



MILLHOG SERIES: **MINI MILLHOG**

- 90 PSI (6.2 BAR) INLET PRESSURE
- 120/230V AC FOR ELECTRIC MOTORS

DISCONNECT AIR SUPPLY BEFORE SERVICING



UNDERSTAND ALL INSTRUCTIONS BEFORE USING

Factory:
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Agent:

ESCO Tool Guarantee

Guarantee: The manufacturer guarantees its products to be free from defects in material or workmanship for a period of one year from date of shipment from its factory. Said guarantee will not apply if equipment is used in conditions of service for which it is not recommended. The manufacturer is not responsible for damage to its products through improper use, physical damage, poor operating practice, or normal wear.

If any device is found unsatisfactory under the guarantee, the buyer must notify ESCO Tool in writing and after receipt of shipping instructions, buyer must return it directly to ESCO Tool, 75 October Hill Road, Holliston, MA 01746, USA, shipping charges prepaid. Such equipment will be replaced or put in satisfactory operating condition, free of all charges except transportation. The correction of any factory defect by repair or replacement by the manufacturer shall constitute fulfillment of all obligations to the purchaser. Manufacturer's guarantee is void if unauthorized repairs are made to its products.

Manufacturer shall not be liable for consequential damage in case of failure to meet the conditions of any Guarantee or Shipping Schedule, nor will claims for labor, loss of profit, repairs, or other expenses incidental to replacement be allowed.

No other representations, guarantees or warranties, expressed or implied, are made by the manufacturer in connection with the manufacture and sale of its equipment.

Hold Harmless Agreement

Customer agrees to defend, indemnify and hold ESCO Tool, its owners, agents, officers, and/or employees free and harmless from and against any and all claims, liabilities, losses, costs and out of pocket expenses (including attorney's fees) arising out of, or in connection with the ESCO Tool equipment, its use or transportation, or out of operations conducted by customer, its agents, employees, contractors, representatives, guests or invitees, including, but not limited to, active and/or passive negligence.

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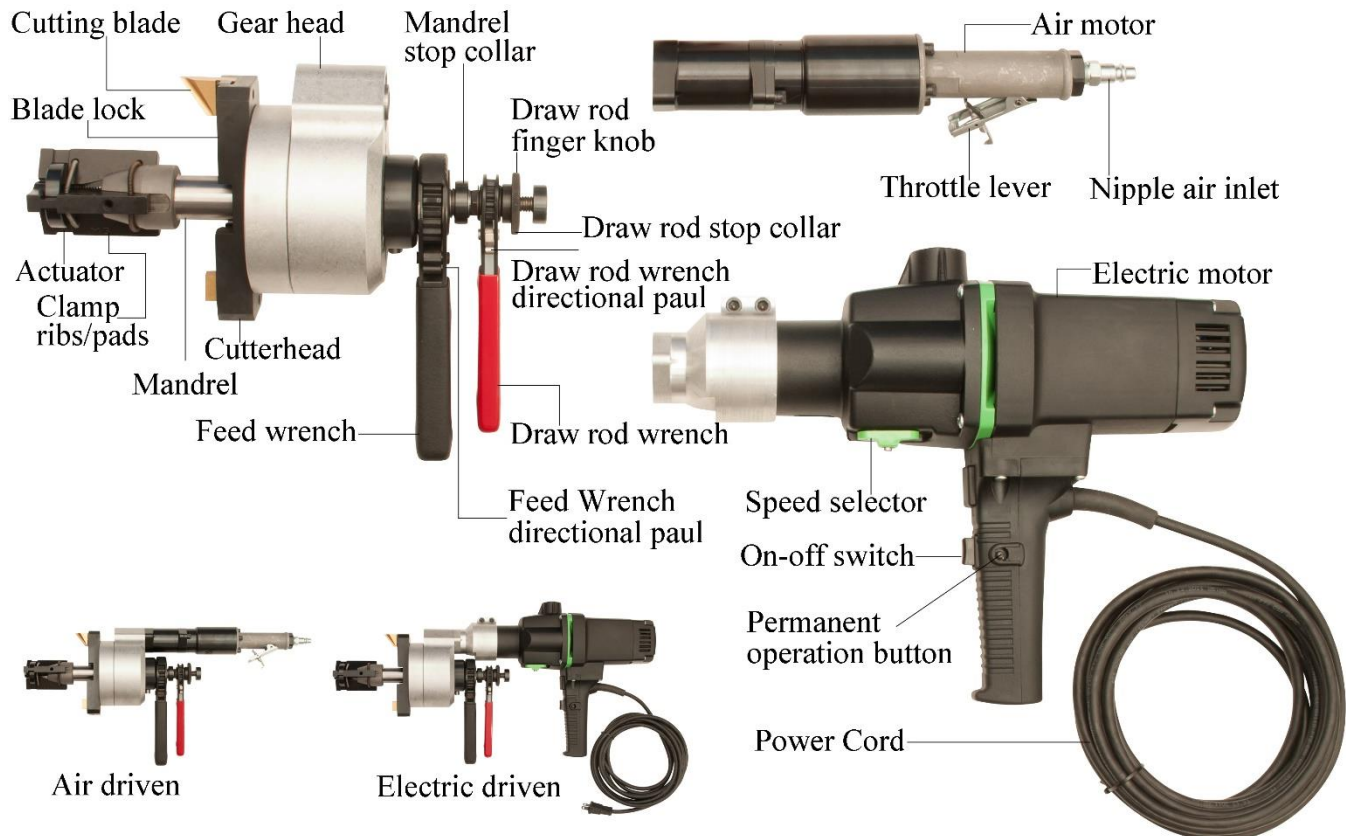
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Instruction for putting into use

Unpacking

1. Use caution when handling the tool, cutting blades are sharp. Typically they are protected, however, exposed blades can cause injury.
2. Clean any excess oil, grease or rust preventive from the surface of the tool.

Illustrated description of function



Power

Air motor

1. Recommended air pressure, 90 psi (6.2 bar)
2. Recommended air volume, 40 cfm (1133 lt/min.)
3. Clean, moisture free air is essential for trouble free operation.
4. Oil laden operating air should be used. Use a light weight air tool motor oil (s.a.e.10).
5. A hose whip with filter and lubricator is provided with each air driven tool. Be sure air filter is clean and lubricator is full before use. For lubricator adjustment instructions see 4a.

Electric motor electric supply

1. Rated Voltage 230/120v ac
2. Power input 1800 w
3. Frequency 40-60 Hz
4. Prior to putting into operation, check the mains voltage for conformity with the requirements on the tools nameplate
5. Voltage variation between + 6% and – 10% are permissible
6. The motor is made in protection class II

Limitation on ambient conditions

Air motor

1. In damp, moist or humid air, extra precaution must be taken in order to provide the tool with moisture free, oil laden air.
2. In temperatures below 32 degrees Fahrenheit (0 Celsius) a lubricant with antifreeze, such as Marvel Air-Tool Oil , must be used.

Electric motor

1. The motor must neither be wet, nor used in humid ambient conditions
2. Use only 3-wire extension cable with protecting conductor and sufficient cross-section. A cross-section which is too small could lead to excessive power loss and to overheating the motor and the cable.
3. Cords and plugs must be approved for work conditions

List of contents

Kit contains:

- Motor and gear drive
- Feed mechanism
- Draw rod and wrench assembly
- One or more clamp rib sets
- One or more clamp pad sets
- Hose, 1/2" with filter, lubricator and quick connect couplers, or electric cord attached to motor
- Allen wrench set
- Carrying case

Safety precautions

Precautions and use of personal protective equipment, eye protection

1. Do not connect power until tool is securely fastened to the inside diameter of a pipe or tube.
2. Use caution when handling the tool, cutting blades are sharp. Typically they are protected, however, exposed blades can cause injury.
3. Personal protective equipment should include, but not be limited to:
 - a. Safety glasses
 - b. Work gloves
 - c. Work boots, or shoes
 - d. Long sleeve shirts
 - e. Long pants
 - f. Ear protection should be used when operator is exposed to long periods of use.

Special safety precautions, pinch points

1. Always disconnect power supply before installing or changing cutting blades, securing to pipe or tube, adjusting, moving, breaking machine down or servicing.
2. Do not modify or defeat safety devices
 - a. Air motor - Never tie down throttle lever
 - b. Electric motor – Only use permanent operation button when tool is securely attached to the tube or pipe.
3. Cutting blades are sharp and can cause serious injury, use caution when handling tool when blades are installed
4. Chips can be hot and sharp. Be careful when clearing from tool.
5. Moving and stationary parts can pinch or cause serious injury. Pay extra attention to rotating cutting blades as they can not be adequately guarded.
6. During use, machinery may separate, lurch or fall.

Disclaimer

1. If the equipment is used in a manner not specified by ESCO Tool, the protection provided by the equipment may be impaired.

Operating ergonomics

1. Tool must be mounted at a reasonable working height.
2. Tool may be used in any orientation.
3. Operator must be in a position not to be injured as the machinery may separate, lurch or fall. Operator must have both feet on a stable platform. Reaching or leaning is not acceptable operating ergonomics.

Explanation of symbols



Caution (refer to accompanying documents).



Safety glasses must be worn.



Protective gloves, cutting blades and chips can be hot and sharp.



Work boots, or shoes



Protective clothing



Ear protection



Pinch points



Disconnect power

Operating instructions

Identification of operating controls and their use

Cutting blade

- Consumable item, available in many sizes and configurations.
- Purpose: to machine end preparations on tube or pipe.

Blade lock

- Holds cutting blade to cutterhead.

Actuator

- Connects the clamp ribs / pads to the draw rod.

Mandrel

- Provides torque acceptance for entire tool.
- Allows axial movement of tool.
- Provides point of rotation for cutterhead.

Clamp ribs / pads

- Secures tool to tube or pipe inside diameter
- Available in many sizes, see accompanying clamp rib chart.

Cutterhead

- Rotates and holds the cutting blades.

Feed wrench

- Used to advance and retract the cutting blade from the work.

Draw rod

- Connects the actuator and draw rod feed wrench.
- Turning draw rod wrench clockwise pulls actuator towards mandrel and expands clamp ribs and pads.
- Turning draw wrench counter-clockwise pushes actuator away from mandrel and relaxes clamp ribs and pads.

Draw rod wrench

- Actuates the clamping mechanism.

Draw rod stop collar

- Prevents the draw rod, actuator and clamps from becoming detached from the tool.

Gear head.

- Rotates cutterhead.
- Axially moves on mandrel.

Nipple, air inlet – Air motor

- Accepts valved quick connect coupler for connecting air supply.
- Air supply must be disconnected before installing or changing cutting blades, securing to pipe or tube, adjusting, moving, or breaking machine down.

Throttle lever – Air motor

- Throttle lever requires deliberate action by the operator to activate the tool.
- Actuating lever starts tool.
- Release of lever stops tool.

Speed selector – electric motor

- The motor is equipped with a two speed gearbox.
- Select the proper speed by pressing-in, shifting and engaging.
- The position of the lower speed is in the direction of the cutterhead.
- change the speed only when the machine is not running, and support the speed changing by slightly rotating the cutterhead.

On-off switch – Electric motor

- Switching on
 - Press the on/off switch
- Switching off
 - Release the on/off switch

Permanent operation switch

- Switching-on - press the on/off switch and, keeping it pressed, engage the lock button.
- Switching-off - press the on/off switch and let it go off again.

Attention! If the machine stops for any reason or due to power failure, immediately release the permanent operation button by pressing the on/off switch and releasing.

Power cord

- Provides electric power to motor - use properly rated receptical and extensions.

Selection of proper tooling

Clamp rib selection

1. Measure inside diameter of tube or pipe. Or using the outside diameter and minimum wall thickness, calculate the inside diameter.
2. Using the inside diameter and the accompanying clamp rib chart select the proper clamp rib / pad set(s).
3. Please note clamp pads attach to clamp ribs. Clamp ribs can be used without clamp pads.

Cutting blade selection

1. Measure the wall thickness of the tube or pipe.
2. Select a blade that is wider than the wall thickness.
3. Standard sizes are: 1/2", 3/4" and 1". Consult factory for other widths.
4. Cutting blade configuration should be matched to your welding specification.
5. Consult factory for special applications such as: counter boring, seal weld removal, "J" preps, etc.

Installation of proper tooling

Clamp rib installation

1. Remove stop collar (M-56), draw rod nut (M-35) and pull draw rod assembly from mandrel (M-53).
2. Slide clamp ribs over the draw rod (M-53) with the slotted end of the clamp rib towards the actuator.
3. Insert the clamp rib slots into the slots on the actuator.
4. Inspect springs, replace if stretched or damaged.
5. There are two sets of clamp springs per set of clamp ribs.
6. Reassemble, insert draw rod assembly into mandrel and install the draw rod wrench and stop collar.

Cutting blade removal and installation

1. Loosen blade lock screw(s) (M-51), do not remove. If more than one blade lock screw has to be loosened they should be loosened evenly.
2. Cutting blade must be slid to the outside of the cutterhead for removal.
3. Insert new cutting blade from the outside of the cutterhead and align so that the blade fully covers the tube or pipe wall.
4. Be sure to tighten *all* blade lock screws

Mounting the tool to the work

1. Using the feed wrench (M-28) extend the mandrel all the way forward, this moves the clamp ribs away from cutterhead.
2. Retract the the mandrel two turns of the feed wrench.
3. Insert the clamp rib portion of the tool into the end of tube or pipe.
4. While positioning the tool keep the cutting blade it at least 1/4" from the pipe or tube end and tighten the draw rod wrench.
 - a. The draw rod finger knob may be used until ratchet wrench can be activated.
5. Be sure the cutterhead can rotate freely, without coming into contact with the tube or pipe, when first starting tool.

Power connection

Air

1. Use the hose supplied with the tool.
2. This hose has a valved quick connect coupler which will hold back all air that is in the supply hose.
 - a. This feature allows the air supply to be safely removed from the tool at any time.

Electric connection

1. Check the mains voltage for conformity with the requirements on the tools nameplate
2. Voltage variation between + 6% and - 10% are permissible
3. Extension cords, plugs and recepticals must rated for electric requirements.

Operation of tool

Air driven

1. Tool activation / deactivation
2. Engage the throttle lever, this will activate the tool.
3. Release the throttle lever, this will deactivate the tool.

Electric driven

Short term operation

1. Engage the on/off switch, this will activate the tool.
2. Release the on/off switch, this will deactivate the tool.

Permanent operation

1. Engage the on/off switch and then engage the permanent operation button, this will permanently engage tool.
2. Engage the on/off switch and release, this will disengage the permanent operation.
3. With the motor engaged use the feed wrench to advance the cutting blade towards the work.
4. Use a steady constant feed creating a continuous chip.
 - a. Using a constant feed allows the heat generated by the cutting action to be removed by the chip. Heat build up is a primary failure mode for cutting tools.
 - b. Engaging a rotating cutting blade with the work surface without feed (rubbing), creates excessive heat build up.
5. When the desired end prep is accomplished, quickly reverse the feed wrench by reversing the directional pawl, and retract the cutting blade from the work.
6. Release the throttle lever, this will stop the tool.
7. Disconnect the air supply.
8. Release the clamp wrench and remove the tool from the work.

Tool limits

Size limits

1. Minimum inside diameter is 1.8" with standard mandrel.
 - a. Minimum inside diameter is 1-1/4" with optional mandrel.
2. Maximum outside diameter is 6-5/8".
3. Maximum wall thickness, 1" with standard tooling.
4. Extremely thin walls may require special tooling to prevent deformation of diameter.

Material limits

1. Difficult materials may require the following to maximize blade life.
 - a. Lubrication such cutting oils, soluble oils, soapy water, plain water, etc.
2. Slow the speed of air motor, using a valve on the air supply.
3. Multiple cutting blades to balance the tool.
4. Vary feed rate, often times difficult materials respond to a heavy feed.

Maintenance and servicing

Regular cleaning and lubrication

1. Hose whip, filter and lubricator
 - a. Inspect filter element by removing nut from end of filter assembly.
 - b. If the filter is dirty or plugged replace it using filter repair kit
 - c. Remove filler plug from lubricator and be sure the adjusting screw is set half way between open and closed.
 - d. Fill lubricator, use a light weight air tool motor oil (s.a.e. 10).
2. Electric motor
 - a. Disconnect from power supply before beginning any repair or maintenance work.
 - b. The motor as well as the ventilation slots always have to be clean.
 - c. During use, pay attention that no foreign elements get into the the interior of the machine.
 - d. In case of failure, a repair has to be carried out by an authorized service workshop.
3. Gear housing grease
 - a. There is no grease fitting on rental tools. This is because of the tendency to over grease. Excess grease can back up into the air motor and cause failure.
 - b. A single pump from a grease gun after every two hundred hours of use is sufficient for all tools equipped with a grease fitting.
 - c. Use grease NLGI # 2
4. Lubrication for storage
 - a. Before putting the tool away, fill air inlet with a liberal amount of air tool oil and actuate motor momentarily. This will distribute oil to internal motor parts, preventing rust build up.
 - b. Wipe tool down using soft cloth removing all dirt, grease, oil and chips.
 - c. Lightly coat tool with rust preventive.

User service

1. Appropriately qualified and experienced personell may provide all service for this machine.
 - a. Factory service or assistance is always available, contact us at the numbers below.
 - b. Complete drawings and parts lists are provided in section six.
 - i. No special tools are required to perform complete service.

Servicing by manufacturer or agent

1. Factory service, return the tool to the Factory address listed below.
2. Agent service, If applicable return tool to the Agent listed below.
 - a. If unsure of Agent contact the factory.

Clamp rib and pad selector chart

<u>I.D. RANGE (in.)</u>	<u>I.D. RANGE (mm)</u>	<u>I.D. CLAMP RIB SET</u>	<u>MANDREL SIZE</u>
1.250 - 1.600	31.8 - 40.6	H-01	1.250" (31.75mm)
1.525 - 1.925	38.9 - 48.9	H-02	1.250" (31.75mm)
1.800 - 2.270	45.8 - 57.6	M-01	1.800" (46 mm)
2.240 - 2.695	56.9 - 68.4	M-02	1.800" (46 mm)
2.665 - 3.120	67.7 - 79.2	M-03	1.800" (46 mm)
3.050 - 3.500	77.4 - 88.9	M-04	1.800" (46 mm)
		<u>I.D. CLAMP PAD SET</u>	
3.415 - 3.865	86.7 - 98.1	M-02 & M-05	1.800" (46 mm)
3.780 - 4.230	96 - 107.4	M-03 & M-05	1.800" (46 mm)
4.145 - 4.595	105.3 - 116.7	M-04 & M-05	1.800" (46 mm)
4.510 - 4.960	114.5 - 126	M-02 & M-08	1.800" (46 mm)
4.875 - 5.325	123.8 - 135.2	M-03 & M-08	1.800" (46 mm)
5.240 - 5.690	133.1 - 144.5	M-04 & M-08	1.800" (46 mm)
5.605 - 6.055	142.3 - 153.8	M-02 & M-11	1.800" (46 mm)
5.970 - 6.420	151.6 - 163.0	M-03 & M-11	1.800" (46 mm)

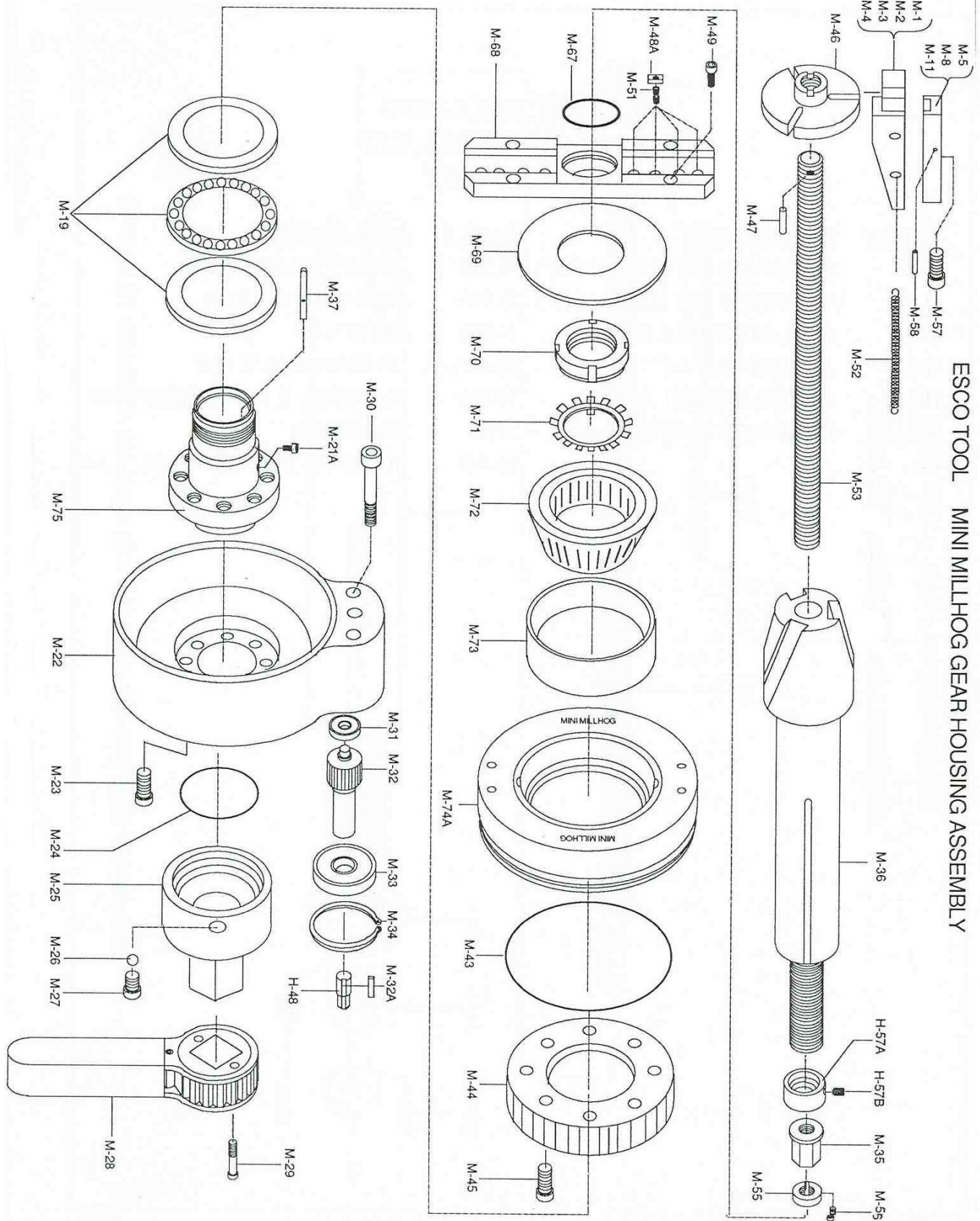
Parts list and drawings

Gear housing assembly

PART #	DESCRIPTION	PART #	DESCRIPTION
M-01	CLAMP RIBS (1.800" - 2.270")	M-44	DRIVEN GEAR
M-02	CLAMP RIBS (2.240" - 2.695")	M-45	SHC SCREW ¼ x 20 x ½
M-03	CLAMP RIBS (2.665" - 3.120")	M-46	ACTUATOR
M-04	CLAMP RIBS (3.050" - 3.500")	M-47	ROLL PIN
M-05	CLAMP PADS	M-48A	9/16" BLADE LOCK
M-08	CLAMP PADS	M-48B	3/4" BLADE LOCK
M-11	CLAMP PADS	M-49	SOCKET HEAD CAP SCREW
M-19	THRUST BEARING ASSY.	M-50	6" BLADE BLOCK
M-20	ROLL PIN	M-51	BLADE LOCK SCREW
M-21A	SOCKET HEAD CAP SCREW	M-52	CLAMP RIB SPRING
M-22	HOUSING	M-53	MMH DRAW ROD
M-23	SOCKET HEAD CAP SCREW	M-54	AIR MOTOR COMPLETE
M-24	"O" RING	M-55	DRAW ROD STOP COLLAR
M-25	FEED KNOB	M-56	SOCKET HEAD SCREW
M-26	BALL BEARING (23) REQUIRED	M-57	PAD SCREW
M-27	SOCKET HEAD CAP SCREW	M-58	ROLL PIN
M-28	FEED WRENCH	M-67	MANDREL WIPER
M-29	SOCKET HEAD CAP SCREW	M-68	TOOL POST
M-30	MOTOR RETAINER SOCKET HEAD CAP SCREW	M-69	CHIP PLATE
M-31	BEARING	M-70	LOCK NUT
M-32	DRIVE GEAR	M-71	WASHER
M-32A	KEY	M-72	TAPERED ROLLER BEARING
M-33	BEARING	M-73	BEARING RACE
M-34	SNAP RING	M-74A	CUTTERHEAD
M-35	DRAW ROD NUT	M-75	SLEEVE W/ BUSHING
M-36	MANDREL (STD 1.800" W/STOP	H-48	SHEAR COUPLER
M-37	MANDREL KEY	H-57A	FEED STOP COLLAR
M-43	"O" RING	H-57B	SET SCREW
		AW-01	ALLEN WRENCH SET

Gear housing assembly (continued)

ESCO TOOL MINI MILLHOG GEAR HOUSING ASSEMBLY

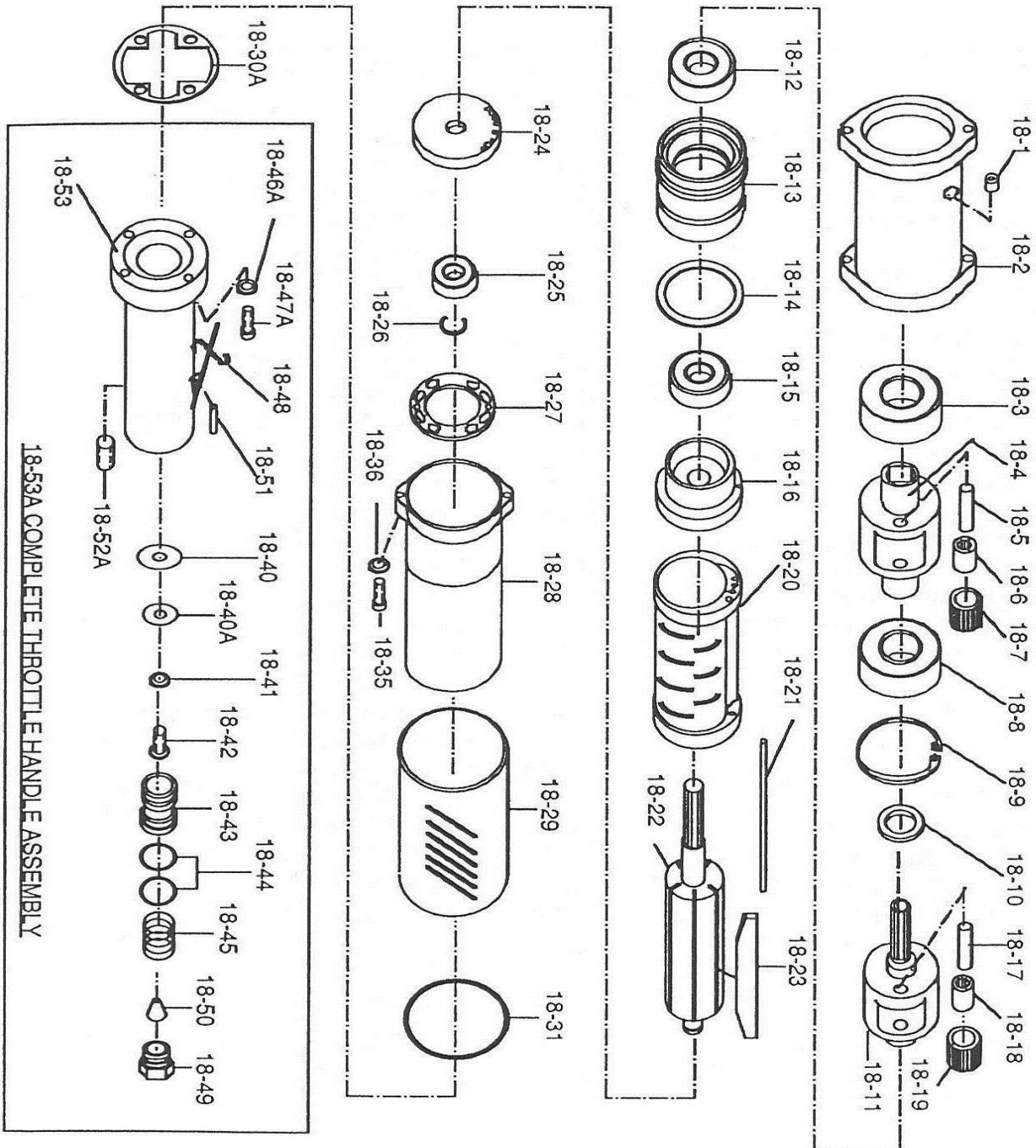


Air motor

<u>PART #</u>	<u>DESCRIPTION</u>	<u>PART #</u>	<u>DESCRIPTION</u>
18-01	GREASE FITTING	18-27	GASKET
18-02	GEAR HOUSING	18-28	AIR MOTOR HOUSING
18-03	BEARING	18-29	EXHAUST DEFLECTOR
18-04	GEAR SPIDER	18-30A	GASKET
18-05	PIN	18-31	"O" RING
18-06	BEARING	18-32	REAR PLATE
18-07	GEAR	18-33	CAP SCREW
18-08	BEARING	18-34	LOCK WASHER
18-09	RETAINER RING	18-35	CAP SCREW
18-10	SPACER	18-36	LOCK WASHER
18-11	GEAR SPIDER	18-40	SEAL
18-12	BEARING	18-40A	WASHER
18-13	BEARING HOUSING	18-41	LOCK WASHER
18-14	GASKET	18-42	BUTTON HEAD SCREW
18-15	BEARING	18-43	AIR VALVE
18-16	FRONT END PLATE	18-44	"O" RING
18-17	PIN	18-45	SPRING
18-18	BEARING	18-46A	LOCK WASHER
18-19	PIN	18-47A	CAP SCREW
18-20	CYLINDER	18-48	THROTTLE LEVER
18-21	ALIGNMENT PIN	18-49	COUPLER
18-22	ROTOR	18-50	SCREEN
18-23	ROTOR BLADES (5 PER SET)	18-51	ROLL PIN
18-24	REAR END PLATE	18-53	THROTTLE HANDLE
18-25	BEARING	18-53A	THROTTLE HANDLE COMPLETE
18-26	RETAINER RING	M-54	COMPLETE AIRMOTOR

Air motor (cont.)

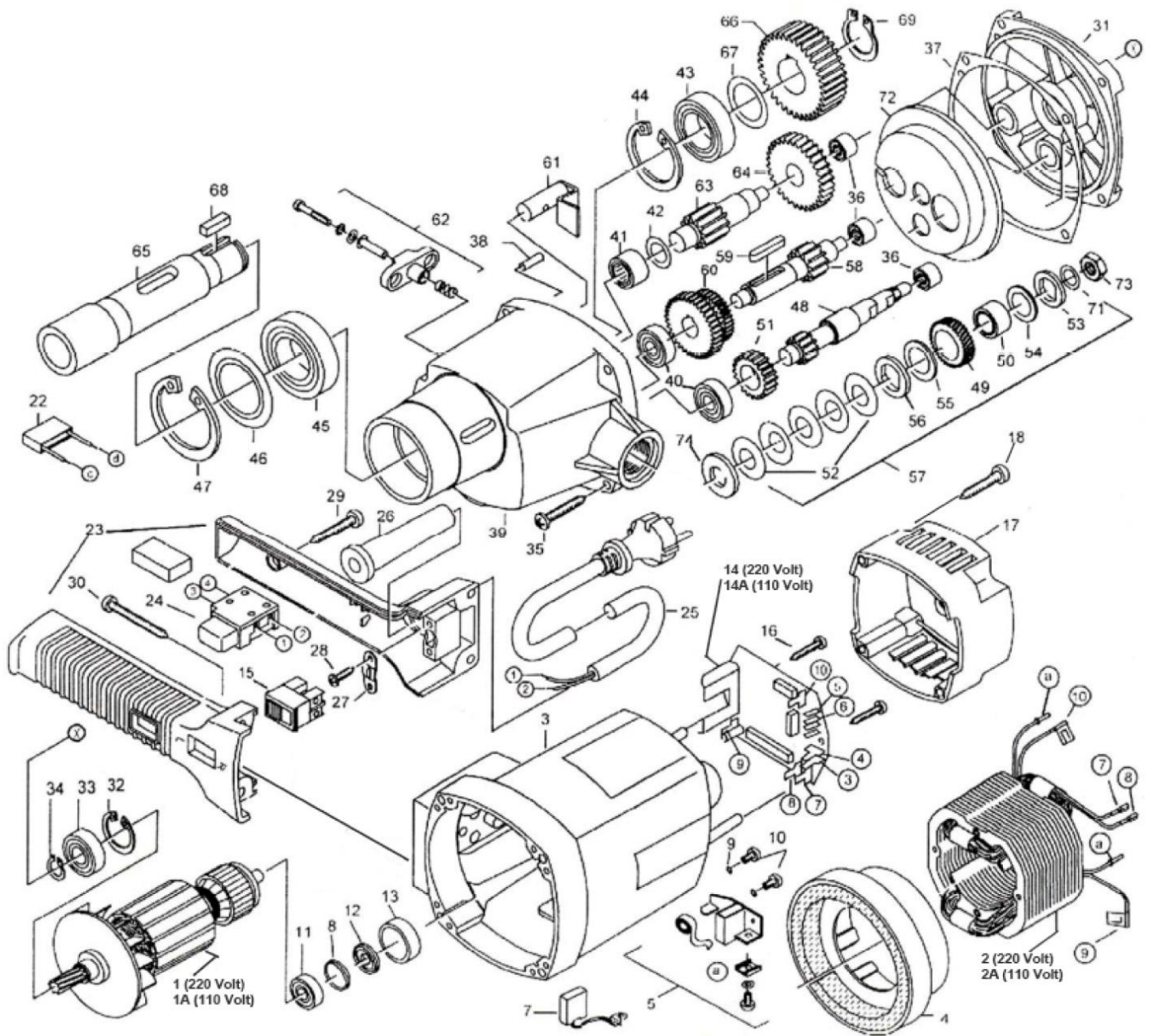
ESCO TOOL MINI MILLHOG AIR MOTOR AND SAFETY HANDLE



PCD-110/220 electric motor

<u>Part #</u>	<u>Description</u>	<u>Part #</u>	<u>Description</u>
PCD-01	ROTOR COMPLETE, 220 VOLT	PCD-39	GEARBOX HOUSING
PCD-01A	ROTOR COMPLETE, 110 VOLT	PCD-40	BEARING
PCD-02	STATOR COMPLETE, 220 VOLT	PCD-41	NEEDLE BEARING
PCD-02A	STATOR COMPLETE, 110 VOLT	PCD-42	DISK OF NEEDLE BEARING
PCD-03	MOTOR HOUSING	PCD-43	BEARING
PCD-04	AIR GUIDING RING	PCD-44	LOCKING RING
PCD-07	CARBON BRUSH	PCD-45	GROOVED BALL BEARING
PCD-08	DISK	PCD-46	DISK F. GROOVED BALL BEARG
PCD-09	SPRING DISK 34	PCD-47	LOCKING RING
PCD-10	SCREW CM4x12	PCD-48	INTERMEDIATE SHAFT 1
PCD-11	BALL BEARING	PCD-49	COUPLING WHEEL
PCD-12	MAGNET RING	PCD-50	GEAR SLEEVE
PCD-13	BEARING SEAL	PCD-51	INTERMEDIATE WHEEL 1
PCD-14	CIRCUIT BOARD-220V	PCD-52	SPRING WASHER
PCD-14A	CIRCUIT BOARD-110V	PCD-53	WASHER
PCD-15	REVERSER	PCD-54	WASHER
PCD-16	SELF TAPPING SCREW	PCD-55	CLUTCH WASHER
PCD-17	MOTOR CAP	PCD-56	C-CLIP
PCD-18	SCREW	PCD-57	COUPLING, COMPLETE
PCD-22	CONDENSOR	PCD-58	INTERMEDIATE SHAFT 2
PCD-23	SIDE HANDLE	PCD-59	FITTING SPRING HARDENED
PCD-24	SWITCH	PCD-60	CLUSTER GEARS
PCD-25	CONNECTION CABLE 230VOLT	PCD-61	COUPLING BOLT
PCD-25A	CONNECTION CABLE, 110V	PCD-62	GEAR SWITCH
PCD-26	CABLE SLEEVE	PCD-63	INTERMEDIATE SHAFT 3
PCD-27	LOCKING FLANGE	PCD-64	INTERMEDIATE WHEEL 2
PCD-28	SCREW 4.2x16	PCD-65	WORK SPINDLE
PCD-29	SCREW	PCD-66	SPINDLE WHEEL
PCD-30	SELF TAPPING SCREW	PCD-67	FITTING DISK
PCD-31	END SHIELD	PCD-68	FITTING SPRING
PCD-32	SAFETY RING 28/1.2	PCD-69	LOCKING RING
PCD-33	BEARING	PCD-71	DISK SPRING
PCD-34	SAFETY RING	PCD-72	GREASE CHAMBER
PCD-35	SCREW 4.2x16	PCD-73	NUT, HEXAGON 8M10 x 1
PCD-36	NEEDLE SLEEVE	PCD-74	DISK OF NEEDLE BEARING
PCD-37	SEAL	PCD-110	MOTOR, COMPLETE, 110V
PCD-38	NOTCHED PIN 5x16	PCD-220	MOTOR, COMPLETE, 220V

PCD-110/220 electric motor (cont.)



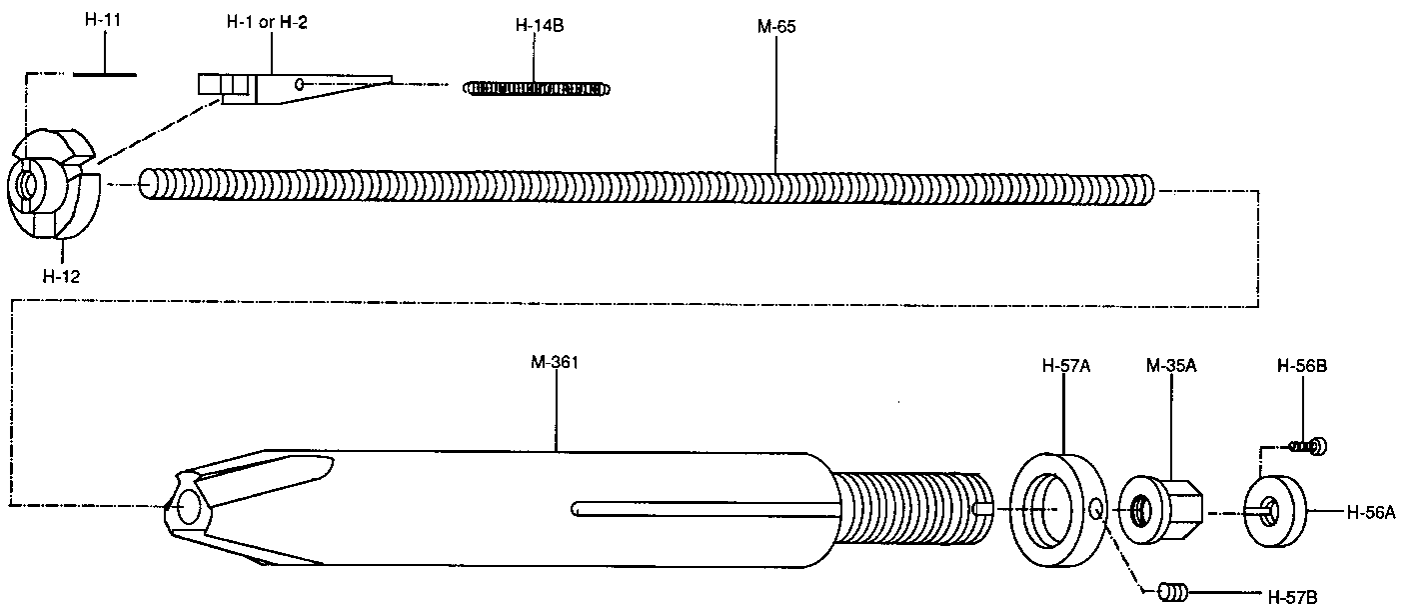
1-1/4" Mandrel kit

**"MINI" MILLHOG
 1-1/4" MANDREL KIT
 PARTS LIST**

<u>PART #</u>	<u>DESCRIPTION</u>	<u>PART #</u>	<u>DESCRIPTION</u>
H-01	CLAMP RIB SET (1.250"-1.600")	H-56B	SOCKET HEAD SCREW
H-02	CLAMP RIB SET (1.525"-1.925")	H-57A	FEED STOP COLLAR
H-11	ACTUATOR ROLL PIN	H-57B	SET SCREW
H-12	ACTUATOR, 1-1/4"	M-35A	DRAW ROD NUT, 3/8"
H-14B	SPRING, FOR H1-H4 RIBS	M-361	MANDREL, 1-1/4" W/ FEED STOP
H-56A	DRAW ROD STOP COLLAR	M-65	DRAW ROD
		M-240	MANDREL KIT COMPLETE, 1-1/4"

ESCO TOOL MINI 1-1/4" MANDREL KIT

COMPLETE MANDREL ASSEMBLY PART# M-240

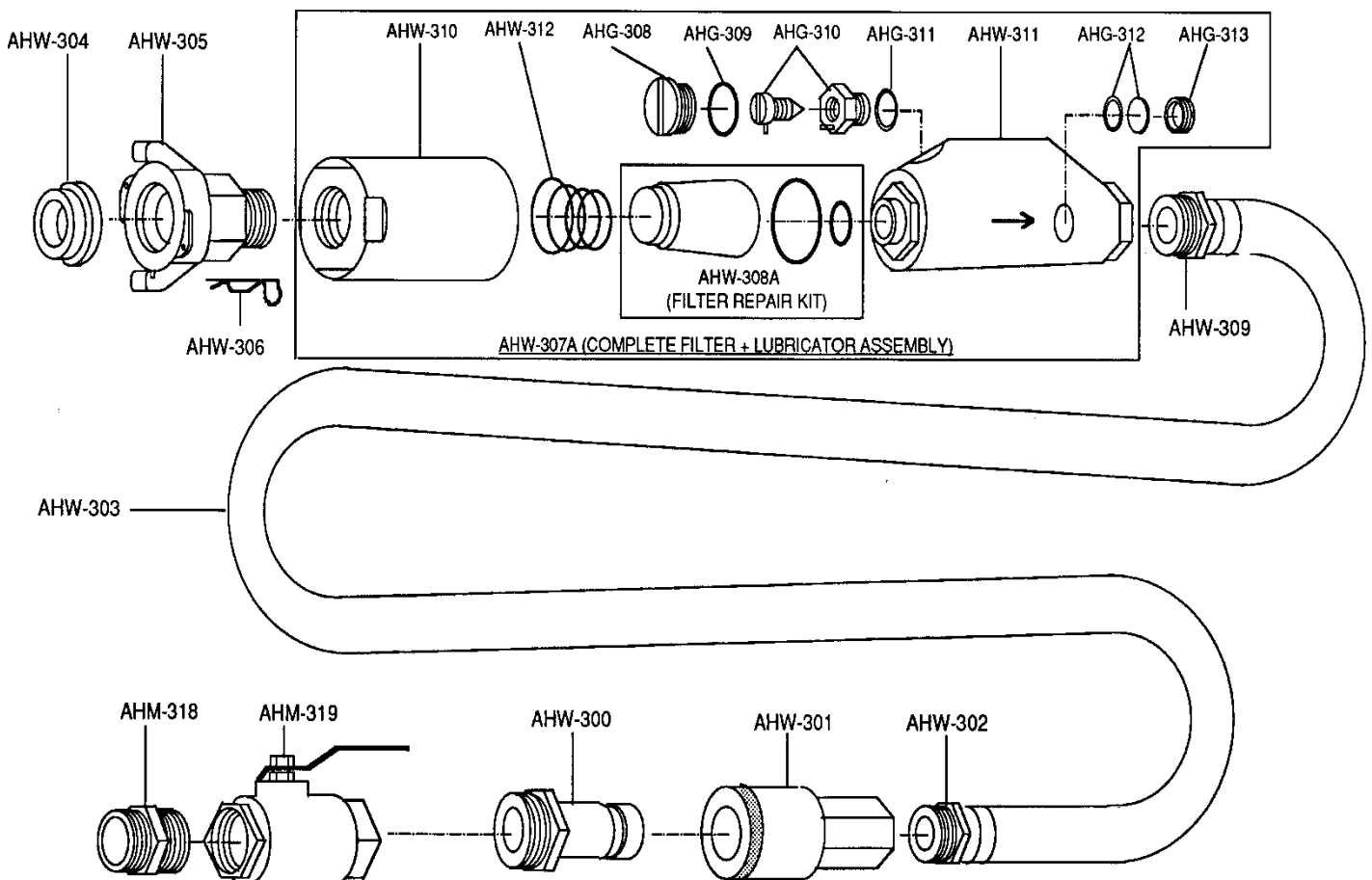


Air hose

**"MINI" MILLHOG
 HOSE ASSEMBLY
 PARTS LIST**

<u>PART #</u>	<u>DESCRIPTION</u>	<u>PART #</u>	<u>DESCRIPTION</u>
AHG-308	FILLER PLUG	AHW-302	HOSE BARB 1/2" x 3/8"
AHG-309	FILLER PLUG "O" RING	AHW-303	HOSE 6'
AHG-310	OIL ADJUSTING VALVE ASSY.	AHW-304	SEAL
AHG-311	VALVE GASKET	AHW-305	CHICAGO FITTING 1/2"
AHG-312	SIGHT DISK & SEAL	AHW-306	SAFETY PIN
AHG-313	SIGHT DISK LOCK NUT	AHW-308A	FILTER REPAIR KIT
AHM-318	THREADED COUPLER	AHW-309	HOSE BARB, 1/2" x 1/2"
AHM-319	BALL VALVE 3/8"	AHW-310	FILTER HOUSING
AHW-300	NIPPLE, 3/8" x 3/8"	AHW-311	LUBRICATOR HOUSING
AHW-301	COUPLER	AHW-312	SPRING

COMPLETE ASSEMBLY - PART# AH-202B



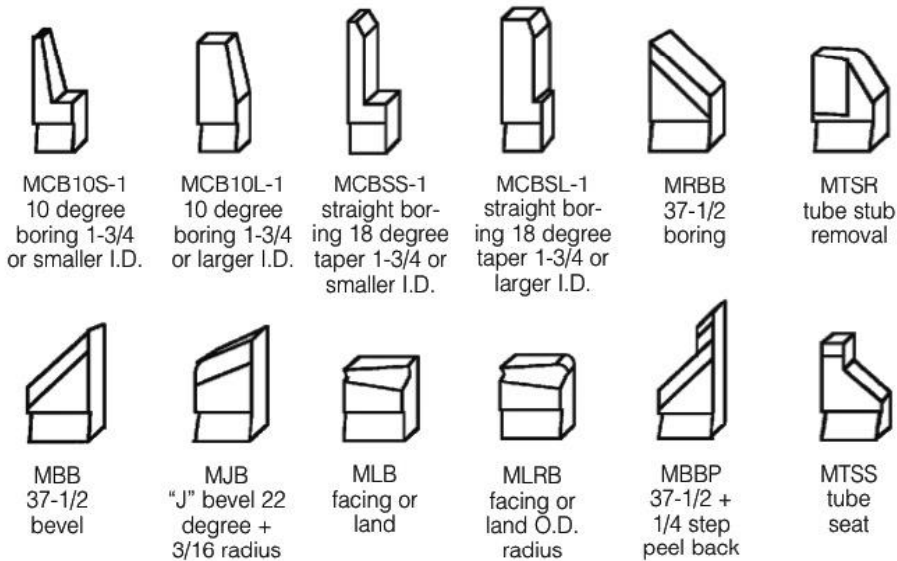
Cutting blades

"MINI" MILLHOG Cutting Blades - (Standard)

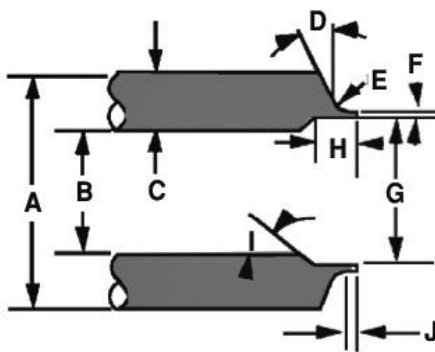
MBB-1	BLADE 1/2" BEVEL TiN
MBB-2	BLADE 3/4" BEVEL TiN
MBB-3	BLADE 1" BEVEL TiN
MBBP-1	1/2" 37-1/2 DEG 1/4" PEEL BACK
MBBP-2	3/4" 37-1/2 DEG 1/4" PEEL BACK
MBBP-3	1" 37-1/2 DEG 1/4" PEEL BACK
MCB-1	BLADE,CUSTOM 1/2"CNTR BORE TiN
MCB-2	BLADE,CUSTOM 3/4"CNTR BORE TiN
MCB-3	BLADE,CUSTOM 1"CNTR BORE TiN
MCB10L-1	1/2" 10 DEG BORING >1-3/4"ID
MCB10L-2	3/4" 10 DEG BORING >1-3/4"ID
MCB10L-3	1" 10 DEG BORING > 1-3/4" ID
MCB10S-1	1/2" 10 DEG BORING <1-3/4 ID
MCB10S-2	3/4" 10 DEG BORING <1-3/4 ID
MCB10S-3	1" 10 DEG BORING < 1-3/4" ID
MCBSL-1	1/2" WIDE 3/8"STRAIGHT BORE 18 DEG TAPER
MCBSL-2	3/4" WIDE 3/8"STRAIGHT BORE 18 DEG TAPER
MCBSL-3	1" WIDE 3/8"STRAIGHT BORE 18 DEG TAPER
MCBSS-1	1/2" WIDE 3/8"STRAIGHT BORE 18 DEG TAPER
MCBSS-2	3/4" WIDE 3/8"STRAIGHT BORE 18 DEG TAPER
MCBSS-3	1" WIDE 3/8"STRAIGHT BORE 18 DEG TAPER
MJB-1	1/2" "J" BEVEL 22 DEG+3/16 RADIUS
MJB-2	3/4" "J" BEVEL 22 DEG+3/16 RADIUS
MJB-3	1" "J" BEVEL 22 DEG+3/16 RADIUS
MLB-1	BLADE 1/2" LAND TiN
MLB-2	BLADE 3/4" LAND TiN
MLB-3	BLADE 1" LAND TiN
MLRB-1	1/2" FACING BLADE W/ OD RADIUS
MLRB-2	3/4" FACING BLADE W/ OD RADIUS
MLRB-3	1" FACING BLADE W/ OD RADIUS
MRBB-1	1/2"37-1/2 DEGREE BORING BLADE
MRBB-2	3/4"37-1/2 DEGREE BORING BLADE
MRBB-3	1" 37-1/2 DEGREE BORING BLADE
MTSR-1	BLADE, 1/2" TUBE STUB REMOVAL
MTSR-2	BLADE, 3/4" TUBE STUB REMOVAL
MTSR-3	BLADE, 1" TUBE STUB REMOVAL
MTSS-1	BLADE, 1/2" TUBE SEAT
MTSS-2	BLADE, 3/4" TUBE SEAT
MTSS-3	BLADE, 1" TUBE SEAT

Cutting blades (cont.)

**Cutter Blades for the Wart, Mini, Prepzilla, Commander,
 and Dictator MILLHOG®**

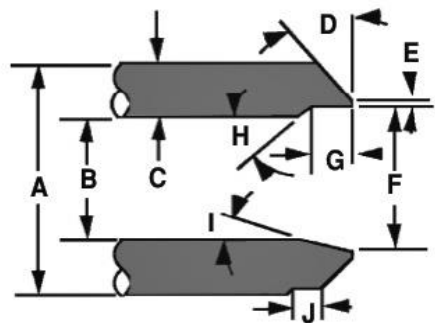


Specifications for "J" Prep Custom Blades



		Standard	Your Spec.
A	Tube O.D.	—	
B	Tube I. D.	—	
C	Wall thickness	—	
D	Bevel Angle	22°	
E	Radius	3/16	
F	Land or Face	—	
G	Bore Dia.	—	
H	Bore Depth	3/8	
I	Bore Taper	18°	
J	Nose (Straight)	—	
K	Tapered bore angle instead of straight bore	10°	

Specifications for "V" Prep Custom Blades



		Standard	Your Spec.
A	Tube O.D.	—	
B	Tube I. D.	—	
C	Wall thickness	—	
D	Bevel Angle	37-1/2°	
E	Land or Face	—	
F	Bore Dia.	—	
G	Depth of Bore	3/8	
H	Taper Angle	18°	
I	Bore Angle	10°	
J	Peel Back	1/4"	