

Operator's manual

Pentruder[®] MDU Core Drill – NTGRA[®] and
Pentruder[®] MCCS Universal Drill Stand



Pentruder[®]

by TRACTIVE

**Operator's manual for
Pentruder® MDU Core Drill – NTGRA® and
Pentruder Universal Drill Rig**



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Support & Service document

Original instructions



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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 Pentrunder MDU Core Drill – NTGRA® is designed and built to last and perform really well over many years. It is the first drill motor which can be run on both 1-phase and 3-phase input power and the efficiency in the motor is extremely high thanks to the brushless motor and advanced motor software.

The Pentrunder universal drill rig has been developed based on over 30 years of experience in this specialized field. Consisting of the TS track, a BTS base plate it offers a light-weight, yet very stable drill stand for any kind of drill motor. With correct handling the Pentrunder universal drill rig offers outstanding performance, safety and reliability.



It is essential that all personnel working with or in close proximity to the machine have read and understood the contents of this manual before commencing operations.

The operator's manual should be kept where the machine is.

To avoid serious or even fatal injury to the operator and persons in close proximity to the machine, it is important that the machine always is operated by trained, responsible personnel. By reading and understanding the manual the operator will be able to take advantage of the many features and benefits of the Pentrunder MDU Core Drill – NTGRA® and Pentrunder MCCA universal drill rig.

1.1 Validity of this operator's manual

This operator's manual is only valid for the Pentrunder MDU Core Drill – NTGRA® and the Pentrunder universal drill rig, described in 4.1 Overview of the machine.

Tractive AB always strives to improve the products. Therefore we reserve the right to make technical changes without previous information.

In the following text, the "machine", "drill motor" or "drill rig" always refers to the Pentrunder MDU Core Drill – NTGRA® and the Pentrunder MCCA Universal Drill Rig.

Should questions arise, please contact our sales distributor.
The address can be found at www.pentrunder.com.

Product:

Pentrunder MDU Core Drill – NTGRA®
Pentrunder MCCA Universal Drill Rig

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2 Description of the machine

2.1 Features

The Pentrunder MDU core drill - NTGRA® offers high performance and productivity, reliability and easy handling. It combines at least two core drills in one as the motor accepts both 1-phase or 3-phase input power. The spindle speed range is very wide. With the Pentrunder MDU core drill - NTGRA® from 30 - 750 mm holes can be drilled easily and efficiently.

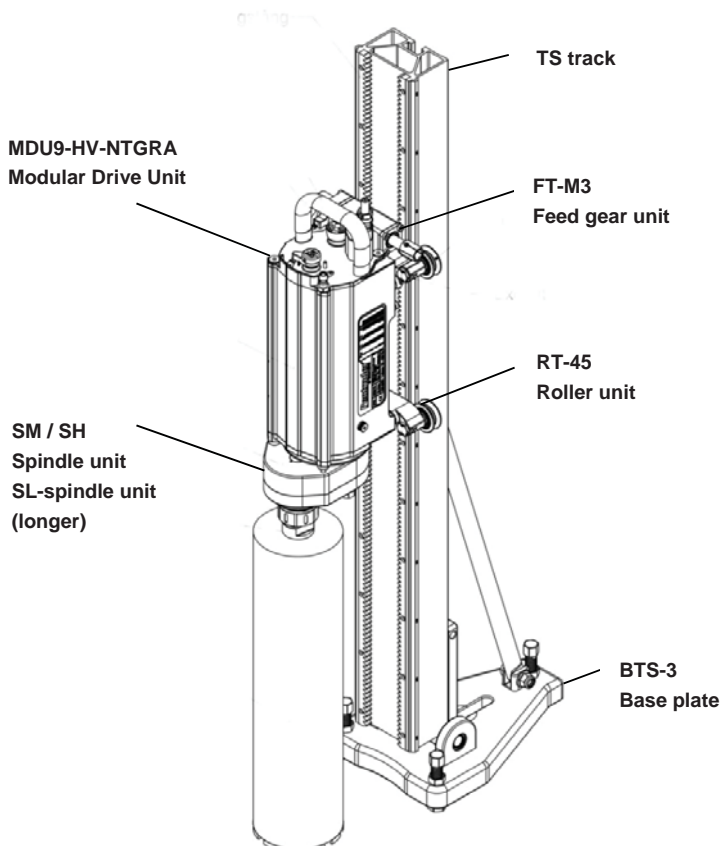
The MDU offers up to 3 kW (4HP) output power in 1-phase and up to 9 kW (12HP) output power in 3-phase mode. With the right drill bits you will be able to drill faster than ever before. The Pentrunder MDU Core Drill - NTGRA® is built to last and will bring better productivity through less downtime and long service life of all components in the power module and drive train.

The MDU offers a very good power to weight ratio and has the highest overall efficiency of all drill motors on the market. Maintenance is low due to the use of a brushless motor and the reliability is the highest possible thanks to an extremely rugged and simple design.

The stator is water cooled and the cooling system is self-draining which means less risk for damage from freezing. The motor module is fully encapsulated in Epoxy for low noise and good thermal conductivity.

2.2 Modules MDU Core Drill - NTGRA®

- MDU9-HV-NTGRA Modular Drive Unit High Voltage 1-phase (230-250 V)/3-phase (400-480 V). Delivered with adapter cable for 1-phase power input.
- FT-M3 Feed gear unit
- RT-45 Roller unit
- SL- / SM- / SH-Spindle unit
- BTS-3 or BTS-4 Base plate
- TS Track



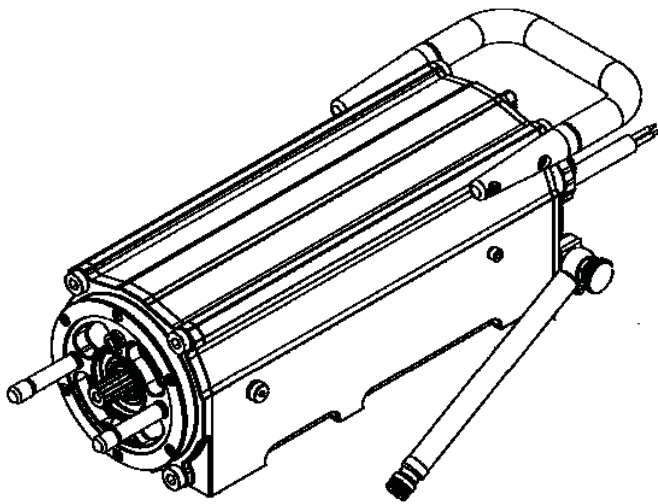
2.2.1 MDU9-HV-NTGRA Modular Drive Unit High Voltage

The 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 MDU.

For maximum stability and performance we recommend using the FT-M3 Feed gear unit and RT-45 Roller unit. When fitted on the Modular Drive Unit the Feed gear and Roller unit the carriage is “integrated” with the drill motor and this design offers high stability, saves weight and set up time.

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, See technical data for more detailed information.

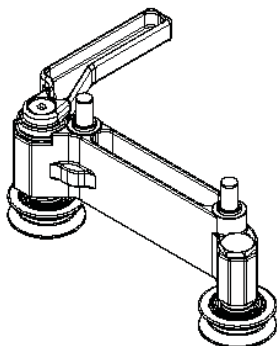
There will be more applications added for the Modular Drive Unit.



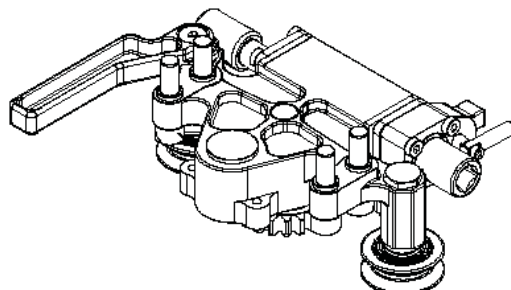
MDU9-HV-NTGRA

2.2.2 FT-M3 Feed gear unit and RT-45 Roller unit

- The MDU Modular Drive Unit can be fitted with the FT-M3 Feed gear unit and RT-45 Roller unit from the factory, or in a few minutes it can be retrofitted on a “bare” MDU9-HV-NTGRA Modular Drive Unit.
- The feed gear and roller unit makes the MDU Core Drill run directly on the Pentrunder wall saw tracks, without an intermediate carriage.
- The integrated Feed gear and Roller design saves weight and offers extraordinary stability.
- The double acting ratchet works in both directions, a must when drilling under up.
- The feed gear is prepared for Autofeed.



RT-45



FT-M3

2.2.3 SL-/SM-/SH-spindle units (with Quick Change coupling for the drill bit – optional)

Three different spindle units (gearboxes) are available for a maximized speed range.

- SL type = 100 – 450 RPM. Max \varnothing 600 drill bit, \varnothing 750 with spacer block.
- SM type = 200 – 900 RPM. Max \varnothing 350 drill bit.
- SH type = 320 – 1440 RPM. Max \varnothing 350 drill bit.

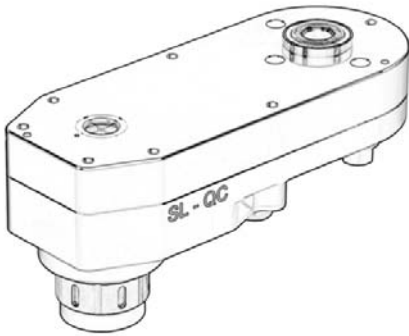
All spindles are available with different spindle threads or a patented Quick Change coupling (QC). See technical data for a complete list of the spindle units.

The Quick Change coupling has a number of important advantages and features:

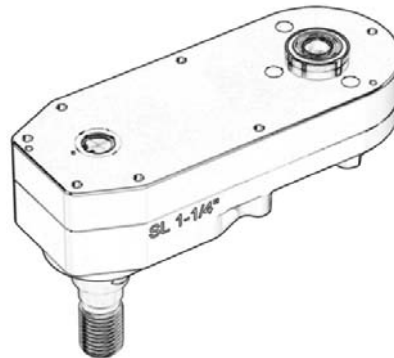
- High precision in the manufacturing gives very good accuracy without vibrations.
- Easy to lock with the help of a small C-spanner.
- The coupling “clicks” when it is locked.
- High quality, case hardened materials are used in the spindle and Quick Change Adapter.
- The coupling can easily be disassembled and cleaned.
- Safety: The Quick Change coupling is designed in such a way that if the splines which drive the drill bit should break because of overload, the Quick Change drill bit adapter will not come loose.

All Spindle units share these features:

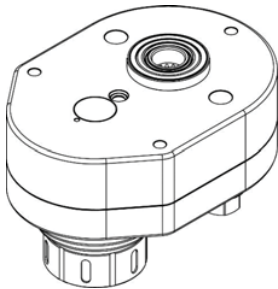
- The spindle gearbox can swivel 360° for better accessibility and simplified set-up and a spindle gearbox can be replaced in less than one minute.
- The spindle is running on two pre-loaded adjustable SKF taper roller bearings = no play. Very rigid spindle bearing arrangement makes approach and drilling at an angle easier.
- Lower wear on drill bits due to extraordinary spindle stability.
- Completely enclosed spindle gearbox.
- Long life double water seals.
- Gears made in F1 steels, precision ground to DIN 3 / AGMA 14 (Laboratory standard).



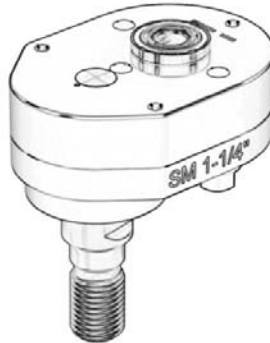
SL-QC



SL-1-1/4" (other threads also available)



SM-QC / SH-QC



SM-/SH-1-1/4" (other threads also available)

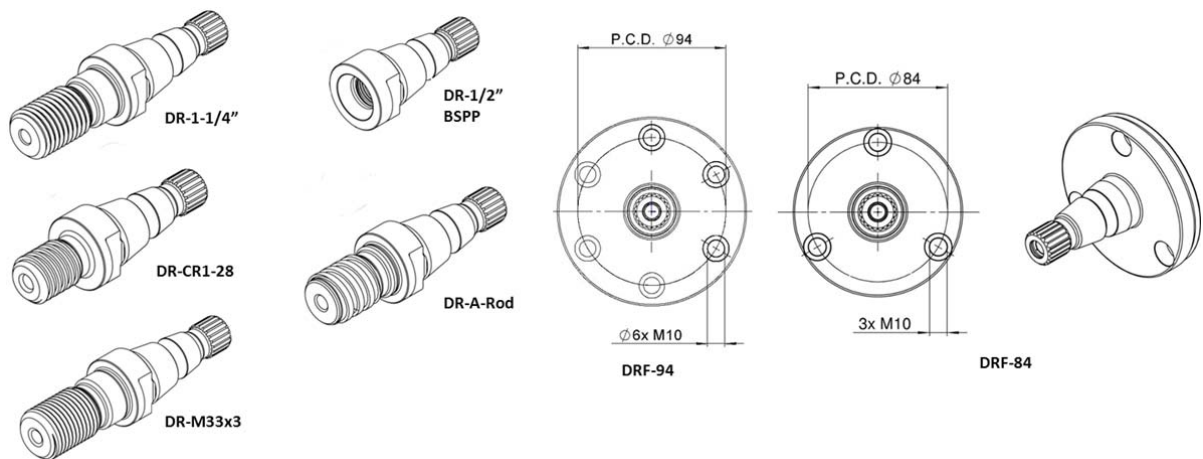
2.3 Accessories MDU

Accessories

- DR Drill bit adapters for use with QC-Spindle Units (Quick Change)
- HK-1 Hand crank for CER and CEG carriages (optional)
- DED Drill bit extension rods
- ERMDU-75 and ERMDU-25 Spacer 75 mm and 25 mm
- AE-U8 Adapter plate for use with other drill rigs

2.3.1 DR Drill bit adapters for use with QC-Spindle units (Quick Change)

- DR-1-1/4": Adapter QC - 1-1/4"-7 UNC
- DR-CR1-28: Adapter QC - CR1-28
- DR-M33: Adapter QC - M33 x 3
- DR-1/2" BSPP: Adapter QC - 1/2" BSPP
- DR-A-Rod: Adapter QC - A-Rod
- DRF-84: Adapter QC - P.C.D. 84 mm, C'bored holes
- DRF-94: Adapter QC - P.C.D. 94 mm, C'bored holes 6x M10



2.3.2 HK-1 Hand crank

For use with MDU, CER or CEG carriages. Instead of a hand crank a Knuckle bar 400 mm 1/2" can be used for feeding.



HK-1 Hand crank

2.4 Rig for MDU Core Drill (MCCS)

2.4.1 Standard modules for drill rig with 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
- TS T-slot type track, 0.85 / 1.15 / 1.7 / 2.0 / 2.3 / 3.45 m
- RST-TS1 Rear support, TS-type (for drilling with long or big drill bits)
- WT-BTS-4 Wheels for BTS-4
- TSP2 Track stop

2.4.2 Base plates BTS3/BTS4 - MCCS



Base plate BTS-3



Base plate BTS-4

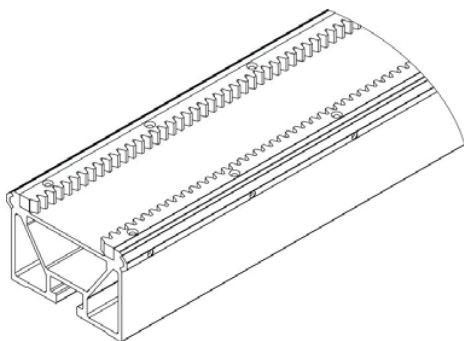
There are two different base plates for the TS track, the BTS-3 and BTS-4.

The BTS-3 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.

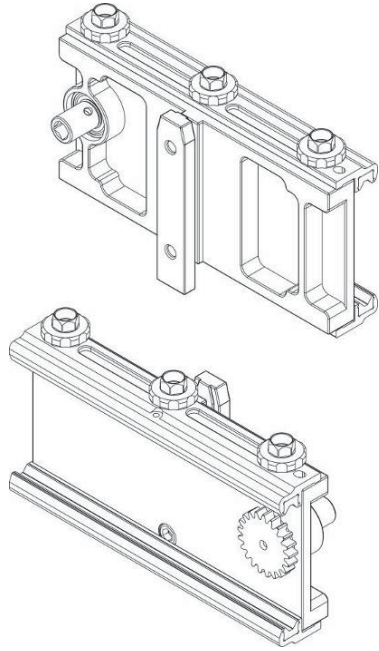
2.4.3 TS T-slot type track - MCCS

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

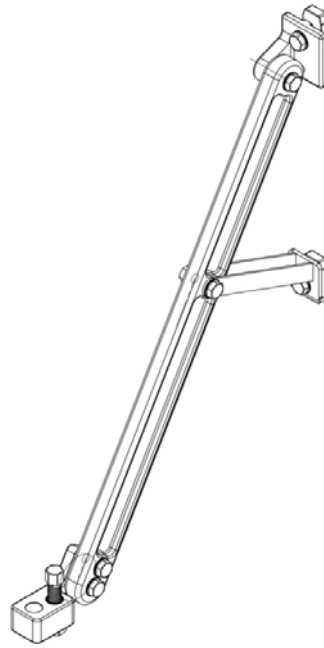
The TS tracks are available in the lengths 0.85, 1.15, 2, 2.3 and 3.45 m and the weight is 6.95 kg per meter.



2.4.4 CEL-TS Carriage line and corner drilling



CEL-TS Carriage line and corner drilling



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 or other useful information.



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! Here 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



WARNING! Here we inform about risks connected with electrical voltage. Danger of life!

3.2 Use of the Drill Motor and Drill Rig



WARNING!

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



WARNING!

This drill motor and/or 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.

3.3 General safety precautions



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 Pentrunder MDU Core Drill - NTGRA® and Pentrunder universal drill rig are 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.
- 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.
- Modifications or changes on the drill rig which might impair the safety of the machine are not allowed.
- The operator is obligated to immediately inform about changes on the machine which can impair the safety of the machine.
- The user is liable that the machine is in faultless condition and that all functions are in order before work is commenced.
- 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.
- 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 any damage occurring as a result of use of non-original parts. If non original parts are being used, the warranty will be void.
- Before any kind of service or mounting on the drill rig is commenced, the drill motor must always be switched off and the 32 Amp plug and cable disconnected from the drill motor.
- The electrical mains connection has to have a circuit breaker.
- The drill motor may not be used in an environment where only explosion proof equipment is allowed.

3.4 Safety precautions at site



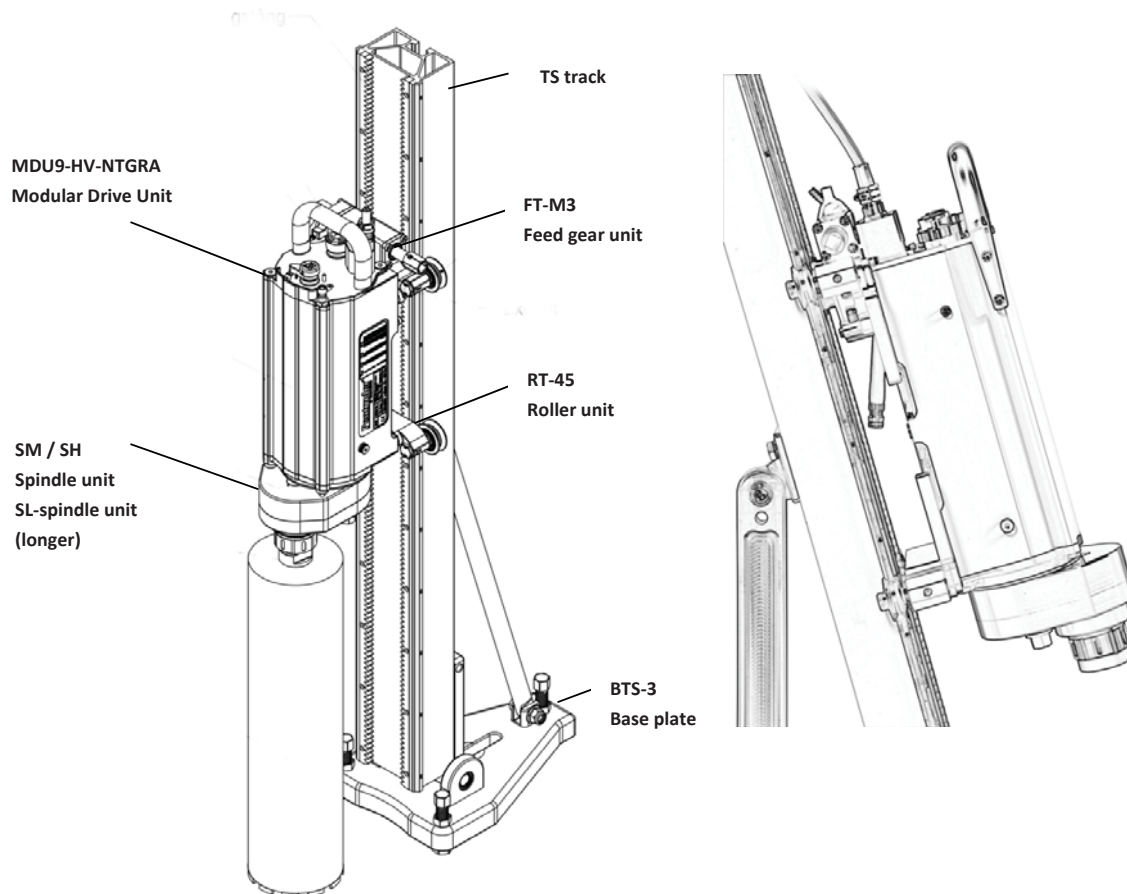
WARNING!

- 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).
- Before drilling is commenced all persons involved must know how the red stop button of the drill motor is working.
- No mounting, for instance change of drill bit, may be performed on the machine unless it is disconnected electrically from the mains.
- Safety regulations at the work place must be followed.
- 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.
- Always lift the drill unit ergonomically correct. Contact your distributor 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.
- The drill bit may not be touched when the drill motor is in operation.
- A drill motor which falls down can lead to severe injury. Avoid the risk area around the drill rig and drill motor.
- Don't use any extension or lever to get a higher feeding power.
- A heavy concrete core which rotates in a drill bit outside of the drilled hole can cause very strong vibration which can lead to the drill stand coming lose. Therefore the drill motor should always be stopped shortly before the drill bit is completely fed out of the drilled hole.
- Rebar which has been cut unfavorable can become wedged between the drill bit and the core. This will block the drill bit and can also damage it. Before the drilling is commenced any broken diamond segments have to be removed from the drilled hole.
- If the drill bit is blocked, the drill motor has to be stopped and the power plug to the motor has to be unplugged. Use a suitable wrench to turn the drill bit backwards and forwards until the drill bit has come lose and can be fed out of the drilled hole.
- When drilling holes in the ceiling, the drill core has to be secured and the danger area blocked.
- When drilling into hollow structures, always check where the cooling water flows to avoid damage.

4 Getting started

Before drilling with the drill stand, 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 Pentrunder MCCS Universal Drill Rig.

4.1 Overview of the machine



4.2 Preparations before drilling

4.2.1 Checking 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.



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 MDU is used again, or the warranty will be void. Please contact your service workshop for service.

4.2.2 Water feed

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

4.2.3 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.

4.2.4 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.

4.2.5 Recommended mounting sequence

1. Mounting the base plate on the track (4.2.6).
2. Fastening the Base plate in the concrete (4.2.7).
3. Adjusting the drill angle (4.2.8).
4. Mounting the Spindle unit on the MDU Modular Drive Unit (4.2.9).
5. Mounting of a Spacer Block (Accessory) (4.2.11).
6. Mounting the MDU on the Track (4.2.12).
7. Mounting the hand crank (Accessory) or ratchet (4.2.13).
8. Cooling water (4.2.14).
9. Mounting the track stop to set drill depth (4.2.15).
10. Mounting the drill bit with Quick Change coupling (14.2.16).
11. Mounting the drill bit on spindle with 1-1/4"-7 UNC (or other) thread (4.2.17)
12. Mounting the Pentrunder MDU Core Drill - NTGRA® on other drill rigs with adapter plate (Accessory) (4.2.18)

See 4.3 for **How to operate** the Pentrunder MDU Core Drill - NTGRA®.

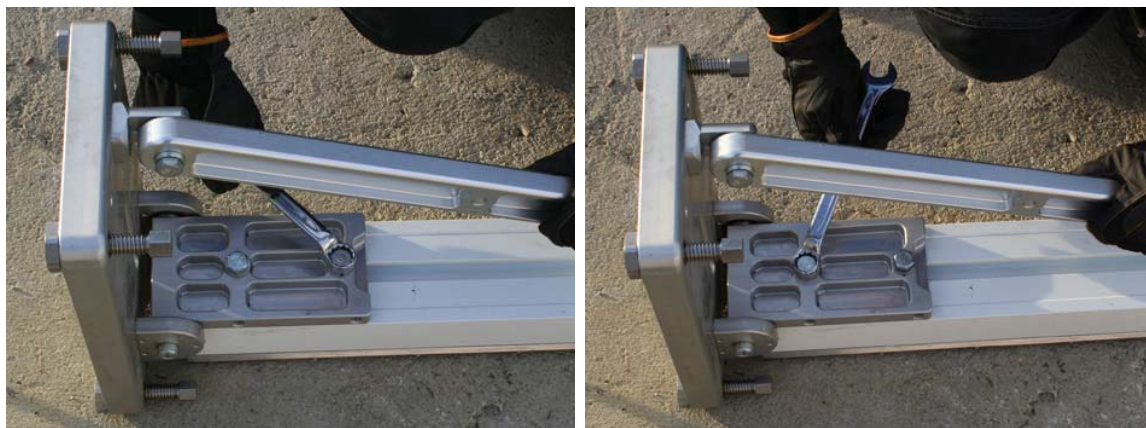
4.2.6 Mounting the track on the base plate

We recommend to assembly the base plate on the track first, and then fastening the assembled drill 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.

4.2.7 Fastening the base plate

1. Secure the base plate to the floor or wall with an expanding anchor and minimum M14 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. 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! Never hit the column or track into position with a hammer or the like.

4.2.8 Adjusting the drill angle



a. Loosen the upper bolt on the back support.



b. Loosen the lower bolt on the back support.



c. Loosen the bolt on the upper brace and tilt the track to the wanted positioned backwards or forwards.



d. Tighten the bolt on the lower brace and the upper and lower bolt on the back support.



Note!

When the track is tilted in a large angle, the size of the maximum drill bit is reduced.



WARNING!

If the track is tilted forwards in a big angle, check that there is no risk of drilling in to the expander bolt.

4.2.9 Fitting Spindle unit on MDU Modular drive unit

Depending on the size of the drill bit different spindle units can be used. See How to operate the MDU and Technical Data for spindle speeds. The spindle units can easily be exchanged.

- a. **Clean and lightly grease** the Quick Change coupling (if a QC is used), both QC-adaptor and the threads in the drill bit thread adapter (if used).



b. To mount the spindle on the drive unit, align the holes in the spindle unit with the water tube, steering pins and splined drive shaft on the drive unit



c. Gently push the spindle unit on to the steering pins. Rotate the spindle a little by hand until you feel that the splines on the drive shaft are in mesh with the splines in the spindle unit.



d. Make sure the spindle unit is pushed in properly, leaving no gap between spindle unit and drive unit, before the two screws are tightened with a 19 mm wrench.



! Important! Do NOT tighten the two screws before the splined shaft is in mesh and the spindle unit is properly pushed on to the drive unit.



e. The spindle unit can be swiveled to any position for easier targeting with the drill bit. Just loosen the two screws with a 19 mm wrench.



f. Swivel the spindle unit to the desired position and tighten the screws again.

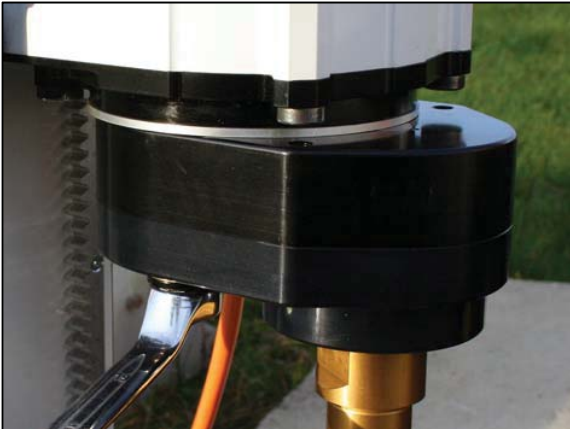
4.2.10 Taking the Spindle unit off of the MDU Modular drive unit



a. To take off the spindle unit, use a 19 mm key to loosen the two screws on the spindle unit.



b. Pull the spindle unit off the drive unit.



c. See 4.2.9 on how to fit the spindle unit on the modular drive unit again.

4.2.11 Mounting of a Spacer Block (Accessory)

There are kits with spacer blocks available to increase the space between the column and spindle to be able to drill with bigger drill bits. The ERMDU-75 and ERMDU-25 Spacer add 75 mm and 25 mm respectively. Please see technical data for more information.

The assembly should preferably be done in an authorized service workshop as the assembly will require the wheels on the FT-M3 Feed unit and RT-45 Roller unit to be adjusted.

Please see separate assembly instructions.



Important! When the spacer blocks are mounted it is very important to follow the instructions in 4.3.9 Drilling with a big or long drill bit.

4.2.12 Mounting MDU Core Drill on Track (with Pentrunder roller and feed unit)



WARNING! Make sure the drill motor is disconnected from power before it is fitted on the track.

There is a latch on the roller and feed unit which prevents the Pentrunder MDU Core Drill - NTGRA® from sliding along the track.

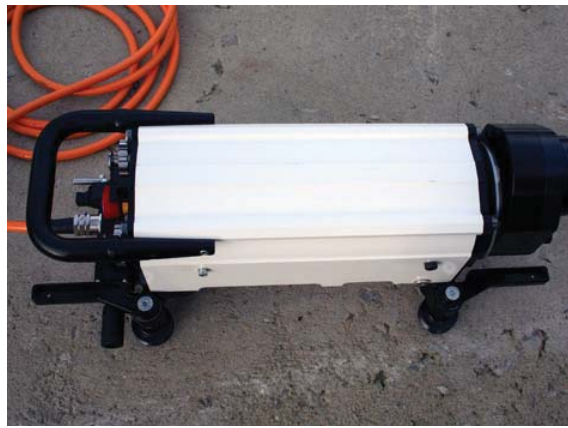


a. Locked position, in either direction.

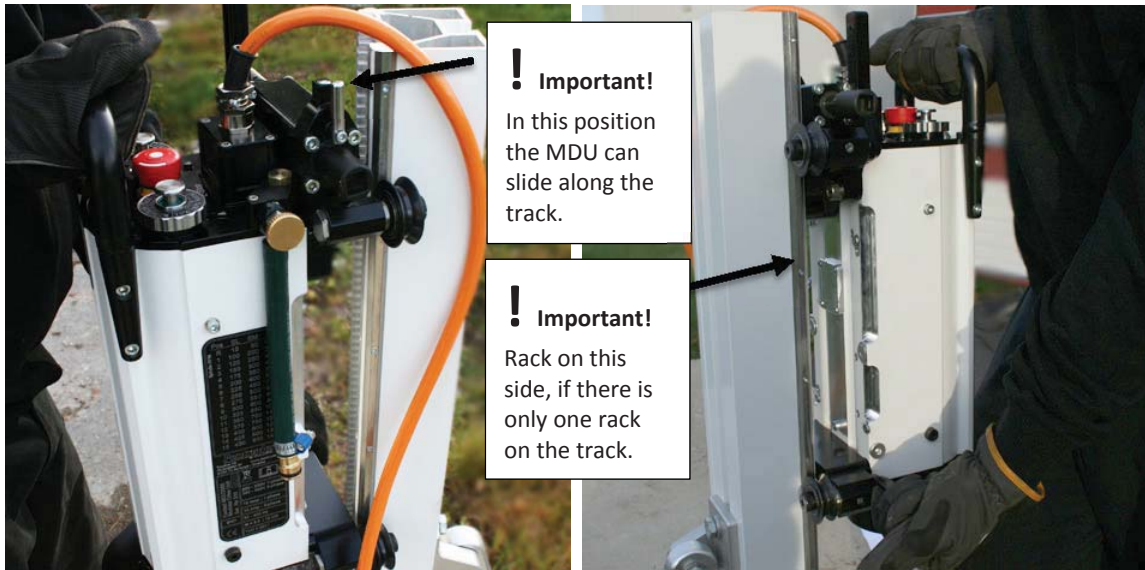


b. Neutral position, used when drilling.

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

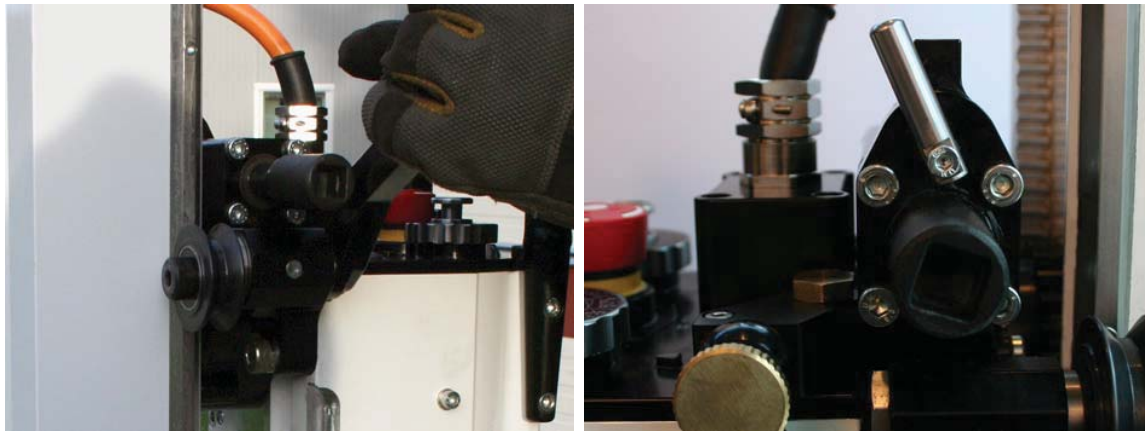


c. and d. Open the handles.



e. Fold the drill motor on to the track with the side without handles first.

f. Fold on the other side of the drill motor and close the handles. First the lower handle.



d. Adjust the drill motor along the track so that the feed gear fits the rack on the track, then, close the upper handle.

e. In this position the latch locks the motor so that it cannot unintentionally be moved downwards, when the drill rig is mounted for vertical drilling downwards.



Note ! Make sure the rollers are properly adjusted on the track so that there is no play. There should be a resistance when closing the handles. See 5.2.2 on how to adjust the rollers.

4.2.13 Mounting the HK-1 hand crank (Accessory) or knuckle bar

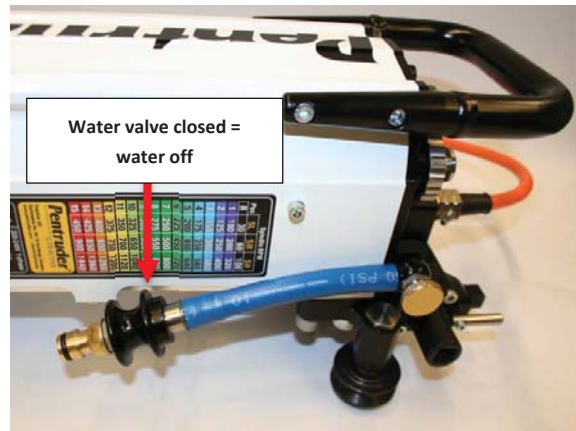
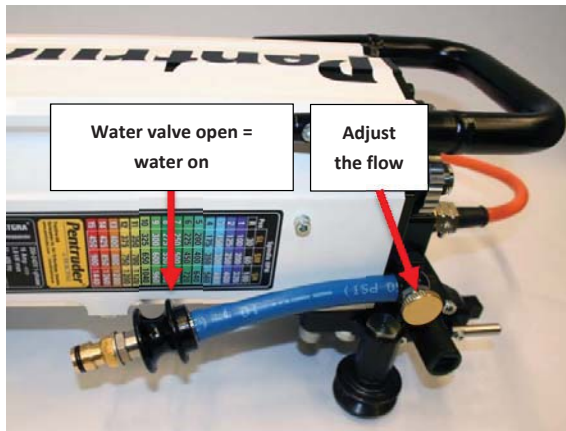


a. Insert the hand crank on either side of the feed unit and tighten it clockwise per hand.



b. Instead of a hand crank a Knuckle bar 400 mm 1/2" can be used for feeding.

4.2.14 Cooling water



The water flow turned on and off with the water valve. In the left picture the water valve is open = water on (valve pushed "up") and in the right picture it is closed = water off (valve pushed down). The screw is used to adjust the water flow.

4.2.15 Track stop (accessory)



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

4.2.16 Mounting the drill bit on spindle with Quick Change coupling

There are Quick change drill bit adapters with different thread/P.C.D. which can be used with the spindle unit with quick disconnect coupling. See 2.3.1 for a list of available drill bit adapters.



Note! Make sure the drill bit has the correct thread corresponding to the drill bit adapter and that the coupling is clean and lightly greased, both the drill bit adapter and the coupling on the spindle unit.



a. Thread the drill bit on to the drill bit adapter, making sure the mating surfaces are clean and lightly greased. Insert the drill bit adapter with drill bit in to the Quick Change coupling on the spindle unit.



b. Close the coupling by turning it to the right per hand.



c. Use a key to fasten the Quick Change coupling. There should be a "click" sound when it is properly secured.



4.2.17 Mounting the drill bit on spindle with 1-1/4"-7 UNC (or other) thread

Make sure the drill bit has the correct thread corresponding to the spindle thread. Clean and lightly grease all mating surfaces..

4.2.18 Mounting the Pentrunder MDU Core Drill - NTGRA® on other drill rigs with adapter plate (Accessory)

The Pentrunder MDU Core Drill can also be mounted on other drill rigs. There is an adapter plate available for this purpose. Please see separate assembly instructions.



Important! Please consult the operator's manual of the other drill rig and make sure that the drill rig is stable enough to handle the full power of the Pentrunder MDU Core Drill – NTGRA®.

4.3 How to operate the Pentrunder MDU Core Drill - NTGRA®

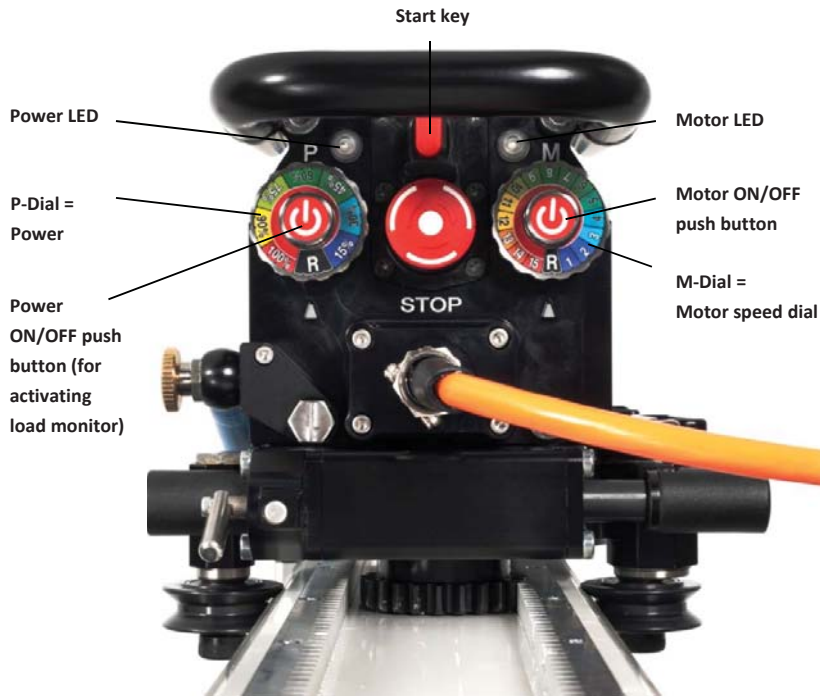


WARNING! All the safety instructions in chapter 3 must be taken into account and followed.



Note!

The Power and Motor LED's will help the operator to use the machine efficiently. Consult the MDU Core Drill Indication chart on page 29.



4.3.1 Connect to input power

The Pentrunder MDU Core Drill - NTGRA® can be connected to both 1-phase and 3-phase power. The European and USA version of the MDU Core Drill can operate in this voltage range: AC 50Hz – 44 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 MDU Core Drill Indication chart on page 29 **How motor load is indicated on the Motor and Power LED**

for more information on the LED's.

4.3.2 Start key

Each Pentrunder 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 29 **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.

4.3.3 Spindle speed – Peripheral speed with different Spindle Units and sizes of drill bits



Set desired spindle speed with the M-Dial. The suitable spindle speed varies with the drill bit, type of concrete and amount of rebar. See Chart on page 40 for Peripheral speed with different spindle units and sizes of drill bits. R stands for Reverse.

There are totally 29 electronic gears. 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.



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.

4.3.4 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.



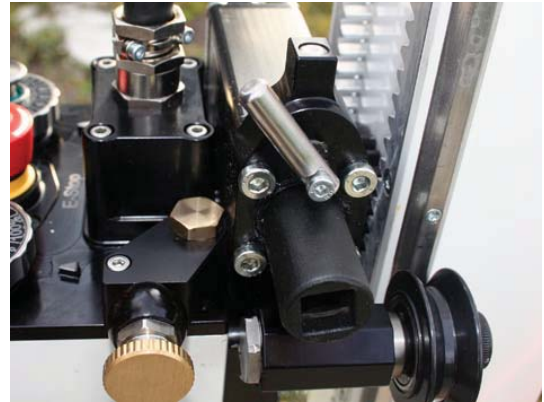
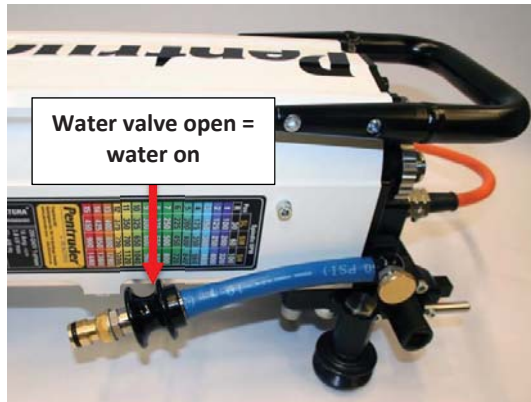
Note! In most cases, there is no need to use the Power Dial and power restriction at all. Use this function to protect smaller and more fragile drill bits from overload and resulting damage by decreasing the maximum available motor power.



Note!

The MDU 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.

4.3.5 Starting the Pentrunder MDU Core Drill



- 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, see 4.2.14.
- b. Make sure the drill bit runs true and is not damaged and that the latch is in the locked position, see 4.2.12.



- c. Press the Motor ON/OFF button to start the spindle.
- d. 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 drill motor downwards or upwards on the track.



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.

4.3.6 Monitoring the load when drilling using the LED's



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 drill motor 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.

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.



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!

- 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!

4.3.7 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 4.3.9 Drilling with a big or long drill bit.

4.3.8 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.

4.3.9 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 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. **Make sure the eccentric rollers are properly adjusted to the track**. This will eliminate play. See 5.2.2 Adjusting the rollers on FT-M3 Feed unit and RT-45 Roller unit.
4. **Clean and lightly grease** the Quick Change coupling (if a QC is used), both QC-adaptor 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, then 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.
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.

4.3.10 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 as described in 4.3.5.

4.3.11 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.

4.3.12 Guidelines on drilling with autofeed (Accessory)

This accessory is not yet available.

4.3.13 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.

4.3.14 MDU Core Drill 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. See 5.2.4 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.

4.3.15 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. See 5.2.4 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).

5 Maintenance

5.2 After drilling

5.2.1 Check red Stop push button and Stop button cover



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 MDU is used again, or the warranty will be void. Please contact your service workshop for service.

5.2.2 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.

5.2.3 Clean the Pentrunder MDU Core Drill and Drill rig



Important!

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



WARNING!

Make sure that the drill motor is disconnected from power before cleaning it.

5.2.4 Storage of drill motor

Store the drill motor in a dry environment and in temperatures higher than zero.

If the temperature is below zero the water has to be drained from the MDU drill motor. 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.



5.2 Every month

Check the following every month:

1. Proper tightening of screws and bolts. Lubricate if needed.
2. Adjusting the eccentric rollers on the FT-M3 Feed unit and RT-45 Roller unit.
3. Tracks and rack
Lubricate if needed.

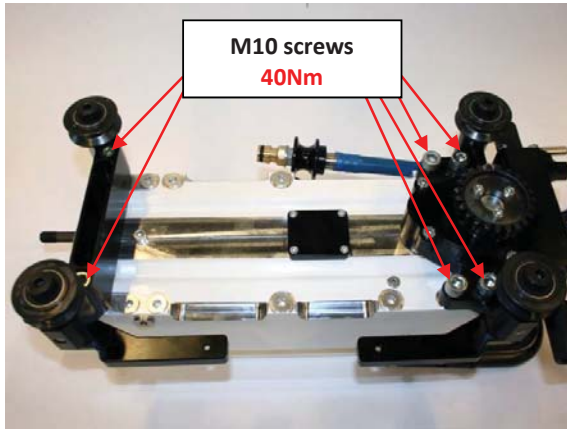
5.2.1 Tightening of screws and bolts

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.



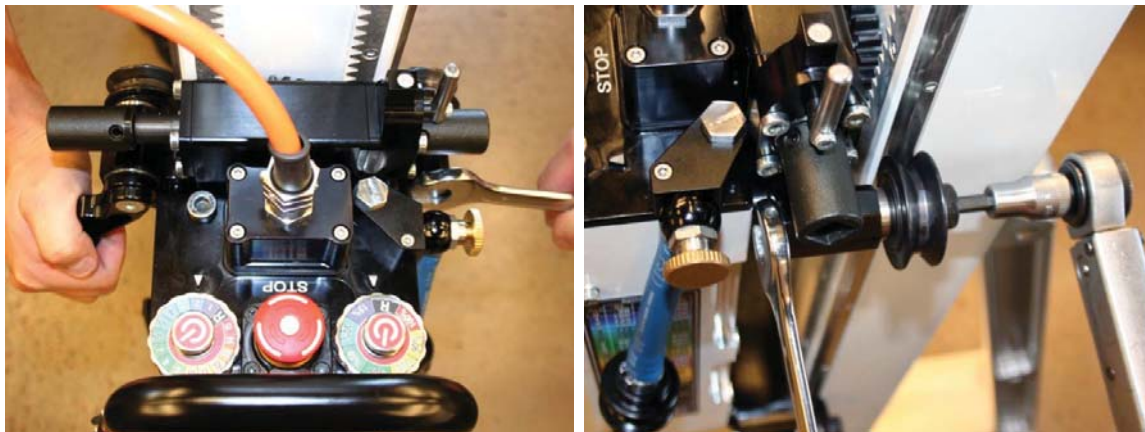
Important!

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



5.2.2 Adjusting the rollers on FT-M3 Feed unit and RT-45 Roller unit

The Pentrunder MDU Core drill needs to be fitted on the track to do this.



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



Important!

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

5.2.3 Checking track and rack



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

5.2.4 Service

The Pentrunder MDU Core Drill - NTGRA[®] should be serviced every 200 running hours. There is a service alarm which starts indicating at 180 running hours. If the Drill motor is not serviced within 200 running hours the manufacturer's warranty will be void.

6 Technical data

Technical data for Pentrunder MDU Core Drill - NTGRA with different spindle units

	230V		400V	
Input power:	3.8 kW		10 kW	
Output power @ 16 Amp:	3.0 kW		9 kW	
Drill bit range \varnothing:		With spacer block ERMDU-75		With spacer block ERMDU-75
Spindle unit SL:	100 - 500 mm	max 650 mm	100 - 609 mm	max 759 mm
Spindle unit SM:	50 - 350 mm	max 500 mm	50 - 350 mm	max 500 mm
Spindle unit SH:	30 - 350 mm	max 500 mm	30 - 350 mm	max 500 mm
Gears:	29 electronic gears + Torque limited reverse gear			
Spindle speed under load: (see also Spindle speed, torque and power chart)				
Spindle unit SL:	100 – 450 rpm		100 – 450 rpm	
Spindle unit SM:	200 – 900 rpm		200 – 900 rpm	
Spindle unit SH:	320 – 1440 rpm		320 – 1440 rpm	
Torque:				
Spindle unit SL:	62 - 264 Nm		200 - 320 Nm	
Spindle unit SM:	30 – 130 Nm		100 - 160 Nm	
Spindle unit SH:	19 – 83 Nm		63 – 100 Nm	
Weight with spindle unit SM and SH / SL				
With feed gear and roller unit:	20 kg / 23.5 kg			
Without feed gear and roller unit:	18 kg / 21 kg			
Protection class:	IP 67 (water proof)			

Technical data for Modular drive unit – stand alone unit

	MDU3-9-HV
Description:	Modular drive unit for 220 V / 400-480V (High Voltage)
Weight kg / lbs:	16 kg

Technical data for Spindle Units SH, SM, SL

	SL-QC SL-1-1/4" SL = n/a SL-A-Rod	SM-QC SM-1-1/4" SM-CR1-28 SM-A-Rod	SH-QC SH-1-1/4" SH-CR1-28 SH-A-Rod
Fastening of drill bit:	Quick Change coupling 1-1/4"-7 UNC thread SL= n/a A-Rod thread	Quick Change coupling 1-1/4"-7 UNC thread CR1-28 thread A-Rod thread	Quick Change coupling 1-1/4"-7 UNC thread CR1-28 thread A-Rod thread

Technical data for Quick Change Drill Bit Adapters for SL-QC, SM-QC and SH-QC Spindle Units

	Description
DR-1-1/4"	Adapter QC - 1-1/4"-7 UNC
DR-CR1-28	Adapter QC - CR1-28
DR-M33	Adapter QC - M33 x 3
DR-1/2" BSPP	Adapter QC – 1/2" BSPP
DR-A-Rod	Adapter QC – A-Rod
DRF-84	Adapter QC - P.C.D. 84 mm, C'bored holes 3x M10
DRF-94	Adapter QC - P.C.D. 94 mm, C'bored holes 6x M10

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

Technical data for base plates BTS3 and BTS4

	BTS3	BTS4
Width mm / inch:	220 / 8.7	220 / 8.7
Length mm / inch:	320 /	320 /
Weight kg / lbs:	5.8 / 40.7	6.6 / 43

Spindle speed, torque and power chart

Pentrunder MDU 1-phase 230-250V								Pentrunder MDU 3-phase 400-480V						
Gear	SL spindle		SM spindle		SH spindle		Power output	SL spindle		SM spindle		SH spindle		Power output
	Spindle RPM	Max torque Nm	Spindle RPM	Max torque Nm	Spindle RPM	Max torque Nm		Spindle RPM	Max torque Nm	Spindle RPM	Max torque Nm	Spindle RPM	Max torque Nm	
1	100	264	200	130	320	83	2.6	100	320	200	160	320	100	3.2
1.5	113	257	225	128	360	80	2.8	113	320	225	160	360	100	3.6
2	125	250	250	125	400	78	3.0	125	320	250	160	400	100	4.1
2.5	138	230	275	115	440	72	3.1	138	320	275	160	440	100	4.4
3	150	210	300	105	480	66	3.0	150	320	300	160	480	100	4.7
3.5	163	195	325	98	520	61	3.1	163	315	325	157	520	98	5.0
4	175	180	350	90	560	56	3.1	175	310	350	155	560	97	5.2
4.5	188	172	375	86	600	54	3.1	188	310	375	155	600	97	5.5
5	200	164	400	82	640	51	3.2	200	310	400	155	640	97	5.7
5.5	213	150	425	75	680	47	3.1	213	310	425	155	680	97	6.2
6	225	136	450	68	720	43	3.0	225	310	450	155	720	97	6.7
6.5	238	128	475	64	760	40	3.0	238	310	475	155	760	97	7.0
7	250	120	500	60	800	38	2.9	250	310	500	155	800	97	7.4
7.5	263	113	525	57	840	35	2.9	263	305	525	152	840	95	7.7
8	275	106	550	53	880	33	2.8	275	300	550	150	880	94	7.9
8.5	288	102	575	51	920	32	2.8	288	295	575	147	920	92	8.2
9	300	98	600	49	960	31	2.9	300	290	600	145	960	91	8.4
9.5	313	94	625	47	1000	29	2.9	313	285	625	142	1000	89	8.7
10	325	90	650	45	1040	28	2.8	325	280	650	140	1040	88	8.9
10.5	338	87	675	44	1080	27	2.9	338	270	675	135	1080	84	8.9
11	350	84	700	42	1120	26	2.9	350	260	700	130	1120	81	8.9
11.5	363	80	725	40	1160	25	2.8	363	254	725	127	1160	79	9.0
12	375	76	750	38	1200	24	2.8	375	248	750	124	1200	78	9.1
12.5	388	75	775	37	1240	23	2.8	388	239	775	119	1240	75	9.1
13	400	74	800	36	1280	23	2.9	400	230	800	115	1280	72	9.1
13.5	413	72	825	35	1320	23	2.9	413	223	825	111	1320	70	9.1
14	425	70	850	33	1360	22	2.9	425	216	850	108	1360	68	9.1
14.5	438	66	875	32	1400	21	2.8	438	208	875	104	1400	65	9.1
15	450	62	900	30	1440	19	2.7	450	200	900	100	1440	63	9.0

Peripheral speed with SL-spindle and different sizes of drill bits

SL-Spindle Unit /	Drill bit Ø mm													
	100	150	200	250	300	350	400	450	500	550	600	650	700	750
1	0.5	0.8	1.1	1.3	1.6	1.8	2.1	2.4	2.6	2.9	3.1	3.4	3.7	3.9
1.5	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.5	3.8	4.1	4.4
2	0.65	1.0	1.3	1.6	2.0	2.3	2.6	2.9	3.3	3.6	3.9	4.3	4.6	4.9
2.5	0.7	1.1	1.5	1.8	2.2	2.5	2.9	3.3	3.6	4.0	4.3	4.7	5.1	5.4
3	0.8	1.2	1.6	2.0	2.4	2.7	3.1	3.5	3.9	4.3	4.7	5.1	5.5	5.9
3.5	0.85	1.3	1.7	2.1	2.6	3.0	3.4	3.8	4.3	4.7	5.1	5.5	6.0	6.4
4	0.9	1.4	1.8	2.3	2.7	3.2	3.7	4.1	4.6	5.0	5.5	6.0	6.4	6.9
4.5	1.0	1.5	2.0	2.5	3.0	3.4	3.9	4.4	4.9	5.4	5.9	6.4	6.9	7.4
5	1.05	1.6	2.1	2.6	3.1	3.7	4.2	4.7	5.2	5.8	6.3	6.8	7.3	7.9
5.5	1.1	1.7	2.2	2.8	3.3	3.9	4.5	5.0	5.6	6.1	6.7	7.2	7.8	8.4
6	1.2	1.8	2.4	2.9	3.5	4.1	4.7	5.3	5.9	6.5	7.1	7.7	8.2	8.8
6.5	1.25	1.9	2.5	3.1	3.7	4.4	5.0	5.6	6.2	6.9	7.5	8.1	8.7	9.3
7	1.3	2.0	2.6	3.3	3.9	4.6	5.2	5.9	6.5	7.2	7.9	8.5	9.2	9.8
7.5	1.4	2.1	2.8	3.4	4.1	4.8	5.5	6.2	6.9	7.6	8.3	9.0	9.6	10.3
8	1.45	2.2	2.9	3.6	4.3	5.0	5.8	6.5	7.2	7.9	8.6	9.4	10.1	10.8
8.5	1.5	2.3	3.0	3.8	4.5	5.3	6.0	6.8	7.5	8.3	9.0	9.8	10.6	11.3
9	1.6	2.4	3.1	3.9	4.7	5.5	6.3	7.1	7.9	8.6	9.4	10.2	11.0	11.8
9.5	1.65	2.5	3.3	4.1	4.9	5.7	6.6	7.4	8.2	9.0	9.8	10.7	11.5	12.3
10	1.7	2.6	3.4	4.3	5.1	6.0	6.8	7.7	8.5	9.4	10.2	11.1	11.9	12.8
10.5	1.75	2.7	3.5	4.4	5.3	6.2	7.1	8.0	8.8	9.7	10.6	11.5	12.4	13.3
11	1.8	2.8	3.7	4.6	5.5	6.4	7.3	8.2	9.2	10.1	11.0	11.9	12.8	13.7
11.5	1.9	2.9	3.8	4.8	5.7	6.7	7.6	8.6	9.5	10.5	11.4	12.4	13.3	14.3
12	2.0	3.0	3.9	4.9	5.9	6.9	7.9	8.8	9.8	10.8	11.8	12.8	13.7	14.7
12.5	2.5	3.1	4.1	5.1	6.1	7.1	8.1	9.1	10.2	11.2	12.2	13.2	14.2	15.2
13	2.1	3.1	4.2	5.2	6.3	7.3	8.4	9.4	10.5	11.5	12.6	13.6	14.7	15.7
13.5	2.15	3.2	4.3	5.4	6.5	7.6	8.6	9.7	10.8	11.9	13.0	14.1	15.1	16.2
14	2.20	3.3	4.5	5.6	6.7	7.8	8.9	10.0	11.1	12.2	13.4	14.5	15.6	16.7
14.5	2.3	3.4	4.6	5.7	6.9	8.0	9.2	10.3	11.5	12.6	13.8	14.9	16.1	17.2
15	2.4	3.5	4.7	5.9	7.1	8.2	9.4	10.6	11.8	13.0	14.1	15.3	16.5	17.1

Peripheral speed with SM-spindle and different sizes of drill bits

SM-Spindle Unit /	Drill bit Ø mm									
	50	100	150	200	250	300	350	400	450	500
1	0,52	1,05	1,57	2,09	2,62	3,14	3,67	4,19	4,71	5,24
1.5	0,59	1,18	1,77	2,36	2,95	3,53	4,12	4,71	5,30	5,89
2	0,65	1,31	1,96	2,62	3,27	3,93	4,58	5,24	5,89	6,54
2.5	0,72	1,44	2,16	2,88	3,60	4,32	5,04	5,76	6,48	7,20
3	0,79	1,57	2,36	3,14	3,93	4,71	5,50	6,28	7,07	7,85
3.5	0,85	1,70	2,55	3,40	4,25	5,11	5,96	6,81	7,66	8,51
4	0,92	1,83	2,75	3,67	4,58	5,50	6,41	7,33	8,25	9,16
4.5	0,98	1,96	2,95	3,93	4,91	5,89	6,87	7,85	8,84	9,82
5	1,05	2,09	3,14	4,19	5,24	6,28	7,33	8,38	9,42	10,47
5.5	1,11	2,23	3,34	4,45	5,56	6,68	7,79	8,90	10,01	11,13
6	1,18	2,36	3,53	4,71	5,89	7,07	8,25	9,42	10,60	11,78
6.5	1,24	2,49	3,73	4,97	6,22	7,46	8,70	9,95	11,19	12,44
7	1,31	2,62	3,93	5,24	6,54	7,85	9,16	10,47	11,78	13,09
7.5	1,37	2,75	4,12	5,50	6,87	8,25	9,62	11,00	12,37	13,74
8	1,44	2,88	4,32	5,76	7,20	8,64	10,08	11,52	12,96	14,40
8.5	1,51	3,01	4,52	6,02	7,53	9,03	10,54	12,04	13,55	15,05
9	1,57	3,14	4,71	6,28	7,85	9,42	11,00	12,57	14,14	15,71
9.5	1,64	3,27	4,91	6,54	8,18	9,82	11,45	13,09	14,73	16,36
10	1,70	3,40	5,11	6,81	8,51	10,21	11,91	13,61	15,32	17,02
10.5	1,77	3,53	5,30	7,07	8,84	10,60	12,37	14,14	15,90	17,67
11	1,83	3,67	5,50	7,33	9,16	11,00	12,83	14,66	16,49	18,33
11.5	1,90	3,80	5,69	7,59	9,49	11,39	13,29	15,18	17,08	18,98
12	1,96	3,93	5,89	7,85	9,82	11,78	13,74	15,71	17,67	19,63
12.5	2,03	4,06	6,09	8,12	10,14	12,17	14,20	16,23	18,26	20,29
13	2,09	4,19	6,28	8,38	10,47	12,57	14,66	16,76	18,85	20,94
13.5	2,16	4,32	6,48	8,64	10,80	12,96	15,12	17,28	19,44	21,60
14	2,23	4,45	6,68	8,90	11,13	13,35	15,58	17,80	20,03	22,25
14.5	2,29	4,58	6,87	9,16	11,45	13,74	16,04	18,33	20,62	22,91
15	2,36	4,71	7,07	9,42	11,78	14,14	16,49	18,85	21,21	23,56

Peripheral speed with SH-spindle and different sizes of drill bits

SH-Spindle Unit /	Drill bit Ø mm									
	50	100	150	200	250	300	350	400	450	500
1	0,84	1,68	2,51	3,35	4,19	5,03	5,86	6,70	7,5	8,38
1.5	0,94	1,88	2,83	3,77	4,71	5,65	6,60	7,54	8,5	9,42
2	1,05	2,09	3,14	4,19	5,24	6,28	7,33	8,38	9,4	10,47
2.5	1,15	2,30	3,46	4,61	5,76	6,91	8,06	9,22	10,4	11,52
3	1,26	2,51	3,77	5,03	6,28	7,54	8,80	10,05	11,3	12,57
3.5	1,36	2,72	4,08	5,45	6,81	8,17	9,53	10,89	12,3	13,61
4	1,47	2,93	4,40	5,86	7,33	8,80	10,26	11,73	13,2	14,66
4.5	1,57	3,14	4,71	6,28	7,85	9,42	11,00	12,57	14,1	15,71
5	1,68	3,35	5,03	6,70	8,38	10,05	11,73	13,40	15,1	16,76
5.5	1,78	3,56	5,34	7,12	8,90	10,68	12,46	14,24	16,0	17,80
6	1,88	3,77	5,65	7,54	9,42	11,31	13,19	15,08	17,0	18,85
6.5	1,99	3,98	5,97	7,96	9,95	11,94	13,93	15,92	17,9	19,90
7	2,09	4,19	6,28	8,38	10,47	12,57	14,66	16,76	18,8	20,94
7.5	2,20	4,40	6,60	8,80	11,00	13,19	15,39	17,59	19,8	21,99
8	2,30	4,61	6,91	9,22	11,52	13,82	16,13	18,43	20,7	23,04
8.5	2,41	4,82	7,23	9,63	12,04	14,45	16,86	19,27	21,7	24,09
9	2,51	5,03	7,54	10,05	12,57	15,08	17,59	20,11	22,6	25,13
9.5	2,62	5,24	7,85	10,47	13,09	15,71	18,33	20,94	23,6	26,18
10	2,72	5,45	8,17	10,89	13,61	16,34	19,06	21,78	24,5	27,23
10.5	2,83	5,65	8,48	11,31	14,14	16,96	19,79	22,62	25,4	28,27
11	2,93	5,86	8,80	11,73	14,66	17,59	20,53	23,46	26,4	29,32
11.5	2,96	5,92	8,87	11,83	14,79	17,75	20,71	23,67	26,6	29,58
12	3,14	6,28	9,42	12,57	15,71	18,85	21,99	25,13	28,3	31,42
12.5	3,25	6,49	9,74	12,99	16,23	19,48	22,72	25,97	29,2	32,46
13	3,35	6,70	10,05	13,40	16,76	20,11	23,46	26,81	30,2	33,51
13.5	3,46	6,91	10,37	13,82	17,28	20,73	24,19	27,65	31,1	34,56
14	3,56	7,12	10,68	14,24	17,80	21,36	24,92	28,48	32,0	35,60
14.5	3,67	7,33	11,00	14,66	18,33	21,99	25,66	29,32	33,0	36,65
15	3,77	7,54	11,31	15,08	18,85	22,62	26,39	30,16	33,9	37,70

Note:

With reservation for technical changes.

Declaration of conformity

**The manufacturer:**

Name: Tractive AB
Address: Gjutargatan 54, 78170 Borlänge, Sweden
E-mail, web: info@tractive.se, www.pentruder.com

declares that the below described machine:

Description: Pentruder MDU Core Drill NTGRA® and Pentruder MCCS Universal Drill Rig
Type: NTGRA® and MCCS
Designed in: 2010
Serial number:

is in conformity with the following provisions and norms:

- Machinery Directive 2006/42/EC.
- Low Voltage Directive 2006/95/EC
- EMC-Directive 2004/108/EC
- DIN EN ISO 12100 Safety of machinery - Basic concepts, general principles for design and
- DIN EN 12348 +A1; 2009 Core drilling machines on stand – Safety.

Person authorized to compile technical documentation: Anders Johnsen

Address of above person: See address of manufacturer

Every modification which will lead to a change of the original properties of the machine must be made by the manufacturer, which has to confirm that the machine still is in conformity with the safety provisions and norms. If this is not followed this declaration of conformity is no longer valid.

Borlänge, Sweden, 1st October, 2011

A handwritten signature in black ink that reads "A. Johnsen".

Anders Johnsen

Technical Director
Tractive AB