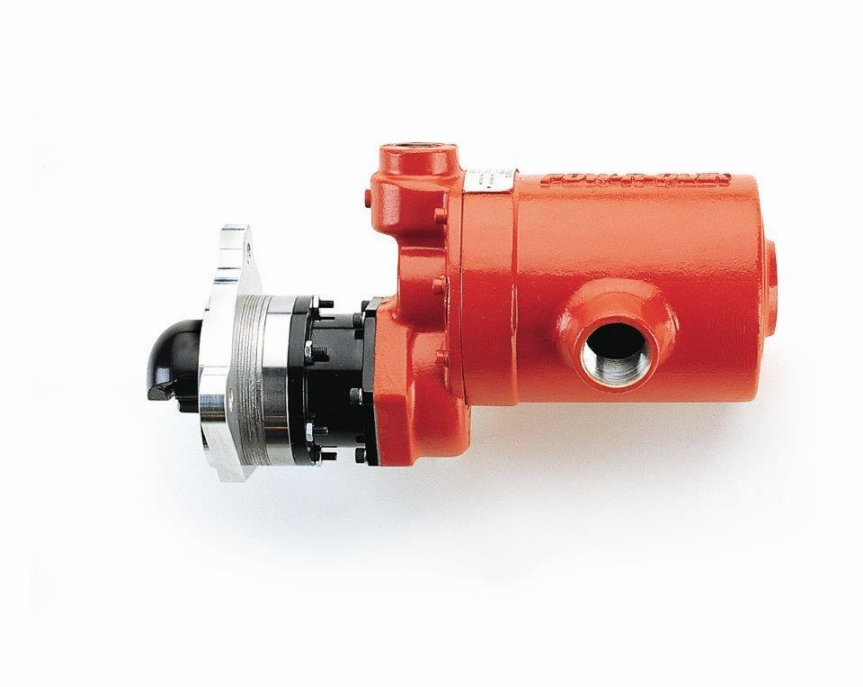
POW-R-QUIK
ENGINE STARTING SYSTEMS

Last Updated 01/05/2024

# Air/Gas Starter LS-8
# Lube - Free, Inertia Drive



# USER MANUAL

**Product Webpage:**
https://powrquik.com/vane-starters/ls-8-air-starter/

**User Manual location:**
https://powrquik.com/ls-8-owner-manual/

*EXCELLENCE IN STARTING SYSTEMS*

MARADYNE Corporation
MANUFACTURING INNOVATION

**4540 West 160th Street, Cleveland, Ohio 44135**
**(216) 404 – 7112**

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### 1.1. Purpose

This manual contains installation and service instructions for the POW-R-QUIK model LS-8, air starter (inertial type).

### 1.2. Application

These systems are primarily utilized in petroleum drilling and production equipment gas compressor engines, water well drilling rigs, highway vehicles, marine engines, construction equipment, diesel powered generator sets and co-generation equipment. When in doubt regarding the proper starting system for a particular application, the detailed installation instructions should be reviewed or a POW-R-QUIK starting system specialist should be contacted.

The LS-8 air starters are designed to operate without any lubrication supplied to the air motor; however, on applications involving severe service conditions such as unfiltered air supply, prolonged cranking, or in starting environments with excessive heat buildups, consult with a POW-R-QUIK starting system specialist as lubrication might be needed.

The LS-8 series can be operated without lubrication for short crank cycles only. Should the cranking time exceed ten (10) seconds, lubrication must be provided to the air motor.
It is recommended that lubrication be provided on all starters used with natural gas engines.
Operation of the LS series, without lubrication may result in loss of efficiency.

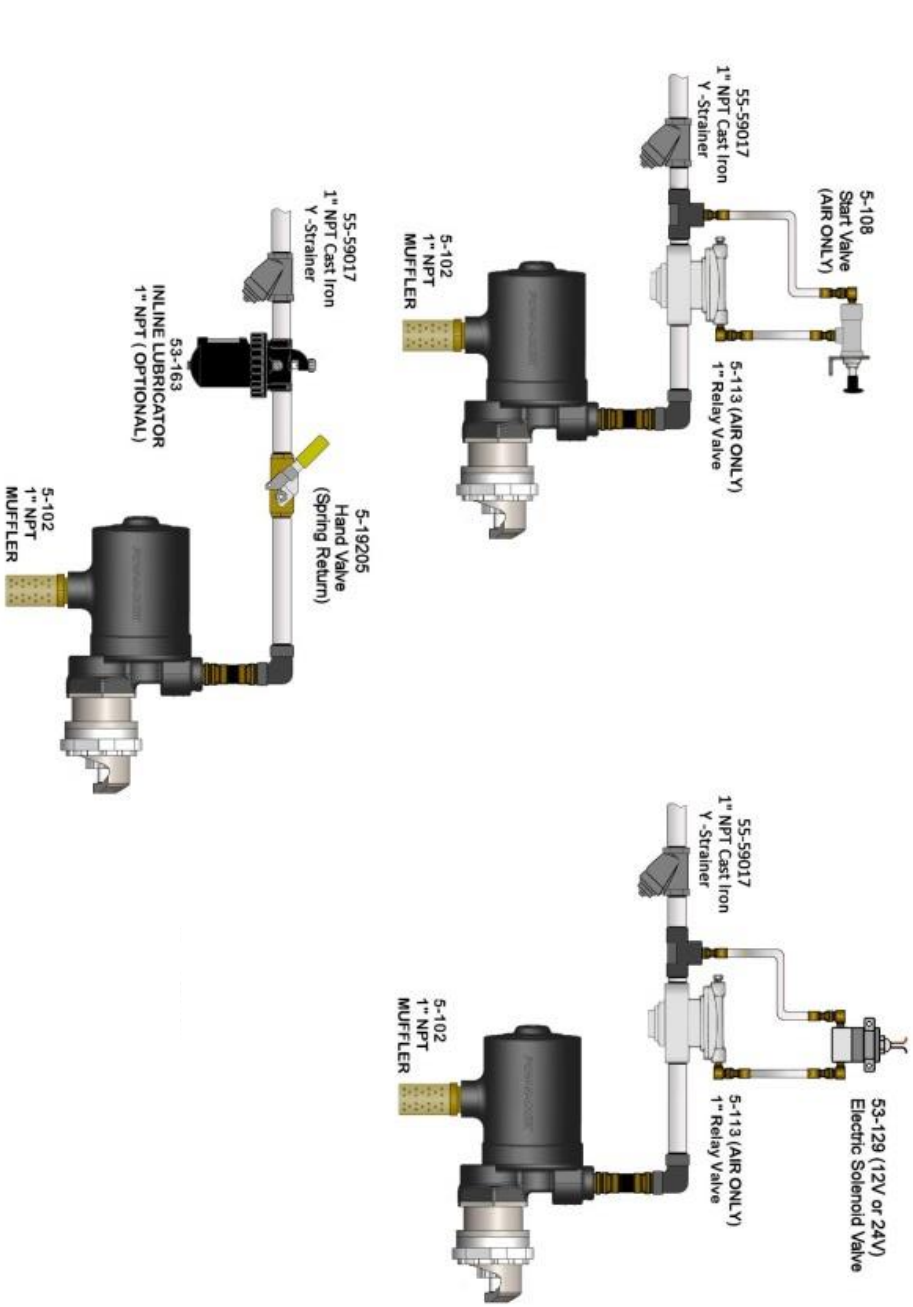
### 1.3. Parts and Service

For guaranteed reliability use only original Pow-R-Quik parts and repair kits. The service is available with our distributors.
Starting system components are available as components or complete system from Pow-R-Quik / Maradyne or its distributors and re-sellers.
Contact factory for identifying distributors and re-sellers in your area.

### 1.4. Air/Gas Starting System / Typical Installation

The POW-R-QUIK Model LS-8 inertia drive air and gas starting system consists of three basic components: starter, operating valves and air/gas supply.

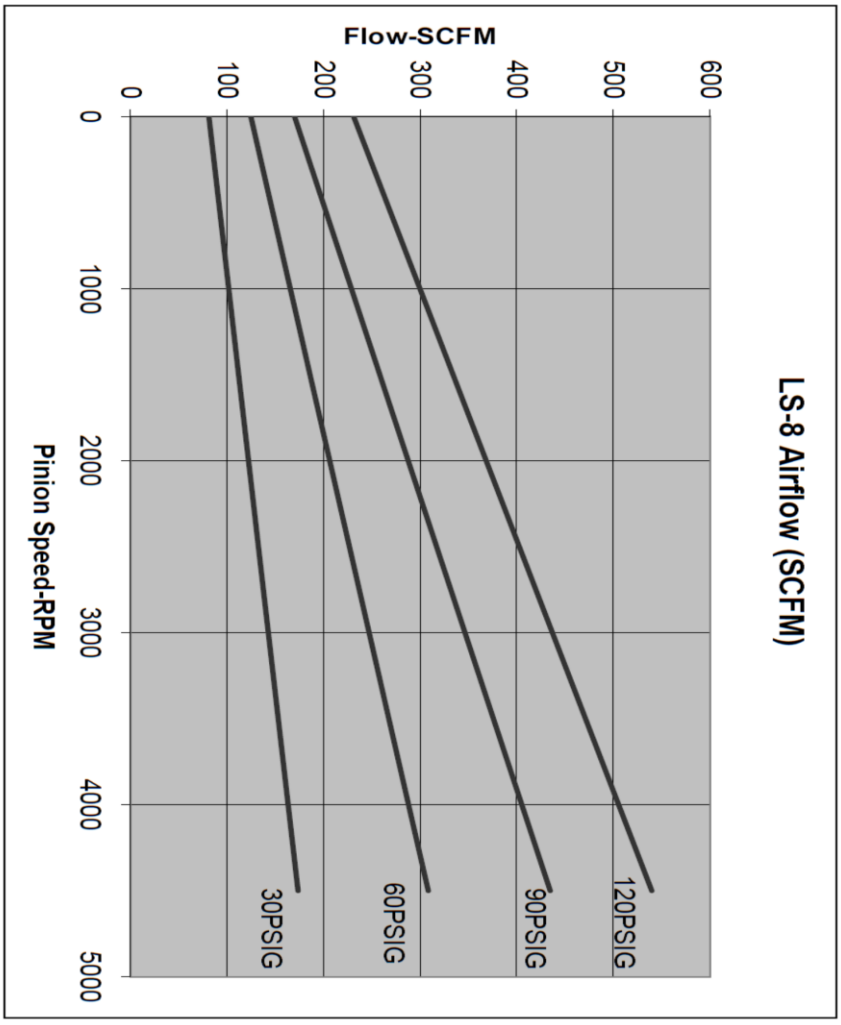
## Air/Gas Starting System / Typical Installation



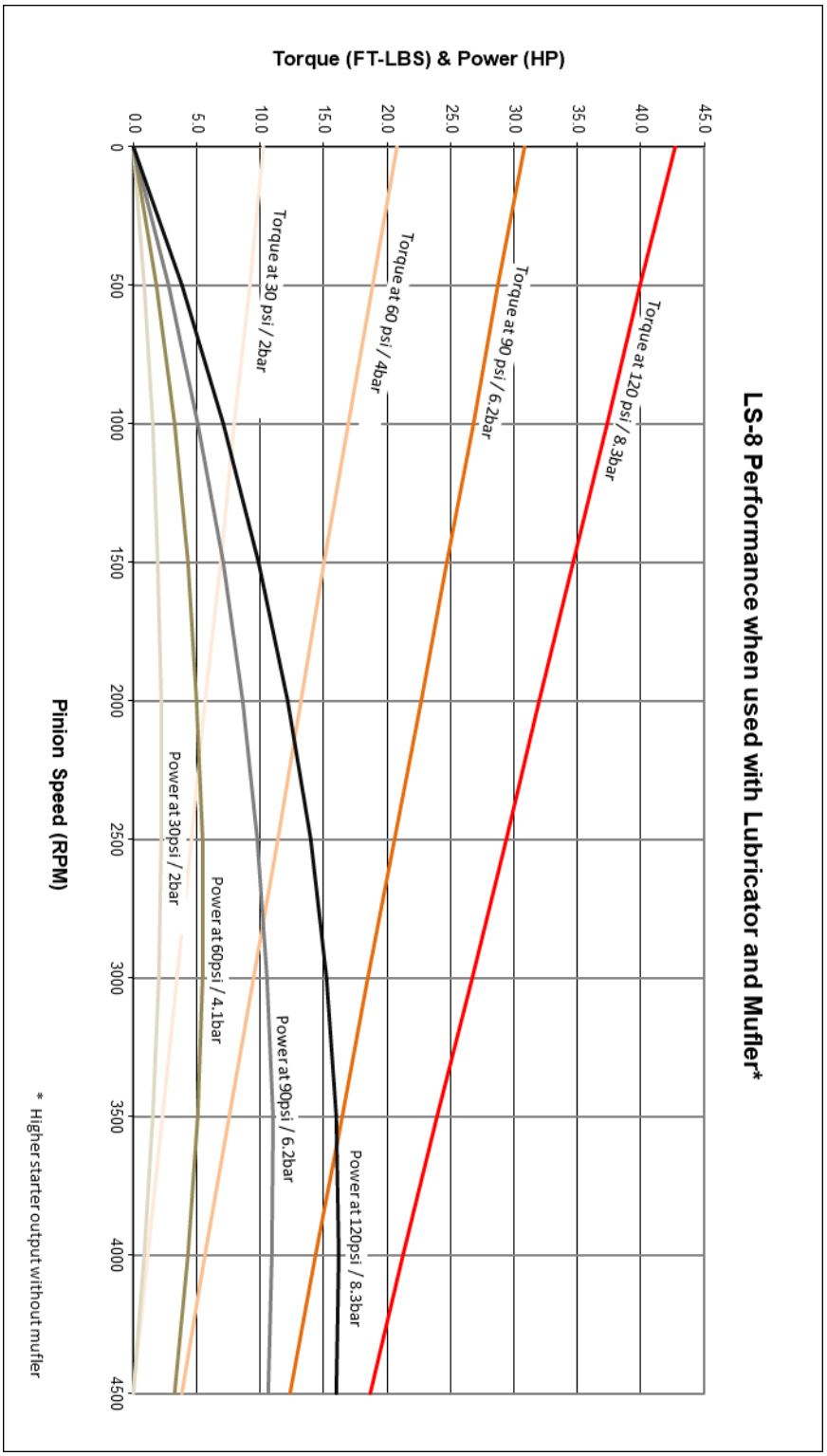

**WARNING: Penetrating oil attack rotor vanes and cause motor failure. USE DIESEL FUEL OR SAE#10 NON-DETERGENT LUBE OIL ONLY.**

LS series can be operated without lubrication for short crank cycles only. Should crank cycles exceed ten (10) seconds, lubrication must be provided to the air starter. It is recommended that lubrication is provided on all starters used in natural gas applications. Recommended drip rate: 15 drops per minute.

## 1.5 Air Flow and Pressure



## 1.6 Technical Performance Curves



### 2.1 Starter.

The LS-8 air starter with inertia drive may be operated manually or automatically from compressed air, natural gas or nitrogen (for other gaseous fluids, please contact factory). It is designed for use on compressed ignited (diesel) engines with displacements up 8L and spark ignited (gas) engines with displacements up to 13L. For proper sizing of the starter for the engine, the engine breakaway torque and parasitic loads are required for a given starting temperature.

*If unsure how to choose the starter for the engine, contact factory or a distributor*

**See Annex1 for dimensions and air ports**

### 3.1 General.

Experienced mechanics will have no difficulty performing field repairs on the LS-8 starter. For guaranteed quality and reliability, use only genuine Pow- R-Quik parts and repair kits.

### 3.2 Periodic Maintenance Inspections.

The following inspections should be performed monthly or during all regular engine servicing or inspections

1. Inspect all threaded connections for tightness.
2. If an air filter with a manual drain is used, check for moisture accumulation and drain if necessary. Check the filter element and clean or replace as required.
3. If a lubricator is used, check the lubricator for proper operation. If applicable, check the lubricant level and refill, if necessary.

### 3.3 Starter Installation:

1. Position properly the starter on the engine flywheel housing with the starter drive housing
2. Align the bolt holes in the mounting flange flywheel housing with the proper bolts in the. Install and properly torque the required bolts per engine manual
3. Install the air hose on the inlet adaptor
4. Install exhaust piping or muffler, if applicable

## 3.4 Starter Removal

1. Remove the air hose from the starter's inlet adaptor and, if applicable, remove any exhaust piping or muffler.
2. Loosen, but do not remove the starter mounting bolts.
3. Support the starter with one hand and remove the mounting bolts with the other.
4. Remove the starter from the engine.

## 3.5 Starter Air Motor *(Refer to parts exploded view for parts identification)*

### 3.5.a Dis-assembly

NOTE: Scribe reference marks on all mating surfaces to assure proper orientation during reassembly.

1. Remove six screws (#21) and lock washers (#22) from the rotor housing (#1) and separate it from gear housing (#20).
2. Remove O-ring (#19).
3. Remove the rotor and casing assembly from the rotor housing (#1) by grasping the gear (#17) and lifting it straight up and out of the housing.
4. Turn the rotor assembly over and rest it vertically on end plate (#3).
5. Remove bearing (#11), gasket (#40), and seal (#7) from rotor housing (#1).
6. Remove the retaining ring (#8), end plate (#4).
7. Remove rear thrust assembly components; thrust bearing (#6), O-rings (#15 & #39), and bearing race (#9).
8. Remove the rotor casing (#2) from the rotor assembly by lifting it from inlet end plate (#3)
9. Remove all vanes (#12) from the rotor assembly (#5).
10. Remove retaining ring (#18), rotor gear (#17), woodruff key (#13) and end plate (#3) from rotor assembly.
11. Remove bearing (#16) and O-ring (#15) from end plate (#3).
12. Remove forward thrust assembly components; thrust bearing (#6), O-rings (#15 & #39), and bearing race (#9).

### 3.5.b Inspection (*Refer to parts exploded view for parts identification)*

1. Check all rotor slots for burrs or foreign matter. Clean rotor and remove burrs.
2. Inspect the rotor casing (#2), rotor assembly (#5), end plates (#3 & #4), rotor housing (#1) and rotor gear (#17)for damage, replace damaged parts.
3. Clean all parts that are going to be used again.

### 3.5.c Re-assembly / Installation (*Refer to parts exploded view for parts identification)*

1. Lubricate O-ring (#15) and bearing (#16) and install in inlet end plate (#3).
2. Place end plate (#3) with thrust bearing pocket facing up on a flat surface.
3. Lubricate thrust bearing (#6) and install in thrust bearing pocket of end plate (#3).
4. Lubricate and install O-rings (#15 & #39) onto bearing race (#9).
5. Install bearing race (#9) with O-rings (#15 & #39) into thrust bearing pocket of end plate (#3) with the O-rings toward the bearing.
6. With rotor assembly (#5) output shaft facing up install end plate (#3) assembly onto rotor output shaft.
7. Install woodruff key (#13) into rotor shaft.
8. Install rotor gear (#17) with recessed cavity on gear facing up onto rotor shaft and secure with retaining ring (#18).

   NOTE: If roll pins (#41 & #42) have been removed during cleaning and inspection reinstall them now. When assembling a right hand rotation starter, place the rotor casing (#2) in a vertical position with the air inlet opening at six o'clock and the roll pin hole at the one o'clock position. Install the long roll pin (#41) in the one o'clock position, now turn the casing over and install roll pin (#42) in the remaining hole. If the starter motor is a left-hand rotation model, position the rotor casing vertically with the air inlet at six o'clock and the roll pinhole at eleven o'clock. Install the long pin in the eleven o'clock hole, turn the casing over and install the short pin to make a left hand-rotating starter.

9. Flip rotor end plate assembly over and install rotor casing (#2) onto the assembly with the long pin (#41) extended through the inlet end plate (#3).
10. Insert the five (5) vanes (#12) into the rotor slots on the rotor assembly.
11. Place end plate (#4) with thrust bearing pocket facing up on a flat surface.
12. Lubricate thrust bearing (#6) and install in thrust bearing pocket of end plate (#3).

13. Lubricate and install O-rings (#15 & #39) onto bearing race (#9).
14. Install bearing race (#9) with O-rings (#15 & #39) into thrust bearing pocket of end plate (#4) with the O-rings toward the bearing.
15. Place end plate (#4) on to the rotor assembly with the bearing race against the rotor and the short pin (#42) extending through the hole in end plate.
16. Install retaining ring (#8) on the rotor assembly (#5) making certain that the snap ring seats properly into the appropriate groove.
17. Lubricate rotor gear (#17) and install completed motor assembly onto the gear case (#20).

    NOTE: Be sure that the inlet air passage baffle on the rotor casing assembly (#2) properly aligns with the air passage on the inlet end plate (#3) and the gear housing (#20) with long pin (#41) properly inserted into alignment hole on gear case.

18. Install seal (#7) into rotor casing (#1) cup side facing inside.
19. Install bearing (#11) into rotor casing.
20. Install gasket (#40) into the bottom of the rotor housing (#1). Use a light coat of grease to hold the gasket in place.
21. Place a coating of grease on the rotor shaft to lubricate cup seal (#7) during assembly.
22. Install O-ring (#19) onto gear case assembly (#20).
23. Assemble the rotor casing assembly (#1) to the motor and gear case assembly (#20) and position until scribed reference marks are aligned and the end of the rotor shaft extending through bearing (#11) and cup seal (#7).
24. Install the six (6) screws (#21) and lock washers (#22) that attach the gear housing (#20) to the rotor housing (#1). Alternately tighten these screws to 6 to 8 ft. lbs. (8.16-10.88NM) of torque in a crisscross pattern.
25. Bench test the rebuilt starter, using a three quarters of an inch air hose and /or install on the engine for testing.
26. Install the air lines.
27. Test the starter operation on the engine.

## 3.6. Starter Gear Housing and Drive *(Refer to parts exploded view for parts identification)*

### 3.6.a Dis-assembly

NOTE: Scribe reference marks on all mating surfaces to assure proper orientation during reassembly.Disconnect all starter air lines.

1. Remove screws (#36) and lock washers (#22) from gear housing (#20) and remove drive housing (#34, 35).
2. Grasp drive (#33) and pull to remove the drive, arbor shaft and gear assembly from the gear housing (#20).
3. Remove O-ring (#32).
4. Remove retainer (#25).
5. Support sealing spacer (#31) and with a suitable mandrel press on the gear end of arbor shaft (#29) to remove it (#29) from the sealing spacer (#31) and gear (#26).
6. Remove O-rings (#27) and (#30).
7. Remove woodruff key (#13) from arbor shaft (#29).
8. Compress drive (#33) and remove drive pin (#28).
9. Remove drive (#33) from arbor shaft (#29),
10. Remove bearing (#24) from gear housing (#20).
11. Remove bearing (#37) from drive housing (#34, 35).

### 3.6.b Inspection *(Refer to parts exploded view for parts identification)*

1. Inspect the starter drive for visible damage or slippage. Replace if necessary.

   NOTE: A replacement drive for the starter is not included in the LS-8 rebuild kit (order separately)

   Inspect all the parts. Clean all re-usable parts (except the starter drive) using a good commercial grade cleaning solvent, and dry with compressed air.

   CAUTION: Do not apply solvent to the starter drive, as it may remove the factory-applied lubricant.

2. Replace any parts that cannot be re-used.

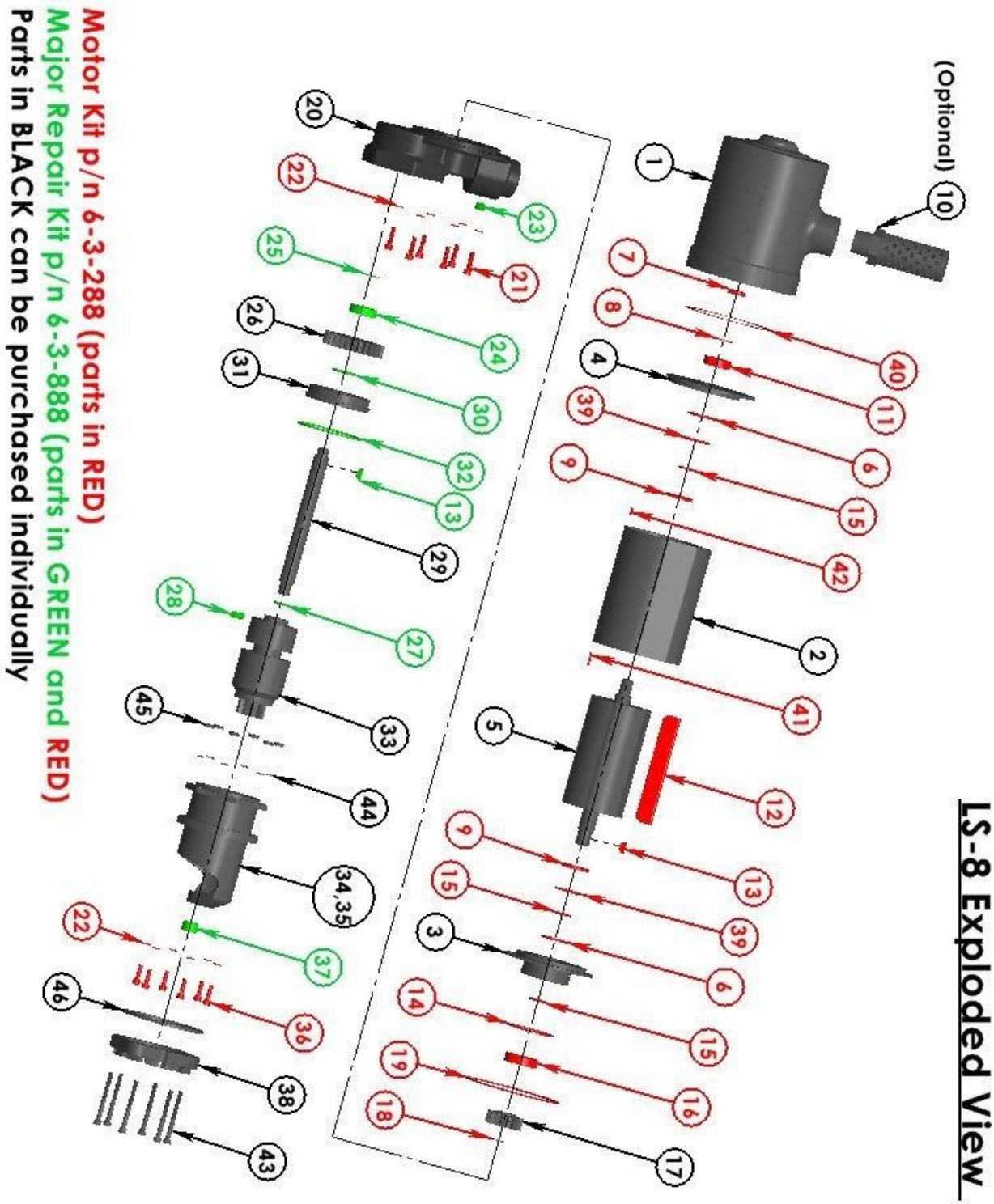
### 3.6.c Re-assembly / Installation *(Refer to parts exploded view for parts identification)*

1. Press bearing (#24) into gear housing (#20).
2. Install plug (#23) into the appropriate hole in gearbox (#20).
3. Install drive (#33) on arbor shaft (#29). Compress drive in such a way so that the drive pin (#28) can be installed through the aligned holes in the arbor shaft (#29) and the drive (#33).
4. Install O-ring (#27) on arbor shaft (#29).
5. Install Woodruff key (#13) on arbor shaft (#29).
6. Place sealing spacer (#31) over arbor shaft (#29) with the large diameter toward the pinion.
7. Install O-ring (#30) in the groove formed between the sealing spacer (#31) and the bottom of the drive (#33).
8. Place gear (#26) on to arbor shaft (#29) and install retainer ring (#25).
9. Install drive, shaft and gear assembly into the gear housing (#20).
10. Install O-ring (#32) into the groove formed between the gear case (#20) and the sealing spacer (#31).
11. Press bearing (#37) into the bore of drive housing (#34 or 35).
12. Install drive housing (#34 or #35) in the proper orientation onto gear housing (#20) secure with screw (#36) and lock washer (#22), Torque to 6 to 8 ft. lbs.
13. Bench test the rebuilt starter, using a three quarters of an inch air hose and /or install on the engine for testing.
14. Install air lines.
15. Test the starter operation on the engine.

### 3.6.d Universal Drive Housing and Flange Assembly *(Refer to parts exploded view for parts identification)*

1. When universal drive housing (# 35) is used a mounting flange (#38) and often the shims (#46) must be used as well.
2. Place the appropriate amount of shims (#46) over the nose of the universal drive housing (#35), Place the universal-mounting flange (#38) over the nose of the universal drive housing (#35). Put the flange in the proper orientation to the drive housing, align the six holes and bolt the assembly together with socket head cap screws (#43) nuts (#45) and lock washers (#44). Torque to 6 to 8 ft. lbs.
3. Bench test the rebuilt starter, using a three quarters of an inch air hose and /or install on the engine for testing.
4. Install the air lines.
5. Test the starter operation on the engine

# Figure 1


Motor Kit p/n 6-3-288 (parts in RED)
Major Repair Kit p/n 6-3-888 (parts in GREEN and RED)
Parts in BLACK can be purchased individually
(Optional)
LS-8 Exploded View

# Table 1

## Individual Parts

| POS # | PART # | DESCRIPTION |
|---|---|---|
| 1 | 6-18-106 | Rotor Housing |
| 2 | 6-18-104L or R | Rotor Casing |
| 3 | 6-18-503R | Inlet End Plate (Right Hand) |
| 3 | 6-18-503L | Inlet End Plate (Left Hand) |
| 4 | 6-18-502R | End Plate (Right Hand) |
| 4 | 6-18-502L | End Plate (Left Hand) |
| 5 | 6-18-101 | Rotor Assembly |
| 10 | 6-5-103 | Muffler |
| 17 | 6-19-175 | Gear – 1.75 Ratio (Standard) |
| 20 | 6-18-508 | Gear Housing |
| 26 | 6-21-175 | Gear – 1.75 Ratio (Standard) |
| 29 | 6-18-103 | Arbor Shaft (.471 dia. Pinion) |
| 29 | 6-18-176 | Arbor Shaft (.625 dia. Pinion) (Replaces 6-18-105) |
| 29 | 6-4081442-2 | Arbor Shaft (LS-8 RH28U) |
| 31 | 6-18-107 | Sealing Spacer |
| 33 | Starter p/n | Drive |
| 34 | 6-18-167 | Drive Housing (SAE 1) |
| 34 | 6-18-166 | Drive Housing (SAE 3) |
| 34 | 6-555-1201 | Drive Housing (Chevy RH28U) |
| 34 | 6-18-163 | Drive Housing 52U |
| 35 | 6-18-160 | Drive Housing (Universal) |
|  | 6-4081173 | Adapter (Chevy RH28U) |
| 38 | Starter p/n | Universal Mounting Flange |
| 43 | 6-17-111 | 2.0” Screw |
| 43 | 6-17-113 | 1.5” Screw |
| 44 | 5-26118 | Lock Washer |
| 45 | 6-17-121 | Nut |
| 46 | 6-4081176-2 | Shim 1/16 inch |
| 46 | 6-4081176-3 | Shim 1/8 inch |
| 46 | 6-4081176-4 | Shim 1/2 inch |

# Table 2

## LS-8 - Air Motor Kit, p/n 6-3-288

| POS # | DESCRIPTION | QTY |
|---|---|---|
| 6 | Thrust Bearing – LS-8 | 2 |
| 7 | Seal – LS-8 | 1 |
| 8 | Retaining Ring | 1 |
| 9 | Race – LS-8 | 2 |
| 11 | Bearing LS-8 | 1 |
| 12 | Motor Vane LS-8 | 5 |
| 13 | Woodruff Key | 1 |
| 14 | O-ring | 1 |
| 15 | O-ring | 3 |
| 16 | Bearing LS-8 | 1 |
| 18 | Retaining Ring | 1 |
| 19 | O-ring | 1 |
| 21 | Screw | 6 |
| 22 | Spring Lock Washer | 12 |
| 36 | Screw | 6 |
| 39 | O-ring | 2 |
| 40 | Gasket | 1 |
| 41 | Roll Pin – LS-8 (Long) | 1 |
| 42 | Roll Pin – LS-8 (Short) | 1 |

# Table 3

## LS-8 - Major Repair Kit, p/n 6-3-888 (includes kit p/n 6-3-288)

| POS # | DESCRIPTION | QTY |
|---|---|---|
| 6 | Thrust Bearing | 2 |
| 7 | Seal | 1 |
| 8 | Retaining Ring | 1 |
| 9 | Race | 2 |
| 11 | Bearing | 1 |
| 12 | Rotor Vane | 5 |
| 13 | Woodruff Key | 2 |
| 14 | O-Ring | 1 |
| 15 | O-Ring | 3 |
| 16 | Bearing | 1 |
| 18 | Retaining Ring | 1 |
| 19 | O-Ring | 1 |
| 21 | Screw | 6 |
| 22 | Lock Washer | 12 |
| 23 | Pipe Plug | 1 |
| 24 | Bearing | 1 |
| 25 | Retaining Ring | 1 |
| 27 | O-Ring – LS-8 Arbor Shaft (Ø.070”) | 1 |
| 27 | O-Ring - LS-8T Arbor Shaft (Ø.040”) | 1 |
| 28 | Pin | 1 |
| 30 | O-Ring | 1 |
| 32 | O-Ring | 1 |
| 36 | Screw | 6 |
| 37 | Bearing | 1 |
| 39 | O-Ring | 2 |
| 40 | Gasket | 1 |
| 41 | Roll Pin (Long) | 1 |
| 42 | Roll Pin (Short) | 1 |

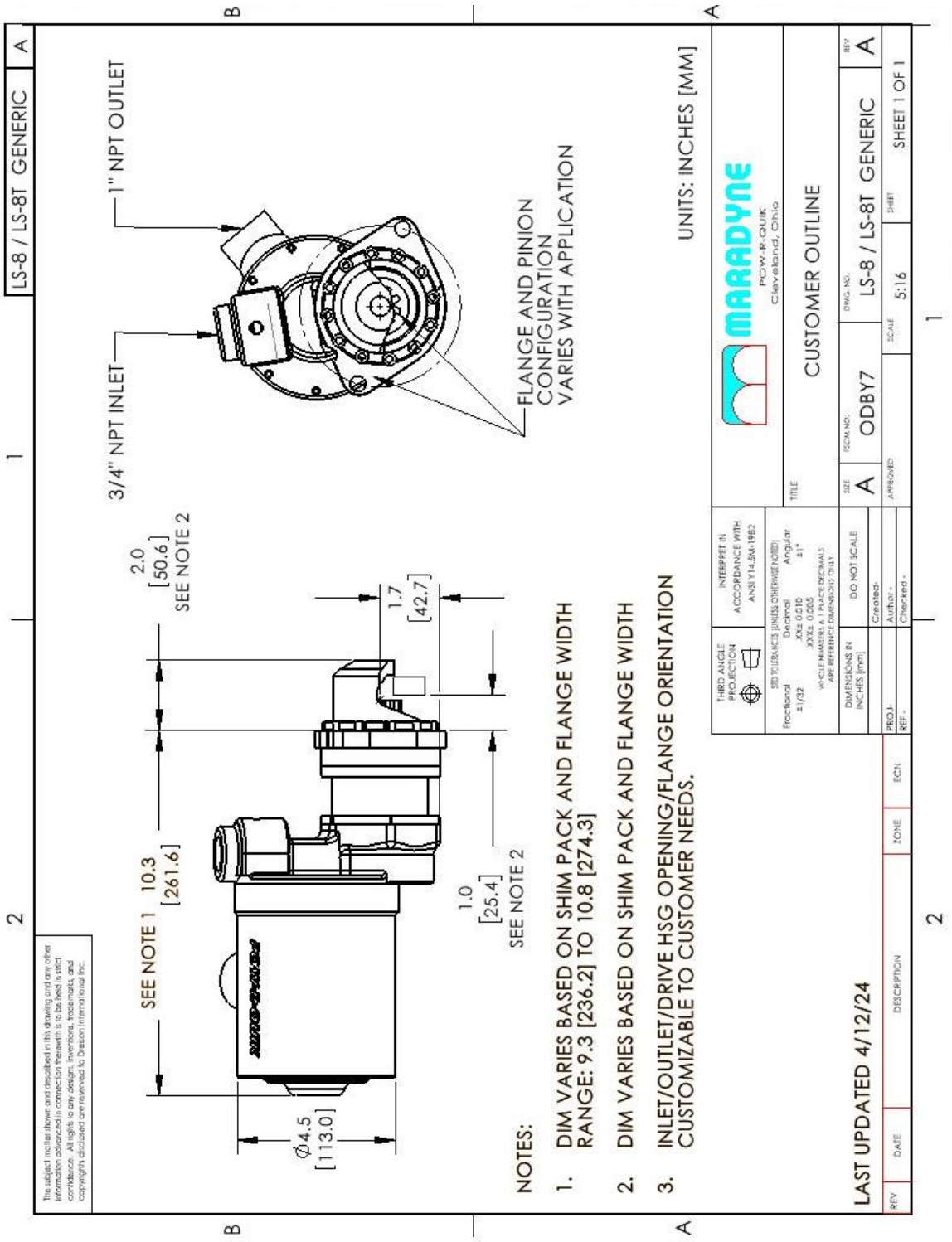
## 4. Warranty.

Pow-R-Quik provides a limited warranty on the products it manufactures and sells under the company name against the failure to perform properly within certain limits of time, application, performance, installation, abuse, and alteration because of a defect in material and/or workmanship. Pow-R-Quik's standard product Warranty is available on the company's website (https://powrquik.com/wp-content/uploads/2020/11/Warranty-2020.pdf) and on request.

**Product Webpage:**
**https://powrquik.com/vane-starters/ls-8-air-starter/**

**Owner Manual location:**
**https://powrquik.com/wp-content/uploads/2023/11/LS-8-Owner-Manual-11-3-2023.pdf**

# Annex 1


LS-8 / LS-8T GENERIC
1" NPT OUTLET
3/4" NPT INLET
FLANGE AND PINION
CONFIGURATION
VARIES WITH APPLICATION
UNITS: INCHES [MM]
2.0
[50.6]
SEE NOTE 2
1.7
[42.7]
SEE NOTE 1 10.3
[261.6]
1.0
[25.4]
SEE NOTE 2
Ø4.5
[113.0]
NOTES:
1. DIM VARIES BASED ON SHIM PACK AND FLANGE WIDTH
RANGE: 9.3 [236.2] TO 10.8 [274.3]
2. DIM VARIES BASED ON SHIM PACK AND FLANGE WIDTH
3. INLET/OUTLET/DRIVE HSG OPENING/FLANGE ORIENTATION
CUSTOMIZABLE TO CUSTOMER NEEDS.
LAST UPDATED 4/12/24
MARADYNE
POW-R-QUIK
Cleveland, Ohio
CUSTOMER OUTLINE
PDCN NO: ODBY7
DWG NO: LS-8 / LS-8T GENERIC
SIZE A
SCALE 5:16
SHEET 1 OF 1
REV A