2 SPEED SWIVEL BASE MAGNETIC DRILLING MACHINE

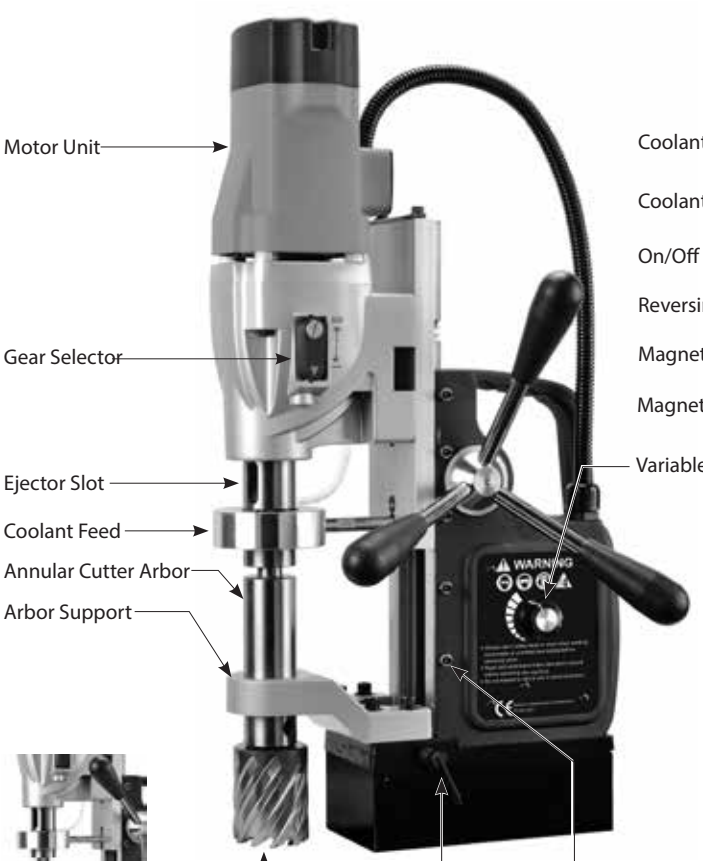
ORIGINAL OPERATING INSTRUCTIONS

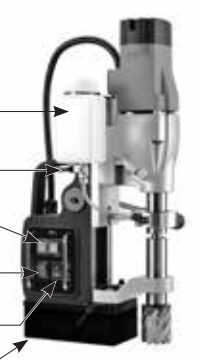
SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE.

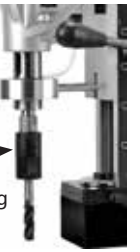
CE CB

Warning:
For tools equipped with over load protection, when motor has shut down off due to over load, always run machine with no load for at least 3 minutes to reduce temperature before returning to operation to avoid burn out of the motor.

Version:20150711







Universal Tapping Chuck for M6 up to M20

MT2 Shank accessories such as twist drills up to 20mm

Twist Drilling with 1/2" Chuck

Power Input	1100W	
Voltage	See machine nameplate	
No / (Full) Load min^{-1}	Speed 1	150~300 (90~180)
	Speed 2	225~450 (135~270)
Max. Capacity	Dia. x Depth of Cutter	50mm x 50mm (2" x 2")
	Dia. x Depth of MT2 Drill	20mm x 150mm (13/16" x 5-7/8")
	Dia x Depth of Chuck Drill	20mm x 110mm (13/16" x 4-5/16")
	Dia x Depth of Tap	M20 x 40mm (13/16" x 1-9/16")
Magnetic Adhesion	17,000 N	
Overload Protection & Soft Start	With	
Net Weight	16.3kg (35.9 Lbs)	

STANDARD ACCESSORIES

* Annular Cutter Arbor
* Drift
* Wrench M8
* Hex Key M2.5
* Hex Key M5
* Coolant Tank Kit
* Chip Guard Kit
* Safety Chain

OPTIONAL ACCESSORIES

* 1/2" (13mm) Chuck, Key & Adapter

WARNING! Read and understand all instruction before operating any drilling system. Failure to follow all instructions listed below may result in electrical shock, damage to drilling system and even personal injury.

GENERAL SAFETY INSTRUCTIONS

Work area

1. **Keep your working area clean and well lighted.** Cluttered benches and working stations causes accidents as well as dark spaces. Always ensure working stations are clean and well lit.
2. **Do not operate power tools in explosive atmosphere, such as in the presence of flammable liquids, gases or extreme dust.** Power tools create sparks that may ignite gases as well as flammable liquids. Dust may enter the ventilation system causing clogging and causing overheating.
3. **Keep bystanders, children and visitors away from moving parts of the power tool**. Any distractions can cause you to loose control of the power tool and an injury could take place.

Electrical Safety

1. **Grounded tools must be plugged into an outlet properly installed and grounded in accordance with all codes and ordinances. Never remove the ground prong or modify the dance plug in any way. Do not use any adaptor plugs. Check with a qualified electrician if you are in doubt as to whether the outlet is properly grounded.** If tools should electrically malfunction or break down, grounding provides a low resistance path to carry electricity away from the user.
2. **Never carry a tool by the cord or hose and "yanking" the cord or the hose to disconnect it from the receptacle.** Always carry the power tools properly and store in dry and dust free place.
3. **Keep cords and hoses away from heat, oil and sharp edges.** Damaged cords increase the risk of electric shock.
4. **Don't expose power tools to rain or wet conditions.** Water entering a power tool will increase the risk of electric shock. **When operating a power tool outside, use an outdoor extension cord marked . W-A. or. W..** These cords are rated for outdoor use and reduce the risk of electric shock.

Personal Safety

1. **Stay alert, watch what you are doing and use common sense when operating a power tool. Do not use tool while tired or under the influence of drugs, alcohol, or medication.** A moment of inattention while operating power tools may result in serious personal injury.
2. **Dress properly. Do not wear loose clothing or jewelry. Contain long hair. Keep your hair, clothing, and gloves away from moving parts.** Loose clothes, jewelry, or long hair can be caught in moving parts.
3. **Avoid accidental starting. Be sure switch is off before plugging in.** Carrying tools with your finger on the switch or plugging in tools that have the switch on invites accidents.
4. **Remove adjusting keys or switches before turning the tool on.** A wrench or a key that is left attached

to a rotating part of the tool may result in personal injury.

5. **Do not overreach. Keep a proper footing and balance at all times.** Proper footing and balance enables better control of the tool in unexpected situations.
6. **Use safety equipment. Always wear eye protection.** Dust mask, non-skid safety shoes, hardhat, or hearing protection must be used for appropriate conditions.

Tool use and care

1. **Use clamps or other practical way to secure and support the work piece to a stable platform.** Holding the work by hand or against your body is unstable and may lead to loss of control.
2. **Do not force tool. Use the correct tool for your application.** The correct tool will do the job better and safer at the rate for which it is designed.
3. **Do not use tool if switch does not turn it on or off.** Any tool that cannot be controlled with the switch is dangerous and must be repaired.
4. **Disconnect the plug from the power source before making any adjustments, changing accessories, or storing the tool.** Such preventive safety measures reduce the risk of starting the tool accidentally. **Store idle ling tools out of reach of children and other untrained persons.** Tools are dangerous in the hands of untrained users.
5. **Maintain tools with care. Keep cutting tools sharp and clean.** Properly maintained tools, with sharp cutting edges are less likely to bind and are easier to control.
6. **Check for misalignment or binding of moving parts, breakage of parts, and any other condition that may affect the tools operation.** If damaged, have the tool serviced before using. Poorly maintained tools cause many accidents.
7. **Use only accessories that are recommended by the manufacturer for your model.** Accessories that may be suitable for one tool may become hazardous when used on another tool.

Service

Only qualified repair personnel must perform tool service. Service or maintenance performed by unqualified personnel could result in a risk of injury.

When servicing tool, use only identical replacement parts. Follow instructions in the Maintenance section of this manual. Use of unauthorized parts or failure to follow Maintenance Instructions may create a risk of electric shock or injury.

Symbols used in this manual

IMPORTANT: Some of the following symbols may be used on your tool. Please study them and learn their meaning. Proper interpretation of these symbols will allow you to operate the tool better and safer.

Symbol	Name	Designation/Explanation
V	Volt	Voltage (potential)
A	Amperes	Current
Hz	Hertz	Frequency (cycles per second)
W	Watt	Power
kg	Kilograms	Weight
min	Minutes	Time
s	Seconds	Time
	Diameter	Size of drill bits
n_0	No load speed	Rotational speed, at no load
min^{-1}	Revolutions per minute	Revolutions, strokes, surface speed per minute.
0	Off position	Zero speed, zero torque…
1, 2, 3, …	Selector settings	Speed setting,higher number means greater speed
~	Alternating current	Type or a characteristic or current
⏚	Class I construction	With electrical earth
⚠	Warning symbol	Alerts user to warning messages

Terminology used in the manual

1. **Warning: This term means that there is a risk of physical harm or death to the operator or people nearby.**
2. **Caution: This term means that there is a risk of damage to the machine, cutting tool or other equipment.**
3. **Note: These terms offer useful information relating to the operation of the machine or its maintenance.**

SPECIFIC SAFETY RULES AND REGULATIONS

1. **Always use safety chain.** Mounting can release.
2. **The magnet's adhesion depends on the thickness of the work piece.** Always ensure that the work piece is a minimum of 12mm (7/16 in.) thick. If it is not, then use a piece of steel plate at least12mm thick and larger than the magnet below the work piece to supplement the magnetic adhesion.
3. **Metal chips and other debris will seriously hamper magnetic adhesion.** Always ensure that the magnet is clean and free of rust and scale.
4. **Other units used on the same receptacle will cause uneven voltage that could lead to the magnet releasing.** Always use the tool alone on the receptacle.
5. **It is hazardous to use the drill upside-down.** Do not exceed 90 degrees from horizontal.
6. **Avoid the magnet releasing.** Ensure that the magnet has properly adhered to the work piece before beginning drilling.
7. **Avoid operating annular cutters without coolant fluid.** Always check coolant level before operating.
8. **Do not operate with dull or damaged cutting tools.** This may overload the motor.
9. **Protect the motor.** Never allow cutting fluid, water, or other contaminants to enter the motor.
10. **Metal chips are often very sharp and hot.** Never touch them with bare hands. Clean up with a

magnetic chip collector and a chip hook or other appropriate tool.

CAUTION: NEVER position machine on a work piece between the electrode and the ground of any arc type welder. Damage to the machine will result, as the welder will ground through the machine's ground cable. When drilling stacked work materials, always stop to clear the slug after the first layer is drilled.

WARNING: Do not operate the machine on a workpiece which is being welded on at the same time. This may lead to damage to the machine and possible injury.

WARNING:NEVER attempt to use machine with incorrect current or abnormally low voltage. Check machine nameplate to ensure that correct voltage and Hz are used. When drilling non-ferrous (non-magnetic) work materials, only use a manufacturer- approved fixture such as a vacuum base adapte.

Magnet Base Duty Cycle

Do not leave the magnet base activated continuously for more than 60 minutes. If the magnet base is overheated, allow it to cool for 30 minutes before continuing.
This machine is not intended for production-line type use.

CAUTION:Turn the magnet base off when not in use. Leaving the magnet base on continuously will damage it.

WARNING: For safe magnetic adhesion, the minimum thickness of the workpiece must be at least 10mm.

ASSEMBLY

Coolant tank assembly required. First attach clear tube to the bottom of the coolant tank. To do this, first loosen the nut and slide nut onto the tube. Then slide tube onto the nipple. Then tighten the nut. Slide tank hanger over the screw on the upper right hand side of slide and tighten. Finally insert the other end of the tube into the quick-release connector in the gearbox. Just directly push in to install. **(To remove, first firmly push the red collar of the connector and pull the tube out.)** Cutting coolant fluid is always required when using annular cutters. Open tank cover and fill. Check coolant fluid level often. Keep coolant tap closed when not in use.
Chip guard must be used. To attach the chip guard, use the supplied butterfly bolts to bolt to the magnet. It is not necessary to remove guard to clean chips. Simply raise guard to its upper position.
Safety chain must be used. Loop chain around the work piece and feed through the machine's handle and clip in place.

MOUNTING ANNULAR CUTTERS

CAUTION: Never use a cutting tool that is larger than the maximum rated capacity of the machine.

1. To insert an annular cutter, first insert the pilot pin into the cutter. Then slide the cutter into the arbor, align the proper flat with the locking screw(s) and tighten securely with the supplied hex wrench.

CAUTION: Ensure that the locking screw is on a flat of the cutter and not just against the rounded shank.

2. Ensure that the oil feed tap is on and coolant feeds properly by pushing the pilot pin. If it feeds too quickly or slowly, adjust the tap accordingly. Keep the tap closed when not in use.

OPERATION-GENERAL

WARNING: Always ensure that the magnet is adhered properly to the work piece before beginning drilling.

NOTE: If mounting to a curved surface beam, mount the machine parallel to the curve in the work piece.

WARNING: Avoid operating at more than 90 degrees from horizontal. When drilling at such an angle take precautions to prevent cutting coolant from entering the motor. Paste-type coolant should be used.

CAUTION: Machine is equipped with a reversing switch. Always ensure that direction of rotation is correct before operating. Operating in the wrong direction could result in damage to the cutter.

1. First fit tool into arbor and line up with intended center of cut. Then switch magnet on.

2. Press green motor on button to start motor. Use the crank handle to feed to work. Always use very light pressure when beginning the cut and just as the tool is breaking through. The crank handle offers tremendous leverage; so do not use too much force. Allow the cutting tool to determine the pace. With experience, the operator will be able to determine the best pace to feed to the work. There should be some degree of audible slowing of the motor but not bogging in the cut. Correct cutting speed with a properly sharp annular cutter will produce long unbroken chips, which produce a "bird's" nest. shaped bundle of chips around the cut.

NOTE: Always ensure that the cutting tool is sharp. A dull cutter typically will have finer and/or choppy shavings.

WARNING: ALWAYS clear chips when there is too much build-up. Excessive chip build-up could result in a jammed cutter or other hazardous situation.

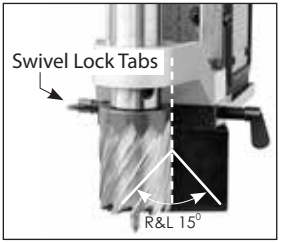
WARNING: the slug ejects at end of cut and is very hot. Always provide a method of catching the slug, where the ejected slug may cause injury to people below.

Note: Lock the slide lock on the side of the machine in the fully raised position when at rest to prevent the slide from accidentally slamming down - remember to unlock it again before commencing drilling.

CAUTION: Never attempt to cut half-circles or to stitch drill (drill overlapping holes) with a TCT cutter. This may destroy the cutter.

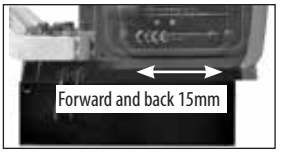
CAUTION: Never attempt to re enter a half-finished cut if the magnet has been turned off and the machine shifted in the interim. This may destroy the cutter.

SWIVEL BASE



The swivel base allows the drill to be precisely positioned under difficult circumstances.

To use: first position the magnet base in the desired position and turn magnet on.
Loosen the 2 Swivel Lock Tabs, then swivel the machine body into the desired position. Finally lock both Swivel Lock Tabs.



CHANGING TOOLS & ADAPTORS WITH MT2 SHANK

To insert a tool, turn the tool until the tang lines up and firmly push into place. It is helpful to tap with a soft-faced mallet to fully engage the taper. If it is properly in position, one will not be able to pull it back apart by hand. To remove, slide the ejector drift into the ejector slot and tap with a hammer to eject the tool.

CAUTION: When removing, take care that the cutting tool does not crash down and get damaged or injure anyone below.

MT2 ANNULAR CUTTER ADAPTOR

This machine is equipped with a unique annular cutter adaptor system with built-in coolant directly to the gearbox.

1. To install the annular cutter adaptor, first insert the taper end of the adaptor into the arbor of the machine as described above.
2. Attach the coolant tank to the slide and ensure that the tube is attached properly.
3. To insert an annular cutter, first insert the pilot pin. Then slide the cutter into the adaptor, align the proper flat with the locking screw(s) and tighten securely with the supplied hex wrench.
4. Ensure that the oil feed tap is on and coolant feeds properly by pushing the pilot pin. If it feeds too quickly or slowly, adjust the tap accordingly. Keep the tap closed when not in use.

GEAR SELECTION

Before drilling select desired gear range by first pushing in on spring-loaded gear selector slider switch and then sliding selector up for high speed or down for low speed. (It may be necessary to turn the arbor slightly in order for the gears to mesh properly). Follow the recommended speed ranges on the cutting speed chart to set the proper speed and gear range.

CAUTION: Ensure that that gears engage fully.

CAUTION: ALWAYS ensure that the machine is fully stopped before attempting to change gears! NEVER change gears on a running machine!

GEAR CHART

GEAR	NO LOAD min^{-1}	FULL LOAD min^{-1}	CUTTERS	TAPS
1	150~300	90~180	35~50mm (1-3/8 to 2")	M20 or less (13/16")
2	225~450	135~270	Up to 35mm (up to 1-3/8")	N/A

NOTE: These speeds are general recommendations only. The material should determine actual speeds and the cutting speed recommended by the cutting tool manufacturer. See the section below "RECOMMENDED SURFACE SPEEDS" and use the formula to calculate the best RPM.

VARIABLE MOTOR SPEED

The electronic variable motor speed control allows the motor speed to be lowered for further flexibility for adjusting the cutting speed to suit the size of cutter and type of material. Simply turn the thumb wheel to raise or lower the motor speed electronically.

NOTE: whenever possible, it is always preferable to lower the speed by changing the gear rather than lowering the motor speed. A slower motor speed will have less cooling and somewhat less torque so always try to keep the motor going as fast as possible. Only lower the motor speed if you have no other option.

(For example: If you need the RPM at about 300/min, it is much better to use 1st gear at full motor speed than to use 2nd gear at a lower motor speed.)

AVOID OVERHEATING THE MOTOR

When using the machine at or near maximum capacity with a slow motor speed the motor will be at maximum stress and very hot. After each cut is finished, **ALWAYS** cool the motor by running at no load at the maximum motor speed for a few minutes.

CUTTING SPEEDS

The type of material to be drilled, its hardness and thickness will all greatly affect the recommended cutting speed. See the chart below for general guidelines for cutting speeds. Use the formula to determine the recommended RPM for the diameter of annular cutter being used:

RECOMMENDED SURFACE SPEEDS

Note: work materials which have been flame cut will be heat treated in the affected area. These areas will require much slower cutting speeds.

Work Material	**Surface Speed MPM (m/min)**
Aluminum	60-90
Brass	40-50
Soft Cast Iron	30-50
Hard Cast Iron	15-21
Mild Steel	24-30
High Tensile Steel	6~13
Stainless Steel	3~5

RPM = 318.5 x MPM / cutter diameter (in mm)
For example: if you are drilling mild steel with a 50mm cutter, the recommended MPM would be about 30 m/min, so the ideal RPM would be:
318.5 x 30/50 =191/min
But if you were drilling high tensile steel, the MPM would be about 6 m/min, so the ideal RPM would be: 318.5 x 6/50 =38/mi**n**

MT2 SHANK ACCESSORIES

If it is desired to use any of various MT2 shank accessories, such as twist drills, countersinks, reamers, etc., it may or may not be necessary to remove the arbor support bracket. If removal is necessary, then follow the instructions below for replacement.

ARBOR SUPPORT BRACKET REPLACEMENT

1. Replace arbor support bracket and screw in the 4 socket cap screws finger tight only (ensure that the needle bearing is clean and adequately greased.)
2. Replace the annular cutter arbor and carefully tighten the screws evenly to ensure proper alignment.

WARNING: use extreme care to avoid contacting the rotating arbor shaft!

3. Double check to ensure that there is no binding anywhere throughout the stroke.

NOTE: A pilot hole may be necessary when drilling with larger twist drills. If an MT2 twist drill is used, it may not be necessary to remove the arbor support bracket.

CHUCK

If an MT2 chuck adaptor & chuck are used, then the bracket must be removed. To replace, see the instructions above under "ARBOR SUPPORT BRACKET REPLACEMENT".

REVERSING SWITCH

The reversing switch is necessary for tapping operations.
Select desired direction of rotation. This switch has 3 positions: up is forward, middle is neutral, and down is reverse rotation.

WARNING: If the motor is switched on with the direction switch in the neutral position, the machine will not turn but will be "live", as soon as either forward or reverse is selected, the arbor will begin turning! Take due care to avoid surprises.

TAPPING

For tapping, the arbor support bracket must be removed. To Replace, see the instructions above under: "ARBOR SUPPORT BRACKET REPLACEMENT". If using the optional two jaw universal tapping chuck, simply mount the unit in the spindle, insert the tap's square into the chuck and tighten firmly. (If using an outside sourced MT2 tapping chuck & clamp collet, follow the manucturer's instructions.)

CAUTION: To avoid damage to the tap, always very carefully line the tap up with the hole and ensure that the size of the hole is correct for the tap to be used.

CAUTION: To avoid damage to the tap or machine, be very careful to stop the machine in time to NOT allow the tap bottom out. The motor continues to coast for a while after being shut off, so plan for this and anticipate. This machine does NOT have a tapping clutch.

CAUTION: To avoid damage to the machine, ALWAYS allow the machine to come to a full stop before reversing rotation.

1. Select the proper speed according to the chart for the size of tap used.
2. Begin with forward direction of rotation with standard right hand threads. (Opposite with left-hand threads)
3. Allow the tap to determine the feed rate. A light touch on the feed handle is all that is needed once it is started in the hole.4. When the desired thread is tapped, hit the red motor stop switch. Allow the machine to come to a full stop. Then reverse direction and restart machine by pressing the green motor switch to remove tap. Guide the tap back out with the feed handle. Proper order of operations for normal tapping is as follows: magnet: on. direction: forward. motor: on. motor: off. THEN: direction: reverse. motor: on. motor: off - magnet: off.

MAINTENANCE

Every 50 hours of operation blow compressed air through the motor while running at no load to clean out accumulated dust. (If operating in especially dusty conditions, perform this operation more often.)

1. Keep the machine clean and free of chips.
2. Check for loose fittings and tighten as needed.
3. Ensure that the ventilation slots are clear so that motor can be cooled normally. Blow low-pressure compressed air through the ventilation slots with the motor running to keep motor clean.

THE ARBOR SHAFT

Keep the arbor shaft free of dirt and lightly grease as needed. If the arbor support bearing is noisy, it may be dirty or have a chip lodged in it. Remove the arbor shaft to clean and re-grease the arbor support bearing.

THE GIBS (DOVETAIL SLIDES)

The gibs require adjustment if too loose. To adjust, loosen the lock nuts and adjust the adjustor screws evenly while moving the handle up and down. Adjust so that there is no free play, yet any binding anywhere in its range of travel. Then retighten the lock nuts. Periodically check, lubricate, and adjust as needed.

THE CARBON BRUSHES

The carbon brushes are a normal wearing part and must be replaced when they reach their wear limit.

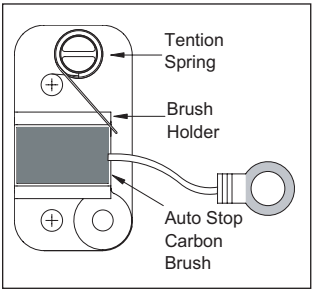
Caution: Always replace the brushes as a pair.

To replace:

1. Remove the 4 screws and remove the motor tail cover.
2. Using pliers rotate the brush spring out of the way and slide the old carbon brush out of the brush holder.
3. Unscrew the screw to remove the brush lead. The old carbon brush may now be lifted away.
4. Install a new brush. Installation is the reverse of removal.
5. Replace the motor tail cover.

AUTO STOP CARBON BRUSH

Due to the new auto stop carbon brush if the machine comes to a stop without any reason, the brushes have to be checked. The auto feature stops the machine before the carbon brushes are finished and protects the motor.



MAGNET TROUBLESHOOTING

Full magnet performance is absolutely essential for magnetic drill operation.
If the magnet works, but does not hold well, it is likely that one of the coils has failed. If the magnet does not work at all, it is likely to be a failed rectifier. (It is highly unlikely that both magnet coils would fail at the same time)

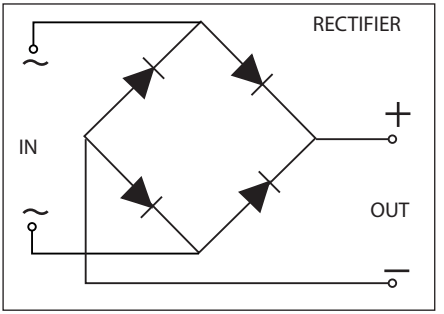
NOTE: A faulty magnet coil can also damage the rectifier, so whenever there is a magnet problem, BOTH the magnet coils and rectifier must be checked.
WARNING: Never attempt to operate a magnetic drill with a faulty magnet!

CHECKING THE MAGNET (qualified technicians only)

If the magnet is not working well, it must be checked. Separate the wires of each indiviual coil and test the resistance of each coil separately. (note that 110V models are wired in parallel and 230V models are wired in series) The resistance of the coils of different sizes of magnets varies, but it should be in the region of hundreds of ohms. Most importantly, both coils must have very nearly the same resistance. If one of the coils has zero resistance, it means that it is shorted. If one of the coils has infinite resistance, it means that the circuit is broken. If either coil has a problem, the magnet must be replaced. A faulty magnet may also cause damage to the rectifier. Also check the rectifier when replacing a faulty magnet. (see below)

CHECKING THE RECTIFIER (Qualified technicians only)

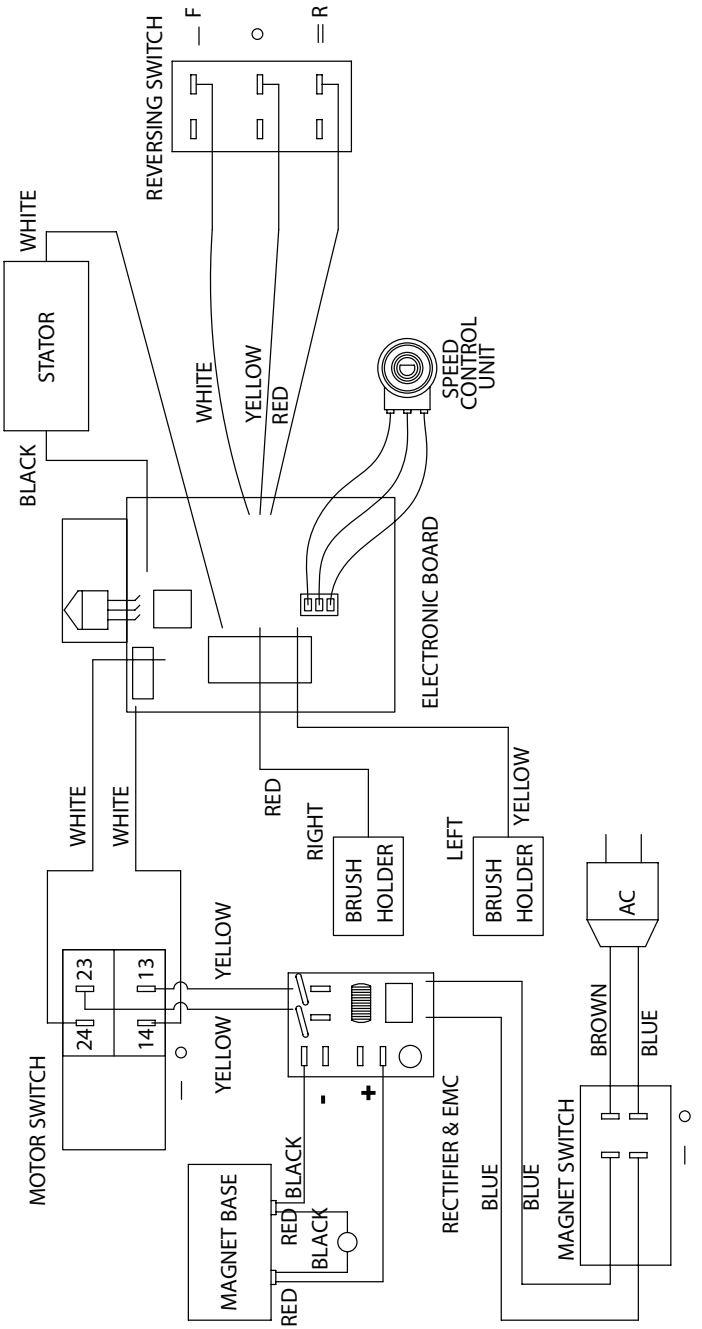
The rectifier takes the AC household current and converts it to DC to power the magnet. If it fails, the magnet coils will not receive power.
Disconnect the rectifier and test the resistance of both circuits of the rectifier between the AC and the DC sides. Note that polarity matters, so you can only take a reading if test probes are oriented correctly. Each side will be the opposite of the other. Both circuits should have very nearly the same resistance reading. If one of the circuits has zero resistance, it means that it is shorted. If one of the circuits has infinite resistance, it means that the circuit is broken.



If the replacement of the power supply cord is necessary, this has to be done by the manufacturer or their agent in order to avoid a safety hazard.

WARNING: All repairs must be entrusted to an authorized service center. Incorrectly performed repairs could lead to injury or death.

Wiring


REVERSING SWITCH
F
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SPEED CONTROL UNIT
ELECTRONIC BOARD
WHITE
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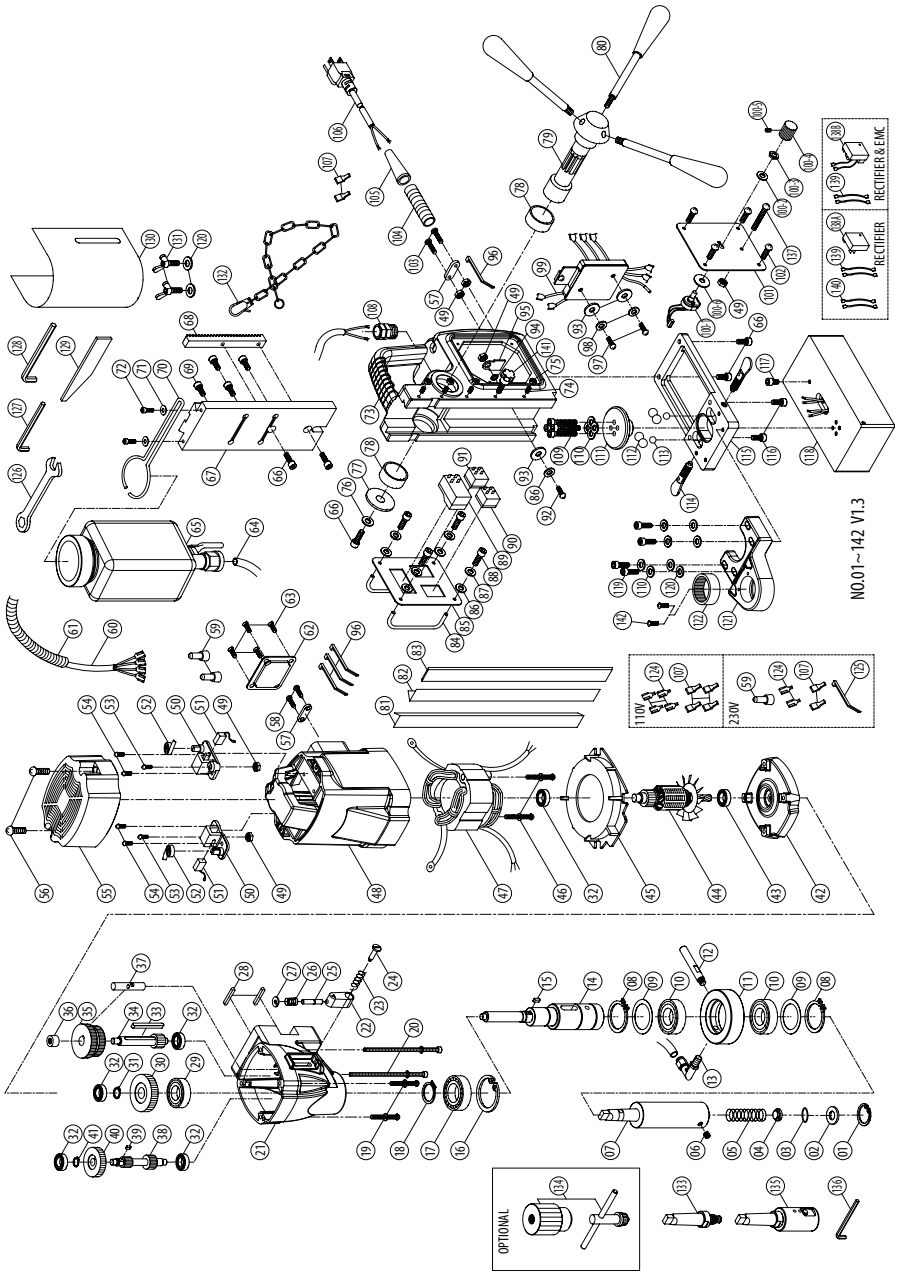
Exploded View & Parts list



NO.	Parts Name	Q'TY	76	FLAT WASHER Ø6 x Ø25 x 1	1
1	INTERNAL CIRCLIP R-19	1	77	FLAT WASHER Ø6 x Ø40 x 2.5	1
2	ARBOR WASHER Ø10 x Ø18.5 x 0.8	1	78	BUSHING Ø28 x Ø32 x 12	2
3	O-RING Ø12 x Ø20 x 4	1	79	CRANK SPINDLE	1
4	COOLANT SEAL	1	80	CRANK LEVER	3
5	SPRING Ø1.2 x Ø10.1 x Ø12.5 x 12T x 85L	1	81	GIB STRIP - LEFT 235mm	1
6	SET SCREW M10 x 7 x P1.5	1	82	GIB STRIP - RIGHT 235mm	1
7	ARBOR MT2	1	83	GIB TENSIONER 235 x 11 x 1.2	1
8	EXTERNAL CIRCLIP S-35	2	84	SWITCH GUARD BAR	2
9	SPACER Ø35.2 x Ø55 x 0.5	2	85	SWITCH PANEL	1
10	OIL SEAL Ø35 x Ø47 x 7	2	86	FLAT WASHER Ø4 x Ø10 x 1	5
11	COOLANT FEED RING	1	87	SPRING WASHER M4	4
12	STOP BAR 67.5L	1	88	SOCKET CAP SCREW M4 x 16	4
13	COOLANT CONNECTOR	1	89	MOTOR SWITCH	1
14	SPINDLE MT2	1	90	REVERSING SWITCH	1
15	PARALLEL KEY 5 x 5 x 10	1	91	MAGNET SWITCH	1
16	INTERNAL CIRCLIP R-47	1	92	SCREW M4 x 16	1
17	BEARING 6005 zz	1	93	RUBBER WASHER M4	3
18	EXTERNAL CIRCLIP S-25	1	94	STAR WASHER M5	1
19	SCREW M5 x 65	2	95	EARTHING MARKING	1
20	SCREW M5 x 110	2	96	ZIP TIE 2.5mm x 160mm	4
21	GEAR CASE	1	97	SCREW M5 x 20	2
22	SELECTOR TAB	1	98	FLAT WASHER Ø5 x Ø12 x 1	2
23	SPRING Ø1 x Ø9 x Ø11 x 4T x 11L	1	99	ELECTRONIC BOARD 110V/220V	1
24	SHOULDER SCREW	1	100	SPEED CONTROL RHEOSTAT	1
25	DETENT PIN	1	100-1	RHEOSTAT	1
26	SPRING Ø5.3 x Ø6.5 x 5T x 17L	1	100-2	FLAT WASHER	1
27	E-CLIP E-3	1	100-3	NUT	1
28	PARALLEL KEY 4 x 4 x 30	2	100-4	KNOB	1
29	OIL SEAL Ø25 x Ø40 x 7	1	100-5	SCREW	1
30	OUTPUT GEAR M1.25 x 39T	1	100-6	INSULATION SPACER	-
31	EXTERNAL CIRCLIP S-15	1	101	SWITCH PANEL	1
32	BEARING 608 zz	5	102	SCREW M4 x 8	4
33	PARALLEL KEY M5 x 5 x 50	1	103	SCREW M4 x 30	2
34	INTERMEDIATE GEAR PINION M1.25 x 10T	1	104	STRAIN RELIEF 7cm	1
35	INTERMEDIATE GEAR M1.0 x 46T & 42T	1	105	CORD ARMOR	1
36	NEEDLE BEARING HK 0810	1	106	POWER SUPPLY CABLE	1
37	SELECTOR FORK	1	107	TERMINAL COVER	6
38	INPUT PINION M1.0 x 11T & 15T	1	108	CABLE GLAND	1
39	PARALLEL KEY 4 x 4 x 8	1	109	SOCKET CAP BOLT M6 x 35	4
40	INPUT GEAR M1.0 x 36T	1	110	SPRING WASHER M6	8
41	EXTERNAL CIRCLIP S-10	1	111	LOCKING POST	1
42	GEAR PLATE	1	112	CHECK BALL Ø12	4
43	BEARING 6001-LLU	1	113	CHECK BALL Ø8	2
44	ARMATURE 7T	1	114	SWIVEL LOCK TAB	2
45	FAN SHROUD	1	115	SWIVEL PLATE	1
46	SCREW M5 x 60	2	116	SOCKET CAP BOLT M6 x 20	2
47	STATOR	1	117	SOCKET CAP BOLT M6 x 8	1
48	MOTOR HOUSING	1	118	MAGNET BASE 176 x 90 x 55.5	1
49	NUT M4 x 8	6	119	SOCKET CAP BOLT M6 x 30	4
50	BRUSH HOLDER	2	120	FLAT WASHER Ø6 x Ø13 x 1	6
51	CARBON BRUSH 7 x 11 x 17	2	121	ARBOR SUPPORT BRACKET	1
52	BRUSH SPRING	2	122	SUPPORT BEARING HK 3516	1
53	SCREW M4 x 10	2	123	N/A	-
54	SCREW M4 x 12	4	124	SPADE TERMINAL	4
55	MOTOR TAIL COVER	1	125	ZIP TIE	1
56	SCREW M4 x 25	2	126	M8 COMBINATION WRENCH M8	1
57	CABLE CLIP	2	127	M2.5 L-HEX KEY M2.5	1
58	SCREW M4 x 14	2	128	M5 L-HEX KEY M5	1
59	END SPLICE TERMINAL C4	3	129	DRIFT	1
60	MOTOR CABLE	1	130	CHIP GUARD	1
61	CABLE PROTECTOR 40cm	1	131	BUTTERFLY SCREW M6 x 10	2
62	MOTOR COVER PLATE	1	132	SAFETY CHAIN	1
63	FLAT HEAD SCREW M4 x 8	4	133	MT2 CHUCK ADAPTOR	1
64	COOLANT TUBE 20cm	1	134	CHUCK(OPTIONAL) 1/2"	1
65	COOLANT TANK ASSEMBLY	1	135	TAP COLLET ARBOR	1
66	SOCKET CAP BOLT M6 x 16	5	136	M4 L-HEX KEY M4	1
67	SLIDE PLATE 218mm	1	137	SCREW M4 x 25	1
68	GEAR RACK	1	138A	RECTIFIER	1
69	SOCKET CAP BOLT M8 x 16	4	138B	RECTIFIER & EMC	1
70	COOLANT TANK BRACKET	1	138B	RECTIFIER & EMC	1
71	FLAT WASHER Ø5 x Ø12 x 1	2	139	LEAD WIRE	2
72	SOCKET CAP SCREW M5 x 16	2	140	LEAD WIRE	2
73	STAND BODY	1	141	THUMB SCREW M5 x 16	1
74	GIB SET SCREW M5 x 20	5	142	FIXING SCREW M4 x 8	2
75	GIB LOCK NUT M5	5			