1.3 Clean the Pentruder MD1 Drill System and MDU9 Modular Drive Unit



Important!

Do not use a high pressure cleaner to clean the drill system. It can be cleaned with a water hose and a brush.

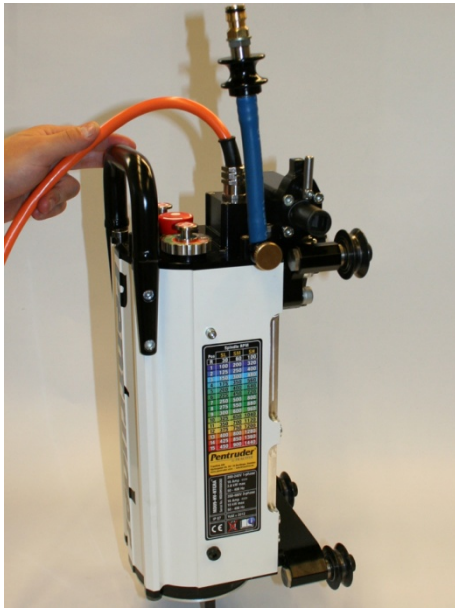


WARNING!

Make sure that the MDU9 Drive Unit is disconnected from power before cleaning it.

7.1.4 Storage of drill motor

Store the MD1 Drill System in a dry environment and in temperatures higher than zero.
If the temperature is below zero the water has to be drained from the MDU9 Modular Drive Unit.
This is easily done by opening the water valve and swivel the water hose upwards. Position the drill motor in vertical position as seen in the picture below.



7.2 Every month

Check the following every month:

1. Proper tightening of screws and bolts. Lubricate if needed.
2. Adjusting the eccentric rollers on the CER-M3-MD1 Carriage (if this carriage is used).
See 4.5.4 Mounting of CER carriage, roller type carriage with manual feed for an instruction.
3. Tracks and rack. Check function and lubricate if needed.
4. Oil change in MG41 Gearbox
5. Oil change in ST3 Spindle Unit
6. Något mer?



Note! If another drill rig than the Pentruder universal drill rig is used, please refer to the operator's manual from the manufacturer of the drill rig.

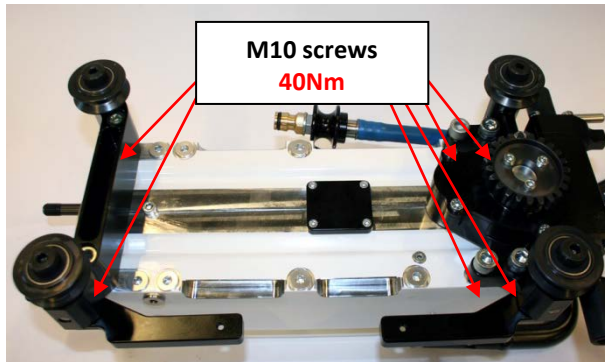
7.2.1 Tightening of screws and bolts

Check that the screws which hold the RT-45 Roller unit and FT-M3 Feed unit in place are tightened correctly. A torque wrench should be used and the screws should be tightened to 40 Nm. Vilka screws and bolts kan vara viktiga?



Important!

Do not over tighten the screws, as this may damage the thread.



7.2.3 MG41 Gearbox - Oil change

The Pentruder drill system has a separate 4-speed gearbox which is lubricated in a separate oil bath. To change oil, clean thoroughly around the plug and blow with compressed air before the plug is removed. If dirt is allowed to enter, the gearbox may seize and the warranty is not valid. 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.

7.2.4 Spindle unit ST3 - Oil change

The Pentruder drill system has a separate output gearbox or spindle unit which is lubricated in a separate oil bath. Clean thoroughly around the oil plug and blow with compressed air before the oil plug is removed. If dirt is allowed to enter, the gearbox may seize and the warranty is not valid. 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.

8 Technical Data

Pentrunder MD1 – Modular Drilling Machine with MDU9 Modular Drive Unit

MDU9 Modular Drive Unit - NTGRA®

Technical data for MDU9 Modular drive unit – stand alone unit

	MDU9-HV-NTGRA
Description:	Modular drive unit for 220 V / 400-480V (High Voltage)
Weight kg / lbs:	16 kg

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 - ST3

Technical data for spindle units ST2 and ST3

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

Torque with spindle unit ST3 and MDU9 Drive unit

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 ST3 :	620 /	600 / 23.6
Spindle unit ST3 + 1 x ERMD1:	830 / 32.6	790 / 31.1
Spindle unit ST3 + 2 x ERMD1:	1020 / 40.1	970 / 38.1
Spindle unit ST3 + 3 x ERMD1:	1210 / 47.6	1160 / 45.6

Base plates – 70 mm column system:*Technical data for Base plates BE1, BE2 and BE6*

	BE1	BE2	BE6
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, cut outs
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, front 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 PT-MD1 feed unit– 70 mm column system:

Technical data for CE1 carriage and PT-MD1 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 – BTS-3/BTS-4/BTS-5 – MCCS:

Technical data for base plates BTS3 and BTS4

	BTS-3	BTS-4	BTS-5
Width mm / inch:	492 / 19.4	492 / 19.4	280 / 11
Length mm / inch:	610 / 24	610 / 24	400 / 15.8
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	BTS-3, BTS.4, BTS-5	BTS-3, BTS.4, BTS-5	BTS-3, BTS.4, BTS-5	BTS-3, BTS.4, BTS-5	BTS-3, BTS.4, BTS-5

Carriages CEG/CER - MCCS:

Technical data for CEG and CER carriages

	CEG-M25	CER-M3-MD1
Type:	Gliding	Rollers
Feed:	Manual, 1:25	Manual, 1:3
Max drill bit Ø mm:	1200	600

Spindle speeds, kW output and torque

The chart below describes the spindle speeds with the MG41 Gearbox, ST3 Spindle Unit and MDU9 Drive Unit and different gears.

Spindle rpm with ST3 spindle units and MG41 4-speed gearbox

Speed dial MDU	Output	Spindle speeds / Torque MDU with ST3 spindle unit and MG41 4-speed gearbox							
	kW MDU	1:st gear MG41 (rpm) / (Nm)		2:nd gear MG41 (rpm) / (Nm)		3:rd gear MG41 rpm) / (Nm)		4:th gear MG41 (rpm) / (Nm)	
1	3.2	35	873	55	556	95	322	150	204
1.5	3.6	39	882	62	555	107	321	169	203
2	4.1	43	911	69	567	119	329	187	209
2.5	4.4	48	875	75	560	130	323	206	204
3	4.7	52	863	82	547	142	316	225	199
3.5	5.0	56	853	89	537	154	310	243	197
4	5.2	61	814	96	517	166	299	262	190
4.5	5.5	65	808	103	510	178	295	281	187
5	5.7	69	789	110	495	190	287	300	181
5.5	6.2	74	800	117	506	201	295	318	186
6	6.7	78	820	123	520	213	300	337	190
6.5	7.0	82	815	130	514	225	297	356	188
7	7.4	86	822	137	516	237	298	375	188
7.5	7.7	91	808	144	511	249	295	393	187
8	7.9	95	794	151	500	261	289	412	183
8.5	8.2	99	791	158	496	273	287	431	182
9	8.4	104	771	165	486	284	282	449	179
9.5	8.7	108	769	171	486	296	281	468	178
10	8.9	112	759	178	478	308	276	487	175
10.5	8.9	117	726	185	459	320	266	506	168
11	8.9	121	702	192	443	332	256	524	162
11.5	9.0	125	688	199	432	344	250	543	158
12	9.1	130	669	206	422	356	244	562	155
12.5	9.1	134	649	213	408	367	237	581	150
13	9.1	138	630	220	395	379	229	599	145
13.5	9.1	143	608	226	385	391	222	618	141
14	9.1	147	591	233	373	403	216	637	135
14.5	9.1	151	576	240	362	415	209	655	133
15	9.0	156	551	247	348	427	201	674	128

Please note that the MDU Modular Drive Unit has the highest mechanical power output at the highest speeds.

Speed 1 – 4.5 gives a quite low output power. From speed 5 the mechanical output is over 5 kW. The highest kW output power is at the highest speed. So when drilling with big diameter drill bits it is better to use a high speed on the MDU and a lower gear on the MG41.

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.

Peripheral speeds MDU with ST3 spindle unit and MG41 gearbox

		Gear MG41				Gear MG41				Gear MG41				Gear MG41				Gear MG41			
		1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Speed dial MDU	kW	m/second with Ø 100 mm drill bit				m/second with Ø 250 mm drill bit				m/second with Ø 500 mm drill bit				m/second with Ø 750 mm drill bit				m/second with Ø 1000 mm drill bit			
1	3.2	0,2	0,3	0,5	0,8	0,5	0,7	1,2	2	0,9	1,4	2,5	3,9	1,4	2,2	3,7	5,9	1,8	2,9	5	7,9
2	4.1	0,2	0,4	0,6	1	0,6	0,9	1,6	2,5	1,1	1,8	3,1	4,9	1,7	2,7	4,7	7,4	2,3	3,6	6,2	9,8
3	4.7	0,3	0,4	0,7	1,2	0,7	1,1	1,9	2,9	1,4	2,2	3,7	5,9	2	3,2	5,6	8,5	2,7	4,3	7,5	12
4	5.2	0,3	0,5	0,9	1,4	0,8	1,3	2,2	3,4	1,6	2,5	4,3	6,9	2,4	3,8	6,5	10	3,2	5	8,7	14
5	5.7	0,4	0,6	1	1,6	0,9	1,4	2,5	3,9	1,8	2,9	5	7,9	2,7	4,3	7,5	12	3,6	5,8	9,9	16
6	6.7	0,4	0,6	1,1	1,8	1	1,6	2,8	4,4	2	3,2	5,6	8,8	3,4	4,9	8,4	13	4,1	6,5	11	
7	7.4	0,5	0,7	1,2	2	1,1	1,8	3,1	4,9	2,3	3,6	6,2	9,8	3,4	5,4	9,3		4,5	7,2	12	
8	7.9	0,5	0,8	1,4	2,2	1,2	2	3,4	5,4	2,5	4	6,8	11	3,7	5,9	10		5	7,9		
9	8.4	0,5	0,8	1,4	2,3	1,3	2,1	3,6	5,6	2,6	4,1	7,1	11	3,9	6,2	11		5,2	8,3		
10	8.9	0,6	0,9	1,6	2,6	1,5	2,3	4	6,4	2,9	4,7	8,1	13	4,4	7	12		5,9	9,3		
11	8.9	0,6	1	1,7	2,7	1,6	2,5	4,3	6,9	3,2	5	8,7	14	4,8	7,5	13		6,3	10		
12	9.1	0,7	1,1	1,9	2,9	1,7	2,7	4,7	7,4	3,4	5,4	9,3	15	5,1	8,1	14		6,8	11		
13	9.1	0,7	1,2	2	3,1	1,8	2,9	5	7,9	3,6	5,8	9,9		5,4	8,6			7,3	12		
14	9.1	0,8	1,2	2,1	3,3	1,9	3,1	5,3	8,3	3,9	6,1	11		5,8	9,2			7,7	12		
15	9.0	0,8	1,3	2,2	3,4	2	3,2	5,6	8,8	4,1	6,5	11		6,1	9,7			8,2	13		

Declaration of conformity

According to the Machinery Directive 2006/42/EC, annex A1

The Manufacturer: **Tractive AB**
Gjutargatan 54
78170 Borlänge
Sweden

Hereby declare that the machine:

Category: Drill System
Make: Pentruder
Type MD1 Modular Drill System
Drive motor: MDU9 Modular Drive Unit - NTGRA®
Type: MDU9-HV-NTGRA
Modules and Accessories: As stated in the Operator's manual for Pentruder MD1 Drill System with MDU9 Modular Drive Unit

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 19th of September, 2013



Anders Johnsen

Technical Director