

Operators Manual for Pentruder[®] Modular Drill System



Version: 1.1

Subject: Pentruder[®] Modular Drill System

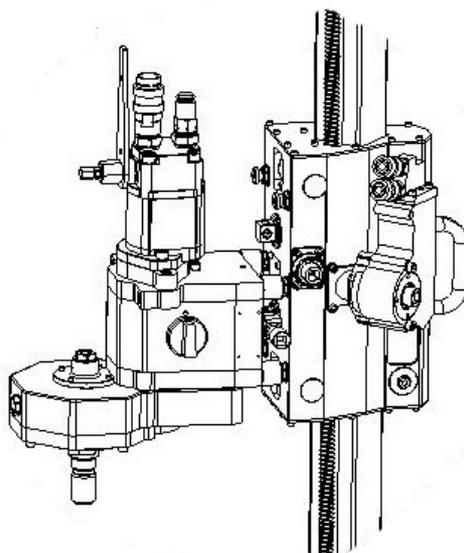
Support & Service
document
Manual Drill 2004-02-25.doc

Copyright © 1997 – 2004 Tractive AB.
Pentruder is a registered trademark belonging to Tractive AB.

Contents

INTRODUCTION	2
GENERAL SAFETY INSTRUCTIONS	3
OVERVIEW OF THE MACHINE	5
RECOMMENDED MOUNTING SEQUENCE	5
EQUIPMENT NEEDED FOR DRILLING	6
DRILL STAND (BASE PLATES– BE1/BE2, COLUMNS - CN).....	7
CARRIAGE - CE1	9
PIVOTING HEAD - PD1.....	10
EXTENSION ADAPTER - ER	11
GEARBOX - MG41	11
GEARBOX - MG41	12
SPINDLE UNIT - ST2.....	14
HYDRAULIC MOTOR HR 16 AND 25	16
DRILL BIT - DT.....	17
HYDRAULIC FEED UNIT - HD	19
HYDRAULIC POWER PACK PENTPAK 15 / PENTPAK 25.....	21
DRILLING IN FLOORS	ERROR! BOOKMARK NOT DEFINED.
DRILLING IN THE CEILING	ERROR! BOOKMARK NOT DEFINED.
DRILLING IN THE WALL.....	ERROR! BOOKMARK NOT DEFINED.
GETTING STARTED	26
MAINTENANCE	30
TECHNICAL DATA PENTRUDER MODULAR DRILL SYSTEM	32
WORDLIST	ERROR! BOOKMARK NOT DEFINED.
DECLARATION OF CONFORMITY	34
DECLARATION OF CONFORMITY	35

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

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

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

Product:

Pentrunder Modular Drill System

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

Manufacturer:

Tractive AB
Aldbäcken 35
S-781 93 Borlänge
Sweden

Phone: +46 243 - 22 11 55

Fax: +46 243 - 22 11 80

E-mail: info@tractive.se

Web: www.tractive.se

General safety instructions

This drilling machine may not be used before the operator is fully educated by our sales agent 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:

- General safety precautions means that all persons working with, or in the proximity to the drilling machine should wear safety equipment, i.e. protection helmet, protection shoes, gloves, eye and ear protectors. Other safety regulations at the work place must be followed. The noise level at drilling might lead to permanent hearing disorders if not ear guards are worn.
- Always check that the equipment is in faultless condition and that all functions are in order before work is commenced.
- Warning! Never connect the hydraulic hoses to either drill unit or power pack while the power pack is running. The power pack must be disconnected from the power supply by removing the 32 or 63 Amp plug and cable from the power pack before any hydraulic connections are made.
- The power pack must always be switched off and the 32/63 Amp plug and cable disconnected from the power pack before any kind of service is commenced, for example filling of oil, oil change and filter replacement.
- Mounting and dismounting of the drilling unit and drill bit may only take place when the drill motor is disconnected from the power pack by removing the two large hydraulic hoses from the drill unit.
- 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.
- The power pack must only be operated when in an upright position.
- 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.

- 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).
- 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 Pentrunder drill system or such equipment, which has been manufactured or approved by Tractive AB.

Overview of the machine

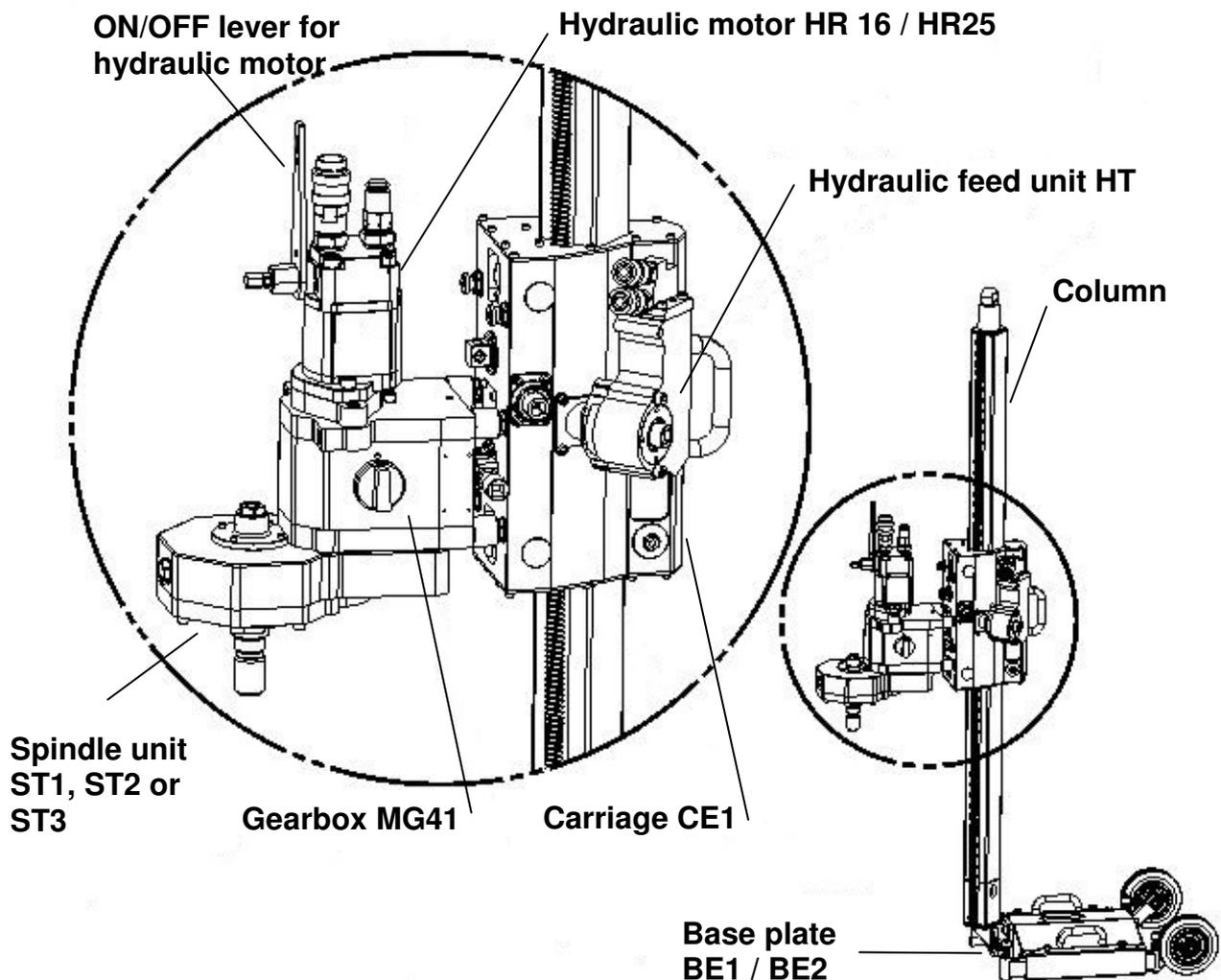


Fig. 1. Drill unit and drill stand with the drill unit enlarged

Spindle unit (page 14)
 Base plate (page 7)
 Carriage (page 9)
 Motor lever (page 15)
 Hydraulic motor (page 15)

Column (page 7)
 Gearbox (page 12)
 Spindle unit (page 14)
 Hydraulic feed unit (page 18)

Recommended mounting sequence

1. Drill stand (Base plate and column) (see page. 7)
2. Carriage and Column and if necessary pivoting head incl. columns (see page 9 and 10)
3. Drill unit
 - a. Gearbox (see page 12)
 - b. Spindle unit (see page 14)
 - c. Hydraulic motor (see page 15)
4. Drill bit (see page 16)
5. Hydraulic couplings to the power pack and drill unit (see page 24)
6. Cooling water fittings to the power pack and drill unit (see page 25)

Equipment needed for drilling

The operator should have the following material at hand:

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

Drill stand (Base plates– BE1/BE2, Columns - CN)

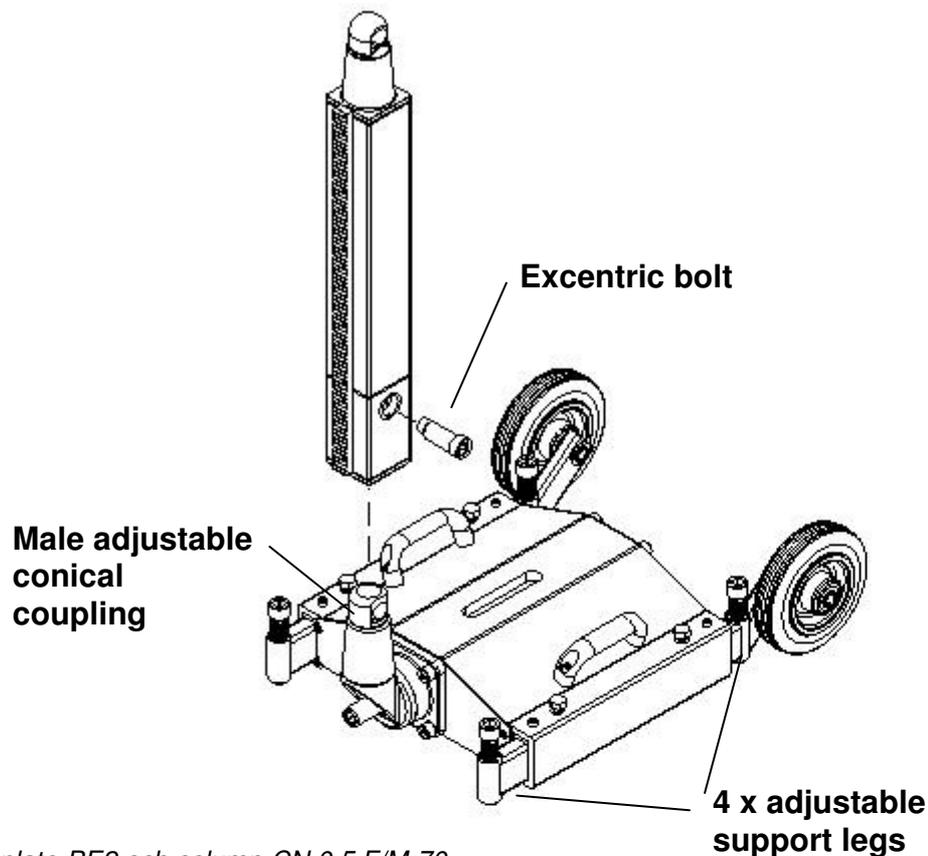


Fig. 2. Base plate-BE2 och column-CN 0.5 F/M-70.

Mounting of drill stand

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 be properly secured. If mounted on brick or light concrete we recommend securing 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 (see fig. 2).
4. Pull out the support legs (see fig. 2) 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.

Important! The base plate must be securely fastened to perform safe drilling.

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

Important! Be careful to clean the mounting hole for the base plate with water or air before fitting an expander bolt.

Columns

There are two types of column. Extendable columns with a female / male configuration, meaning that each column is fitted with a female conical quick release coupling at one end, and a male coupling at the other end.

Columns with a Jack Screw in one end, where the male coupling sits on an extendable column, to be used to jack the machine against ceiling or wall.

The columns are available in three lengths, 0.5 m, 1.2 m and 1.5 m.

On BE2, the conical quick coupling can be swivelled sideways in increments of 5° for angular drilling operations. (see fig. 3).

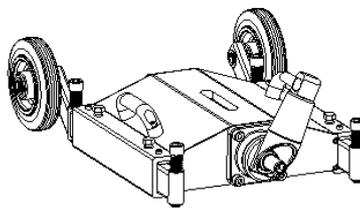


Fig. 3. Base plate-BE2 with swivelled quick coupling.

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

The column is locked by turning the eccentric bolt Clockwise.

To release the column, the eccentric is turned Counter Clockwise until it lifts from the cone, the eccentric bolt is removed and the column can be removed.

Back support

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.

Carriage - CE1

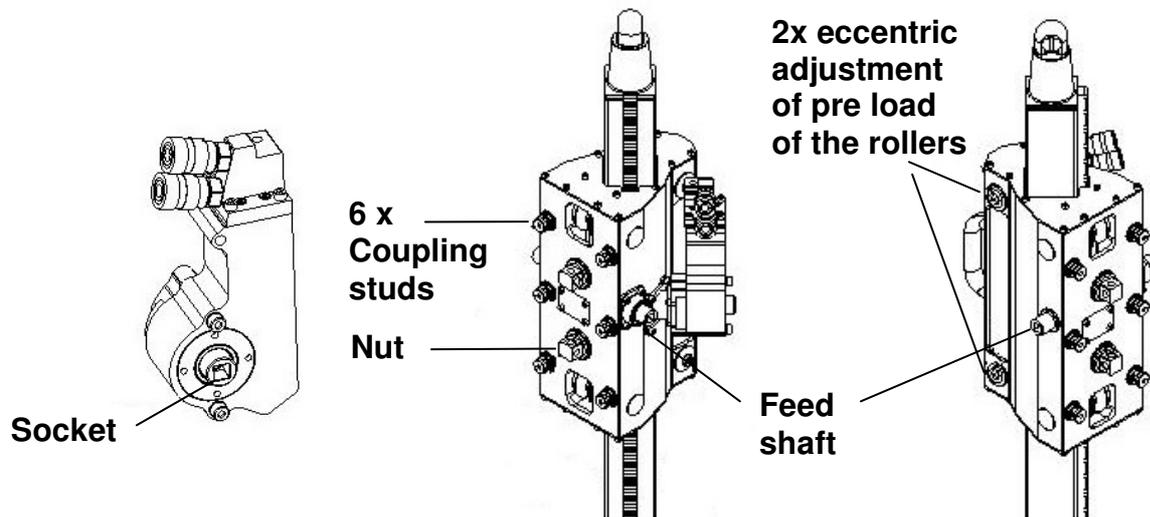


Fig. 4. Hydraulic feed unit HD and carriage CE1 on the column.

Mounting of carriage

1. Loosen the socket on the hydraulic feed unit.
2. Put the carriage on the column (see fig. 4).
3. Adjust the height of the carriage by turning the feed shaft with the ratchet.
4. Tighten the socket until the carriage does not slide down the column.
5. For optimum preload of the rollers on the column, the rear rollers should be adjusted using a 1/2" spanner and a 15 mm wrench. 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 eccenters (see fig. 4) with an 15 mm wrench.

The drill unit (gearbox, spindle unit and hydraulic motor) can be mounted on the carriage with the drill spindle pointing in both directions along the column. Be careful when mounting the carriage on the column. Make sure the coupling is tightened to avoid clamp injuries, this also applies to carriages with the hydraulic feed unit. Do not overtighten the clamp bolt!

Note that the drill unit can be mounted in two positions along the carriage.

With correct preload on the rollers, the carriage will run smoothly and give a very rigid support for the drill bit.

The eccentric roller shafts can be adjusted using a 1/2" spanner and a 15 mm wrench (see fig. 15) to open and lock the eccenters.

Pivoting head - PD1

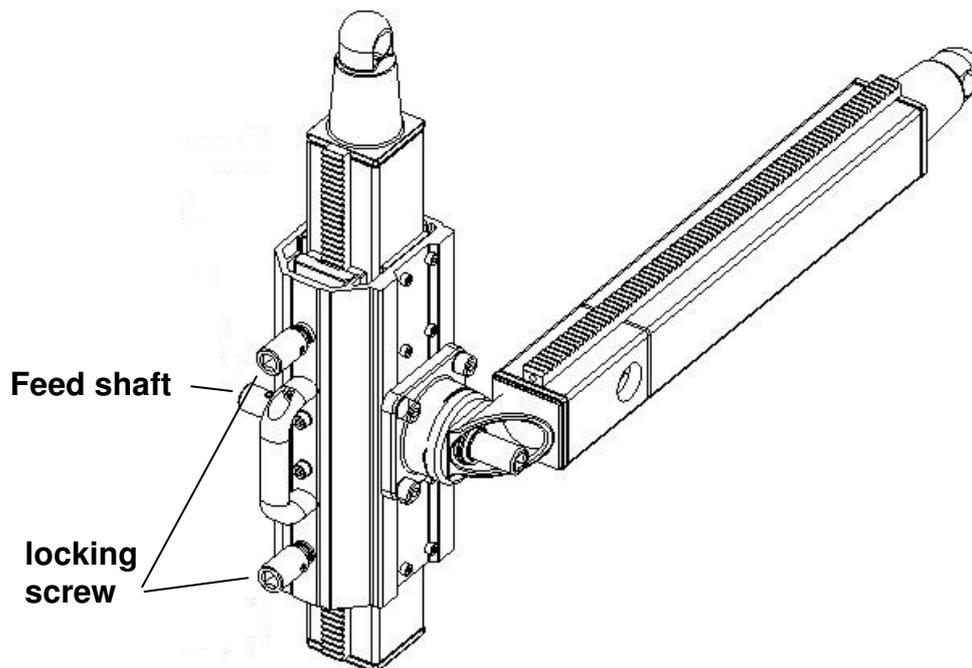


Fig. 5. Pivoting head-PD1 with assembled column.

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.

Mounting of pivoting head

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

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

Important! Be observant so that the eccentric bolt does not slip out of the column when the coulumn is put on the pivoting head. It **MUST** be completely flush with the column side face.

Important! When the adjustable male coupling shall be adjusted, please make sure the teeth are correctly in mesh.

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

Extension adapter – ER100

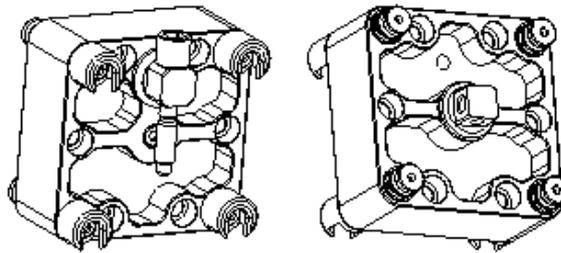


Fig. 6 Extension adapter-ER100 from two views.

When drilling big diameter holes over $\varnothing 550$ mm (21.6") an extension adapter (see fig. 6) 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 100 mm (4") further away from the column, i.e. gives additional clearance for a 200 mm (8") bigger drill bit.

Mounting of extension adapter

1. Mount the extension adapter on the quick couplings on the carriage. (se fig. 7)
2. Screw the clamp screw into the nut on the carriage. Do not overtighten as the thread in the nut can be damaged.
3. Fit the gearbox (see "Gearbox - MG41").

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

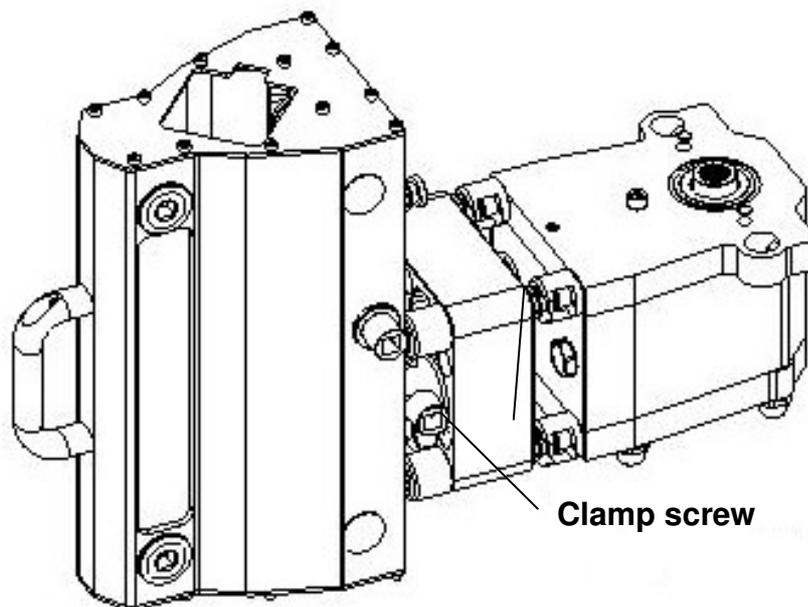


Fig. 7 Extension adapter-ER mounted between carriage CE1 and gearbox MG41.

Gearbox - MG41

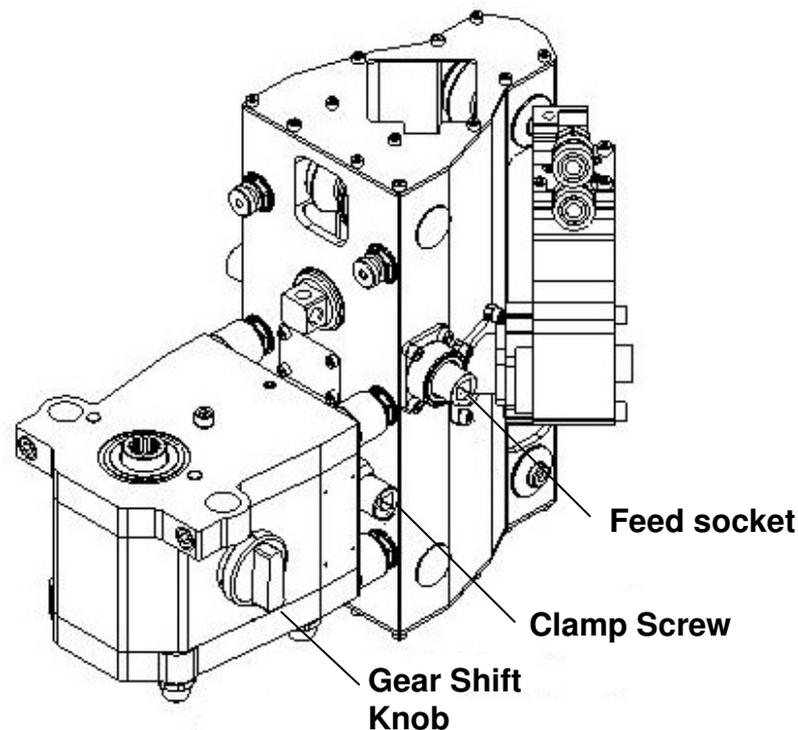


Fig. 8. Gearbox - MG41 mounted on the carriage - CE1.

4-speed Gearbox MG41

The Pentrunder 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. See chart on page 15 for correct gear and speed.

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

Mounting the gearbox on the carriage or extension adapter

1. Mount the gearbox on the quick release couplings on the carriage (see fig. 8) 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 (see fig. 8). Do not overtighten the clamp bolt or the nut will be damaged.
4. Adjust the height of the carriage by turning the feed socket (see fig. 8) with a knuckle bar or with the hydraulic feed unit.

Gear change

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

Warning! 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.

Spindle unit - ST2

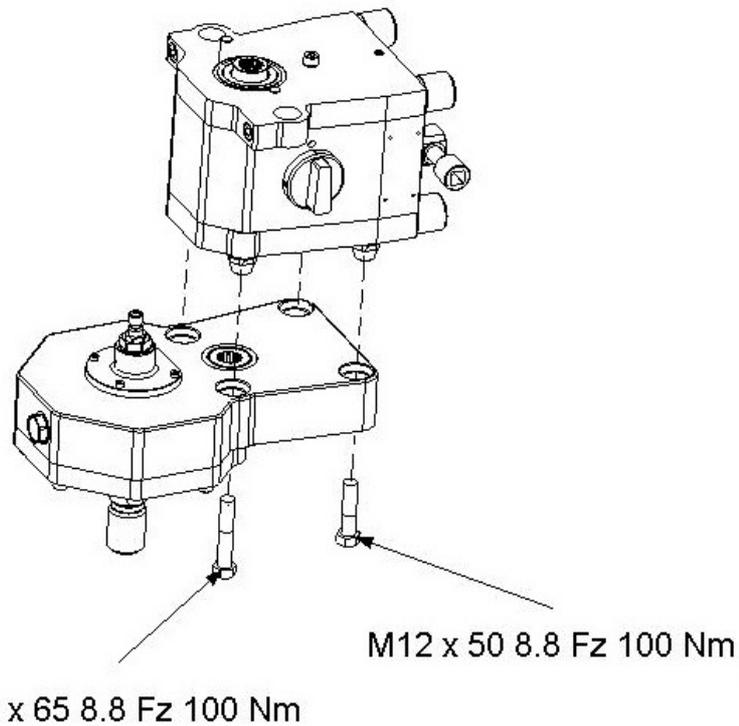


Fig. 9. Spindle unit-ST2 and gearbox-MG41.

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

- Small diameter drill bits are run with the ST1 spindle unit.
- Big diameter drill bits are run with the ST2 and ST3 spindle units.

Chart 1 below describes the spindle speeds of ST2 and ST2 with different hydraulic motors and Pentpak 15 or 25. (The ST1 spindle unit is available only from August 2004)

Spindle Speeds for MG41 Gearbox with ST2 and ST3 Spindel Unit

Spindle Unit Type ST2	1:st gear	2:nd gear	3:rd gear	4:th gear	Speed of hydraulic motor, under load
	ST2	ST2	ST2	ST2	
	Spindle	Spindle	Spindle	Spindle	
	RPM	RPM	RPM	RPM	
PP25 80L/min 25 cc motor	122	193	333	529	2 880rpm
PP15 42L/min 16 cc motor	100	159	273	434	2 363rpm
PP15 42L/min 25 cc motor	64	102	175	278	1 512rpm
Total reduction ratio gearbox + Spindle unit	23.63:1	14.89:1	8.64:1	5.44:1	
Spindle Unit Type ST3	1:st gear	2:nd gear	3:rd gear	4:th gear	
	ST3	ST3	ST3	ST3	
	Spindle	Spindle	Spindle	Spindle	
	RPM	RPM	RPM	RPM	
PP25 80L/min 25 cc motor	249	395	680	1 080	2 880rpm
PP15 42L/min 16 cc motor	204	324	558	886	2 363rpm
PP15 42L/min 25 cc motor	131	207	357	567	1 512rpm
Total reduction ratio gearbox + Spindle unit	11.57:1	7.29:1	4.23:1	2.67:1	

Chart 1: Spindle speeds

Change of spindle unit

1. Clean the coupling cones thoroughly.
2. Mount the spindle unit on the gearbox (see fig. 9) and tighten the screws to 100Nm.

Hydraulic motor HR 16 and 25

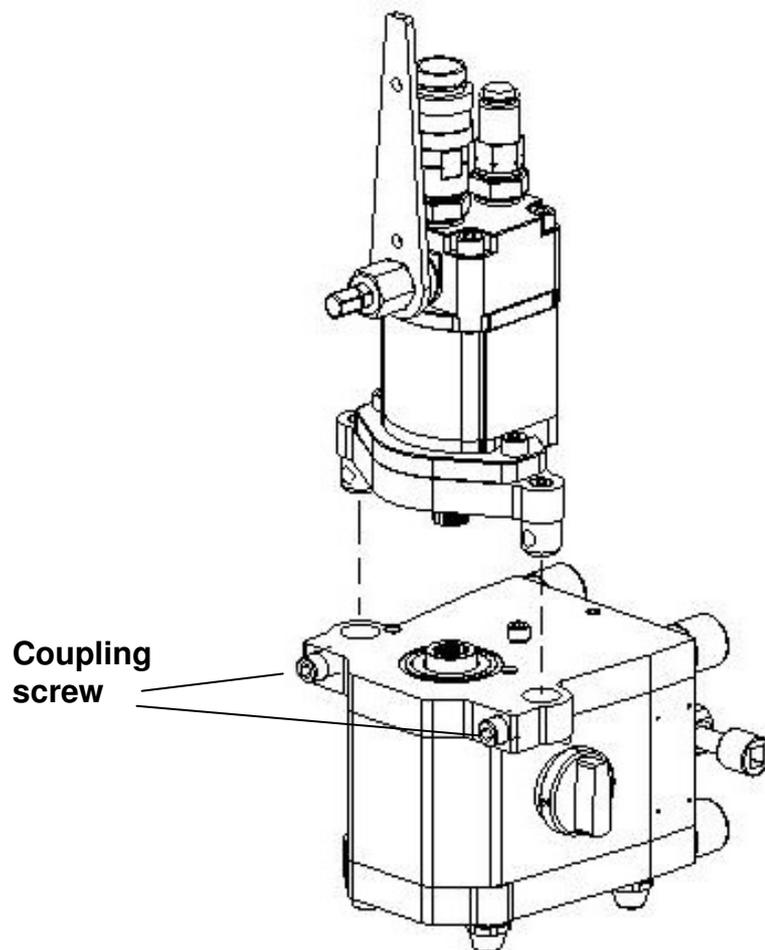


Fig. 10. Positioning of hydraulic motor-HR on gearbox -MG41 at assembly.

Mounting of the hydraulic motor on the gearbox

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

Lever on hydraulic motor

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

See also –"Start of drill system"

Start of drill unit

See –"Start of drill system"

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

Drill bit

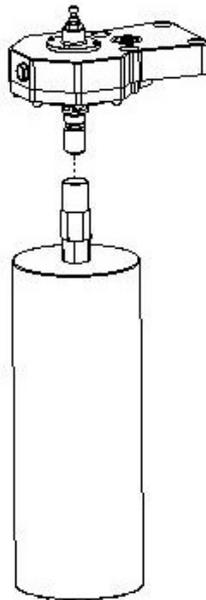


Fig. 11. Drill bit positioned to be fitted on the spindle unit - ST2.

Mounting of the drill bit through threading

1. Clean the thread and lubricate with grease.
2. Thread the drill bit onto the spindle unit. (see fig. 11).
3. Check that the drill bit is correctly fastened.
4. If a "Slider" is used, be careful to check its condition prior to use. The ST1 and ST2 spindle units produce torque levels high enough to destroy the "Slider".

Important! Do not use tools directly on the drill bit tube when mounting it.

Periferal speed

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

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

Drilling with a big drill bit

When drilling with a big 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.

Important! 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, and then remove the drill bit with the drill core from the wall using a crane or other device.

Important! Inspect the drill bit before drilling is commenced to see if the drill bit runs true or if segments are missing. Never use a faulty drill bit!

Important! Never try to stop a rotating drill bit with feet or hands.

Water cooling of the drill bit

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

Hydraulic Feed - HF

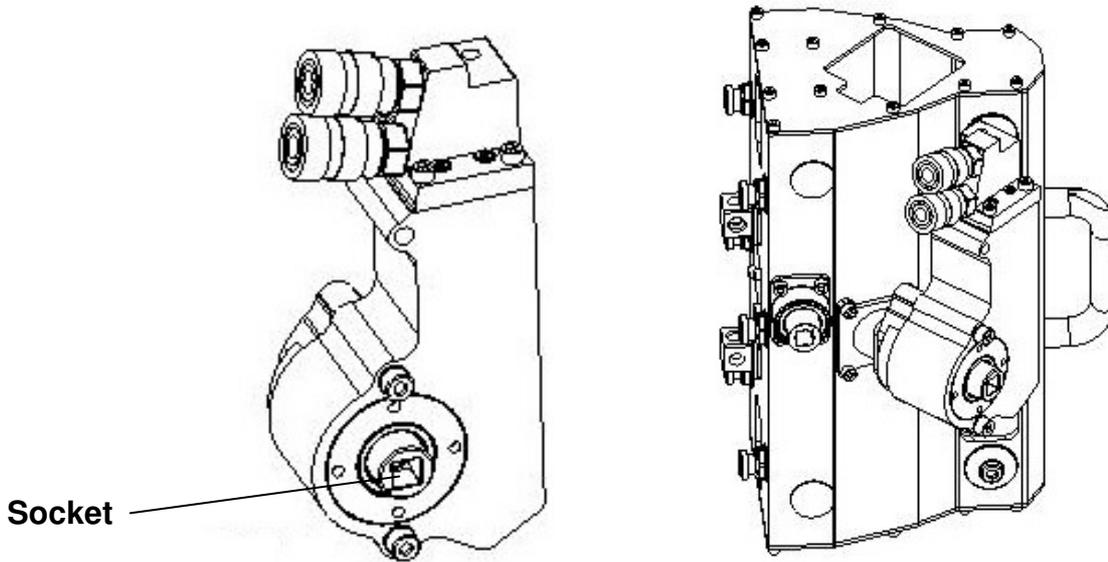


Fig. 12. Hydraulic feed unit-HF and carriage-CE1 with the hydraulic feed unit mounted

A hydraulic feed unit is available. The feed unit is controlled by the remote control from the Pentpak 15 or 25 or from a hydraulic/hydraulic remote control valve block.

Mounting of feed unit

1. Remove the carriage from the column.
2. Loosen the socket.
3. Assembly the hydraulic feed unit according to fig.
4. There is an allen screw inside a punched hole in the lower right corner on the power pack. Completely tighten and then turn this screw 4 – 5 turns CCW before starting to drill with the hydraulic feed.
5. Tighten the socket (se fig.12) on the hydraulic feed unit before hydraulic feeding is started. Do not overtighten the socket!!!
6. For manual feed with a knuckle bar, loosen the socket on the hydraulic feed unit and operate the LH or RH socket on the carriage.

Feeding of the drill bit

Feeding of the drill bit into the concrete is either done per hand by using a knuckle bar on the carriage or with the help of the hydraulic feed unit. A "slow start" with reduced speed of the drill bit can be done by just slowly pulling the lever on the hydraulic motor until the drill bit starts rotating. By first, slowly cutting a groove, the drilling is facilitated. When using the hydraulic feed unit the feeding speed is controlled with a potentiometer on the remote control (see Remote control –"Potentiometer for feeding speed) Adjust the feeding speed until an even, continous cutting pace is reached.

Feed regulation using the hydraulic HD feed unit

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

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

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

Rapid traverse

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

Hydraulic power pack Pentpak 15 / Pentpak 25

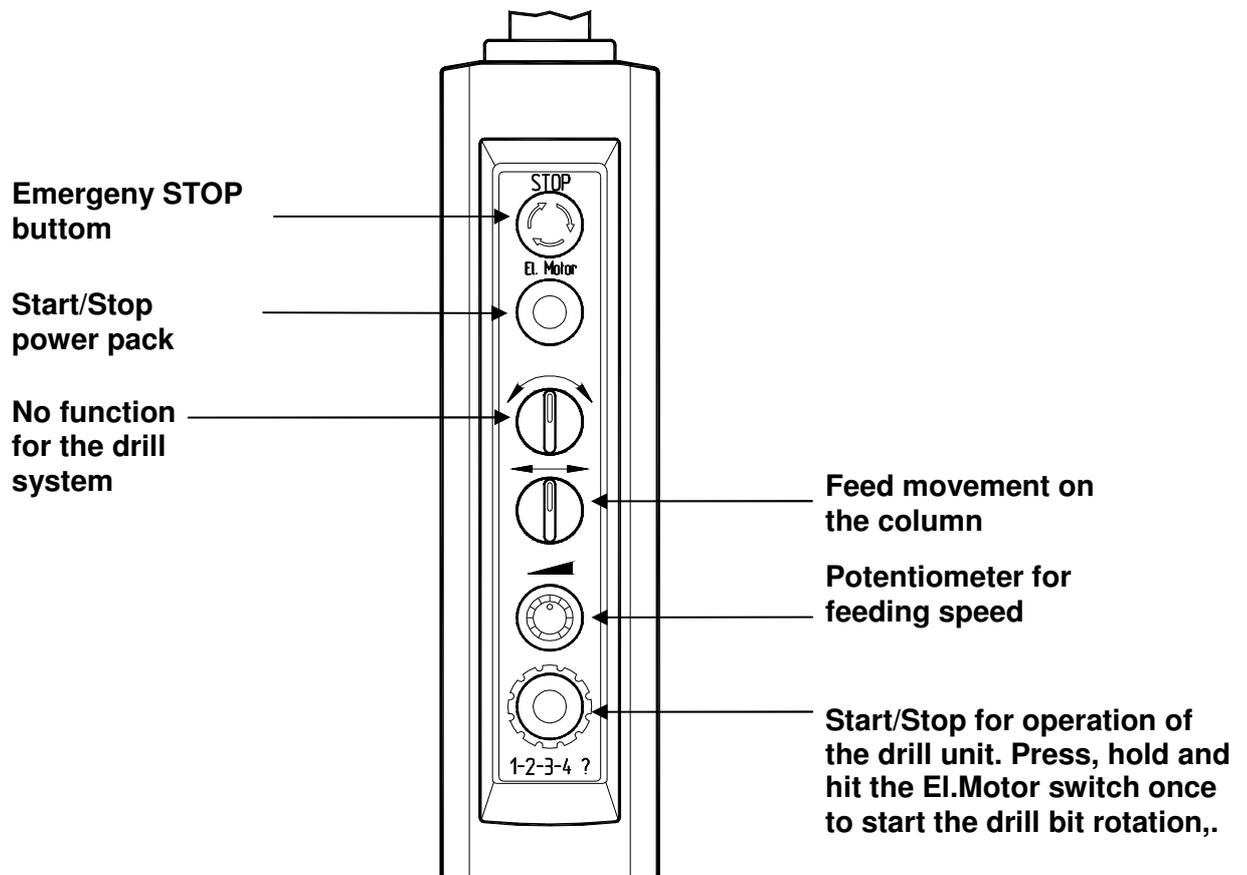


Fig. 13. Remote control

Remote control

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

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

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

Remote control - Extension of cable

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

Starting the operation of the drill unit

To start the operation of the drill unit, press the Start/Stop button for operation of the drill unit and keep it pressed, then press the Start/Stop power pack button.

Positioning the power pack

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

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

Connecting to mains

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

Warning! *The power pack may not be electrically connected when the hydraulic hoses are connected.*

Warning! *Never connect the hydraulic hoses to either power pack or hydraulic motor when the power pack is running. The power pack must be switched off and disconnected from the mains by removing the 63 Amp plug before any of the hydraulic hoses are connected.*

Warning! *Be sure to lock the 3/4" hydraulic couplings by turning the sleeves on the female couplings after they are connected.*

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

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

Soft start on Pentpak 25 (or Pentpak 20)

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

Shutting off the electrical motor of the power pack

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

Emergency stop button

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

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

Transportation of the power pack

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

Transport, wheels

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

Thermal protection relay

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

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

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

Couplings/hoses

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

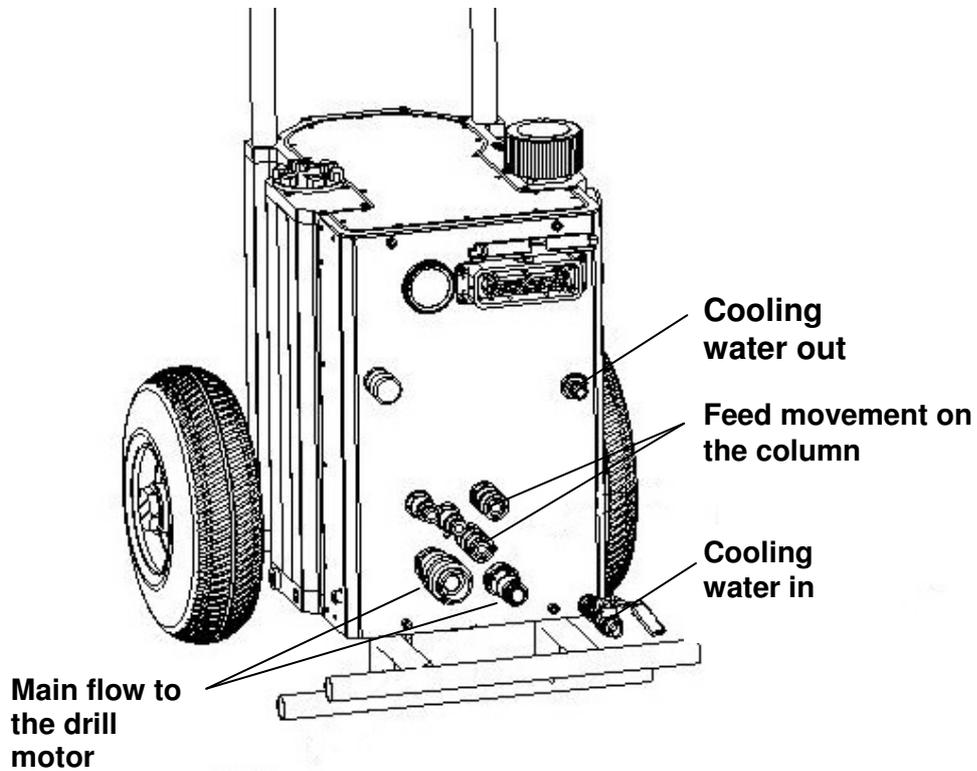


Fig. 14. Connections on the power pack Pentpak 15.

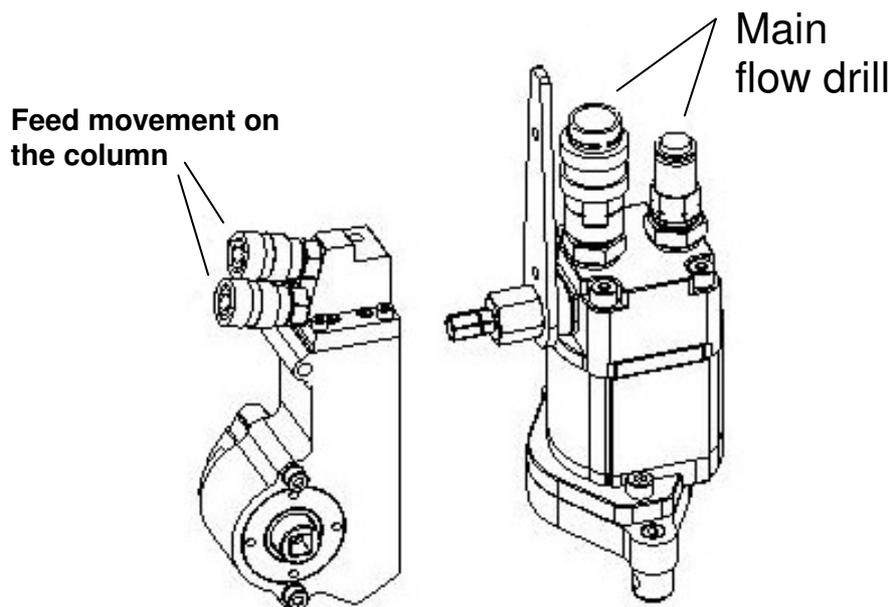


Fig. 15. Connections on hydraulic feed unit-HD and motor-HR.

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

Mounting the hydraulic hoses

1. Connect the two 5/8" / 3/4" hydraulic hoses to the Male and female 1/2" or 3/4" couplings on the hydraulic motor (see fig. 15) and on the power pack see fig. 14).
2. *Connect the two 1/4" hydraulic hoses to the couplings 1/4" on the hydraulic feed unit (see fig.15) and the power pack (see fig. 14).*

Hoses, extension

As far, as is possible the hoses should not be extended to avoid pressure drop and power losses. If the hoses must be extended, we recommend a maximum total length of 30 m from power pack to drill motor. After the extension hoses have been connected, the power pack should be left running for a minute operating the movements and starting the blade motor. Then check the oil level and top up if necessary. **Note: If the extension hoses are not pre-filled with oil, the oil will foam and the power pack will not operate correctly. The power pack must be bled and oil level reestablished. Contact your sales agent for advice before using extension hoses.**

Oil level

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

Pressure drop

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

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

Water cooling

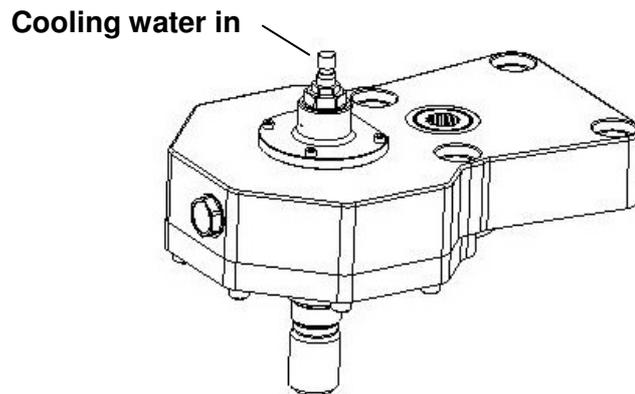


Fig. 16. Coupling for cooling water on Spindle unit - ST2.

The 10mm cooling water hose must be connected between the power pack and the spindle unit. **The power pack is water-cooled and needs a minimum of 8 litres of cool water per minute at full power output.** As for drilling less water is normally used, be careful to not overheat the power pack. The water pressure should be at least 1 bar. The water supply may only be connected to the lower connection on the power pack, never to the upper one. The upper connection is connected to the water hose running up to the drill. (see fig. 13).

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

Mounting the cooling water hoses

1. Connect the water hose between the power pack (see fig. 14) and spindle unit (see fig. 16).
2. Connect the water hose between the power pack and (see fig.14) och water post (not delivered by Tractive).

Getting started

Preparations before commencing work.

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

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

Tools: Use only those tools that are intended to be used to operate the machine: Kuckle bar 400 mm 1/2" (see fig. 14) and an extension 1/2" L = 125mm (not shown in the picture. 15 mm wrench to adjust carriage rollers.

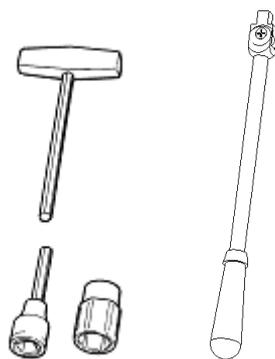


Fig. 17. Tool kit.

- Quick disconnects:** Check all quick disconnect couplings for correct function and cleanliness.
- Remote Control unit:** Check the remote control unit for correct function and that the multi-pin-plug is free from dirt and undamaged.
- Water feed:** Check that the machine can be supplied with clean cold water.
- Hoses:** Check that all hoses are the correct type, R2 for the main $\frac{3}{4}$ " hoses, and that they are in faultless condition.
- Oil level in the power pack:** On the 76 mm level indicator the oil should be up to 1/3 of the glass when the power pack is switched off, with the new 127 mm level indicator the oil should be up to 2/3 of the glass when the power pack is switched off.
- Power supply:** Check if sufficient power is available on the site. The machine must be connected to a 5-pin 400/230 (depending on version) V 3-phase supply with minimum 25 (16) Amp fuses.
- | | Pentpak 25 | Pentpak 15 |
|------------------|------------|------------|
| Current idling | 11 Amp | 9 Amp |
| Current at 8 kW | | 16 Amp |
| Current at 15 kW | 26 Amp | 30 Amp |
| Current at 20 kW | 36 Amp | |
| Current at 25 kW | 45 Amp | |
- Safety precautions on the site:** Check with the foreman responsible that all necessary precautions have been performed before commencing work. Await the approval of the safety precautions and mounting position of the machine from a responsible person before work is commenced.
- Safety** Show all persons involved how the emergency stop 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 unauthorised persons.*

Starting the drill system

All preparations above should be finished before starting the machine. The starting sequence is described below.

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

***Important!** Do not increase the feeding speed of the drill bit when drilling in re-bars. Decrease the speedf instead until the re-bars are drilled through.*
14. **Gear change:** Shut off the operation of the drill unit with the remote control. Turn the lever on the hydraulic motor to **OFF**. If the operator does not have overview of the power pack, it should be shut off and the hydraulic hoses should be

disconnected. Push the index knob when changing gear. The change of gear is facilitated if the drill bit is turned at the same time as the index knob.

Important! *Never change the gear while the drill bit or the hydraulic motors are running.*

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

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

16. **Change of drill bit:** Shut off the operation of the drill unit with the remote control. Turn the lever on the hydraulic motor to **OFF**. If the operator doesn't have overview of the power pack it should be shut off and the hydraulic hoses should be disconnected. Remove the drill bit. Mount the new drill bit by threading it on to the spindle unit.

17. **Start after change of drill bit:** See pos 15.

18. **Drilling is finished:** Shut of the operation of the drill unit and then the power pack. Turn the lever on the hydraulic motor to **OFF**. If there is a risk of temperatures below zero, the water should be drained from the power pack. This is done by disconnection the two water hoses from the power pack. The valve on the power pack is open and the water can be drained.

Important! *If material should be stuck between the drill bit and the wall of the drill hole, shut off the spindle, the power pack and try to remove the bit.*

Important! *Remember to cover drilled holes.*

Important! *If the drill core should be 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.*

MAINTENANCE

For the Pentrunder modular drill system / Pentpak 15/25 to remain in a condition that is safe for operation at all times, certain maintenance is needed. Please read the instructions below carefully before any service work is commenced.

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

Please respect the following maintenance instructions:

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

Warning! No service or maintenance may be performed on the saw head unless it is disconnected hydraulically from the power pack.

REMOTE CONTROL

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

POWER PACK

Oil level in the power pack:

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

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

Oil change in the power pack:

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

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

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

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

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

Oil change in the power

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

GEARBOX

Oil change in Gearbox MD41:

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

SPINDLE UNIT

Oil change in the Spindle unit

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

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

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

Quick disconnect hydraulic couplings: Check all couplings for proper function and replace when necessary.

Technical Data Pentrunder Modular Drill System

Base plate - BE1/BE2:

Width including wheels:	492 mm
Width less wheels:	380 mm
Length including support legs and wheels:	610 mm med stödbenen inskjutna
Length less wheels, front and rear legs:	426 mm
Height not including coupling cone:	111 mm
Length / width of slot for anchoring:	100 x 22 mm
Size of wheels:	Ø 160 mm
Weight including wheels and support legs:	18.5/19.5 kg
Weight less wheels and support legs:	12.8/13.8 kg

Columns - CN:

Chart 2: Technical data for column CN.

	CN 0.5 F/M - 70	CN 1.2 F/M - 70	CN 1.5 F/M - 70	CN 0.5 F/J - 70	CN 1.2 F/J - 70	CN 1.5 F/J - 70
Length (mm)	508	1200	1500	5.8	1200	1500
Weight (kg)	6.4	11.9	14.3	6.6	12.1	14.5
Coupling	Female/Male	Female/Male	Female/Male	Female / Jack screw	Female / Jack screw	Female / Jack screw
Extendable	Yes	Yes	Yes	No	No	No

Carriage - CE1:

Width including 1/2" feed sockets	219 mm
Width housing:	150 mm
Length:	376 mm
Depth:	228 mm
Weight:	9 kg

Pivoting head - PD1:

Width including coupling and 1/2" drive socket:	236 mm
Width housing:	106 mm
Length:	320 mm
Depth incl. clamp screws:	170 mm
Weight:	7.7 kg

4-speed gearbox- MG41

Max power throughput:	12 kW (16HP)
Number of speeds:	4
Width including gearshift knob:	192 mm
Height:	142 mm
Depth:	213 mm
Weight:	7.1 kg

Spindle unit - ST2 and ST3

Spindle Speeds for MG41 Gearbox with ST2 and ST3 Spindel Unit

Spindle Unit Type ST2	1:st gear	2:nd gear	3:rd gear	4:th gear	Speed of hydraulic motor, under load
	ST2 Spindle RPM	ST2 Spindle RPM	ST2 Spindle RPM	ST2 Spindle RPM	
PP25 80L/min 25 cc motor	122	193	333	529	2 880rpm
PP15 42L/min 16 cc motor	100	159	273	434	2 363rpm
PP15 42L/min 25 cc motor	64	102	175	278	1 512rpm
Total reduction ratio gearbox + Spindle unit	23.63:1	14.89:1	8.64:1	5.44:1	
Spindle Unit Type (New) ST3	1:st gear	2:nd gear	3:rd gear	4:th gear	Speed of hydraulic motor, under load
	ST3 Spindle RPM	ST3 Spindle RPM	ST3 Spindle RPM	ST3 Spindle RPM	
PP25 80L/min 25 cc motor	249	395	680	1 080	2 880rpm
PP15 42L/min 16 cc motor	204	324	558	886	2 363rpm
PP15 42L/min 25 cc motor	131	207	357	567	1 512rpm
Total reduction ratio gearbox + Spindle unit	11.57:1	7.29:1	4.23:1	2.67:1	

Chart 1: Spindle speeds

Spindle thread:	1-1/4" – 7 UNC
Width:	184 mm
Height including spindle:	205 mm
Depth:	298 mm
Weight:	7.0 kg
Lubrication:	Oil

Declaration of conformity

We, Tractive AB declare that the machine

Manufacturer: Tractive AB
Aldbäcken 35
78193 Borlänge
Sweden

Category: Hydraulic Drilling System

Type: Pentrunder Drilling system

- Is in conformity with the provisions of the Machinery Directive 98/37/EC.
- Is in conformity with the provisions of the following other EC-directives:

Low Voltage Directive 73/23/EEC (amended by 93/68/EEC)

EMC-Directive 89/336/EEC (amended by 92/31/EEC and 93/68/EEC).

Aldbäcken, Borlänge 2 January, 2002



Anders Johnsen
Technical Director

Declaration of conformity

We, Tractive AB declare that the machine

Manufacturer: Tractive AB
Aldbäcken 35
78193 Borlänge
Sweden

Category: Hydraulic Power Pack

Make: Pentpak

Type: PP 15

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

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

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

Noise related value: 15 kW

Measured sound power level: L_{wa}: 97 dB (A)

Guaranteed sound power level: L_{wa}: 104 dB (A)

Aldbäcken, Borlänge 23 September 2002



Anders Johnsen

Technical Director