

OPERATION AND MAINTENANCE MANUAL

for

SERIES HXAX ANGLE CUTOFF TOOLS

NOTICE

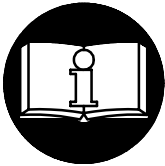
Series HXAX Angle Cutoff Tools are designed for close-quarter work in the metal fabricating industry, shipyards, pipe fabrication, die manufacturing and limited space applications. They are particularly good where conduits, pipes, ducts, etc. pass through bulkheads or frames. Ingersoll-Rand is not responsible for customer modification of tools for applications on which Ingersoll-Rand was not consulted.

⚠ WARNING

**IMPORTANT SAFETY INFORMATION ENCLOSED.
READ THIS MANUAL BEFORE OPERATING TOOL.**

**IT IS THE RESPONSIBILITY OF THE EMPLOYER TO PLACE THE INFORMATION
IN THIS MANUAL INTO THE HANDS OF THE OPERATOR.**

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.



PLACING TOOL IN SERVICE

- Always operate, inspect and maintain this tool in accordance with American National Standards Institute Safety Code for Portable Air Tools (ANSI B186.1).
- For safety, top performance, and maximum durability of parts, operate this tool at 90 psig (6.2 bar/ 620 kPa) maximum air pressure at the inlet with 3/8" (10 mm) inside diameter air supply hose.
- Always turn off the air supply and disconnect the air supply hose before installing, removing or adjusting any accessory on this tool, or before performing any maintenance on this tool.
- Do not use damaged, frayed or deteriorated air hoses and fittings.
- Be sure all hoses and fittings are the correct size and are tightly secured. See Dwg. TPD905-1 for a typical piping arrangement.
- Always use clean, dry air at 90 psig maximum air pressure. Dust, corrosive fumes and/or excessive moisture can ruin the motor of an air tool.
- Do not lubricate tools with flammable or volatile liquids such as kerosene, diesel or jet fuel.
- Do not remove any labels. Replace any damaged label.

USING THE TOOL

- Always wear eye protection when operating or performing maintenance on this tool.
- Always wear hearing protection when operating this tool.
- Keep hands, loose clothing and long hair away from rotating end of tool.
- Anticipate and be alert for sudden changes in motion during start up and operation of any power tool.
- Keep body stance balanced and firm. Do not over-reach when operating this tool. High reaction torques can occur at or below the recommended air pressure.
- Tool accessories may continue to rotate briefly after throttle is released.
- Air powered tools can vibrate in use. Vibration, repetitive motions or uncomfortable positions may be harmful to your hands and arms. Stop using any tool if discomfort, tingling feeling or pain occurs. Seek medical advice before resuming use.
- Use accessories recommended by Ingersoll-Rand.
- This tool is not designed for working in explosive atmospheres.
- This tool is not insulated against electric shock.

NOTICE

The use of other than genuine Ingersoll-Rand replacement parts may result in safety hazards, decreased tool performance, and increased maintenance, and may invalidate all warranties.

Repairs should be made only by authorized trained personnel. Consult your nearest Ingersoll-Rand Authorized Servicenter.

Refer All Communications to the Nearest
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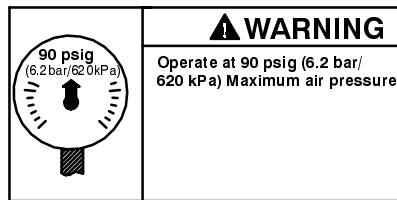
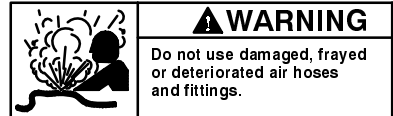
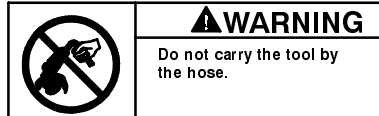
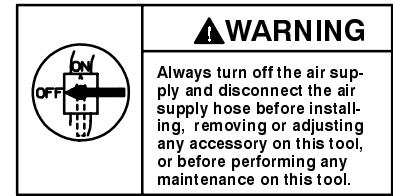
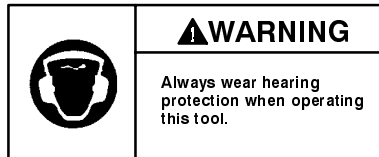
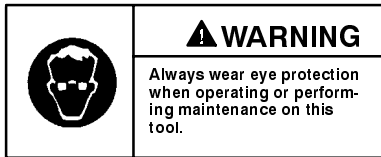
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INGERSOLL-RAND®
PROFESSIONAL TOOLS

WARNING LABEL IDENTIFICATION

⚠ WARNING

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.



CUTOFF TOOL SPECIFIC WARNINGS

⚠ WARNING

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

- Do not use this tool if actual free speed exceeds the nameplate rpm.
- Before mounting a wheel, after any tool repair or whenever a Grinder is issued for use, check free speed of Grinder with a tachometer to make certain its actual speed at 90 psig (6.2 bar/620 kPa) does not exceed rpm stamped or printed on the nameplate. Grinders in use on the job must be similarly checked at least once each shift.
- Always use the recommended Ingersoll-Rand Wheel Guard furnished with the Grinder.
- Do not use any cutoff wheel having a maximum operating speed less than the free speed of the Cutoff Tool in which it is being used.
- Inspect all cutoff wheels for chips or cracks prior to mounting. Do not use a wheel that is chipped or cracked or otherwise damaged. Do not use a wheel that has been soaked in water or any other liquid.
- Make certain the cutoff wheel properly fits the arbor. Do not use reducing bushings to adapt a wheel to any arbor unless such bushings are supplied by and recommended by the wheel manufacturer.
- After mounting a new wheel, hold the Cutoff Tool under a steel workbench or inside a casting and run it for at least 60 seconds. Make certain no one is within the operating plane of the grinding wheel. If a wheel is defective, improperly mounted or the wrong size and speed, this is the time it will usually fail.
- When starting with a cold wheel, apply it to the work slowly until the wheel gradually warms up. Make smooth contact with the work and avoid any bumping action or excessive pressure.
- Always replace a damaged, bent or severely worn wheel guard. Do not use a wheel guard that has been subjected to a wheel failure.
- Always use the Flange Nut furnished by the manufacturer; never use a makeshift Wheel Flange Nut. Tighten the Flange Nut securely.
- Guard opening must face away from operator. Bottom of wheel must not project beyond guard.

PLACING TOOL IN SERVICE

LUBRICATION



Ingersoll-Rand No. 10 Ingersoll-Rand No. 67
 Ingersoll-Rand No. 50 Ingersoll-Rand No. 68
 Ingersoll-Rand No. 63 Ingersoll-Rand No. 77

After each two hours of operation, inject 1/2 to 1 cc of Ingersoll-Rand No. 10 Oil into the Air Inlet.
 After each eight hours of operation, inject approximately 3 cc of Ingersoll-Rand No. 67 or Ingersoll-Rand No. 77 Grease into the Grease Fitting (39). Excessive lubrication will cause grease to work out around the Arbor.

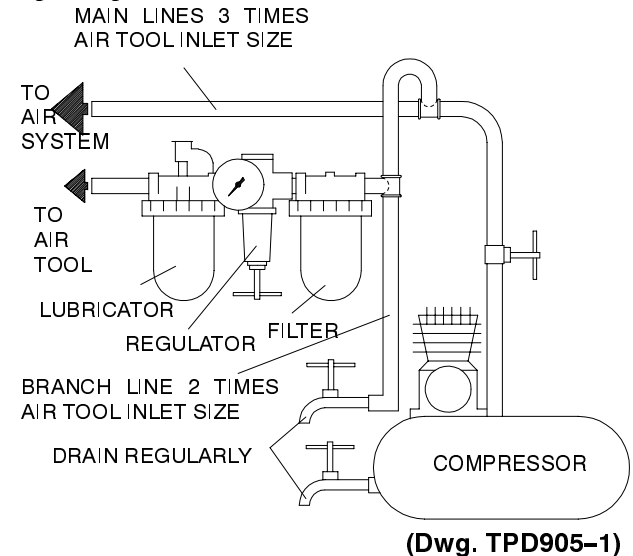
CAUTION

Do not mark any nonmetallic surface of this tool with customer identification codes. Such action could affect tool performance.

Air Supply and Connections

Always use clean, dry air. Dust-corrosive fumes and/or excessive moisture can ruin the motor of an air tool. An air line filter can greatly increase the life of an air tool. The filter removes dust and moisture.

Make sure all hoses and fittings are the correct size and are tightly secured. See Dwg. TPD905-1 for typical piping arrangement



HOW TO ORDER A CYCLONE ANGLE CUTOFF TOOL

ANGLE CUTOFF TOOL with 6" WHEEL

Model	Free Speed rpm
HXAX125RH66 (Rear Exhaust)	12 500
HXAX125RH64 (Rear Exhaust)	12 500

NOTICE

Any model listed above can be changed to a front exhaust tool by reversing the Flow Ring and aligning the indicator marks with the letter "F" on the Housing. To order a front exhaust tool from the factory, substitute the letter "F" for the letter "R" in the model number. Example: HXAX125RH66 Rear Exhaust Model becomes HXAX125FH66 Front Exhaust Model.

PLACING TOOL IN SERVICE

HOW TO ORDER CUSTOM MODELS

- To order a tool with a Locking Lever, select the desired model and add and "L" to the end of the existing number.

Example: HXAX125RH66L

NOTICE

Anytime a tool is ordered with a Low-Profile Concentric Flange, it will come equipped with a Locking

Lever from the factory.

- To order a tool with a Low-Profile Concentric Flange, select the desired rear exhaust model and add a "C" to the end of the existing number. Concentric Flanges are not available for front exhaust models.

Example: HXAS125RH66C

NEW GRINDER TO ACCESSORY COLOR MATCHING GUIDE

(NOT AVAILABLE IN EUROPE)

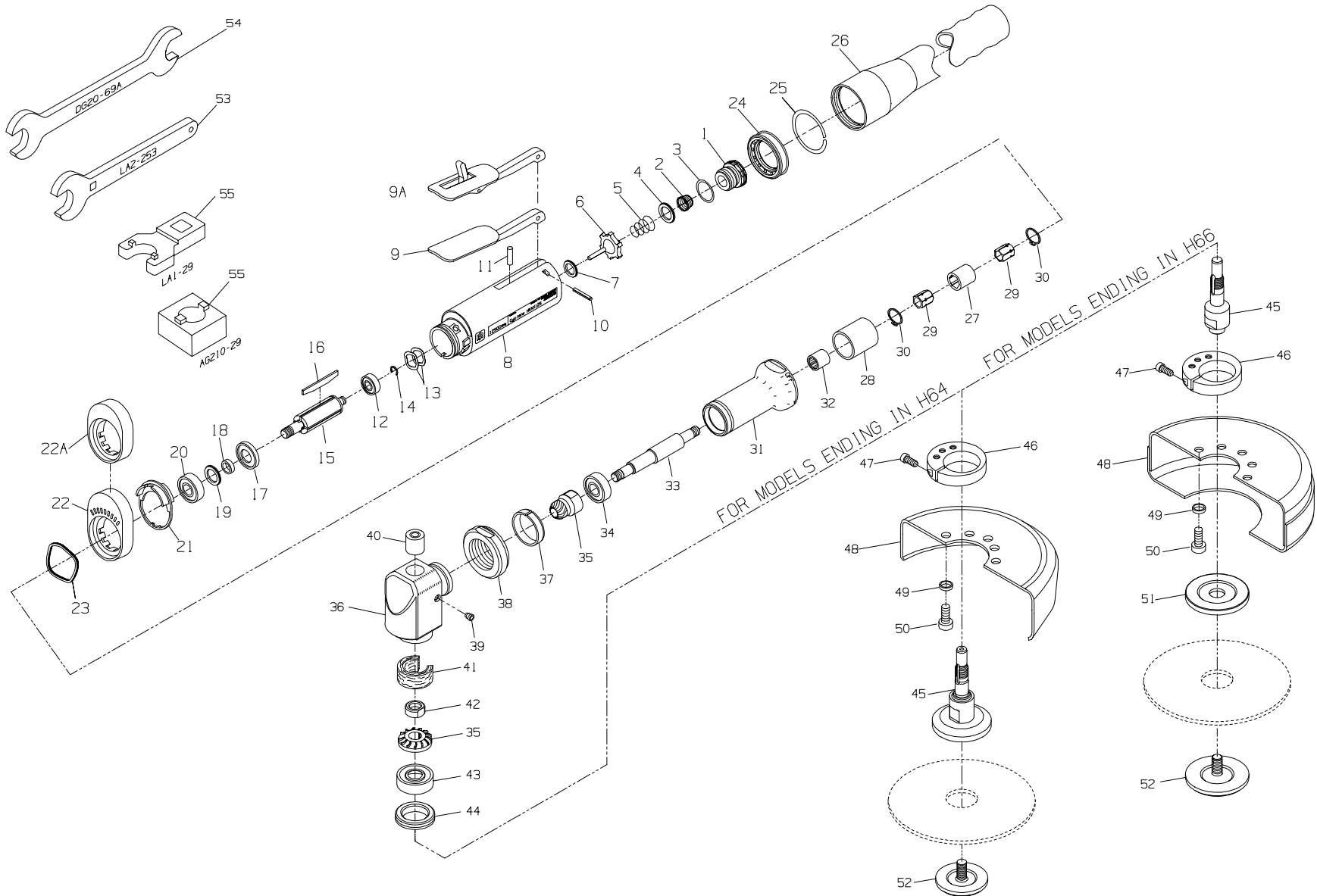
Ingersoll-Rand has pioneered a new color code system designed to:

- Simplify the identification of rated tool speed via a unique corresponding color match.
- Easily communicate the appropriate backing pads and accessories for each tool through a matching color code system on the backing pads and/or other corresponding Grinder accessories.
- The chart below demonstrates the color code system between the Grinder and the accessory.

(NOT AVAILABLE IN EUROPE)

SPEED COLOR ON NAMEPLATE	RATED TOOL SPEED	SAFE RANGE ACCESSORY (MAXIMUM OPERATING SPEED)							
		35,000	30,000	25,000	20,000	18,000	15,000	12,000	9,000
RED	35,000	RED							
ORANGE	30,000		ORANGE						
YELLOW	25,000			YELLOW					
GREEN	20,000				GREEN				
BLUE	18,000					BLUE			
GREY	15,000						GREY		
TAN	12,000							TAN	
VIOLET	9,000								VIOLET

(Dwg. TPD1146-1)



MAINTENANC SECTION

(Dwg. TPA1409-2)



PART NUMBER FOR ORDERING →

PART NUMBER FOR ORDERING →

1	Inlet Assembly	LG2-A465	18	Front End Plate Spacer	LG2-65
2	Inlet Screen	R1602-61	• 19	Front Seal Cup Assembly	61H-A32
• 3	Inlet Seal	R18LF-21	20	Front Rotor Bearing	LG2-24
4	Throttle Valve Spring Seat	LG3-592	21	Flow Ring (red)	LG2-103-3
5	Throttle Valve Spring	7L-51	22	High Profile Flange	LG2-23
6	Throttle Valve	LG3-302	# 22A	Concentric Flange	LG3R-23
7	Throttle Valve Seat	LG3-303	23	Flange Clamp	LG2-29
8	Motor Housing	LG3-40		Piped-Away Exhaust Kit	LG2-K284
9	Throttle Lever	LG2-273	♦ 24	Exhaust Hose Adapter	LG2-184
9A	Locking Throttle Lever Assembly (for all models ending in L or C)	LG2-A400	♦ 25	Exhaust Hose Retainer	6WT-203
*	Lever Lock	LG1-402	♦ 26	Exhaust Hose	3RL-284
*	Lock Spring	LG1-405	*	Warning Label	LG2-99
*	Lock Pin	5UT-757	*	Nameplate	LA3125-301
10	Throttle Lever Pin	61H-120	• 27	Arbor Coupling	LE2-304
11	Throttle Valve Plunger	LG2-191	28	Clamp Sleeve	LE2-176
12	Rear Rotor Bearing	R120-127	29	Spindle Bearing Nut (2)	LE2-85
• 13	Rear Rotor Bearing Spacer (2)	400-25-191	30	Coupling Retaining Ring (2)	RX3-729
• 14	Rear Rotor Bearing Retainer	LG1-118	• 31	Extension Housing Assembly	LA2-A20
15	Rotor	LG3-53-4	32	Rear Spindle Bearing	LE2-24
• 16	Vane Packet (set of 4 Vanes)	DG31-42-4	33	Spindle	LA2-4
17	Front End Plate	LG2-11	34	Front Spindle Bearing	LG1-24

MAINTENANCE SECTION

* Not illustrated.



Always install a Locking Throttle Lever Assembly (9A) on a tool with a Low Profile Concentric Flange (22A). Installing a Concentric Flange on a tool without a Locking Throttle Lever will allow the tool to continue running if the tool is dropped or set down on the standard non-locking Throttle Lever (9).

- ♦ Standard equipment with all models ending in **M, MC** or **ML**. Optional equipment on all other models.
- To keep downtime to a minimum, it is desirable to have on hand certain repair parts. We recommend that you stock one (pair or set) of each part indicated by a bullet (•) for every four tools in service.

PART NUMBER FOR ORDERING

PART NUMBER FOR ORDERING

35	Bevel Pinion and Bevel Gear (sold only as a matched set)	LA1-A552-1.5A	49	Guard Lock Washer (3)	R2-320
36	Angle Housing Assembly	LA1-A550S	50	Guard Mounting Screw (3)	AG31-667
37	Clamp Spacer	LA1-46	51	Wheel Flange (for models ending in H66) . . .	LA3-337-6
38	Clamp Nut	LG1-27	52	Wheel Flange Nut for models ending in H66	LA3-338-6
39	Grease Fitting	D0F9-879		for models ending in H64	LA2-388
40	Upper Arbor Bearing	AG210-693	53	Clamp Nut Wrench (double-end 1-3/16" x 1-1/2")	LA2-253
+ 41	Wick	LA1-561	54	Arbor Wrench (double-end 7/16" x 11/16") (for H66 models)	DG20-69A
42	Bevel Gear Nut	AG210-578A	55	Arbor Bearing Cap Wrench for models ending in H66	AG210-29
43	Lower Arbor Bearing	AG210-24		for models ending in H64	LA1-29
44	Arbor Bearing Cap	AG210-531	*	I-R No. 10 Oil (4 oz. bottle)	10Z4
45	Arbor for models ending in H66	LA1-4-1	*	I-R No. 63 Oil (4 oz. bottle)	63Z4
	for models ending in H64	LA1-104-1	*	I-R No. 67 Grease (1 lb. can)	67-1LB
46	Guard Adapter Assembly	LA1-A710	*	I-R No. 77 Grease (1 lb. can)	77-1LB
47	Guard Adapter Pinch Bolt	804-634			
48	Wheel Guard for models ending in H66	LAX2-6			
	for models ending in H64	AG121-106-4			

* Not illustrated.

+ The LA1-A550S Angle Housing Assembly is furnished with two Wicks. Use Wick (LA1-561) **with** the notch on HXAX125 models.

MAINTENANCE SECTION

WARNING

Always wear eye protection when operating or performing maintenance on this tool.

Always turn off the air supply and disconnect the air supply hose before installing, removing or adjusting any accessory on this tool, or before performing any maintenance on this tool.

LUBRICATION

Whenever one of these Grinders is disassembled for overhaul or replacement of parts, lubricate as follows:

1. Always wipe the Vanes (16) with a light film of oil before inserting them into the vane slots.
2. Inject 0.5 to 1.0 cc of Ingersoll-Rand No. 10 Oil into the air Inlet Assembly (1) after assembly.

DISASSEMBLY

General Instructions

1. Do not disassemble the tool any further than necessary to replace or repair damaged parts.
2. When grasping a tool or part in a vise, always use leather-covered or copper-covered vise jaws to protect the surface of the part or tool and help prevent distortion. This is particularly true of threaded members and housings.
3. Do not remove any part which is a press fit in or on a subassembly unless the removal of that part is necessary for repairs or replacement.
4. Do not disassemble the tool unless you have a complete set of new gaskets and O-rings for replacement.
5. Do not press any needle bearing from a part unless you have a new needle bearing on hand for installation. Needle bearings are always damaged during the removal process.

Disassembly of the Angle Head

1. Grasp the tool in copper-covered or leather-covered vise jaws with the Wheel Flange Nut (52) upward.
2. Use an Arbor Wrench to hold the Arbor (45) and using a 7/16" wrench, unscrew and remove the Wheel Flange Nut. Remove the wheel and Wheel Flange (51) from the Arbor.
3. Using a 1/8" hex wrench, unscrew and remove the three Guard Mounting Screws (50) and Guard Lock Washers (49) to separate the Wheel Guard from the Adapter.
4. Using the Arbor Bearing Cap Wrench (55), unscrew and remove the Arbor Bearing Cap (44). This is a **left-hand thread**. Rotate the Wrench **clockwise** to remove the Cap.

NOTICE

In the following step, do not allow the Angle Head to rotate when separating it from the Extension Housing. Components may fall from the Extension Housing.

5. Using the Clamp Nut Wrench (53), loosen the Clamp Nut (38) and pull the Angle Housing Assembly (36) away from the Extension Housing Assembly (31). This is a **left-hand thread**. Rotate the Nut Wrench **clockwise** to loosen the Nut.
6. Grasp the Arbor and pull the assembled Arbor out of the Angle Head. If the Wick (41) needs replacement, pull it out of the Angle Housing. The Wick is staked into position and will be destroyed by removal. Make certain a replacement Wick is available before removing the old Wick.
7. If the Upper Arbor Bearing (40) needs replacement, place the Angle Head on the table of an arbor press, arbor end down, and press the Bearing out of the Angle Head.
8. Grasp the Arbor in copper-covered or leather-covered vise jaws with the wheel end downward. Using an adjustable wrench, unscrew and remove the Bevel Gear Nut (42) and lift the Bevel Gear off the Arbor.
9. If the Lower Arbor Bearing (43) must be replaced, use a piece of tubing to support the Bearing on the table of an arbor press and press the Arbor from the Bearing.
10. Using a 9/64" hex wrench, loosen the Guard Adapter Pinch Bolt (47) and remove the Guard Adapter Assembly (46) along with the assembled Wheel Guard (48).

Disassembly of Extension Assembly

1. Being careful not to distort the Housing, grasp the tool in copper-covered or leather-covered vise jaws with the Spindle (33) upward. Using a 1-1/2" wrench on the flats of the Extension Housing Assembly (31), unscrew and remove the assembled Housing. This is a **left-hand thread**. Rotate the Housing **clockwise** to remove it. Remove the Arbor Coupling (27), Clamp Sleeve (28) and Flange Clamp (23).
2. Using snap ring pliers, remove the Coupling Retaining Ring (30) from the Spindle Bearing Nut (29) in the large end of the Extension Housing Assembly.
3. After removing the Retaining Ring, push on the Nut end of the Spindle until the assembled Spindle exits the angle head end of the Extension Housing. The Rear Spindle Bearing (32) will remain in the Housing and the Nut will pass through the Bearing.
4. If the Front Spindle Bearing (34) must be replaced, use one 1/2" wrench on the flats of the Bevel Pinion and one 1/2" wrench on the Spindle Bearing Nut to unscrew and remove either the Pinion or the Nut.
5. Using an adjustable wrench on the flats of the Spindle, unscrew and remove whichever component remained threaded onto the Spindle.
6. Press the Bearing from the Spindle.
7. If the Rear Spindle Bearing must be replaced, press the Bearing out the large end of the Extension Housing.

MAINTENANCE SECTION

Disassembly of the Motor

1. Pull the Flange (22) and Flow Ring (21) off the front of the Motor Housing (8).
2. Grasp the Spindle Bearing Nut (29) and pull the assembled motor out of the Motor Housing. Remove the two Rear Rotor Bearing Spacers (13) from the bottom of the Housing.
3. Remove the Vanes (16) from the Rotor (15).
4. Grasp the Rotor in copper-covered or leather-covered vise jaws with the Spindle Bearing Nut upward. Using a 1/2" wrench, unscrew and remove the Nut.
5. If the Front Rotor Bearing (20) must be replaced, support the Front End Plate (17) between two blocks on the table of an arbor press. Place the blocks as close to the body of the Rotor as possible and press the Rotor from the Bearing and End Plate. Remove the Front End Plate Spacer (18) and Front Seal Cup Assembly (19) from the hub of the Rotor.
6. If the Rear Rotor Bearing (12) must be replaced, use snap ring pliers to remove the Rear Rotor Bearing Retainer (14).
7. Using a bearing puller, pull the Rear Rotor Bearing off the hub of the Rotor.

Disassembly of the Inlet and Throttle

1. Using a 15/16" wrench or six point socket, unscrew and remove the Inlet Assembly (1).
2. Remove the Inlet Seal (3) and Inlet Screen (2) from the Inlet.
3. Remove the Throttle Valve Spring Seat (4), Throttle Valve Spring (5) and Throttle Valve (6) from the Motor Housing (8).
4. If the Throttle Valve Seat (7) must be replaced, insert a hooked tool through the central opening of the Seat and, catching the underside of the Seat, pull it from the Housing.
5. Press the Throttle Lever Pin (10) from the Housing and remove the Throttle Lever (9). Remove the Throttle Valve Plunger (11).

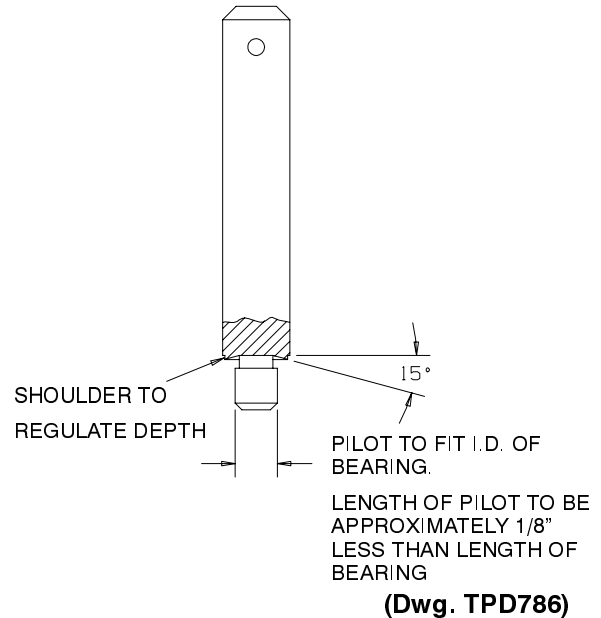
ASSEMBLY

General Instructions

1. Always press on the **inner** ring of a ball-type bearing when installing the bearing on a shaft.
2. Always press on the **outer** ring of a ball-type bearing when pressing the bearing into a bearing recess.
3. Whenever grasping a tool or part in a vise, always use leather-covered or copper-covered vise jaws. Take extra care not to damage threads or distort housings.
4. Except for bearings, always clean every part and wipe every part with a thin film of oil before installation.
5. Check every bearing for roughness. If an open bearing must be cleaned, wash it thoroughly in **clean** solution and dry with a clean cloth. Sealed or shielded bearings should not be cleaned. Work grease into every open bearing before installation.

* Product of N.D. Industries

6. Apply a film of O-ring lubricant to every O-ring before installation.
7. Unless otherwise noted, always press on the stamped end of a needle bearing when installing a needle bearing into a recess. Use a needle bearing inserting tool similar to the one shown in Dwg. TPD786.



Assembly of the Throttle and Inlet

1. Insert the Throttle Valve Plunger (11) into the Motor Housing (8).
2. Position the Throttle Lever (9) on the Motor Housing and using an arbor press, press the Throttle Lever Pin (10) into the Housing and Lever. The Lever will retain the Plunger in the Housing.
3. If the Throttle Valve Seat (7) was removed, use a 5/8" wooden dowel with a flat end to push the Seat into the Motor Housing.
4. Push the small end of the Throttle Valve Spring (5) onto the end of the Throttle Valve (6) with the short stem until the Spring snaps into position around the hub and remains there. Install the dish end of the Throttle Valve Spring Seat (4) onto the large end of the Throttle Valve Spring.
5. Holding the Housing with the Lever downward, make sure the Plunger is out of the way and insert the assembled Throttle Valve, long stem end leading, into the housing recess.
6. Push the Inlet Screen (2), closed end leading, into the bushing of the Inlet Assembly (1). After moistening the Inlet Seal (3) with O-ring lubricant and being careful not to nick the Seal on the threads of the Inlet, install the Seal on the Inlet.

MAINTENANCE SECTION

7. Thread the Inlet Assembly into the Housing and tighten it between 20 and 25 ft-lb (27.1 and 33.9 Nm) torque.

Assembly of the Motor

1. If the Rear Rotor Bearing (12) was removed, stand the Rotor (15) upright on the table of an arbor press with the threaded end downward. Place the threaded rotor hub into a hole drilled into a flat, smooth block so that the Rotor rests against the large rotor body. Press the Rear Rotor Bearing onto the hub of the Rotor.
2. Install the Rear Rotor Bearing Retainer (14) in the groove on the hub of the Rotor.
3. Install the Front End Plate (17), counterbored end trailing, onto the threaded hub of the Rotor. Using finger pressure, press the Front Seal Cup Assembly (19), felt end trailing, onto the end of the Front End Plate Spacer (18) that is opposite the the large internal bevel. Continue pressing until the felt end is flush with the end of the Spacer. Saturate the felt with Ingersoll-Rand No. 50 Oil. Place the assembled Spacer, Seal Assembly trailing, onto the threaded hub of the Rotor. Make sure the Seal Assembly enters the recess in the Front End Plate.

NOTICE

Before performing the next step, be aware that the Front Rotor Bearing is a flush ground bearing and must be installed in a specific manner. The end of the Bearing with a black stain or hash marks must be away from the Spacer.

4. Stand the small hub of the Rotor on the table of an arbor press with the threaded end upward and press the Front Rotor Bearing (20) onto the hub of the Rotor.
5. Grasp the assembled Rotor in copper-covered or leather-covered vise jaws with the threaded rotor hub upward.
6. Thread the Spindle Bearing Nut (29) onto the Rotor and using a torque wrench, tighten the Nut between 14 and 19 ft-lb (19.0 and 25.8 Nm) torque.
7. Using snap ring pliers, install the Coupling Retaining Ring (30) on the Spindle Bearing Nut.
8. Inject approximately 1 cc of Ingersoll-Rand No. 68 Grease into the small recess at the bottom of the motor housing bore. Drop the two Rear Rotor Bearing Spacers (13) into the bottom of the motor housing bore.
9. Wipe each Vane (16) with a light film of oil and insert a Vane into each vane slot in the Rotor.
10. Grasp the Spindle Bearing Nut and insert the assembled Rotor into the Motor Housing (8).
11. Assemble the Flow Ring (21) with the Flange (22) before installing the Flange on the Housing. Mate the Flow Ring to the end of the Flange without perforations. The positioning of the Flow Ring is dictated by the desired exhaust. To set the tool exhaust, proceed as follows:
 - a. **For front exhaust tools**, align the notched projection on the edge of the Flow Ring with the letter "F" on the Housing.
 - b. **For rear exhaust tools**, align the notched projection on the edge of the Flow Ring with the letter "R" on the Housing.

12. Carefully install the assembled Flange, Flow Ring leading, onto the front of the Motor Housing. Make certain the Ring properly engages the Housing.

Assembly of the Extension Housing

1. If the Rear Spindle Bearing (32) was replaced, proceed as follows:
 - a. Stand the Extension Housing (31) on the table of an arbor press with the small end downward.
 - b. Using a bearing inserting tool like the one shown on Page 9, press the Bearing into the Housing until the trailing end of the Bearing is 1.408" to 1.418" (35.7 mm to 36.0 mm) below the face of the large end of the Extension Housing.
2. If the Front Spindle Bearing (34) was replaced, stand the Spindle (33) on the table of an arbor press, small threaded end upward. Being careful not to damage the threads on the large end of the Spindle, press the Bearing, stained or marked end trailing, onto the Spindle until it seats against the shoulder of the shaft.
3. Using an adjustable wrench on the flats of the Spindle and a 9/16" wrench on the flats of the Bevel Pinion (35), thread the Pinion onto the Spindle against the Bearing and tighten it between 14 and 19 ft-lb (19.0 and 25.8 Nm) torque.
4. Using an adjustable wrench on the flats of the Spindle and a 1/2" wrench on one of the Spindle Bearing Nuts (29), thread the Nut without the Coupling Retaining Ring (30), counterbored end leading, onto the Spindle. Tighten the Nut between 14 and 19 ft-lb (19.0 and 25.8 Nm) torque.
5. Insert the assembled Spindle, Nut end leading, into the small end of the Extension Housing. Push the assembly into the Housing until the Front Spindle Bearing bottoms on the housing shoulder.
6. Using snap ring pliers, install the Coupling Nut Retaining Ring on the Spindle Bearing Nut protruding into the large end of the Extension Housing.
7. Grasp the assembled motor in copper-covered or leather-covered vise jaws with the Spindle Bearing Nut upward. Coat the inside of the Arbor Coupling (27) with approximately 1 cc of Ingersoll-Rand No. 68 Grease and install the Coupling over the Bearing Nut. Position the Clamp Sleeve (28) over the Coupling in the Motor Housing and the Flange Clamp (23) over the Sleeve against the Flange (22).
8. Insert the Spindle Bearing Nut in the assembled Extension Housing into the Arbor Coupling and thread the Extension Housing onto the Motor Housing. This is a **left-hand thread**; rotate the Extension Housing **counterclockwise** to tighten it. Tighten the Housing between 20 to 25 ft-lb (27.1 to 33.9 Nm) torque.

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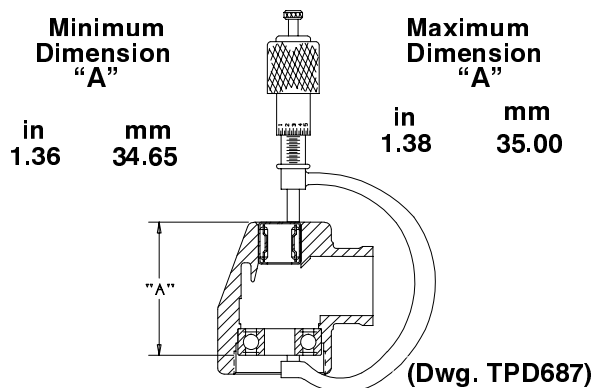
Assembly of the Angle Head

1. If the Upper Arbor Bearing (40) was removed and a new Bearing must be installed, proceed as follows:
 - a. Support the machined face of the Angle Head (36) on the table of an arbor press with the upper arbor bearing bore upward.

NOTICE

When installing the Bearing in the next step, always press on the stamped or closed end of the Bearing.

- b. Press a new Upper Arbor Bearing into the bore, flush with the top of the Angle Housing.
2. Install the Guard Adaptor Assembly (46) on the Arbor (45).
 3. If the Lower Arbor Bearing (43) is being installed, it is necessary to note the identification marks on the Lower Arbor Bearing. The side of the Bearing having black stains or black hash marks across the inner and outer races is opposite the flush ground side.
 4. Using your hand, push the Lower Arbor Bearing, **flush ground side inward**, into the recess at the machined end of the Angle Head.
 5. Using a 2" micrometer, take a measurement from the inner ring of the Lower Arbor Bearing to the stamped or closed end of the Upper Arbor Bearing. (Refer to Drawing TPD687).



6. Additional pressing of the Upper Arbor Bearing may be required to finally attain the correct dimension as indicated above.
7. Remove the Lower Arbor Bearing from the Angle Head.

NOTICE

In the following step, make certain any shims included with the Lower Arbor Bearing are installed onto the Arbor (45) between the Bevel Gear (35) and the Bearing.

8. Using a sleeve that contacts the inner ring of the Lower Arbor Bearing, press the Bearing, **black stain or hash mark side of the Bearing away from the Bevel Gear**, onto the Arbor.

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NOTICE

The Bevel Gear and Bevel Pinion in the next step are specially matched sets. Some sets are color coded for manufacturing purposes only. Only the Gear and Pinion set furnished as a replacement part or the same Gear and Pinion set removed from one tool, is a matched set. A Bevel Gear from one tool used with a Bevel Pinion from another tool with the same color code IS NOT A MATCHED SET. Replace these parts only as a matched set. Failure to do so will result in unsatisfactory tool performance and damage to the Bevel Gear and Bevel Pinion.

9. Slide the Bevel Gear, geared face trailing, onto the small threaded end of the Arbor, aligning the integral keys of the Gear with the slotted keyways in the Arbor.
10. Thoroughly clean the small threads on the Arbor above the Bevel Gear and the threads in the Bevel Gear Nut (42).
11. Apply a thin coat of a thread locking compound w/ Primer (M. I. Hernon Grade 427) to the threads of the Bevel Gear Nut. Thread the Bevel Gear Nut onto the Arbor to retain the Bevel Gear and tighten the Nut between 8 and 9 ft-lb (10.8 and 12.2 Nm) torque.
12. Form the Wick (41) into a horseshoe shape and fully insert it into the U-shaped cavity in the Angle Head. Make certain the Wick is positioned behind the staking points in the Angle Head. When installing the Wick, make certain the notch enters the Housing first. Saturate the Wick with approximately 1.5 cc of Ingersoll-Rand No. 63 Oil. **Do not substitute any other oil.**
13. Inject 2 cc of Ingersoll-Rand No. 67 or Ingersoll-Rand No. 77 Grease into the Upper Arbor Bearing and Wick cavity in the Angle Head. **Do not substitute any other grease.**
14. Carefully grasp the assembled motor in copper-covered or leather-covered vise jaws with the Throttle Lever (9) **downward**.
15. Install the motor Clamp Nut (38), threaded end trailing, onto the motor end of the Angle Head. Spread the Clamp Spacer (37) and install it, beveled end trailing, onto the motor end of the Angle Head against the Clamp Nut.
16. Position the output end of the Angle Head upward and 180 degrees opposite to the Throttle Lever and thread the Clamp Nut onto the Extension Housing. Using the Motor Clamp Nut Wrench (53), tighten the Nut between 20 and 25 ft-lb (27 and 34 Nm) torque. This is a **left-hand thread**, turn **counterclockwise** to tighten.

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17. Thoroughly clean the internal threads of the Angle Head and the threads on the Arbor Bearing Cap (44).
18. Insert the assembled Arbor into the Angle Head, bevel gear end first, making sure the teeth on the Bevel Gear and Pinion mesh. Rotate the Arbor manually to determine they are rotating smoothly.
19. Carefully apply a uniform coat of Vibra-Tite VC3 No. 205 * to at least the first three threads of the Arbor Bearing Cap and allow the compound to cure for 12 to 15 minutes.
20. Using the Arbor Bearing Cap Wrench (55), install the Arbor Bearing Cap and tighten it between 12 and 15 ft-lb (16.2 and 20.3 Nm) torque. The Bearing Cap has a **left-hand thread**: turn **counterclockwise** to install.
21. If the Wheel Guard (48) was separated from the Guard Adapter Assembly (46), use a 1/8" hex wrench for the Guard Mounting Screws (50) and Lock Washers (49) to attach the Guard to the Adapter. Tighten each Screw between 3 and 3-1/2 ft-lb (4.1 and 4.7 Nm) torque.
22. Orient the assembled Wheel Guard and the Guard Adapter Assembly on the Angle Housing and using a 9/64" hex wrench, tighten the Guard Pinch Bolt (47) between 5 and 5-1/2 ft-lb (6.8 and 8.8 Nm) torque. Install cutoff wheel and Wheel Flange Nut (52) onto the Arbor. Using the Arbor Wrench to hold the Arbor and a 7/16" wrench on the Wheel Flange Nut, tighten the Wheel Flange Nut securely

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TROUBLESHOOTING GUIDE

Trouble	Probable Cause	Solution
Low power or low free speed	Insufficient air pressure	Check air line pressure at the Inlet of the tool. It must be 90 psig (6.2 bar/620 kPa).
	Clogged muffler elements	Disassemble the tool and agitate bare Motor Housing and Flange in a clean, suitable, cleaning solution. If elements cannot be cleaned, replace the Motor Housing and/or the Flange.
	Plugged Inlet Screen	Clean the Inlet Screen in a clean, suitable, cleaning solution or replace the Screen.
	Worn or broken Vanes	Install a complete set of new Vanes.
	Loose Clamp Nut or Arbor Housing	Tighten the Nut or Housing between 20 and 25 ft-lb (27 and 34 Nm) torque.
	Worn or broken Motor Housing	Replace the Motor Housing.
	Internal air leakage in the Motor Housing indicated by high air consumption/low speed or air leaking out the front and rear exhaust simultaneously	Replace the Motor Housing.
	Grit buildup under the Throttle Lever restricting full Throttle Valve Plunger movement	Remove the Throttle Lever and clean the groove in the Motor Housing.
	Bent stem on Throttle Valve	Replace the Throttle Valve.
	Front Seal Cup Assembly dragging against the shield of the Front Rotor Bearing	Reposition the Front Seal Cup Assembly.
Excessive runout	Bent Arbor	Replace the Arbor.
	Worn or damaged Upper Arbor Bearing or Lower Arbor Bearing	Replace the worn or damaged Bearing.
Scoring of End Plate	Worn Front End Plate Spacer or Front End Plate	Install a new Front End Plate Spacer and Front End Plate.
	Worn Front Rotor Bearing	Install a new Front Rotor Bearing.
Leaky Throttle Valve	Dirt accumulation on Throttle Valve or Throttle Valve Seat	Disassemble, inspect and clean parts.
	Worn Throttle Valve or Throttle Valve Seat	Replace the Throttle Valve and/or Throttle Valve Seat.
	Excessive dirt build-up beneath the Throttle Lever	Clean out the slot area.
	Bent Throttle Valve Plunger	Replace the Plunger.
Exhausts at wrong direction	Incorrect orientation of the Flow Ring.	Reverse the face of the Flow Ring against the Motor Housing.

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TROUBLESHOOTING GUIDE

Trouble	Probable Cause	Solution
Front Rotor Bearing runs hot	Incorrect installation of the Front Seal Cup Assembly	Reposition the Front Seal Cup Assembly flush with the face of the Front End Plate Spacer.
	Front End Plate Spacer rubbing the bore of the front End Plate.	Replace the Front End Plate and Front End Plate Spacer combination.
Slow tool idle	Bent or leaky Throttle Valve	Replace the Throttle Valve.
Air leakage around Flow Ring	Damaged, mutilated or missing Flange Clamp	Replace the Flange Clamp.
	Damaged Flow Ring	Replace the Flow Ring.
Rough operation/vibration	Improper lubrication or dirt buildup	Disassemble the Tool and clean in a suitable cleaning solution. Assemble the Tool and inject 3 cc of the recommended oil into the Inlet and run the Grinder long enough to coat the internal parts with the oil.
	Worn or broken Rear Rotor Bearing or Front Rotor Bearing	Replace the worn or broken Bearings. Examine the Front End Plate, Front End Plate Spacer Front Seal Cup Assembly and Rear Rotor Bearing Spacers and replace any damaged parts. If the rear end plate is damaged, replace the Rotor.
	Worn or broken Upper Arbor Bearing or Lower Arbor Bearing	Replace the worn or broken Bearing.
	Worn or broken Bevel Gear or Bevel Pinion	Examine the Bevel Gear and Bevel Pinion. If either is worn or damaged, replace both the Gear and the Pinion because they are a matched set and must not be used separately.

NOTES