

MAGBEAST®



JEI
Solutions
.....
Built for Industry

**SAFETY INSTRUCTIONS
AND OPERATORS MANUAL
FOR
DRILLING MACHINE
MAGBEAST HM40**



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**BEFORE YOU START WORK WITH THE MACHINE,
PLEASE READ THESE INSTRUCTIONS CAREFULLY
AND USE ALL RECOMMENDATIONS.**

1. GENERAL INFORMATION

Portable drilling machines with electromagnetic bases are fast becoming very universal power tools not only at steel fabricating workshops or steel building sites but also at every factory maintenance workshop, truck manufacture & repair company, military equipment service, onboard ship maintenance shop etc.

But full advantages of electromagnetic drilling machines can be achieved only with optimal tooling. Milling cutters are designed and manufactured specifically for use with these machines and offer a whole range of advantages such as 3 inch diameter holes through more than 2 inch steel, in one pass and with precision not otherwise attainable without heavy stationary equipment.

The MAGBEAST HM40 machine is capable of milling 40 mm holes through 2 inch plate what is totally unique for an electromagnetic drill of that size and weight. The MAGBEAST HM40 is equipped with a powerful verified for many years of exploitation drive and electromagnet with field control system.

Before you start work with the machine, please read these instructions carefully. Take special note of safety recommendations.

2. GENERAL SAFETY ADVICE

Drilling machine must not be used when:

1. The operator has not read the Operator's Manual.
2. The work to be done is not in agreement with the recommendations in this
3. Drilling machine is not complete or has been repaired with non-original parts.
4. Power supply parameters do not conform to those stated on the motor's plate.
5. Machines operator has not checked condition of the drilling machine, condition of power cable, control panel or cutter.
6. Power supply socket is not equipped with a protection circuit.
7. Machine is not secured with safety chain as a protection from falling down especially when used at heights or in vertical or upside-down positions.
8. Bystanders are present in the immediate vicinity of machine.



Warning!

Read and save all instruction for future reference!

Important rules of safe use of drilling machine

- 1) Before attempting to work with the machine check condition of electrics including power cord and plug.
- 2) The drilling machine should be connected to an installation equipped with protection circuit (neutral or ground) and protected with a 16 A fuse for 220V and 32 A fuse for 120V. **When used on building sites, it must be supplied through a separation transformer made in the second class of protection**
- 3) Machine can be used outdoors, but is not weatherproof. Do not expose to rain, snow or frost.
- 4) Machine should not be used on: rusty surfaces, steel plates with thick covered with paint, uneven surfaces, next to a welding machine.
- 5) In all cases always use a safety chain/strap /see drawing 1/. The safety chain mustn't be loose! To avoid this situation the safety chain should be wrapped around the element it is hooked to.



*Drawing 1.
Examples how safety chain should be fastened..*



Safety chain can also secure the drill through the handle.

- 6) Do not use the machine in explosion hazard zones.
- 7) Do not start work if the machine has excessive play on guide slides.
- 8) Always wear safety goggles and ear protection.
- 9) Do not remove metal chips with bare hands.
- 10) Do not touch the spindle and the cutter during work.
- 11) Tools must be fastened firmly. When a milling cutter is used, check before start of work if tool holding screws are screwed tight.
- 12) It is not permitted to use blunt or damaged tools.
- 13) Do not use milling cutter without pilots, and arbors without ejection spring.



Do not touch or replace the tool with power source on – while electromagnetic base is being used.

- 14) Use tools recommended in Operator's Manual only.
- 15) After use, always clean drilling machine from metal chips and coolant.
- 16) Always unplug machine from power supply during any work on the machine.
- 17) Before each use the machine should be checked for the presence of damage and the proper and consistent use. Check whether any of the parts are broken and all the parts are fasten properly. Make sure to maintain proper conditions affecting work of the machine.

- 18) In the case that the machine falls on a hard surface, from a height, is wet or is subjected to other unfortunate events that could affect its technical state - work should be terminated immediately and the machine should be sent to service for inspection as soon as possible.

It is not allowed to use drill on steel thinner than (less than 3/8" (10 mm)). On thin steel (less than 3/8" (10 mm)) magnet's adhesive power would be significantly reduced what can cause machines failure or individuals injury. The machine should be located on the work piece with the entire surface of the electromagnetic base! It is recommended that each time, before positioning the machine surface under the electromagnetic base should be sanded down with abrasive paper!



Please keep all recommendation.

3. STANDARD EQUIPMENT

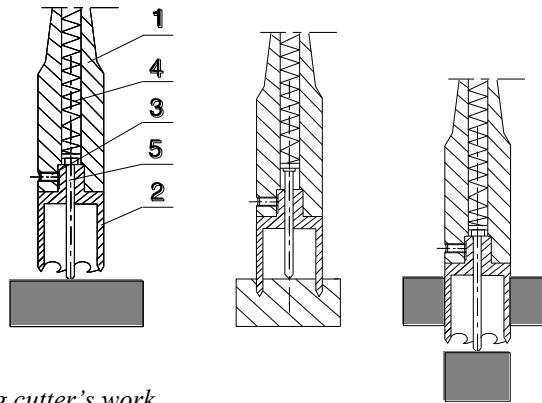
MAGBEAST HM40 comes in a standard equipment set which consists of:

metal box	- 1 pc
drilling machine	- 1 pc
cooling system	- 1 pc
2.5 Allen Key	- 1 pc
3 Allen Key	- 1 pc
4 Allen Key	- 1 pc
8 mm flat wrench	- 1 pc
spoke handles	- 3 pcs
safety chain with snap hook	- 1 pc
operator's manual	- 1 pc
plastic box	- 1 pc

4. START UP AND OPERATION

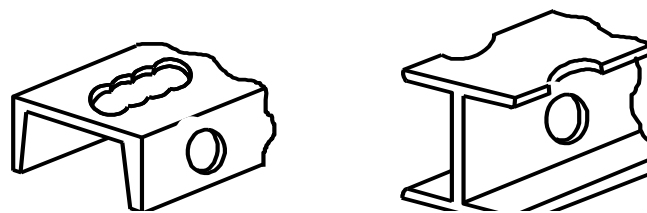
4.1 Cutters and optional equipment features.

This drilling machine's spindle has a Weldon Shank type socket 3/4" or 19,05 mm and is specifically designed for use with milling cutters.



*Drawing 2.
Principle of milling cutter's work*

Milling cutter (2) is located inside arbor body (1) and is fastened with screws (3). While fastening the cutter in the socket, be aware that screws should be screwed tight so that they could not come unscrewed. It is important to position the cutter in relation to the socket in such a way that fixing flats on the cutter shank are positioned opposite to the fixing screws (3). Both fastening screws(3) should be used to fasten the cutter. Pilot (5) is located inside the cutter. It makes it easier to position milling cutter over centre of a planned hole. During drilling as the cutter goes deep into steel, the pilot moves back into the arbor body and tightens discharge spring (4). That spring ejects slug which is a by-product of milling a hole with a centre free cutter.



*Drawing 3.
A few types of holes that can be done with a milling cutter*

Basically milling cutters are designed to make through holes. On occasions when there is a need for an overlapping hole pilot should not be used.

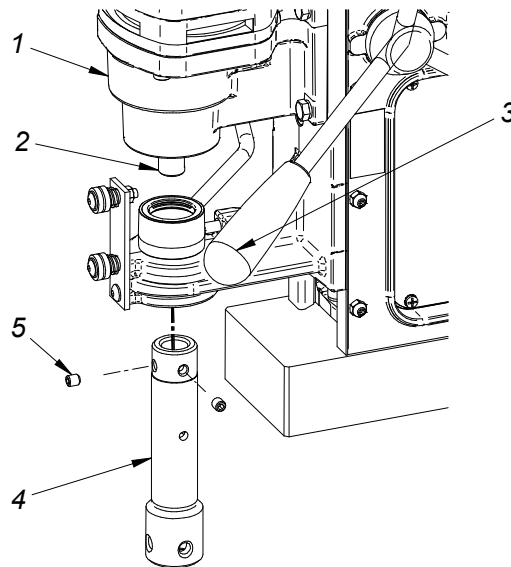
4.1.1 Installing and uninstalling the arbor



The arbor installation and uninstallation should be carried out when the machine is turned off and disconnected from the power grid!

Installing the arbor:

- a) Raise the drive and the slide (1) up using the lever (3);
- b) Raise the guard,
- c) Clean the spindle (2) using a cotton cloth,
- d) Before mounting, clean off the lubricant from the new arbor (4),
- e) Place the arbor on the spindle, so that the flat sides of the spindle are found facing the screws (5)
- f) Tighten the screws securely (5)

**Uninstalling the arbor:**

- a) Raise the drive and the slide (1) up using the lever (3);
- b) Raise the guard in order to attain access to the arbor (4) screws (5).
- c) Loosen the screws (5);
- d) Remove the arbor (4).

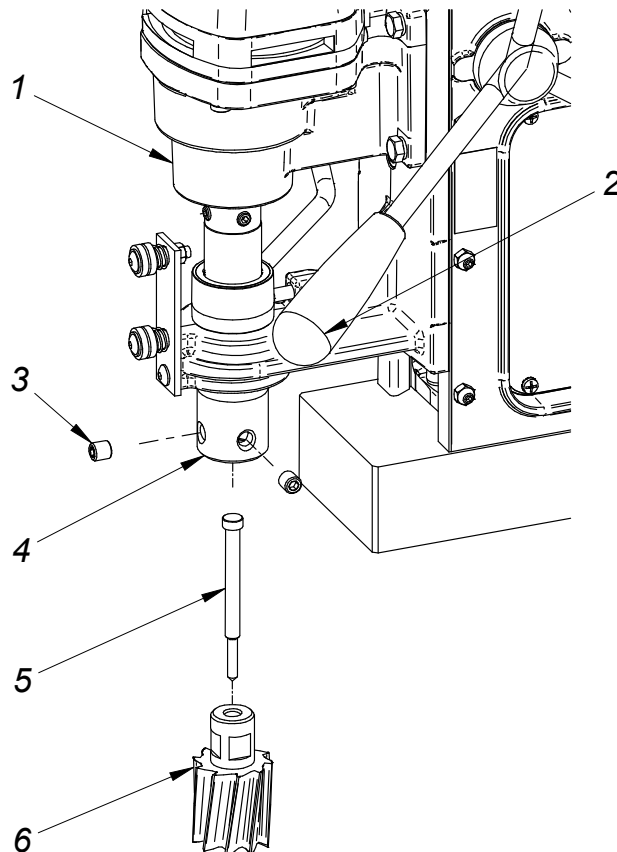
4.1.2 Installing and uninstalling the milling cutter



Milling cutter installation and uninstallation should be carried out when the machine is turned off and disconnected from the power grid!

Installing the milling cutter:

1. Raise the drive and the slide (1) up using the lever (2);
2. Raise the guard in order to attain access to the arbor (4) screws (3);
3. Insert the appropriate type of pilot (5) into the milling cutter (6);
4. Position the milling cutter (6) with the cutter facing up, so that the flat sides of the milling cutter are found facing the screws (3)
5. Put the milling cutter (6) into the arbor socket (4);
6. Tighten the screws securely (3).



Uninstalling the milling cutter:

1. Raise the drive and the slide (1) up using the lever (2);
2. Raise the guard in order to attain access to the arbor (4) screws (3).
3. Loosen the screws (3);
4. Remove the milling cutter (6) and the pilot (5) from the arbor socket (4).

4.2 Operating instructions

The machine is supplied in a metal box. Check if all parts listed in paragraph 3 are included. Steel elements of the drilling machine are protected for transit and storing with grease film. Before first start up of the machine all grease should be removed. Before each use all spoke handles should be screwed into pinion.

Control panel,

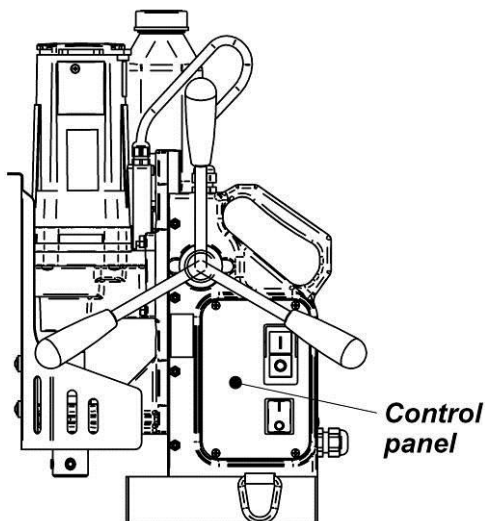
Control elements include:

- 2-position main switch Magnet (01),
- START-STOP switch (02),

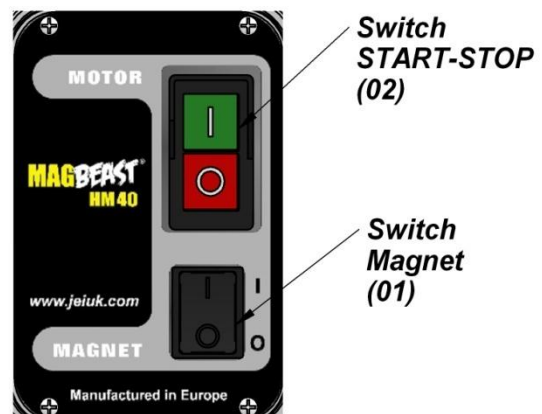
a) In order to start the machine press the main switch (01) on "I" button. Now you can start the motor by pressing green button "I" (02).

b) Stopping the motor is executed with red button „O" (then the motor is switched OFF but the electromagnetic base is still ON) (02).

c) To move machine into next drilling spot, stop the motor as described above and push the mains switch (01) to the position "O".



Drawing 4. View of the machine



Drawing 5. Control panel

**CAUTION: READ THE WHOLE INSTRUCTIONS MANUAL
BEFORE ATTEMPTING TO START UP****4.3 Before you cut**

Before positioning the machine on work piece always make sure that:

- work piece is made of steel;
- thickness of work piece is at least 3/8" (10 mm)
- surface of steel under the magnet is flat
- wipe, brush or sand down clean surface where you intended to place the drilling machine, so that you remove rust, paint, dirt etc which would reduce adhesive power of the electromagnetic base.

Install drill bit, milling cutter or other tooling such as tap or reamer in the machine before plugging it into mains. Then plug it in and position where you wish to use it. Place the machine so that the tool is over the centre of the hole you intend to make and turn the magnetic base ON.

Prior to use always make sure that the machine is secured from falling down with original chain (as described in paragraph 4 "Important rules of safe use of drilling machine").

4.4 Cutting

- Cooling and lubricant fluid commercially available in concentrated are recommended to use for cooling twist drill and annular cutter.
- It's allowed to use of emulsions formed from a mixture of water and drilling oil.



Do not use clean water as the liquid cooling and lubricant.

The cooling system is an integral part of the machine and should always be used. (see point 4.9)

Warning: The cooling system can only be used when drilling machine is in vertical position. In other positions additional external source of cooling should be used, for example: a coolant bottle with a long nozzle.

- Check working of cooling system. Open coolant reservoir's tap and apply pressure on the pilot by turning spokes counter clockwise. As the pilot starts to sink into the cutter cooling liquid should start to run down cutters inner wall. If there is no liquid flowing down check if the tap is fully opened. It may take a few seconds for cooling liquid to fill the whole system.

- Turn the motor on.

Bring the cutter gently into contact with the work piece and slowly start to apply pressure on the cutter.

Making a hole with a milling cutter should ideally be done in one pass. It makes the cutter work better and easier to eject the slug after the hole is completed. If you experience slugs getting stuck inside a cutter after hole is complete try to reduce pressure on the cutter or use different coolant. Do not allow excessive swarf build up around the cutter and arbor.

WARNING: when the milling cutter goes through the material the slug can be pushed out often with considerable strength. Pay attention to avoid injury.

- After a hole is made the cutter should be withdrawn back and both the motor and the electromagnet should be switched OFF.
- When work with the machine is finished the power cord should be disconnected from the power source, the machine should be cleaned up from swarf, coolant etc and the cutter should be removed and cleaned.
- The tool should be removed from drill chuck before inserting to the toolbox.

4.5. Types of a ground material

As shown on the graphs [Drawing 6] magnetic clamping force of the electromagnetic base to the ferromagnetic ground depends on its magnetic properties. Steel with increased carbon content and some other alloying ingredients has lower magnetic permeability, what causes a decrease in the clamping force. Also a thickness of a work piece, on which the drill is placed, is significant.

Maximum clamping force of the electromagnetic base to a 5 mm thick work piece surface is only about 25% of a clamping force obtained from a smooth, plane, 22 mm thick standard plate.

If such thin ground material does not bow, one can try to carry out drilling of a hole, although with keeping the strictest precautions. Particularly a magnitude of a pushing force on a feed handle should be very limited.

Appropriate rpm should be adjusted depending on if drilling would be carried out with a drill bit, or with trepan type metal cutter and a metal cutter's diameter. A drive is equipped in mechanical 1-step reducing gearbox of a motor rpm. A general

dependence between drilling diameter and drilling speed is shown in drawing 7, detailed guide is supplied by manufacturer of used drilling tools. The graph is just a general guide and the shown dependence applies to average structural steel. One should remember that during the drilling a cooling has to be used in a form of oil emulsion in a titer of 5 -10%.

Cooling agent is fed gravitationally from a coolant bottle through an arbor to an inside of the metal cutter. For on-a-wall and on-a-ceiling positions special cooling pastes have to be used.

4.6 Electromagnetic base clamping force control system

This system for security reasons is an integral part of each drill type HM40. It works by constant monitoring of the electromagnetic force base adhesion value to the substrate. In the case of fall the force value below to guarantee safe operation of the machine, the system automatically switches off the drive drill. It also does not allow to enable drive which does not guarantee the proper clamping force.

Clamping force depends on: type and thickness of substrate, thick coatings on the substrate, rust or other contaminants, lack of flatness of the substrate, excessive roughness of the surface, excessive wear of the lower part of the electromagnetic base.

If there's a problem to enable drive after turn on of the electromagnetic base so drive works only after START button is pressed, and after release the drive is off - it means that system works properly. The system didn't allow to for further work due to insufficient clamping force drills.

4.7 How to use the special functions

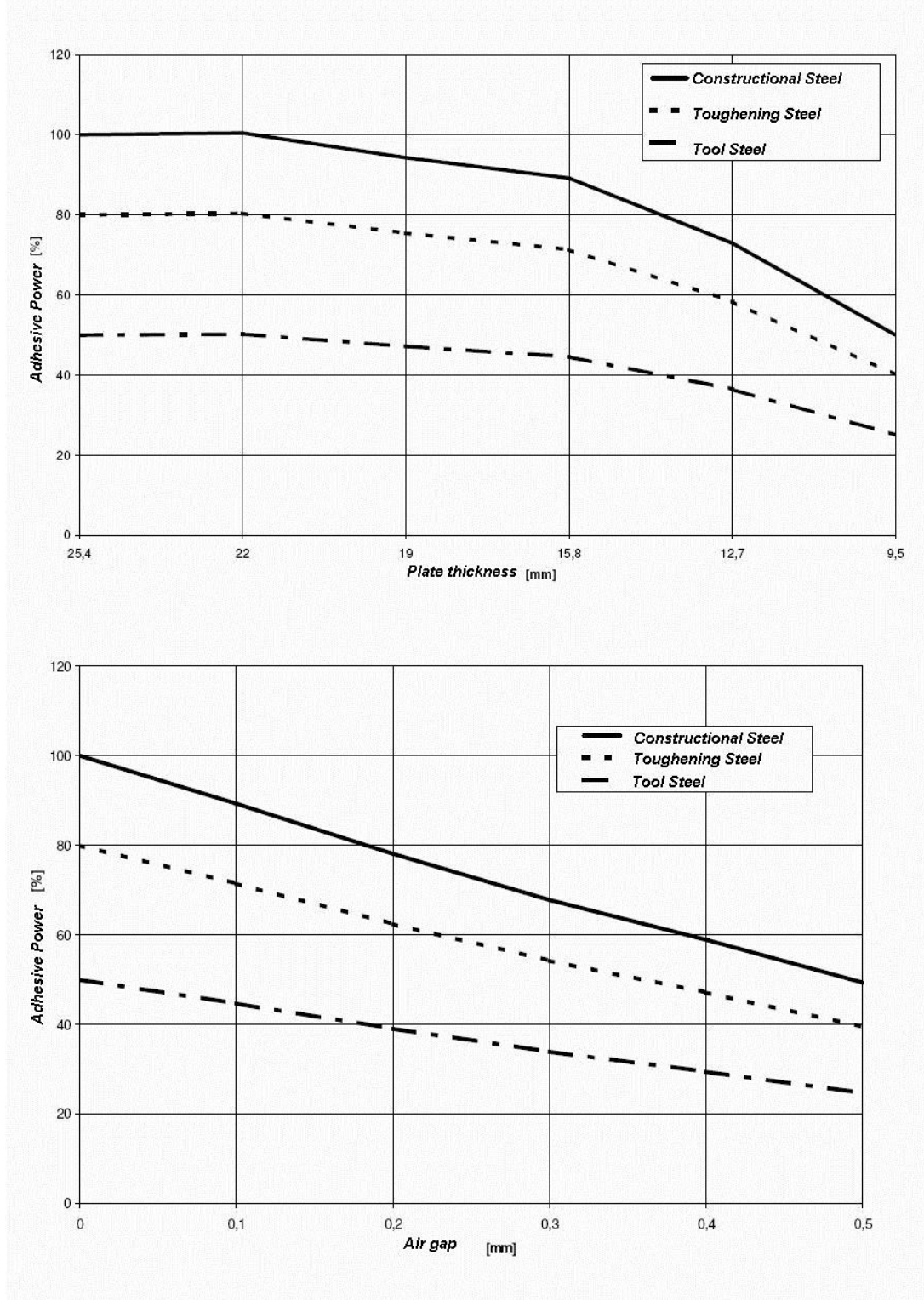
There are many causes which can reduce magnet holding force. These can be: insufficient work piece thickness, paint coating, rust or dirt, uneven and rough surfaces, extensive wear of the magnets bottom surface etc.

If after turning drills electromagnet ON the motor would not start it can be caused by machines safety system which had detected insufficient magnets holding power. Motors operation can then be executed by holding the green Start "I" button pressed continuously. After release of the Start button the motor will stop. To eliminate this situation it is necessary to improve magnetic properties of the work piece or recondition the magnetic base.

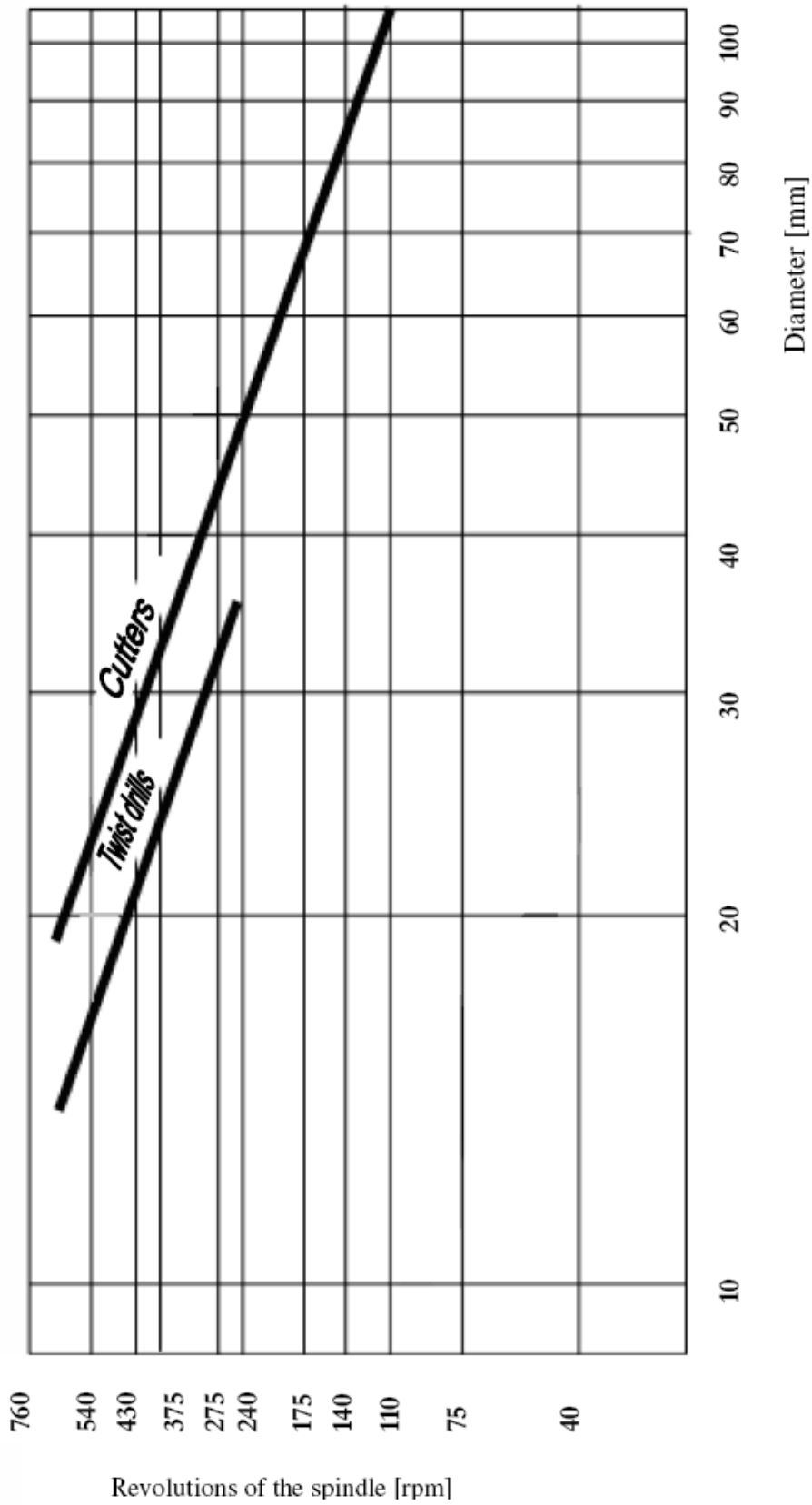
To operate this machine you should push on the main switch in position "I". Then you should turn on the green button "I" to turn on the motor. To stop the motor you should push on red button "O" (It causes the motor off, the magnet still holds). To move on the machine to drill in another place you should stop the motor and then push on the main switch in position "I".

4.8 Working in difficult areas

While working in difficult access areas as well as left-handed operator, there's a possibility to change location of the pinion with spoke handles to the other side of drilling machine.



Drawing 6. Clamping force depending on the thickness of the substrate and the value gap.

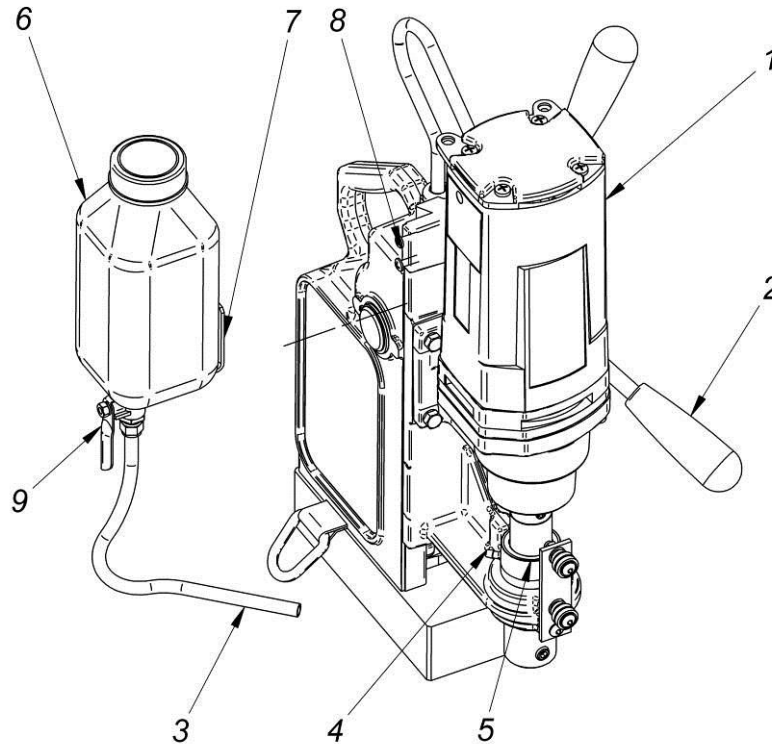


Drawing 7. Dependence of rotational speed on drilling diameter.

4.9 Installing and uninstalling the cooling system

Installing the cooling system:

- a) Place the machine in the vertical position,
- b) Slide the drive and the slider (1) up using lever (2),
- c) Coolant bracket (7) with cooling unit (6) on screws (8) located to the side of the slider,
- d) Connect the cooling conduit ending (3) with the coolant coupling (4) found in the cooling ring (5).



Before starting the machine:

- Remove the bottle's cap,
- Fill it with cooling lubricant,
- Replace bottle cap.

After fulfilling the above actions and making sure, that the system has been appropriately fixed, and the cooling conduit (3) is placed correctly on the valve ending (4), the bottle cap should be loosened by 1/3 of a turn in order to deaerate it, turn on the valve (9), so that liquid travels to the hose, after which the machine can be started (see point 4.2)

After ending work, one must remember to tighten the bottle cap and turn off the valve (9) (to prevent liquid from leaking during the time that the machine is not being used) and uninstall the cooling system (6) before placing the machine in the box.

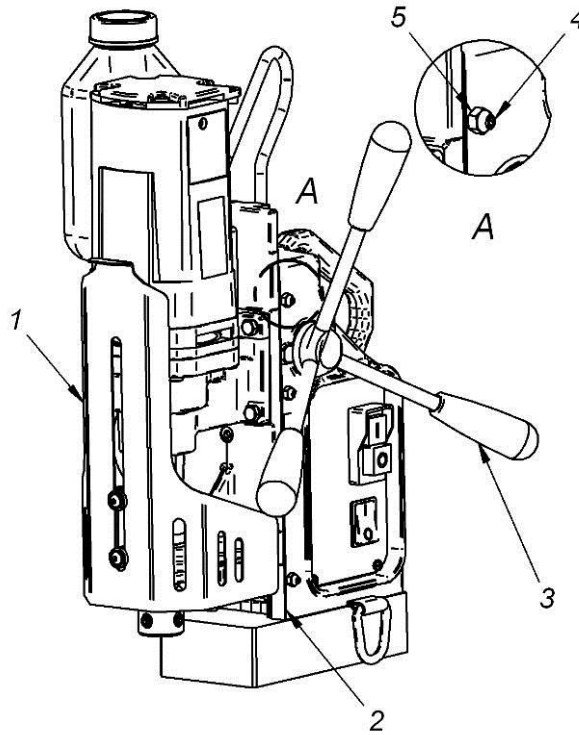
Uninstalling the cooling system:

- a) Place the machine in the vertical position,
- b) Slide the drive and the slider (1) up using lever (2),
- c) Disconnect the cooling conduit ending (3) and the coolant coupling (4) found in the cooling ring (5).
- d) Take off the cooling system.

4.10 Canceling clearance

The drive and the slider (1) can be slid up and down smoothly using the lever (3), uncovering strip (2) and the drill body.

In order to cancel clearance, the regulation screws (4) and the counter nuts (5) must be tightened in order to safeguard against loosening.



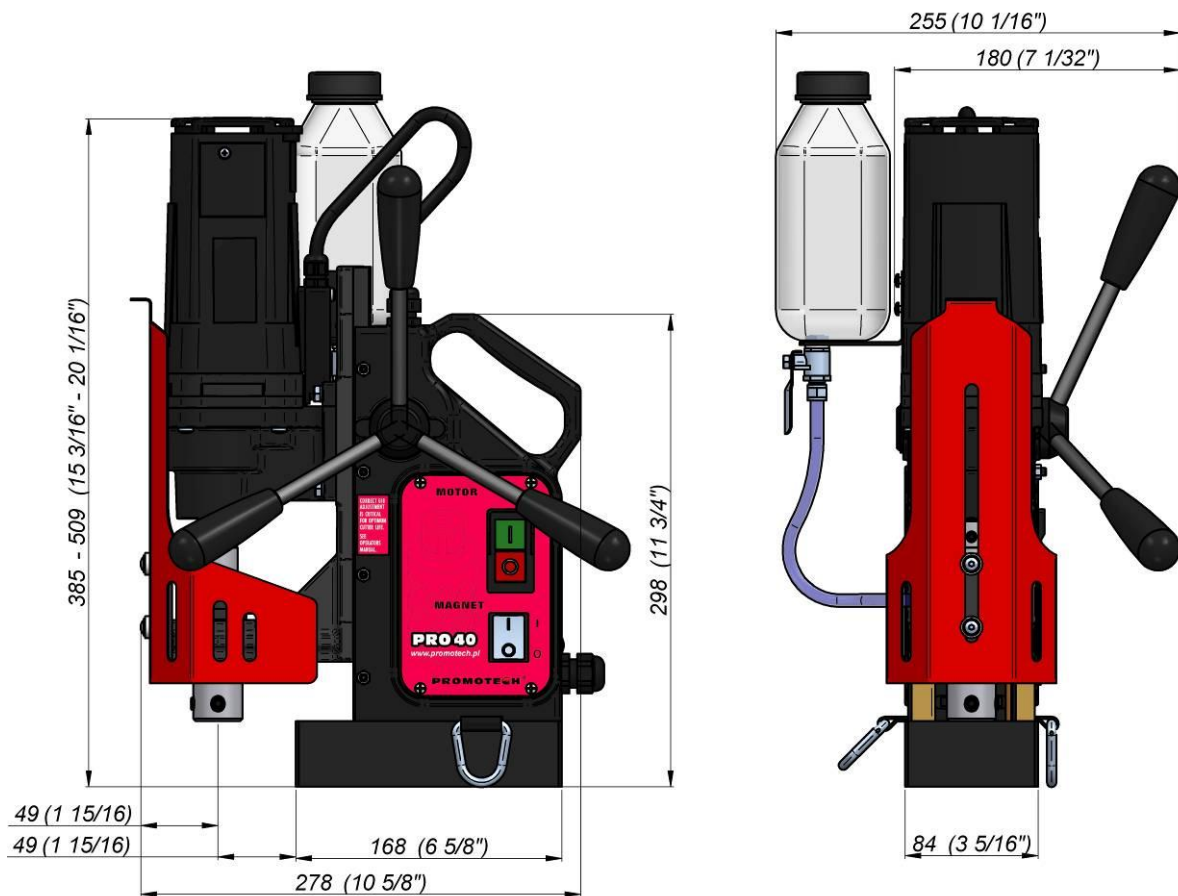
Clearance cancellation should be carried out as follows:

1. loosen screws (4) after undoing the nuts (5),
2. slide the slider up and down several times,
3. slide the slider to its lowermost position
4. tighten the screws located at the height of the slider,
5. slide the slider up,
6. tighten the remaining screws,
7. slide the slider up and down and if necessary, tighten or loosen screws at the height where problems with moving the slider occur,
8. tighten counter nuts (5) when screw has been put into position (using a hexagonal key)



Please keep all recommendation.

5. TECHNICAL DATA



Power supply	110-120 V 50/60 Hz~ 220-240 V 50/60 Hz~
Power required	1100 W
Motor power	1020 W
Tool holder	3/4" Weldon /19,05 mm/
Max. milling cutter diameter	40 mm
Max. drilling diameter	16 mm
Max. milling depth	2" /51 mm/
Insulation Class	I
Standard adhesive force of electromagnet	9 800 N
Slide stroke	124 mm
Machine speeds /under load/	1440 rpm
Electromagnetic base	84x168x41,5 mm
Length of the power cord	3,0 m
Total weight	12,7 kg
Noise level	above 85 dB
Surrounding temperature	0°C – 40°C

5.1 Parameters depending on spindle speed(drilling)*Relationship between machine speed and cutter diameter*

The cutter diameter		Rotary speed [rpm]
[inch]	[mm]	
0,47÷1,38	12÷40	440

Relationship between machine speed and twist drill diameter

The twist drill diameter		Rotary speed [rpm]
[inch]	[mm]	
0,20÷0,63	5÷16	440

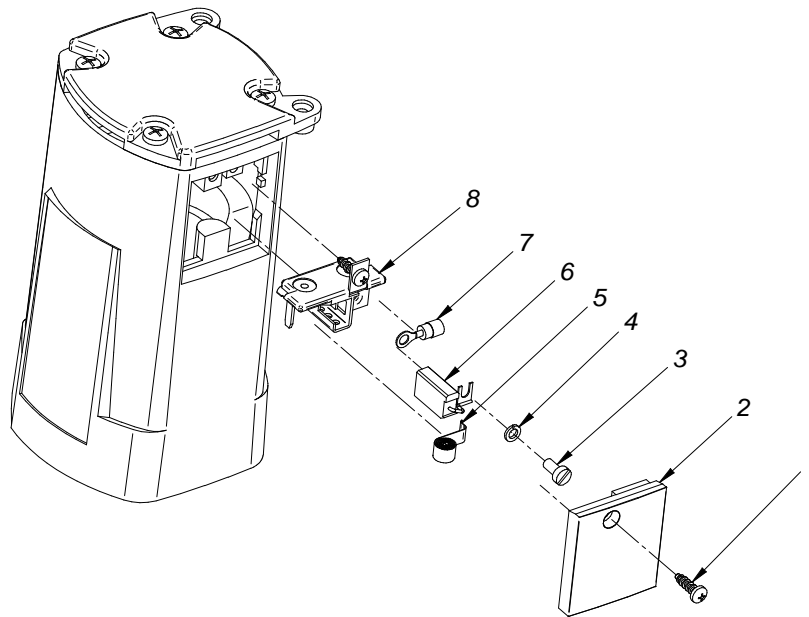
**Detailed PARTS LIST of Drilling Machine HM-40
is available at
Seller, Dealer, Service Office.**

5.2 Replacement of motor brushes:

For the HM-40 drill, the condition of the carbon brushes should be monitored every 100 working hours.



Replacement of motor brushes should take place when the machine is turned off and the power cable is disconnected from the power grid!



1. Unscrew 2 screws (1) fastening brush housing (2).
2. Loosen M4x6 screw (3) clamping the pressure plate (5) of the brush holder (8).
3. Pull out the brush's terminal clamping tip (6) from under the pressure plate (4).
4. Bend off the brush plate's pressure spring (5) and take out the brush(6) carefully.
5. Examine a length of the brush – if it is smaller than 5 mm it has to be replaced with a brand new original piece.
6. Follow above steps in reverse order to re-assemble the motor unit.

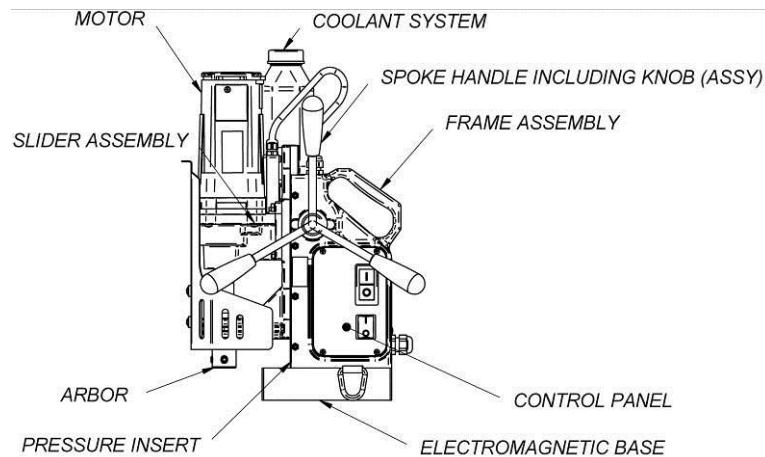
ATTENTION: During the process of mounting terminal clamping tip (6) of the brush, pay attention to position of the motor's wire (7), which un-insulated part should be permanently pressed down with the pressure plate (4) of the brush holder.

After replacement, new brushes should be Grinded in for about 20 minutes on idle gear. Replacement of engine brushes is possible without removing the drive from the drill.

6. MAINTENANCE AND SERVICE

To avoid accidents drill stand, power cable, wiring, plug connectors, switches must be regularly inspected for damage.

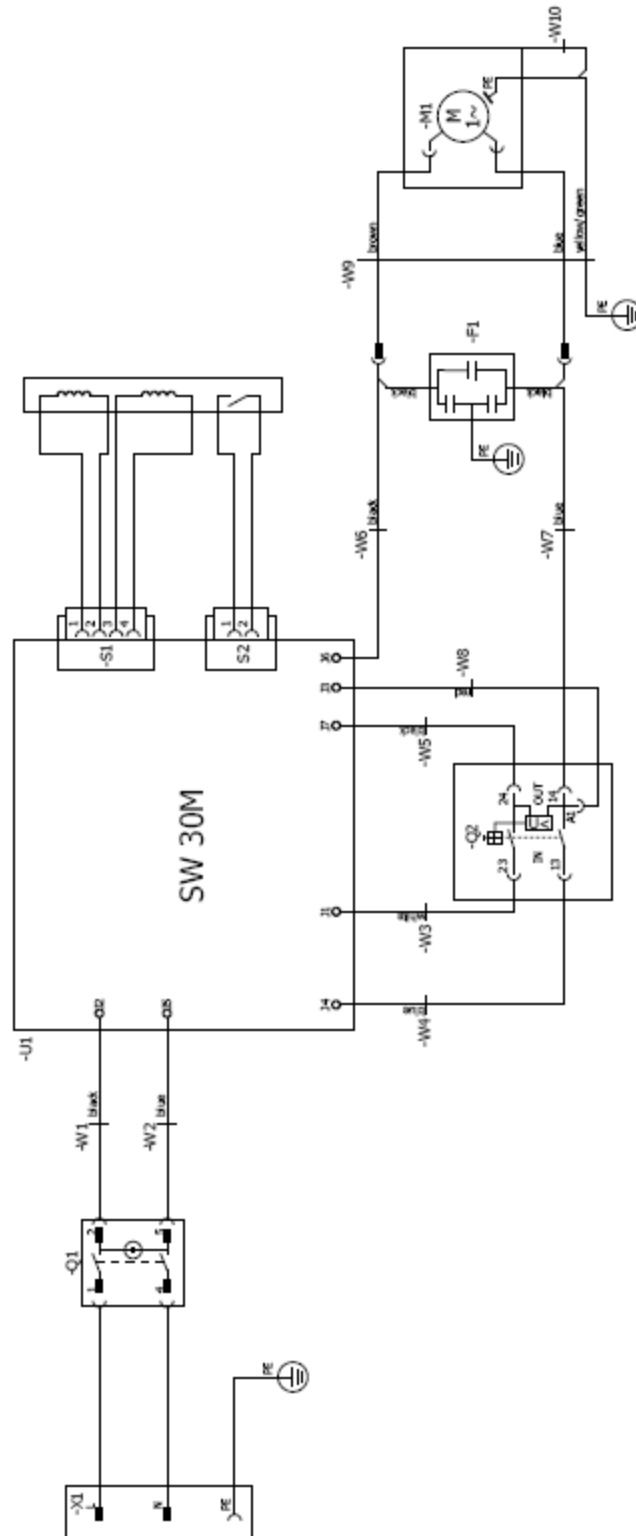
- Perform adjustment of the machine play guides every 50 hours or as necessary performed by the regulation screws. Slide guide loose is correct if the drive can be moved smoothly by using the lever. It's not accepted to automatically slide down under its own weight. (see point 4.10)
- Every 100 hours of work check condition of carbon brushes. If their length is less than 5 mm they should be replaced for original new ones. After replacement new brushes should be run-in without load for about 20 min. Other repair work should be done only by authorized service points, appointed by distributor. Replacement of brushes is possible without removal motor unit from the unit. (see 5.2)
- Lubricate regularly brass slide guide inserts with grease as well as the rack and pinion.
- To prevent the machine from rusting (especially when used outdoors) all steel parts should be covered with thin layer of grease film
- Damaged machine parts to be exchanged only to original parts.
- New spare parts order: required to enter the code or send the damage part with information about type of drilling machine and power supply.



Caution:

In the case that the machine falls on a hard surface, from a height, is wet or is subjected to other unfortunate events that could affect its technical state - work should be terminated immediately and the machine should be sent to service for inspection as soon as possible.

7. ELECTRICAL DIAGRAM



8. MACHINE TEST CERTIFICATE

Machine control card

MAGBEAST HM40 /120V**MAGBEAST HM40 /230V**

Serial No. _____

Date of test: _____

Electric test results:

Test	Result
Test with sinusoidal voltage of 1000 V and frequency 50 Hz	
Resistance of the protective circuit [Ω]	

The above-mentioned product meets the requirements of safe usage as prescribed in standard IEC-745

Name of tester _____

Quality Control _____

JEI Six (6) month limited warranty

JEI Solutions warrants the Magbeast HM40 Drilling machine to be free of defects in material and workmanship under normal use for a period of six months from date of purchase. **This warranty does not cover damage or wear which arise from misuse, accident, tampering or any other causes not related to defects in workmanship or materials.** This warranty is conditioned upon the prepaid return of the Magbeast HM40 Machine to JEI Solutions Ltd, Unit 30, Newhallhey Business Park, Rossendale, Lancs. Or our International representative for our international customers for examination and verification of the claimed defects. If defect is verified, JEI Solutions Ltd will replace, free of charge, any defective parts. If inspection of the machine does not disclose any defect in workmanship or materials, the original purchaser will be notified by JEI Solutions Ltd, or its representative, of the costs of necessary repairs. If repairs are authorized, repairs will be made and the costs of repair and return transportation will be billed through the customer's distributor.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES (EXPRESSED OR IMPLIED) INCLUDING WARRANTY OF MERCHANT ABILITY OR FITNESS FOR A PARTICULAR PURPOSE, SPECIAL AND CONSEQUENTIAL ARE EXPRESSLY EXCLUDED AND DENIED.



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