



SPARTAN TOOL

FOR TOUGH CUSTOMERS. SINCE 1943.



SPARTAN SERVICE MANUAL REVOLUTION M4

powered by 

Spartan Tool LLC | 1618 Terminal Road | Niles, MI 49120
order by phone **800.435.3866** | order online **SpartanTool.com**

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Part #3560032012ST



Contents

SAFETY INFORMATION	4
Environment	6
Transport.....	6
Storage.....	6
Disposal.....	6
GENERAL INFORMATION	7
TECHNICAL INFORMATION	9
Intended Use	9
Available Tooling	9
Voltage.....	10
Power Plugs	10
Safety Features	10
SAFETY FEATURES	10
Noise Levels, Vibrations & Emissions	11
CE DECLARATION OF CONFORMITY	12
OPERATING INSTRUCTIONS	13
Before Operation	13
During operation	13
Starting & Using the Machine	13
Control Box Display Messages.....	13
Attaching Tooling.....	14
Tightening Set Screws	14
MAINTENANCE	15
Warranty Periods	15
Changing the Flexible Shaft.....	16
Servicing the Flexible Shaft & Outer casing	17
Flexible Shaft Extension.....	17
Inspecting Flexible Shaft for Damage.....	17
Changing Oil in the Angle Gear	18
PRODUCTS & SPARE PARTS	19
Spare Parts	19
SERVICE TOOLS	20

PRACTICAL TIPS & SAFETY ADVICE	21
Cutting The Flexible Shaft	21
Cutting The Outer Casing	21
Shaft Rounder	21
Sleeve	22
Creating Leaders	22
Adding a Visual Safety Marker	22
TROUBLESHOOTING FLOWCHART	23
TROUBLESHOOTING FAULT CODES	24
TRAINING	25
WARRANTY INFORMATION	26



Safety Information



WARNING: This section contains important safety information. Failure to comply could result in serious injury or death.

SAFETY SYMBOLS

Safety symbols are used throughout this manual to draw attention to potential hazards.



Danger risk of serious injury, follow instructions.



Danger
Electric shock risk

Danger risk of serious injury or death by electrocution, follow instructions.



Danger risk of serious injury from moving parts, follow instructions.



Danger risk of serious injury from hot parts, follow instructions.



Danger do not touch. Risk of injury, follow instructions.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Always use Personal Protective Equipment including suitable protective clothing, footwear, plus:



Suitable eye protection to protect against injuries and chemicals from irritating eyes.



Suitable ear protection to protect against injuries and chemicals from irritating eyes.



Suitable heat and cut-resistant gloves to help prevent any hand injuries.
Any open injuries or skin irritations should always be covered to avoid contact with sewage, chemicals or dust.



Suitable respirator to prevent any dust or fumes being inhaled or consumed, which could cause occupational asthma or dermatitis.

GENERAL MACHINE SAFETY INFORMATION



WARNING: This section contains important safety information. Failure to comply could result in serious injury or death.



1. Always wear eye and ear protection as well as heat and cut-resistant gloves.
2. Always ensure that the machine is fully turned off and unplugged before inspection, maintenance, or installing any accessories to the machine. Always follow the instructions in the manufacturer's manual.
3. Before each use inspect Revolution and shaft carefully for any potential damage. Change damaged parts immediately.
4. Ensure the pipe has been opened and ventilated to prevent any gases accumulating.
5. Dust produced when working can be dangerous to your health, inflammable or explosive. Make sure that the job location is well ventilated before grinding or drilling. Always use a vacuum extraction system in the pipe to remove dust. The operator must wear a dust mask when using dry grinding to clean pipes.
6. If the working environment is extremely hot and humid, or badly polluted by conductive dust, use a GFCI-enabled power outlet to increase operator safety.
7. Ensure that the Revolution ventilation openings are kept clear when working in dusty conditions to avoid damaging internal parts. If it should become necessary to clear dust, first unplug the machine.
8. When in use, it is very important that the machine is stable and on an even surface at all times.
9. Never leave the machine running unattended.
10. Always hold the shaft when operating the machine.
11. Never touch rotating parts.
12. Do not touch the tooling immediately after use, it may be hot and could burn skin.
13. Do not use on any pipes containing asbestos fibers.
14. Do not stand on the machine.
15. Only operate the foot pedal (OPC) as instructed. Never place anything on it in place of the operator's foot.
16. Do not extend the shaft by more than one extension.
17. Only use the Revolution with the accessories and spare parts offered by the Picote Solutions. Accessories and spare parts should only be used in the manner intended and as described by Picote Solutions.

Safety Information

ENVIRONMENT

- **Operational Ambient Temperature Range:** 14°F to 122°F (-10°C to 50°C), frost and condensation free.
- **Storage Ambient Temperature Range:** -4°F to 140°F (-20°C to 60°C), frost and condensation free.
- **Maximum Altitude:** 2000m or 6500 ft. Derate above 3280 ft (1000m): 328 ft (1% / 100m).
- **Maximum Humidity:** 95% non-condensing.

TRANSPORT

Revolutions should be transported laid down and secured with ratchet straps to prevent any sudden movements or accidents caused by hard braking or an accident.

Never transport with tooling attached to the shaft.

If using a pick-up or trailer to transport, always suitably cover the machine to protect it from the elements.

STORAGE

It is recommended that Revolutions be stored indoors to protect them from rain and sunlight, and also in a constant ambient temperature. The best way to store the Revolution is using the original box that it was shipped in.

Revolutions should be stored under cover in between 50°F to 104°F (+10°C to +40°C). If the Revolution has been stored in an environment colder than +10°C or 50°F, it should be stood at room temperature for 24 hours before use.

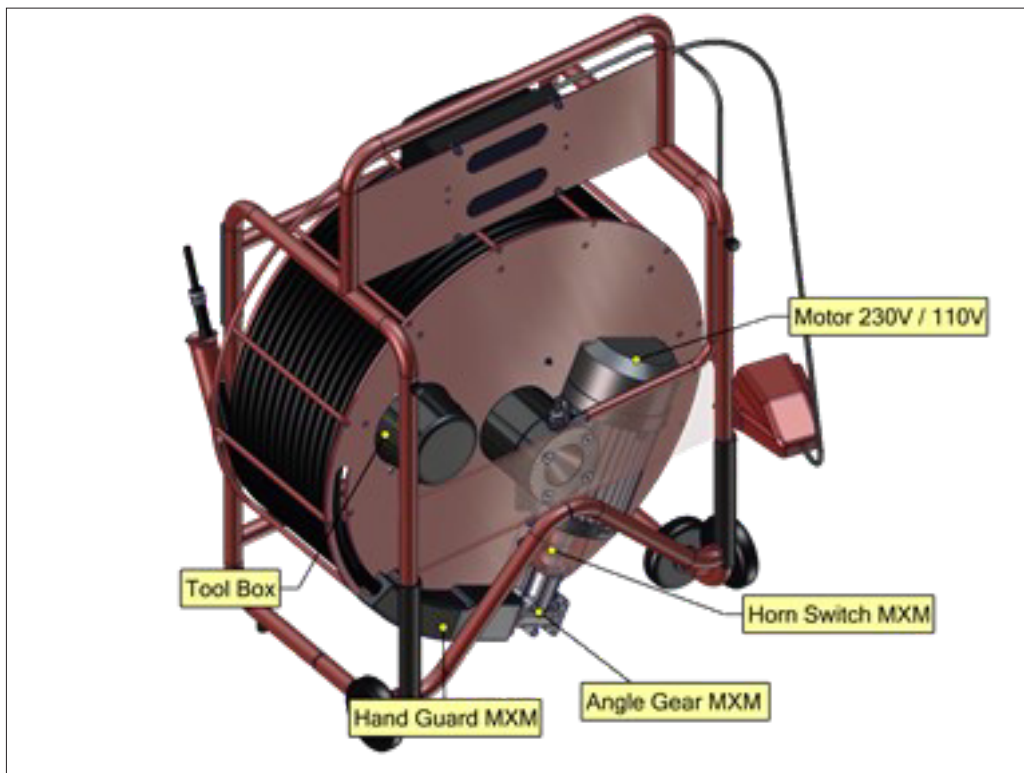
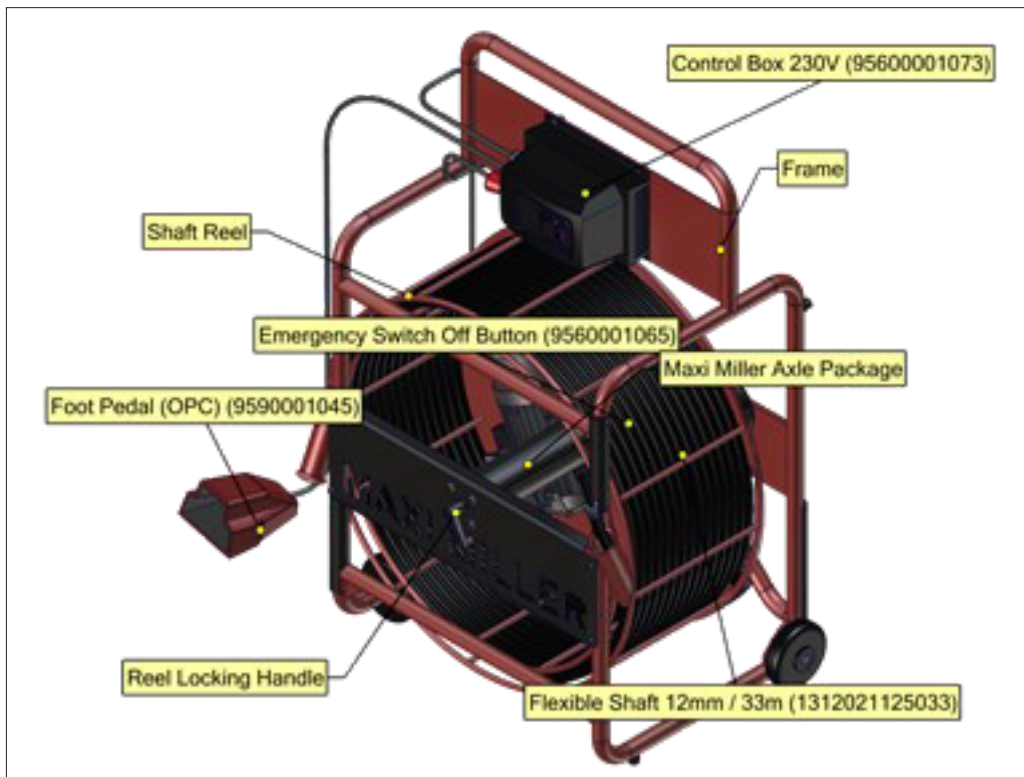
If the Revolution has been stored for long periods of time (over 2-3 months), it should be checked and tested according to the maintenance program before use.

DISPOSAL

The Revolution motor, control box, electric wires, axle package including slip ring can be disposed in Europe at Waste Electrical and Electronic Equipment (WEEE) collection points.

Shaft outer casing can be disposed of as plastic waste.

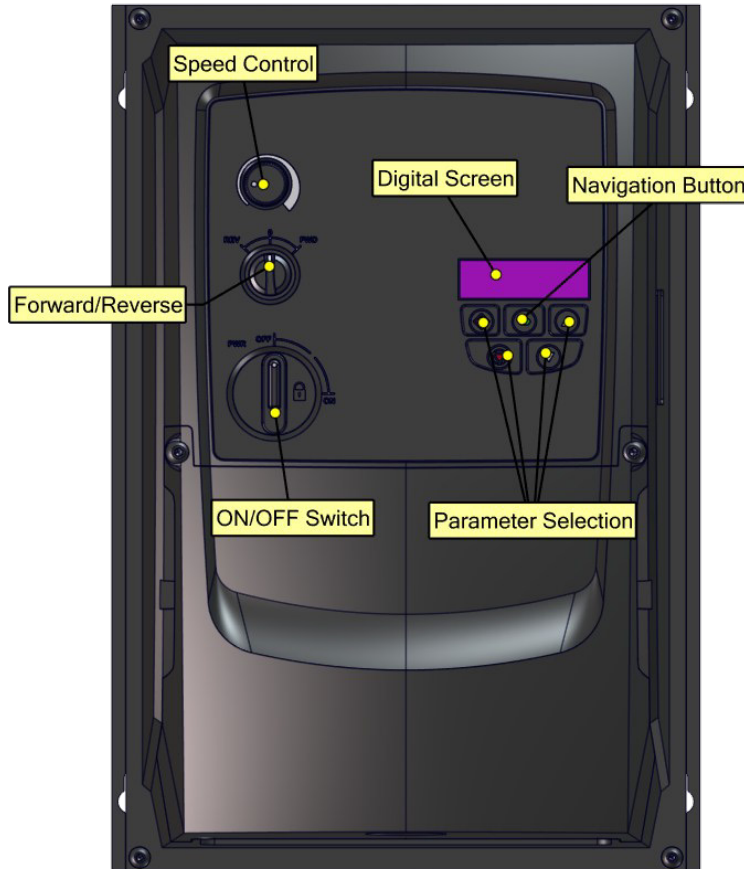
Always follow all local, regional, and national waste handling rules and regulations for disposal.



CAUTION: When in use always lay the machine down horizontally on the floor. When not in use some non-hazardous Picote Flexible Shaft Lubricant might leak from the hand guard.

General Information

DIGITAL CONTROL BOX



Parameters of your Revolution have been pre-set by the manufacturer.

The Control Box has been pre-programmed and requires no additional adjustments.

Picote Solutions accepts no liability for failures or accidents caused by tampering or changing manufacturer settings.

Opening the Control Box or changing the factory setting may cause damage and will void the warranty.

The Navigation button can be pressed to see the rotational speed (rpm), amount of current sent to motor (amp), power generated in motor (kW), and power frequency of motor (Hz).

DO NOT hold the button down continually.



SIZE	SHAFT	RANGE	PIPE DIAMETER	ROTATING SPEED	OUTPUT (W)	POWER SOURCE	WEIGHT	IP CLASS
1150 x 854 x 489 mm (45 x 34 x 19")	12 (1/2") Thick Casing	30m (100 ft)	DN75-200* (3-8")*	500-1475	120V: 1.13kW	Electric Motor	89 (196)	54

Note: The Revolution M4 Model 12/30 Plus is supplied with a separate control panel, which is detached from the machine and can be positioned up to 5m (16 ft) away from the machine.

INTENDED USE

1. Cleaning, descaling, and unblocking pipes, drains and sewers.
2. Reinstating CIPP lined connections by drilling and grinding.
3. Cutting excess length of cured linings.
4. Removing metallic obstructions.
5. Removing deformed or collapsed CIPP linings.
6. Internal pipe coating using the Picote Brush Coating System™.

Always follow the Picote Solutions instructions when installing and using the machine with tooling and accessories.

AVAILABLE TOOLING

Original Chains	Cyclone Chains	Tiger Original Chains
Tiger Drill Chain	Tiger Cyclone Chain	Express Drill Chain
3D Chain (Premium and PVC)	Tiger Twister	Twister Express
Twister	Special Drill Head	Twister Metal Grinder
Twister Liner Remover	Twister Concrete Remover	Smart Cutter™
Nylon Cleaning/Coating Brush	Wire Brush	Smart Spider
Tiger Twister Liner & Concrete Remover	Tiger Twister Lateral Cutter	Tiger Bore

Please check Picote Solutions Quick Guides and Tool Manuals for more detailed information: www.picoteinstitute.com.



Safety Features

VOLTAGE

Ensure that the supply voltage is correct. The voltage of the power source must match the value given on the nameplate of the machine. Machines with a 230V plate can be used in 220V mains and 110 machines in the 120V grid. The machine should be connected to a power supply of the same voltage as indicated on the nameplate, and can only be operated on single-phase AC supply.

The machine has been double sealed according to European standards. The power source has to be grounded.

The frequency transformer of the motor can cause residual current device or GFI to trip out. If this happens frequently, change the power source to one without residual current device or GFI.

POWER PLUGS

For safety purposes only use grounded outlets. If the plug does not fit securely or match the outlet, do not force it — contact an electrician to determine required power supply. Never alter or adapt the plug in any way. If a power generator is used as power source, ensure that the power rating is sufficient. Only an appropriately gauged, heavy duty extension cord that can be fully inserted into the cord's socket.

110-125V: The Revolution M4 is equipped with a 30 amp (120V), 3 prong twist-lock type plug. Power cable lead minimum thickness 4 mm² / 12 AWG. The Revolution M4 must be supplied with sufficient power and proper current rating. A minimum of 30A is needed to operate it safely and efficiently. Never plug the Revolution M4 into the 110V output on the generator as this will damage the Control Box. Contact your Reseller or Picote technical support for more information.

SAFETY FEATURES

This machine is equipped with an Emergency Switch Off Button.

The power supply to the motor is cut off when the Emergency Switch Off Button is pushed. Always make sure the Emergency Switch Off Button is pressed or completely unplug the machine when the machine tooling and accessories (e.g. Cutter or Chains) are not inside a pipe. Always engage the Emergency Switch Off Button and unplug the machine from the power source when performing any maintenance or repairs to the machine.



The machine is operated by a Foot Pedal Operator Presence Control or 'OPC'. When the foot pedal is not held down, the machine stops. Never place any kind of object on the pedal in place of the operator's foot (such as a brick).



The typical A-weighted noise level determined according to EN60745:

Sound pressure level (LpA): 85 dB (A)

Sound power level (LWA): 98 dB (A)

NOISE LEVELS, VIBRATIONS & EMISSIONS

Wear Ear Protection:

Emissions during actual use of the machine can differ from declared values depending on the ways that the machine is used. Safety measures to protect the operator should be determined by actual conditions, taking into account all aspects of the operating cycle (such as when the machine is switched off and when it is running idle).

Vibrations:

Hand vibration levels depend on the distance from the tool head to the user and working conditions. The vibration levels detailed below have been measured at the Picote training facilities in Finland.

Vibration has been determined according to ISO-5349 and EU-directive 2002/44/EG.

Safe daily exposure time for user:

Exposure Action Value (EAV) 2,5 m/s²

Exposure Limit Value (ELV) 5,0 m/s²

TOOLING	WORKING DISTANCE (M/FT)	EAV	ELV
Twister DN100 (4")	2m (6.6 ft)	Over 24h	Over 24h
Twister DN100 (4")	12m (39.4 ft)	13h 25min	Over 24h
Original Cleaning Chain DN150 (6")	0-2m (0-6.6 ft)	1h 33min	6h 11min
Original Cleaning Chain DN150 (6")	10m (32 ft)	3h 14min	12h 57min

Due to continuing product development, the specifications herein are subject to change without notice.



CE Declaration of Conformity

We Picote Solutions Oy Ltd as the responsible manufacturer, declare that the following Picote Solutions Oy Ltd drain cleaning machines:

Maxi Miller:

Model No: MXM 12/30

And

Maxi Miller Plus:

Model No: MXM12/30 PLUS

are of series production and

Conform to the following EU Directive:

2006/42/EY

And are manufactured in accordance with the following standards or standardized documents:

EN62841-1

EN 62841-3-14

ISO-53491:2001

The technical documentation is kept by our authorised representative in Europe who is:

Picote Solutions Oy Ltd, Pienteollisuustie 24
06450 Porvoo, Finland

1st June 2017

Katja Lindy-Wilkinson
C.E.O.

Picote Solutions Oy Ltd
Pienteollisuustie 24, 06450 Porvoo, Finland



BEFORE OPERATION

Before installing Picote tools, always make sure that the machine is fully turned off and unplugged.

Always round off the sharp edges of the shaft to avoid cuts and to make it easier to insert the shaft into the tool or for a leader to be used.

Check that there is the correct length of flexible shaft (without its outer casing) exposed and that all screws have been loosened so that the shaft can be easily inserted completely inside the tooling. Position the shaft inside the tooling, as far as it will go, and tighten the screws. Consult accessory tooling manuals for detailed information.

DO NOT rotate the shaft in reverse under load!

DURING OPERATION

Always lay the machine down horizontally on the floor. During cleaning and cutting processes, always use a separate vacuum extraction system or run water in the drain to remove dust. When not in use some non-hazardous Picote Flexible Shaft Lubricant might leak from the hand guard.

STARTING & USING THE MACHINE

1. Machine has an Operator Presence Control Foot Control Pedal or 'OPC'. The machine will only run when the foot pedal is pressed/ held down.
2. Machine can also be stopped by pushing the Emergency Stop Button down, rotating the power gear to "O" or unplugging the machine.
3. Check the rotational direction of the shaft and the rpm. The rotational direction switch is on the Control Box (forward or reverse). The control of the rotational speed is located on the Control Box. The rotational speed increases when the Speed Control Knob is turned clockwise.
4. Place the tooling inside the pipe.
5. Turn on the power switch.
6. Release the Red Emergency Switch Off Button.
7. The machine starts when the OPC foot pedal is pressed down.
8. Always hold the shaft with both hands firmly while operating the machine.
9. Rotating the tooling slowly makes it easier to move forward inside the pipe.
10. The lifespan of the shaft outer casing can be prolonged by using a Sleeve Bearing designed for the outer casing.

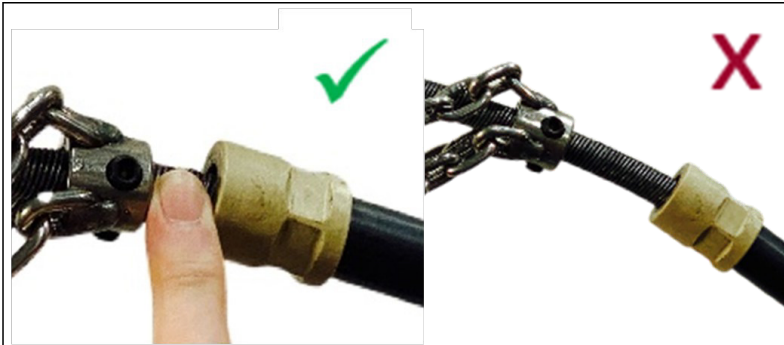
CONTROL BOX DISPLAY MESSAGES

There is a display on the frequency transformer. The following messages may occur:

- **Stop:** The Revolution is ready and waiting for Foot Pedal (OPC) activation.
- **.... (RED flashing dots):** The Revolution M4 is using more current than nominal current.
- **E-trip:** The Revolution is overloaded to the point that the power will be cut off momentarily. Lift your foot off the pedal and press the pedal down again to continue. Avoid overloading the motor.

Operating Instructions

ATTACHING TOOLING



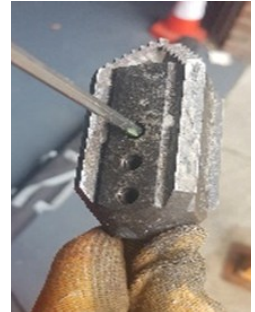
Keep the gap between the Sleeve and the Tool to 6mm (1/4")



SLEEVE

TIGHTENING SET SCREWS

When you add tooling, always tighten the set screws starting from the screw furthest away from the end of the flexible shaft (where applicable).





MAINTENANCE TASK	MONTHS		
	3	6	12
Tightness of motor attachment			I
Alignment of motor & gear box			I
Condition of frame			I
Condition of wheels & rubber feet			I
Condition of Control Box			I
Condition of electric cables	I	I	I
Condition of electrical connections	I	I	I
Lubricate Shaft	P	P	P
Operation of E-stop	I	I	I

I: Inspect, fix, or replace if needed.

P: Perform, replace if needed.

R: Replace

WARRANTY PERIODS

Picote Solutions grants limited warranty for certain machines, equipment & components.

Read more detailed information in the Picote Warranty Policy and Procedure section.

SERVICE PERIOD	3 MONTHS	6 MONTHS	1 YEAR
A			
B			
C			
A	Milling machine & spare parts, except;		
B	Electric motors		
C	Service Center repair work		

Maintenance

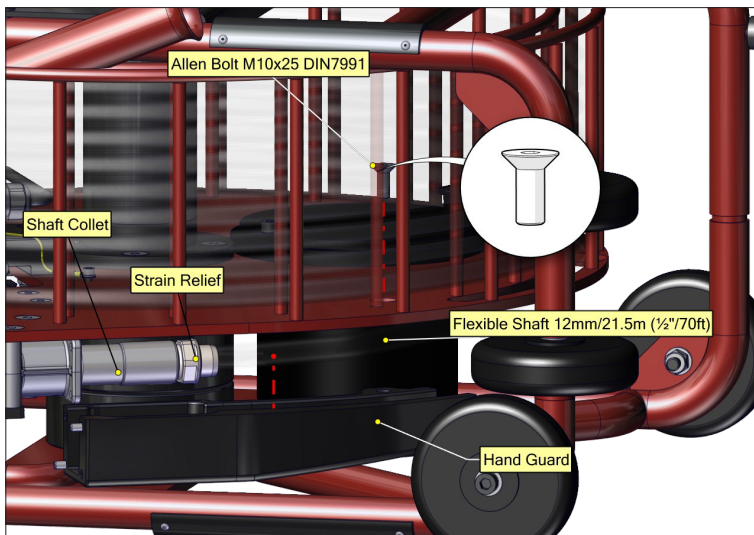
1. Before performing any maintenance always check that the machine is fully turned off and unplugged.
2. Always inspect the flexible shaft before each use. If there are potential weak points, or the shaft is damaged, cut off the damaged length using a band saw or replace the entire shaft as needed.
3. For safety and efficiency, always keep the machine and its motor, drive unit, ventilation and cooling slots clean.
4. Remove handguard and check that the screws for the shaft socket are securely tightened (weekly).
5. Check that all the bolts and screws on the machine are securely tightened.
6. It is recommended that the oil in the angle gear should be changed about every 12 months. Only use regular oil developed for gearboxes.

CHANGING THE FLEXIBLE SHAFT

Only use the shaft and its outer casing specified by Picote Solutions. Order the replacement shaft from your reseller. The flexible shaft is pre-treated with Picote Flexible Shaft Lubricant and the casing replaced prior to shipping.

1. Loosen the bolts holding the hand guard and remove the hand guard.
2. Loosen the bolts in the shaft socket that hold the shaft. Remove strain relief. Pull the old shaft out of the machine.
3. Insert new shaft. Before inserting the shaft inside the shaft socket, add strain relief.
4. Verify that the shaft goes all the way to the end. Tighten the bolts.
5. Mount the hand guard & tighten the bolts.
6. Look at the assembly under hand guard from below.

Assembly under the hand guard:



SERVICING THE FLEXIBLE SHAFT & OUTER CASING

The flexible shaft is pre-treated with Picote Flexible Shaft Lubricant and the outer casing replaced prior to shipping. Always inspect the condition of the shaft and its outer casing regularly. Also, inspect at least once a week that the shaft is well attached under the hand guard at the machine end. If the shaft appears to have gaps between the windings from the beginning to the end, the entire shaft will need to be replaced.

In order to add lubricant the shaft needs to be disconnected from the clutch and removed from the reel. The shaft needs to be taken out from outer casing about 1-1,5m (3-5 ft) and lubricant needs to be added on the other side, inside the cavity. No more than 50ml / 50g / 2oz will be required for the entire shaft. Too much lubricant can cause a strain on the cable. After the lubricant has been poured, the free shaft end should be pushed through the outer casing. The shaft will push the lubricant evenly inside the outer casing. Connect the shaft to the machine and rotate with low rotation speed so that the shaft will push excess lubricant to the outside. Use a mat to protect the work area under the machine to prevent damage to floors.

Keeping the shaft well lubricated will prolong its life span and decrease the friction caused by the shaft when it turns around. Lower friction will decrease the burden caused to the motor.

If preferred, the shaft can be taken out of its outer casing for lubrication.

Appropriate oil to use: Picote Flexible Shaft Lubricant (available from your reseller)

FLEXIBLE SHAFT EXTENSION

Flexible extension shafts are available for the Revolution M4 in lengths of 10m (32 ft). Do not extend the shaft by more than one extension and only use a Picote shaft extension and connector.

Before attaching or removing the shaft extension always make sure that the machine is fully turned off and unplugged.

1. Operate the machine out as far as possible with the flexible shaft before fitting the extension.
2. Remove the flexible shaft from the pipe.
3. Push the extension down the pipe and then connect onto the existing flexible shaft using a shaft connector.

Note: for vertical pipes connect the extension onto the existing flexible shaft before pushing the extension down the pipe.

INSPECTING FLEXIBLE SHAFT FOR DAMAGE

Carefully inspect the flexible shaft and its casing on a regular basis to ensure that there are no signs of wear and tear.

Change the flexible shaft and casing when required.

Damaged shaft needs to be trimmed back before attaching tools (see examples to right).



CHANGING OIL IN THE ANGLE GEAR

The oil should be changed after every 3,000 hours of use or 12 months.

1. Dismount the gear guard and the hand guard.
2. Take the shaft socket off of the shaft.
3. Loosen the bolts holding the angle gear.
4. Pull the angle gear away from the motor following the axle of the motor.
5. When the angle gear has been dismounted, loosen the oil belt (there is only one bolt on the gearbox).
6. Pour the old oil out and add the new oil.
7. Reassemble the angle by repeating the previous steps in reverse order.

Appropriate oils to use:

Shell omala 100 or Agip blasia 100 or Tamoil ep 100

Amount of oil:

42 g / 1.5 oz / 47 ml



Revolution M4

- 1/2" shaft
- Cleaning 3-10"
- Cutting 3-8"
- Coating 3-12"
- Max Range: 100 ft + 50 ft ext
- Weight: 196 lbs
- Speed: 500-1475rpm

The Revolution M4 is a high-speed high torque powerhouse. Designed for tough challenges like heavy cleaning, removing concrete or failed CIPP liners, lateral reinstatements, and Picote Brush Coating™. Featuring a 1/2" flexible shaft, it has a range of 100 ft that can be extended 32 ft with a shaft extension. It can also be used for Picote Brush Coating™ by pairing with the Maxi Coating Pump or Xpress Coating System.

Standard safety features: protective outer shaft casing, operator presence foot control, electronic safety clutch, and an E-stop.

PRODUCT #	MODEL
3560032012ST	110V

SPARE PARTS

1312021125033	Revolution M4 Replacement Shaft, 12mm (1/2"), Thick Casing, 33m (108 ft)
1312021125010	Shaft Extension, 12mm (1/2"), 10m (32 ft)
1313002125	Shaft Connector, 12mm to 12mm (1/2" to 1/2")
93212322125	Sleeve 12mm (1/2"), Thick



Shaft Rounder

1350000018



Rounds sharp edges of the shaft.

Sheath Cutter 1

1350000006



Used when there is no shaft in the outer casing.

Sheath Cutter 2 (Shaft inside outer casing)

1350000011



Used when there is shaft inside the outer casing.

Cutter for Side Grinding Panels

1350000012



Used when there is no shaft in the outer casing.

Hex Keys



PRODUCT

MODEL

1350000008

Hex Key 4mm

1350000009

Hex Key 3mm

1350000010

Hex Key 2.5mm

1350000013

Combo Hex Key 1-6mm

Picote Flexible Shaft Lubricant



Prolong the lifespan of your Revolution with Picote's Flexible Shaft Lubricant. Instructions on maintaining the shaft. Including how to lubricate are included in your Revolution operating manuals.

PRODUCT

MODEL

1350000020

.5L / 16.9 oz Bottle

1350000021

6 Bottle Package



Here are some useful tips on how to get the most out of your Picote system.

Always use the recommended tools for maintenance to avoid personal injury.

CUTTING THE FLEXIBLE SHAFT



Always inspect the flexible shaft before each use.

Run the machine briefly in clockwise direction to allow the shaft to return to its natural resting length/position.

If there are potential weak points or the shaft is damaged, cut off the damaged length using a band saw.

For most tools, the shaft should extend ~40mm (1½") past the casing/Sleeve.

Hubs and Original chains without a leader require more exposed shaft.

CUTTING THE OUTER CASING



Always inspect the outer casing before each use.

The easiest and safest way to shorten the outer casing to the correct length is using a sheath cutter.

Only the necessary amount of bare shaft should be exposed at any time.

SHAFT ROUNDER

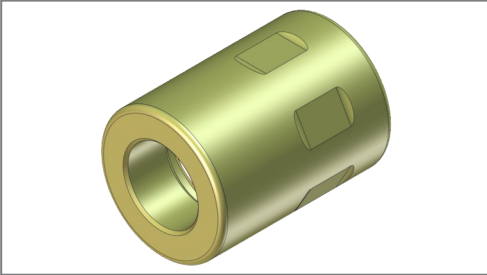


The Shaft Rounder is used to smooth the end of the flexible shaft, preventing the user from being cut by the otherwise sharp metal edge.



Practical Tips & Safety Advice

SLEEVE

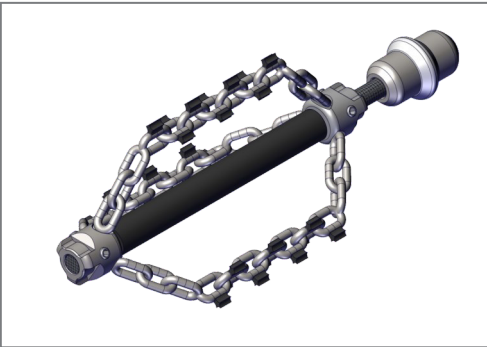


Always use a sleeve when working with the Revolution M4.

It prolongs the life of the flexible shaft and prevents the outer casing from melting in the tool end.

The Sleeve can be reused when the outer casing is shortened.

CREATING LEADERS



You can extend the life of the flexible shaft and increase productivity by making individual leaders for the most commonly used tools.

This way you easily and quickly switch between tools.

Leaders should always be used if the situation permits it.

ADDING A VISUAL SAFETY MARKER



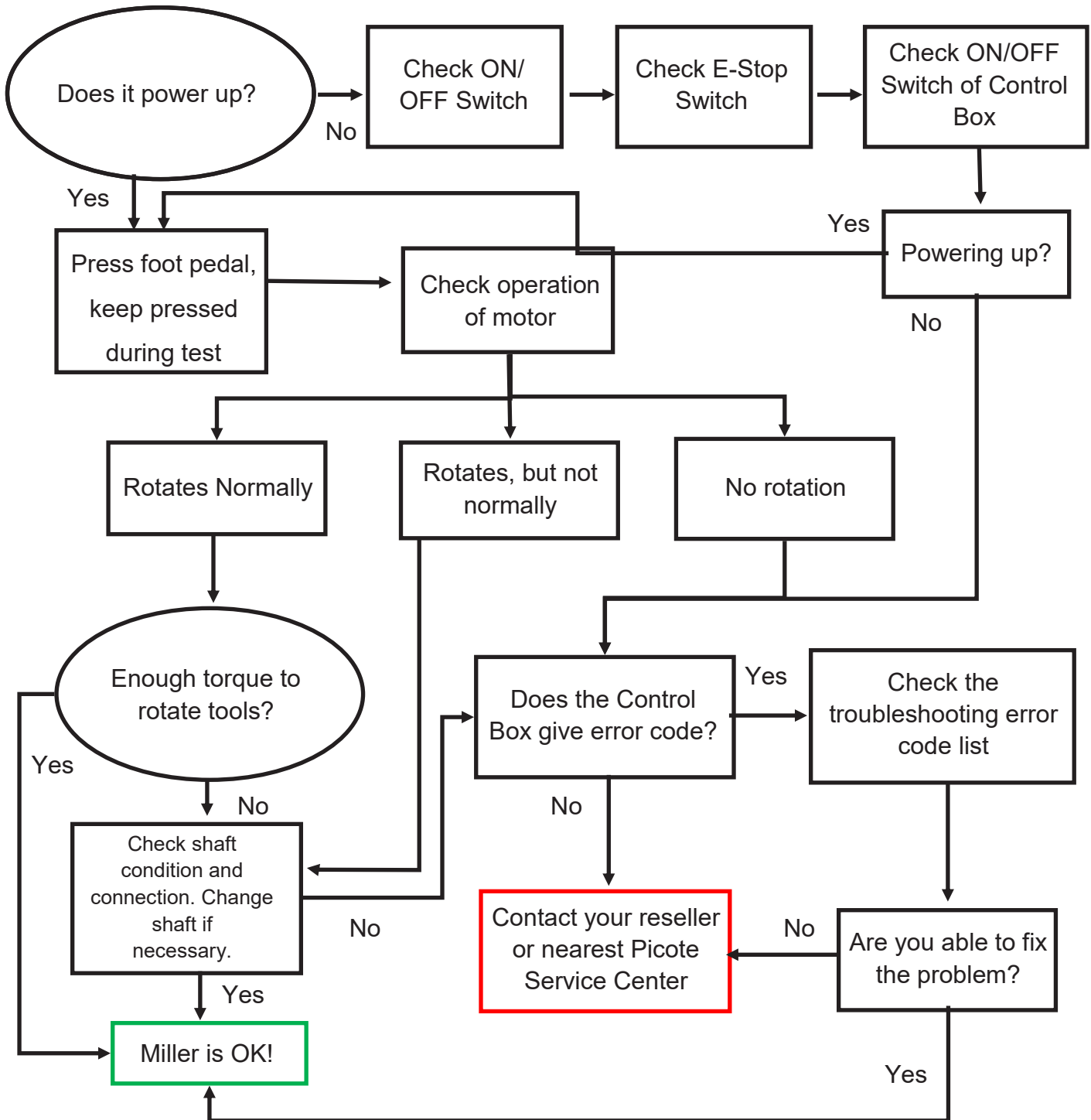
If not using a "leader" attach a visual marker (tape) on the outer casing of the flexible shaft.

Place it around 500mm (20") from the end of the shaft.

The marker will indicate the tools location and help prevent possible injury from the rotating parts by alerting you when the tool is about to exit the pipe.



Troubleshooting Flowchart



If there is a problem that you cannot resolve with this manual, please consult Spartan Tool or Picote Solutions at claims@picotesolutions.com.



Troubleshooting Fault Codes

The Control Box will show fault codes according to different problems which the machine may encounter during use.

Please check from the list below the most common fault codes.

If a code other than those shown below is received, or if the fault does not correct, please write down the error code and contact your reseller or Picote Solutions.

FAULT CODES	DESCRIPTION	SUGGESTED CAUSE
no-F _L t	No Fault	Not required
0-1	Output over current	Instantaneous over current on the drive output. Excess load or shock load on the motor. Note: Following a trip, the drive cannot be immediately reset. A delay time is inbuilt, which allows the power components of the drive time to recover to avoid damage.
1 _t -trP	Motor thermal overload	The drive has tripped to prevent damage to the motor. Try not to overload motor. Ensure sufficient cooling air is free to circulate around the motor and that the entry and exit vents are not blocked or obstructed.
P5-trp	Power stage trip	Check for short circuits on the motor and connection cable.
0-volt	Over voltage on DC bus	Check the supply voltage is within the allowed tolerance for the drive.
U-volt	Under voltage on DC bus	The incoming supply voltage is too low. This trip occurs routinely when power is removed from the drive. If it occurs during running, check the incoming power supply voltage and all components in the power feed line to the drive.
0-t	Heatsink over temperature	The drive is too hot. Check the ambient temperature around the drive is within the drive specification: +50°C (122°F). Ensure sufficient cooling air is free to circulate around the drive. Increase the panel ventilation if required. Ensure sufficient cooling air can enter the drive, and that the bottom entry and top exit vents are not blocked or obstructed.
U-t	Under temperature	Trip occurs when ambient temperature is less than -10°C (14°F). Temperature must be raised over -10°C (14°F) in order to start the drive.
E-trip	External trip	Normally closed contact has opened for some reason. Check if the motor is too hot.
FLt-dc	DC bus ripple too high	Check incoming supply phases are all present and balanced.
P-L055	Input phase loss trip	Check incoming power supply phases are present and balanced.
h 0-1	Output over current	Check for short circuits on the motor and connection cable. Note: Following a trip, the drive cannot be immediately reset. A delay time is inbuilt, which allows the power components of the drive time to recover to avoid damage.
dAtA-F	Internal memory fault (IO)	Press stop-key. If fault persists, consult Picote Solutions.
dAtA-E	Internal memory fault (DSP)	Press stop-key. If fault persists, consult Picote Solutions.
Fan-F	Cooling Fan Fault	Consult Picote Solutions.
0-hEAt	Drive internal temperature too high	Drive ambient temperature too high, check adequate cooling air is provided. Increase the panel ventilation if required. Ensure sufficient cooling air can enter the drive, and that the bottom entry and top exit vents are not blocked or obstructed.
Out-F	Output fault	Indicates a fault on the output of the drive, such as one phase missing, motor phase currents not balanced. Check the motor and connections.



TRAINING CENTERS

- Phoenix, Arizona, USA
- Porvoo, Finland
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