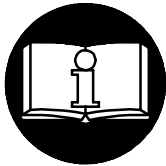
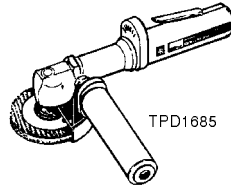


OPERATION AND MAINTENANCE MANUAL for SERIES HPA ANGLE GRINDERS



⚠ WARNING

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

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

- 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 a 3/8" (10 mm) inside diameter air supply hose.
- 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.
- 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.
- 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.
- Check for excessive speed and vibration before operating.
- Tool shaft may continue to rotate briefly after throttle is released.
- 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.
- Use accessories recommended by Ingersoll-Rand.

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.

Ingersoll-Rand is not responsible for customer modification of tools for applications on which Ingersoll-Rand was not consulted.

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

It is the responsibility of the employer to place the information in this manual into the hands of the operator.

Refer All Communications to the Nearest
Ingersoll-Rand Office or Distributor.

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INGERSOLL-RAND®
PROFESSIONAL TOOLS

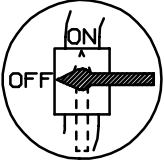
WARNING LABEL IDENTIFICATION

WARNING

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

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

	 WARNING
Always wear hearing protection when operating this tool.	

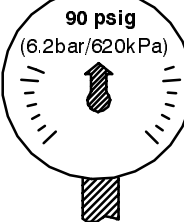
	 WARNING
Always turn off the air supply and disconnect the air supply hose before installing, removing or adjusting any accessory on this tool, or before performing any maintenance on this tool.	

	 WARNING
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.	

	 WARNING
Do not carry the tool by the hose.	

	 WARNING
Do not use damaged, frayed or deteriorated air hoses and fittings.	

	 WARNING
Keep body stance balanced and firm. Do not overreach when operating this tool.	

	 WARNING
Operate at 90 psig (6.2 bar/620 kPa) Maximum air pressure.	

GRINDER 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 grinding wheel, bur or other accessory having a maximum operating speed less than the free speed of the Grinder in which it is being used. Always conform to maximum rpm on grinding wheel blotters.
- Inspect all grinding 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 grinding 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 Grinder 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 wheel failure.
- Make certain wheel flanges are at least 1/3 the diameter of grinding wheel, free of nicks, burrs and sharp edges. Always use wheel flanges furnished by the manufacturer; never use a makeshift flange or a plain washer. Tighten Flange Nut securely.
- Guard opening must face away from operator. Bottom of wheel must not project beyond guard.
- Series HPA120 Angle Grinders have a free speed of 12 000 rpm when operated at 90 psig (6.2 bar/620 kPa) air pressure. Operation at higher air pressure will result in excessive speed.
- Always match collet size with accessory shank size.
- Always insert tool shank no less than 3/8" (10 mm) in the collet. Tighten collet nut securely to prevent accessory from working out during operation of the Grinder. Check tightness of collet nut before operating the Grinder. Pay particular attention to the fact that allowed speed of a mounted point is lowered when the length of the shaft is increased between end of collet and mounted point (overhang).
- Incorrect combinations of grinding wheel, wheel guard and tool speed could result in injury. Correct combinations are specified below:

Guard Part Number	Wheel Type	Wheel Diameter in. (mm)	Maximum Wheel Thickness in. (mm)	Maximum Speed rpm
AG121-106-4	27	4 (100)	1/4 (6.4)	15 000
LA3-106-45	27	4.5 (115)	1/4 (6.4)	13 200
LA3-106-5-EU	27	5 (125)	1/4 (6.4)	13 200

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

Always use an air line lubricator with these tools.
 We recommend the following Filter-Lubricator-Regulator Unit:

For U.S.A. - No. C22-04-G00

For International - No. C26-C4-A29

After each two hours of operation, if an air line lubricator is not used, 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 Angle Head Grease Fitting (35). 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 actions could affect tool performance.

INSTALLATION

Air Supply and Connections

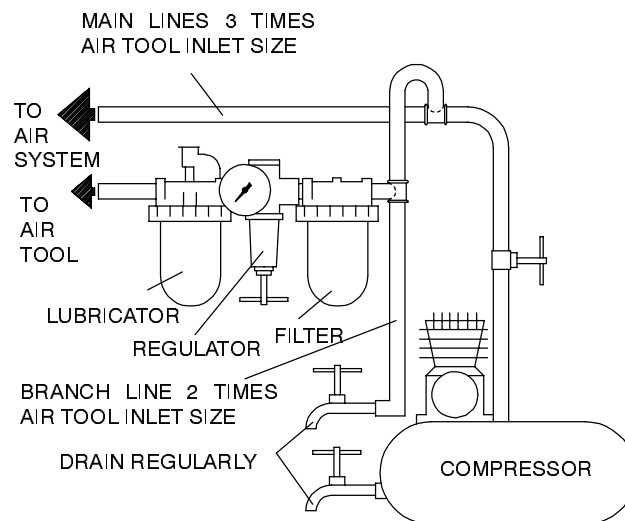
Always use clean, dry air at 90 psig maximum air pressure. Dust, corrosive fumes and/or excessive moisture can ruin the motor of an air tool. An air line filter can greatly increase the life of an air tool. The filter removes dust and moisture.

Series HPA Angle Grinders are designed for close-quarter work in the metal fabricating industry, shipyards, pipe fabrication and limited space applications. They are particularly good where conduits, pipes, ducts, etc. pass through bulkheads or frames. These small Angle Grinders are very efficient for grinding weld bead and leaving a fine finish.

HOW TO ORDER CYCLONE GRINDERS

ANGLE GRINDERS with 1/4" COLLET	
Model	Speed/rpm
HPA120RG4ML (Rear Exhaust)	12 000
ANGLE GRINDERS with 3/8"-24 SPINDLE THREAD	
HPA120RP64ML (Rear Exhaust)	12 000
ANGLE GRINDERS with M14 x 2.0-6g SPINDLE THREAD	
HPA120RP945ML (Rear Exhaust)	12 000
HPA120RP95ML (Rear Exhaust)	12 000

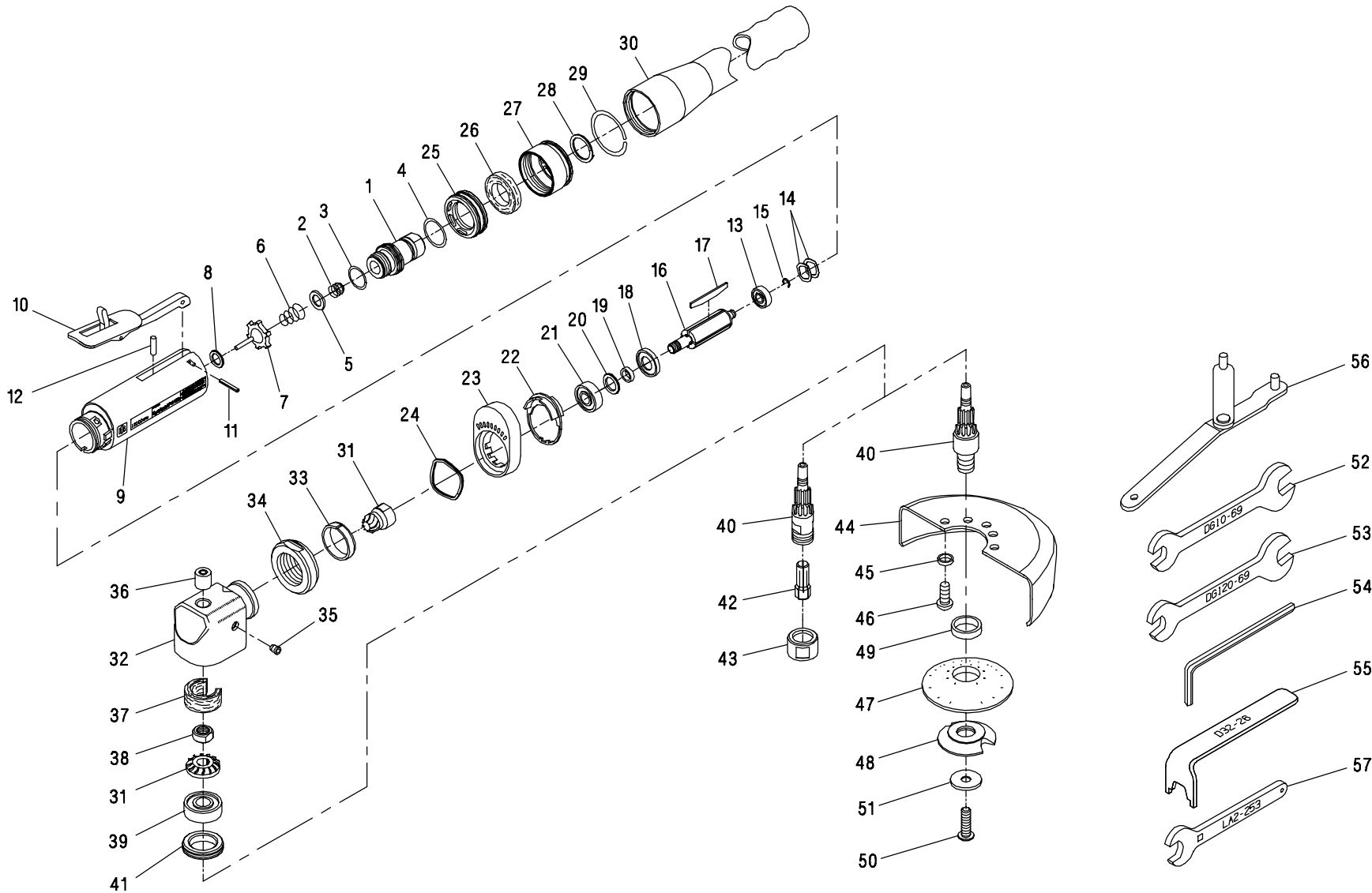
Make sure all hoses and fittings are the correct size and are tightly secured. See Dwg. TPD905-1 for a typical piping arrangement.



(Dwg. TPD905-1)

SERIES HPA ANGLE GRINDERS

5



MAINTENANCE SECTION

(Dwg. TPA1455)

PART NUMBER FOR ORDERING

PART NUMBER FOR ORDERING

Common parts for ALL HPA Grinders					
1	Inlet Bushing Assembly	04342077	28	Exhaust Deflector Retainer	LP20-62
2	Inlet Screen	R1602-61	29	Exhaust Hose Retainer	6WT-203
• 3	Inlet Seal	R18LF-21	30	Exhaust Hose	3RL-284
4	Exhaust Deflector Seal	85H-167	*	Warning Label	
5	Throttle Valve Spring Seat	LG3-592		for models ending in 64ML-EU	EU-64-99
6	Throttle Valve Spring	7L-51		for models ending in 95ML-EU	EU-95-99
7	Throttle Valve	LG3-302		for models ending in 945ML-EU ...	EU-945-99
8	Throttle Valve Seat	LG3-303		for all other models ending in -EU .	EU-99
9	Motor Housing	04338364		for all other models	LG2-99
10	Locking Throttle Lever Assembly	LG2-A400	*	Nameplate	
*	Lever Lock	LG1-402		for models ending in -EU	04350237
*	Lock Spring	LG1-405		for all other models	04340097
*	Lock Pin	5UT-757	31	Bevel Pinion and Bevel Gear	
11	Throttle Lever Pin	61H-120		(sold only as a matched set)	LA2-A552-1.7
12	Throttle Valve Plunger	LG2-191	+ 32	Angle Housing Assembly	LA2-A550S
13	Rear Rotor Bearing	R120-127	33	Clamp Spacer	LA2-46
• 14	Rear Rotor Bearing Spacer (2)	400-25-191	34	Clamp Nut	LG2-27
• 15	Rear Rotor Bearing Retainer	LG1-118	35	Grease Fitting	D0F9-879
16	Rotor	LG3-53-4	36	Upper Arbor Bearing	AG210-693
• 17	Vane Packet (set of 4 Vanes)	DG31-42-4	37	Wick	LA2-560
18	Front End Plate	LG2-11	38	Bevel Gear Nut	LA2-578
19	Front End Plate Spacer	LG2-65	39	Lower Arbor Bearing	LA2-593
• 20	Front Seal Cup Assembly	61H-A32	40	Arbor	
21	Front Rotor Bearing	LG2-24		for models ending in G4ML	AG220-4-G4
22	Flow Ring (grey)	LG2-103-0		for models ending in P64ML	AG220-4
23	High Profile Flange	LG2-23		for models ending in	
24	Flange Clamp	LG2-29		P945ML or P95ML	AG230-4-945
25	Exhaust Deflector Adapter	04285045	41	Arbor Bearing Cap	AG20-531
26	Muffler	04285078		Additional parts for	
27	Exhaust Deflector	04285052		all collet models	
			42	Collet	G160HD-700-1/4
			43	Collet Nut	DG120-699A

* Not illustrated.

• 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.

+ The LA2-A550S Angle Housing Assembly is furnished with three Wicks. Use Wick (LA2-560) **without** the notch on HPA120 models.

PART NUMBER FOR ORDERING

PART NUMBER FOR ORDERING

Additional parts for all wheel models			Accessories for all models		
44	Wheel Guard		52	Collet Body/Arbor Wrench (included with all models ending in G4ML or P64ML) (double-end 1/2" x 9/16")	DG10-69
	for models ending in P64ML (4" or 102 mm)	AG121-106-4	53	Collet Nut Wrench (included with all models ending in G4ML) (double-end 5/8" x 3/4")	DG120-69
	for models ending in P945ML (4-1/2" or 115 mm)	LA3-106-45	54	Arbor Wrench (included with all models ending in P945ML or P95ML (6 mm hex wrench)	AG230-340M
	for models ending in P95ML (5" or 127 mm)	LA3-106-5-EU	55	Flange Nut Wrench (L-shaped) (included with all models ending in P64ML)	D32-26
45	Guard Lock Washer (3)	R2-320	56	Flange Nut Wrench (adjustable spanner)(included with all models ending in P945ML or P95ML)	AG230-26M
46	Guard Mounting Screw (3)	AG31-667	57	Clamp Nut Wrench (1-1/2")	LA2-253
▪ 47	Wheel Flange		*	I-R No. 10 Oil (4 oz. bottle)	10Z4
	for models ending in P64ML	AG31-337-4	*	I-R No. 63 Oil (4 oz. bottle)	63Z4
	for models ending in P945ML or P95ML	LG3-337-45M	*	I-R No. 67 Grease (1 lb. can)	67-1LB
▪ 48	Flange Nut		*	I-R No. 77 Grease (1 lb. can)	77-1LB
	for models ending in P64ML	AG31-338-4			
	for models ending in P945ML or P95ML	AG230-338-45M			
♦ 49	Flange Spacer (for models ending in P64ML)	LA2-111			
50	Wheel Retaining Screw (for models ending in P945ML or P95ML)	LG2-219M			
51	Wheel Retaining Screw Washer (for models ending in P945ML or P95ML)	LG2-218			

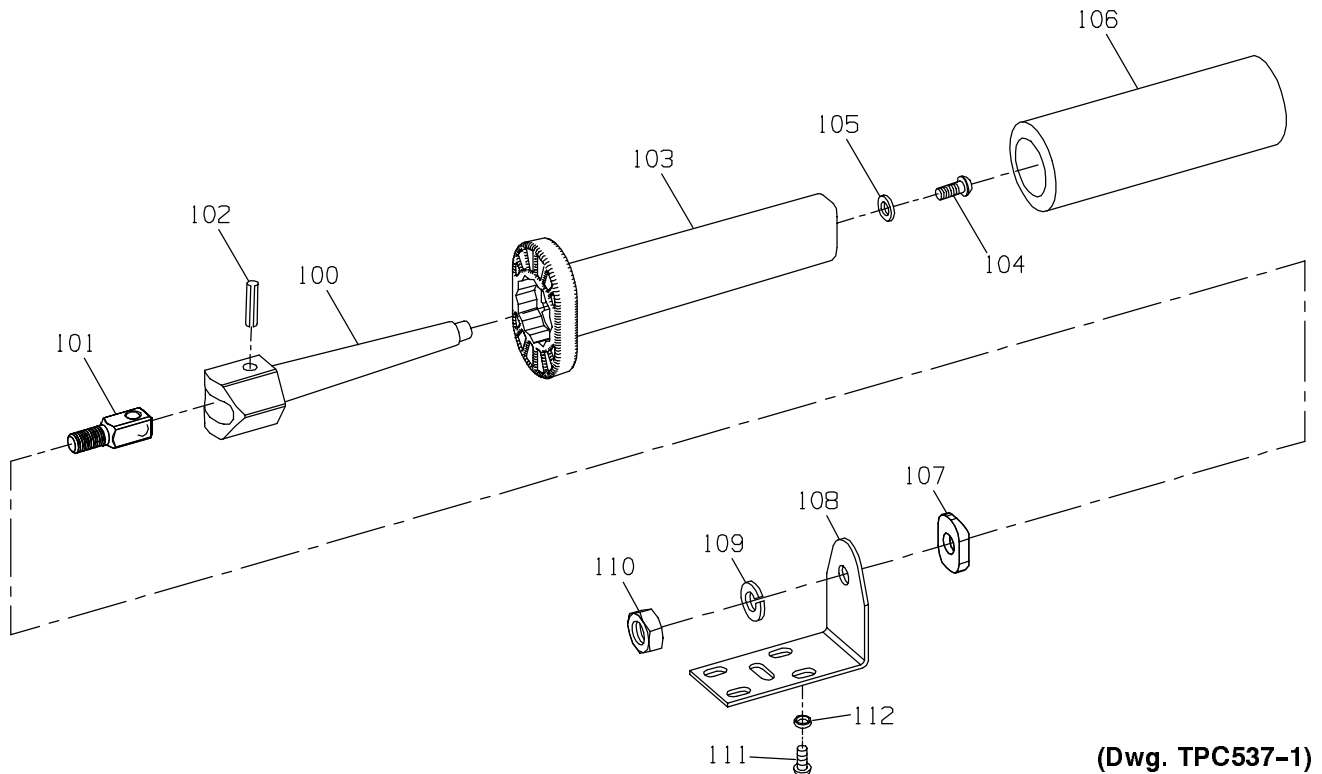
* Not illustrated.

▪ These parts must be used for mounting Type 27 Depressed Center Wheels 4", 4-1/2" or 5" diameter x 1/4" thick.

♦ These Flange Spacers must be used on the specified models in addition to the Guard (44), Flange (47) and Nut (48) when mounting a Type 27 Depressed Center Wheel less than 1/4" thick. For mounting Type 27 Depressed Center Wheels less than 1/4" thick on metric models, reverse the Flange Nut (48).

MAINTENANCE SECTION

LG2-A48 ERGO HANDLE PART LISTING



PART NUMBER FOR ORDERING

	Ergo Handle Assembly	LG2-A48
100	Handle Arbor	LG2-48Y
101	Position Anchor Bolt	LG2-373
102	Anchor Roll Pin	R00A2-120
103	Handle	LG2-48X
104	Handle Lock Screw	AG31-667
105	Lock Screw Washer	MF-37
106	Handle Grip	LG2-48W
107	Anchor Bolt Clamp	LG2-58
108	Handle Bracket	AG120-364
109	Anchor Bolt Lock Washer	T11-58
110	Anchor Bolt Lock Nut	D02-428
111	Guard Mounting Screw (3)	AG31-667
112	Mounting Screw Lock Washer (3)	R2-320

This LG2-A48 Ergo Handle Assembly is designed to attach to the tool between the face of the Angle Housing and the Wheel Guard. Using the three Guard Mounting Screws (111) and Lock Washers (112), install the Handle Bracket (108) with the Handle (103) upward toward the Angle Housing and **NOT DOWNWARD** toward the Wheel Guard.

The Handle can be mounted for right or left hand operation and the angle between the Handle and the tool can be adjusted by loosening the Anchor Bolt Lock Nut (110) and sliding the Handle toward the Housing or away from the Housing. The Handle can be rotated to the most comfortable position by loosening the Handle Lock Screw (104) and turning the Handle to any of the six available positions.

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 (17) with a light film of oil before inserting them into the vane slots.
2. Lubricate the Front Seal Cup Assembly (20) with Ingersoll-Rand No. 50 Oil.
3. Inject 0.5 to 1.0 cc of Ingersoll-Rand No. 10 Oil into the air Inlet Bushing (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 all Collet Model Angle Heads

1. Grasp the tool in copper-covered or leather-covered vise jaws with the Collet (42) upward. Using the Collet Body Wrench (52) on the flats of the collet Arbor (40) and the Collet Nut Wrench (53) on the Collet Nut (43), unscrew the Collet Nut and remove the Collet.
2. Using a spanner wrench, unscrew and remove the Arbor Bearing Cap (41). This is a **left-hand thread**. Rotate the spanner wrench **clockwise** to remove the Cap.

NOTICE

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

3. Using the Clamp Nut Wrench (57), loosen the Clamp Nut (34) and pull the Angle Housing Assembly (32) away from the Motor Housing (9). This is a **left-hand thread**. Rotate the Nut Wrench **clockwise** to loosen the Nut.
4. Remove the Flange Clamp (24) from the Angle Housing or Flange (23).
5. Grasp the collet Arbor and pull the assembled Arbor out of the Angle Head. If the Wick (37) 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.
6. If the Upper Arbor Bearing (36) 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.
7. Grasp the collet Arbor in copper-covered or leather-covered vise jaws with the collet end downward. Using an adjustable wrench, unscrew and remove the Bevel Gear Nut (38) and lift the Bevel Gear off the Arbor.
8. If the Lower Arbor Bearing (39) 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.

WARNING

When removing the Clamp Nut in the following procedure, take all precautions necessary to prevent the Spacer from being forcefully ejected in a manner or direction that is hazardous.

9. If the Clamp Nut must be removed from the Angle Housing, insert the blades of two screwdrivers, approximately 180 degrees apart, under the Clamp Spacer (33) and pry the Spacer off the Housing.

Disassembly of all Wheel Model Angle Heads

1. Grasp the tool in copper-covered or leather-covered vise jaws with the Flange Nut (48) upward.
2. **For models ending in P945ML or P95ML**, use a 4 mm hex wrench to unscrew the Wheel Retaining Screw (50) and remove the Screw and Washer (51).

MAINTENANCE SECTION

3. Use the Arbor Wrench (52 or 54) to hold the Arbor (40) and using the Flange Nut Wrench (55 or 56), unscrew and remove the Flange Nut. Remove the wheel, Wheel Flange (47) and Flange Spacer (49) from the Arbor.
4. Using a 1/8" hex wrench, unscrew and remove the three Guard Mounting Screws (46), Guard Lock Washers (45) and Wheel Guard (44).
5. Using a spanner wrench, unscrew and remove the Arbor Bearing Cap (41). This is a **left-hand thread**. Rotate the spanner wrench **clockwise** to remove the Cap.

NOTICE

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

6. Using the Clamp Nut Wrench (57), loosen the Clamp Nut (34) and pull the Angle Housing Assembly (32) away from the Motor Housing (9). This is a **left-hand thread**. Rotate the Nut Wrench **clockwise** to loosen the Nut.
7. Remove the Flange Clamp (24) from the Angle Housing or Flange (23).
8. Grasp the Arbor and pull the assembled Arbor out of the Angle Head. If the Wick (37) 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.
9. If the Upper Arbor Bearing (36) 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.
10. 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 (38) and lift the Bevel Gear off the Arbor.
11. If the Lower Arbor Bearing (39) 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.
3. Remove the Vanes (17) from the Rotor (16).
4. Grasp the Rotor in copper-covered or leather-covered vise jaws with the Bevel Pinion upward. Using a 9/16" wrench, unscrew and remove the Pinion.
5. If the Front Rotor Bearing (21) must be replaced, support the Front End Plate (18) 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 (19) and Front Seal Cup Assembly (20) from the hub of the Rotor.
6. If the Rear Rotor Bearing (13) must be replaced, use snap ring pliers to remove the Rear Rotor Bearing Retainer (15).
7. Using a bearing puller, pull the Rear Rotor Bearing off the hub of the Rotor.

Disassembly of the Inlet and Throttle

1. Carefully spread the Exhaust Hose Retainer (29) and remove the Retainer and Exhaust Hose (30).
2. Using snap ring pliers, remove the Exhaust Deflector Retainer (28) and unscrew and remove the Exhaust Deflector (27).
3. The Exhaust Deflector Adapter (25) may remain on the Inlet Bushing (1) or it may be removed with the Deflector. If it was removed with the Deflector, unscrew it to remove the Muffler (26).
4. Using a 15/16" wrench, unscrew and remove the Inlet Bushing.
5. Remove the Inlet Seal (3), the Inlet Screen (2) and the Exhaust Deflector Seal (4) from the Inlet Bushing.
6. Remove the Throttle Valve Spring Seat (5), Throttle Valve Spring (6) and Throttle Valve (7) from the Motor Housing (9).
7. If the Throttle Valve Seat (8) 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.
8. Press the Throttle Lever Pin (11) from the Housing and remove the Throttle Lever (10). Remove the Throttle Valve Plunger (12).

ASSEMBLY

General Instructions

Disassembly of the Motor

1. Pull the Flange (23) and Flow Ring (22) off the front of the Motor Housing (9).
2. Grasp the Bevel Pinion (31) and pull the assembled motor out of the Motor Housing. Remove the two Rear Rotor Bearing Spacers (14) from the bottom of the Housing.

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. Always clean every part and wipe every part with a thin film of oil before installation.

MAINTENANCE SECTION

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.
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.

Assembly of the Throttle and Inlet

1. Insert the Throttle Valve Plunger (12) into the Motor Housing (9).
2. Position the Throttle Lever (10) on the Motor Housing and using an arbor press, press the Throttle Lever Pin (11) into the Housing and Lever. The Lever will retain the Plunger in the Housing.
3. If the Throttle Valve Seat (8) 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 (6) onto the end of the Throttle Valve (7) 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 (5) 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 Inlet Bushing (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 Bushing.
7. Moisten the Exhaust Deflector Seal (4) with O-ring lubricant and install it in the groove on the Inlet Bushing.
8. Thread the Inlet Bushing into the Housing and tighten it between 20 and 25 ft-lb (27.1 and 33.9 Nm) torque.
9. Thread the Exhaust Deflector Adapter (25), large open end trailing, onto the Inlet Bushing.
10. Install the Muffler (26) inside the Exhaust Deflector (27) and thread the Deflector onto the Inlet Bushing until the groove in the Bushing is visible. Install the Exhaust Deflector Retainer (28) in the groove of the Bushing to retain the Deflector.
11. Install the Exhaust Hose (30) and Retainer (29) on the Deflector.

Assembly of the Motor

1. If the Rear Rotor Bearing (13) was removed, stand the Rotor (16) 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 (15) in the groove on the hub of the Rotor.
3. Install the Front End Plate (18), counterbored end trailing, onto the threaded hub of the Rotor. Using finger pressure, press the Front Seal Cup Assembly (20), felt end trailing, onto the end of the Front End Plate Spacer (19) 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 (21) 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 Bevel Pinion (31) onto the Rotor and using a torque wrench, tighten the Pinion between 14 and 19 ft-lb (19.0 and 25.8 Nm) torque.
7. 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 (14) into the bottom of the motor housing bore.
8. Wipe each Vane (17) with a light film of oil and insert a Vane into each vane slot in the Rotor.
9. Grasp the Bevel Pinion and insert the assembled Rotor into the Motor Housing (9).

MAINTENANCE SECTION

10. Assemble the Flow Ring (22) with the Flange (23) 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.
11. 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 Angle Head

1. If the Upper Arbor Bearing (36) was removed and a new Bearing must be installed, proceed as follows:
 - a. Support the machined face of the Angle Head (32) 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. If the Lower Arbor Bearing (39) is being installed, it is necessary to note the identification marks on the Lower Arbor Bearing. One side of the Bearing has black stains or black hash marks across the inner and outer races. Using a sleeve that contacts the inner ring of the Lower Arbor Bearing, press the Bearing, **black stain or hash mark side leading**, onto the Arbor (40).

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.

* Product of Loctite Corporation.

** Product of N.D. Industries.

3. Slide the Bevel Gear (31), geared face trailing, onto the small threaded end of the Arbor, aligning the integral keys or spline of the Gear with the slotted keyways or spline in the Arbor.
4. Thoroughly clean the small threads on the Arbor above the Bevel Gear and the threads in the Bevel Gear Nut (38).
5. Apply a thin coat of Loctite 271 w/t 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.
6. Form the Wick (37) 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. If installing one of the Wicks having a notch on one side, 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.**
7. Inject 3 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.**
8. Carefully grasp the assembled motor in copper-covered or leather-covered vise jaws with the Throttle Lever **downward**.
9. Install the motor Clamp Nut (34), threaded end trailing, onto the motor end of the Angle Head. Spread the Clamp Spacer (33) and install it, beveled end trailing, onto the motor end of the Angle Head against the Clamp Nut.
10. Position the output end of the Angle Head upward and 180 degrees opposite to the Throttle Lever and thread the Clamp Nut onto the Motor Housing. Using the Motor Clamp Nut Wrench (57), tighten the Nut between 20 and 25 ft-lb (27 and 34 Nm) torque. This is a **left-hand thread**, turn **counterclockwise** to tighten.
11. Thoroughly clean the internal threads of the Angle Head and the threads on the Arbor Bearing Cap (41).
12. 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.
13. 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.

MAINTENANCE SECTION

14. Using a spanner wrench, 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.

Assembly Instructions for All Collet Models

1. Install the Collet (42) into the end of the Arbor (40).
2. Using the Collet Body Wrench (52) to hold the Arbor, thread the Collet Nut (43) onto the Arbor.

Assembly Instructions for All Wheel Models

1. Position the Wheel Guard (44) against the face of the Angle Housing (32) and using a 1/8" hex wrench, install the three Guard Mounting Screws (46) and Lock Washers (45). Tighten the Screws between 3.0 and 3.5 ft-lb (4.1 and 4.7 Nm) torque.

2. **For models ending in P64ML**, install the Flange Spacer (49) on the Arbor.
3. Install the Wheel Flange (47), wheel and Flange Nut (48) on the Arbor. Use the Arbor Wrench (52 or 54) to hold Arbor while tightening the Flange Nut with the Flange Nut Wrench (55 or 56).
4. **For models ending in P945ML or P95ML**, install the Wheel Retaining Screw (50) and Washer (51) tighten it securely.

MAINTENANCE SECTION

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 clean the Muffler in a clean, suitable cleaning solution or replace the Muffler.
	Plugged Inlet Screen	Clean the Inlet Screen with a clean, suitable cleaning solution or replace the Screen.
	Worn or broken Vanes	Install a complete set of new Vanes.
	Loose Clamp Nut	Tighten the Nut between 20 to 25 ft-lb (27 to 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	Re-position the Front Seal Cup Assembly.
Excessive runout	Bent Arbor	Replace the Arbor.
	Loose Collet Nut	Tighten the Collet Nut until snug.
	Worn or damaged Collet or Collet Nut	Replace the damaged component and re-test.
	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.

MAINTENANCE SECTION

TROUBLESHOOTING GUIDE		
Trouble	Probable Cause	Solution
Front Rotor Bearing runs hot	Incorrect installation of the Front Seal Cup Assembly	Re-position 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.
	Incorrect Front Rotor Bearing installation orientation	If a black stain or black hash-marks are not visible on the face of the Bearing when it is assembled with the End Plate and Rotor, the Bearing is installed backwards. If possible, remove the Bearing and install it correctly or replace the Bearing.
Slow tool idle	Bent Valve Stem 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 build up	Disassemble the tool and clean it in a clean, 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 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 Pinion because they are a matched set and must not be used separately.

NOTICE

SAVE THESE INSTRUCTIONS. DO NOT DESTROY.