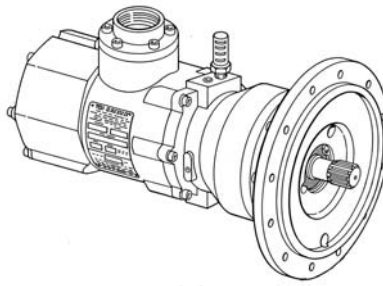


INSTALLATION AND OPERATING MANUAL



MODELS: 56A / 56B / 56G / 56S

Gas Turbine Engine Air Starter Motors

1.0 GENERAL INFORMATION

This manual provides instructions for the installation and operation of the TDI **TURBOSTART** Model 56 series air starters. If there are questions not answered by this manual, please contact your TDI distributor or dealer for assistance.

The 56 series models are turbine driven air starters with a sprag-type over-running clutch. They are best suited for use with industrial gas turbine engines. Model 56A and 56K are designed for installation on engines which use an AND 20002 Type XII-S engine accessory drive pad. Model 56B has a mounting flange per MS 3332-2(AS) with a Type G grooved pilot and a splined output shaft per MS 3335(AS). The 56G has a mounting flange and output spline shaft that mates with the accessory drive assembly starter mounting pad on General Electric LM1600 & LM2500 engines. Model 56S is designed for use on the Solar Saturn starter mount pad.

The 56 Series air starters are suited to operate within a wide range of inlet pressures and ambient temperatures. These starters are designed for operation with either compressed air or natural gas; materials used are compatible with "sour" natural gas and marine environments.

Small amounts of foreign matter or liquid in the air stream will normally not adversely affect 56 Series air starters. As with all other TDI air starter models, no lubrication is required in the supply air.

The 56 Series air starters are normally supplied for use within a dedicated start monitoring system. Some models may be equipped with the TDI Automatic Trip Valve (ATV) to shut off air to the starter when a predetermined cranking speed is reached. This prevents excessive cranking speeds, which could damage the starter.

NOTE

Throughout this manual, the term "air" is used to denote the starter drive medium. Unless otherwise stated, "air" means either compressed air or natural gas.

Please review the rest of this manual before installing your TDI **TURBOSTART** 56 Series starter.

1.1 WARNINGS, CAUTIONS, & NOTES

Throughout this manual, certain types of information will be highlighted for your attention:

WARNING - used where injury to personnel or damage to the equipment is likely.

CAUTION - used where there is the possibility of damage to the equipment.

NOTE - used to point out special interest information.

2.0 ORIENTATION OF THE STARTER

If the factory orientation of the starter's turbine housing assembly does not fit your engine installation, this component can be re-oriented.

Determine the required orientation of the turbine housing assembly and gearbox housing assembly. The turbine housing assembly can be rotated to six different positions relative to the gearbox housing assembly.

CAUTION

The gearbox housing assembly must always be installed so the oil drain is at the bottom (6 o'clock) position. This assures that the oil level check plug is also in the correct position.

Remove the oil drain plug to assure that all oil is drained from the gearbox housing.

Remove the six turbine housing assembly to gearbox housing assembly socket head cap screws.

Rotate the turbine housing assembly to the desired position and reinstall the six cap screws. Torque the six screws to **14 Lb.-Ft (19.2 Nm)**.

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CAUTION

All screw threads are treated at the factory with a fastener retention compound. Every screw and tapped hole must be clean and have a drop of Loctite 290 applied to the threads before being reinstalled.

CAUTION

Ensure that the O-ring on the gearbox housing assembly remains in position and is not cut.

Install the oil drain plug.

Remove the oil level check plug on the side of the gearbox housing and the oil fill plug at the top of the gearbox housing. Add oil to the gearbox housing until it starts to run out of the oil level check port. Install the oil fill plug and oil level check plug.

3.0 INSTALLING THE STARTER

3.1 A turbine driven starter does not require lubrication in the supply air. Therefore, if a vane-type starter motor is being replaced, TDI recommends that all lubrication devices and lines be removed to minimize flow restrictions.

WARNING

If a fuel (pulse) lubricator has previously been installed in the system, disconnect and plug the line to eliminate spraying diesel fuel on the engine.

3.2 Liberally grease the starter's splined shaft with chassis lube and then mount the 56 Series starter on the engine. Tighten all mounting hardware as appropriate.

WARNING

The starter is shipped from the factory without oil in the gearbox. Oil must be added before operating the starter.

Remove the oil level check plug on the side of the gearbox housing and check the oil level in the gearbox housing.

NOTE

Use of a turbine engine oil conforming to MIL-L-7808H, or equal, is recommended for -use in the gearbox.

If oil needs to be added, remove the oil fill plug at the top of the gearbox housing. Add oil to the gearbox housing until it starts to run out of the oil

level check port. Install the oil fill plug and oil level check plug.

After adding oil to the starter, attach the supply air line and all system monitoring and shutdown devices.

3.3 Natural Gas Operation

Proper control of natural gas is a major consideration when used in the starter system.

3.3.1 The turbine exhaust must be plumbed away from the starter area and vented to atmosphere. 3" NPT and 4" NPT exhaust fittings are available from TDI; refer to Section 4.6.

CAUTION

When an exhaust fitting and line are used, the line must be supported to prevent load transfer back to the starter and engine mounting pad.

3.3.2 There is a turbine housing natural gas vent port that is plugged for compressed air use. Remove this 3/8" NPT plug and install a line to carry gas away from the starter area and vent to atmosphere.

CAUTION

Do not connect the turbine housing vent line to the turbine exhaust line; exhaust line gas can pressurize the turbine housing.

3.3.3 If used, the oil fill vent stand pipe (1/2" NPT) must be removed and a line installed to locate this vent away from the immediate vicinity of the starter system monitors.

3.4 Because turbine starters such as the 56 Series are sensitive to flow restrictions, care must be taken to use uniform hose or tubing and fittings for connection of the supply air line. Tees, elbows, and line length must be kept to a minimum. TDI recommends that hose or flex couplings be installed to eliminate possible leakage caused by strain on the supply air line.

3.5 Normally an air strainer is not required. In dirty environments, use of a #40 mesh

Y-strainer is recommended.

supersede the guidelines given in this manual.

WARNING

Recheck all connections for a tight fit.

Fill the air system tank. The 56 Series starter is now ready to operate.

4.0 STARTER OPERATION

The maximum operating pressure limit is the inlet pressure when measured at the starter inlet pressure check port and reflects all supply air pipe and valving losses. In order to check the starter inlet pressure, a 3/4" NPT pipe tap connection is provided in the inlet housing to attach a pressure gauge; refer to Figures 1 and 2. **IN NO CASE SHOULD INLET OPERATING PRESSURE EXCEED 10.3 BAR (150 PSIG).**

WARNING

Do not operate the TDI Turbostart 56 Series air starter with air pressure greater than the pressure rating on the nameplate. This pressure is to be measured at the starter inlet while the starter is running.

The static supply pressure will always be higher than the operating pressure. As a guideline, the maximum pressure limit (proof pressure) that the 56 Series air starter may be subjected to is 600 PSIG (41.4 Bar). System pressure that exceeds the maximum operating limit must use a pressure reducer device to ensure that the operating pressure limit to the 56 Series air starter is maintained.

System pressure that exceeds the 600 PSIG (41.4 Bar) limit must, in addition to a pressure reducer device, incorporate a pressure relief valve, set below 600 PSIG (41.4 Bar), in the supply air line.

All appropriate local pressure codes and pressure limitations on other system components must be adhered to and would

4.1 Follow the engine manufacturer's instructions for starting the engine.

4.2 If a start is aborted before a successful engine start, a restart may be attempted after the starter turbine and engine have come to rest. Refer to the Engine Operator's Manual if the system continues to shut down before a successful start.

4.3 If an Automatic Trip Valve (ATV) is used and the ATV happens to trip before a successful engine start, a restart may be attempted after the starter turbine and engine flywheel have come to rest. If the ATV continues to trip, it indicates that the supply line pressure is too high. Refer to the Operator's Trouble Shooting Guide, Section 6.0.

4.4 If the starter fails to function properly when first operated, or its performance deteriorates with use, refer to the Operator's Trouble Shooting Guide, Section 6.0. If you cannot solve the problem, or repair is necessary, contact your local TDI Turbostart distributor or dealer.

4.5 Gearbox housing lubricant should be checked every six months. Lubricant should flow out of the oil level check port when the plug is removed. If lubricant needs to be added, remove the gearbox housing oil fill plug / stand pipe and add lubricant until it starts to flow from the oil level check port; refer to Section 3.2.

4.6 Accessories

DESCRIPTION	KIT P/N:
3" Marman inlet flange	55-119
6" Marman exhaust flange	55-120
3" NPT exhaust fitting	52-419
3" NPT exhaust elbow	52-403
4" NPT exhaust fitting	52-418

5.0 WARRANTY

TDI TURBOSTART ENGINE STARTER WARRANTY

Tech Development (TDI) warrants to the original user of the TDI Turbostart 56 Series air starters that the starter and related components manufactured by TDI will be free from defects in material and workmanship for a period of One (1) Year from date of purchase by such user. The conditions of this warranty are: a) TDI is notified within this period by return of such product to TDI or its authorized distributor or dealer, transportation prepaid by user, b) such product has been installed according to TDI's specifications; c) such product has not been misused, abused or improperly maintained by user, d) the defect is not the result of normal wear and tear, and e) such starter product has not been repaired with parts not manufactured or authorized by TDI and that TDI installation and repair procedures as outlined in the appropriate manual were properly followed.

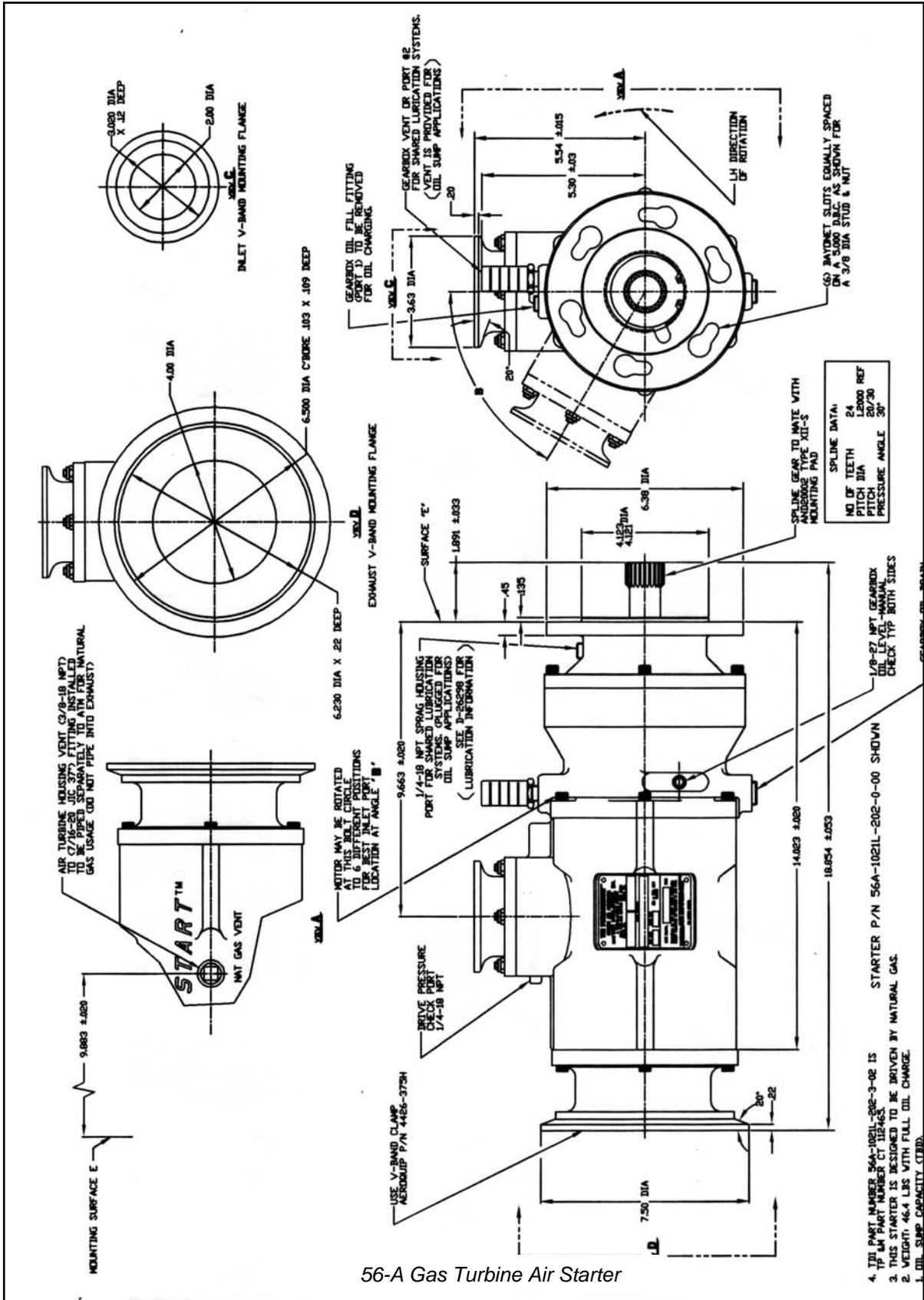
Tech Development shall, at its option, either repair or replace, without charge, any such starter product found upon TDI's examination to be so defective, or by mutual agreement, refund the user's purchase price in exchange for such starter product. Repairs or replacements under this warranty are warranted for the remainder of the original warranty period.

Tech Development makes no other warranty, and IMPLIED WARRANTIES INCLUDING ANY WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

This warranty constitutes the entire obligation of Tech Development relating to the sale and use of such product, and TDI's maximum liability is limited to the purchase price of such product at the date of purchase. In no event shall TDI be liable for incidental, indirect, consequential or special damages of any nature arising from the sale or use of such engine starter product.

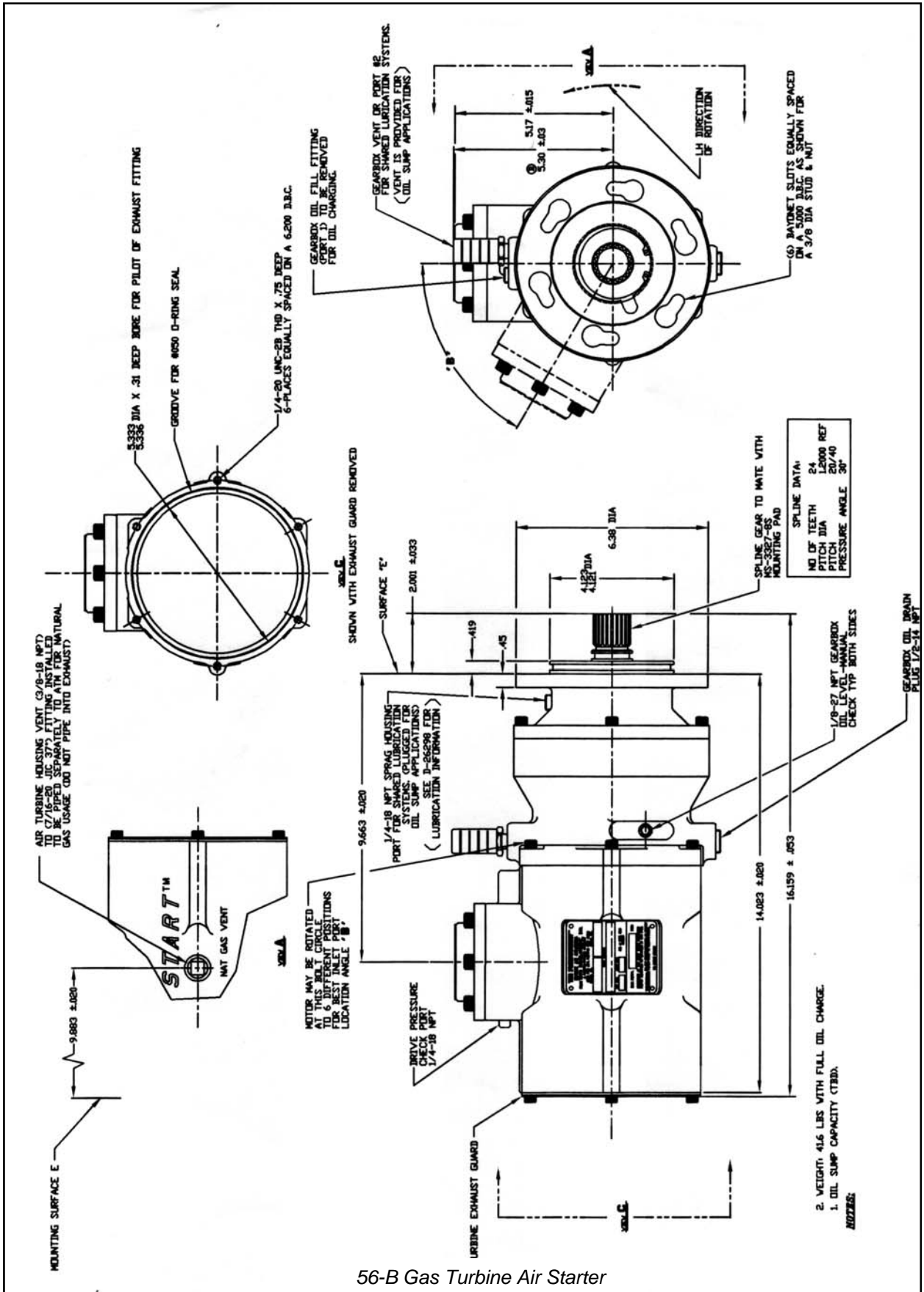
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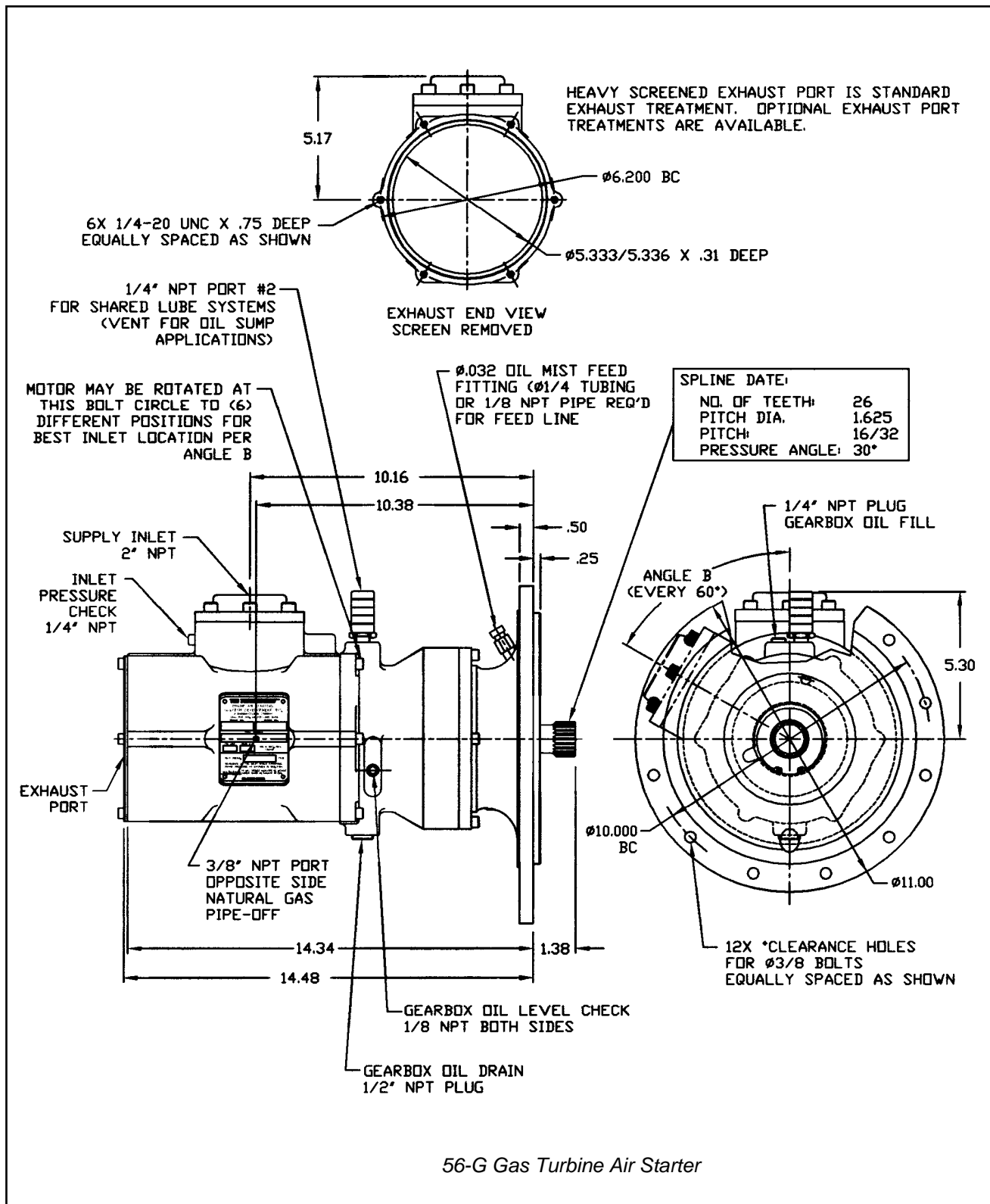
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56-B Gas Turbine Air Starter

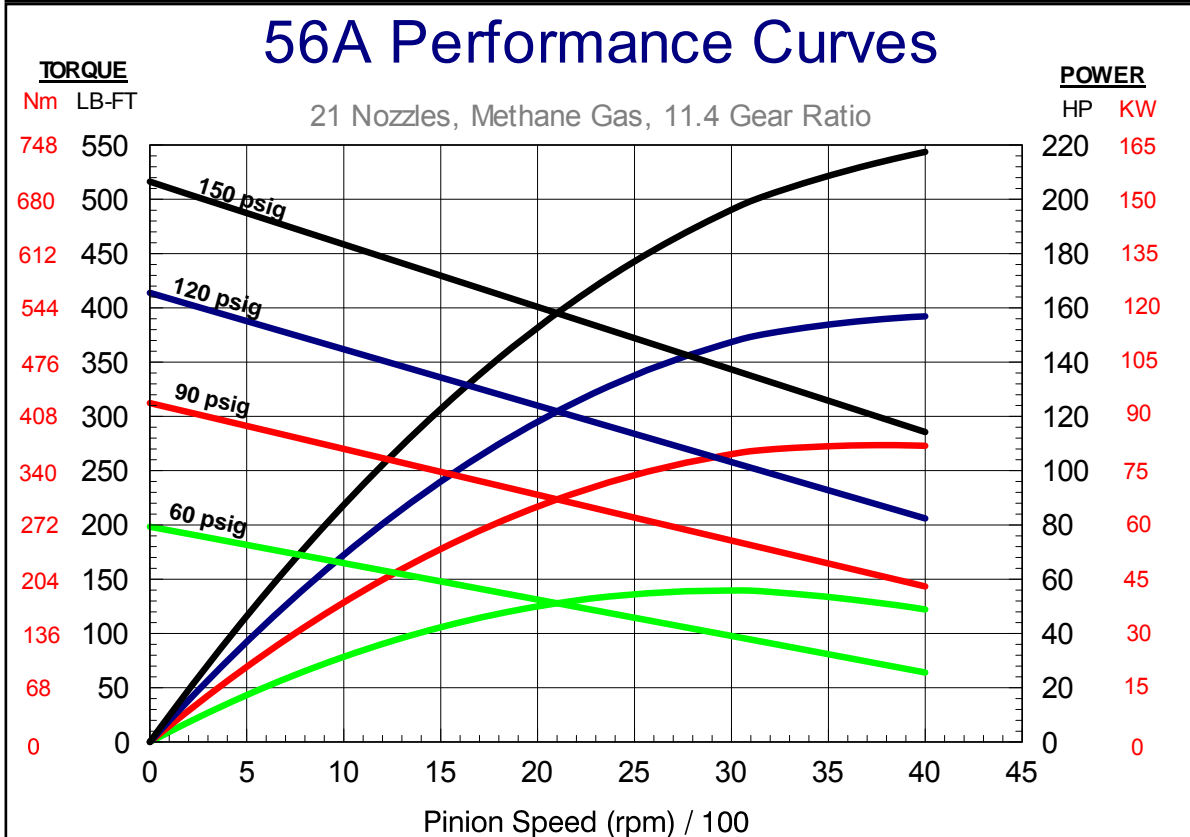
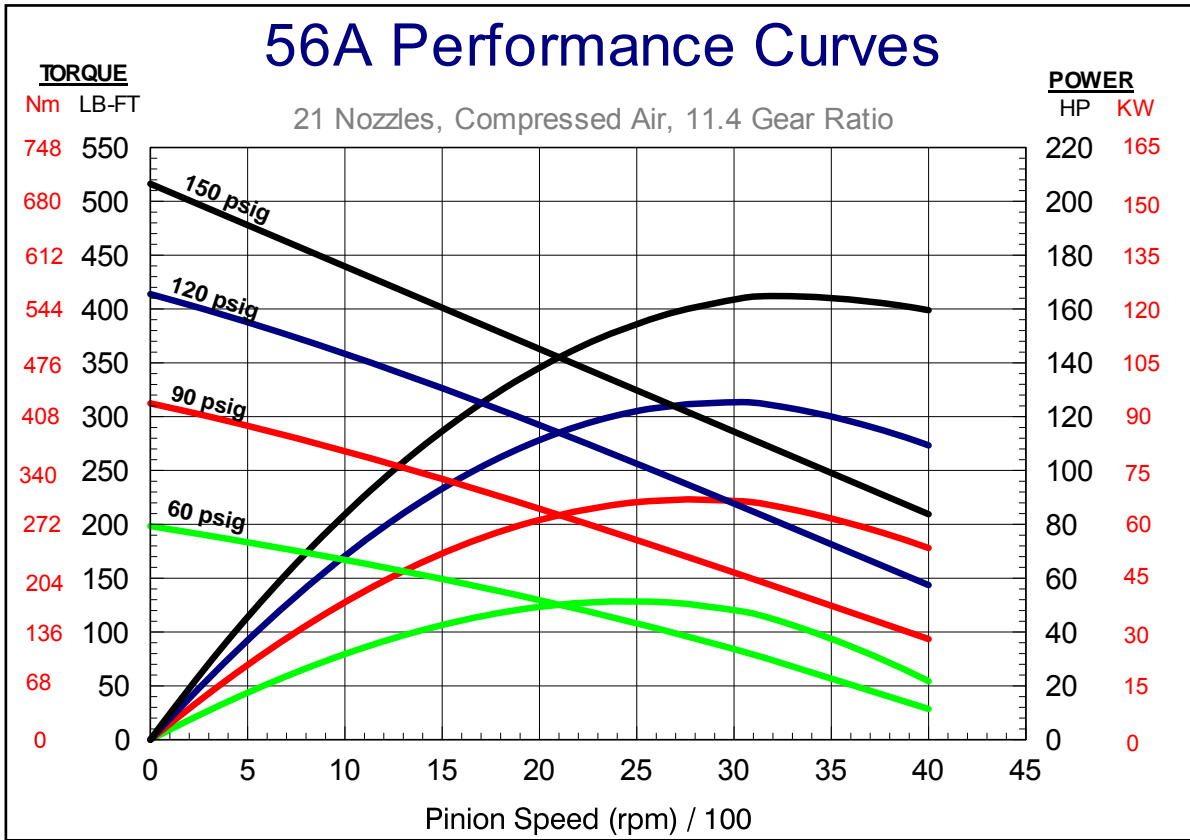
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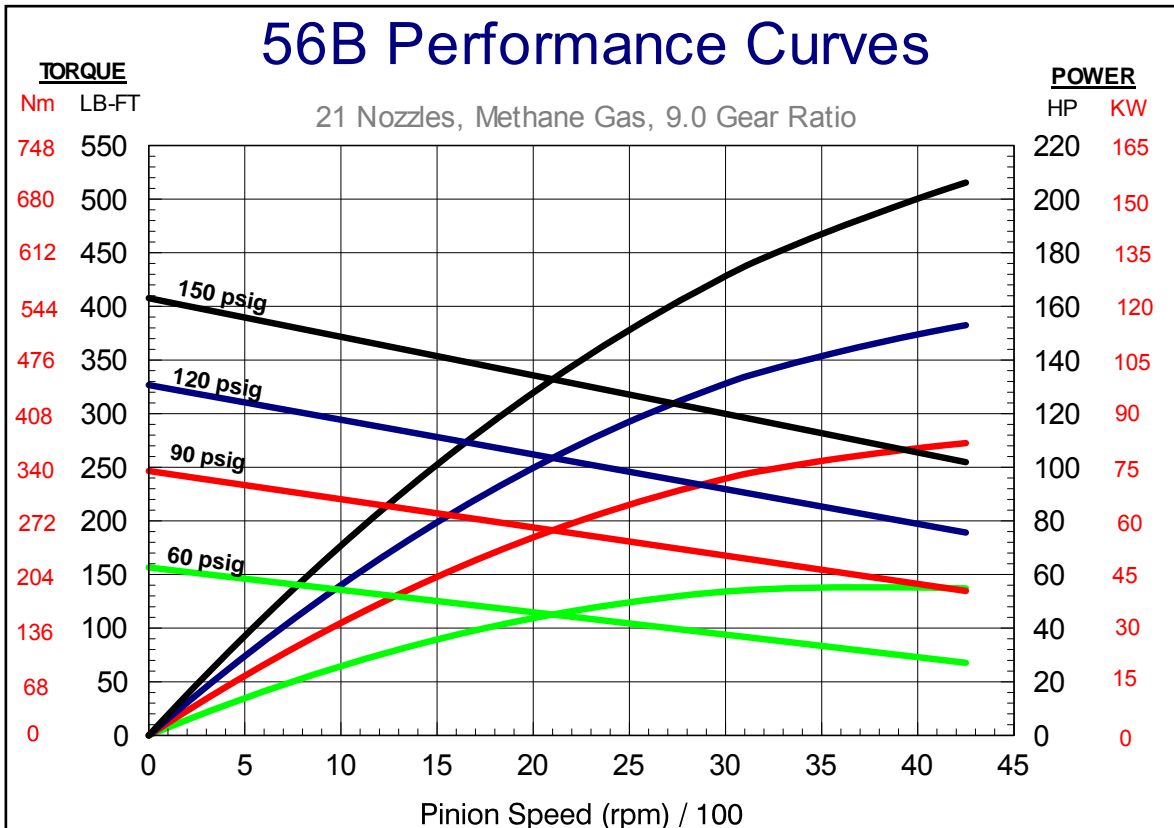
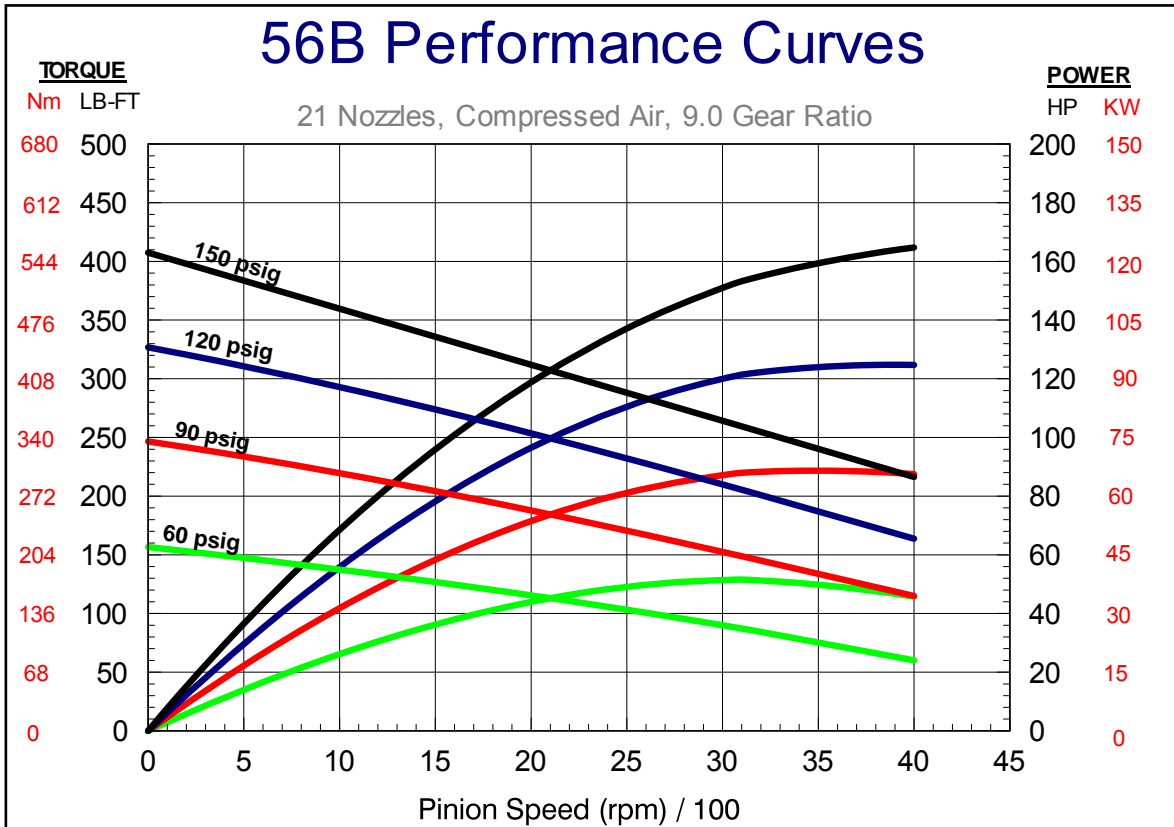
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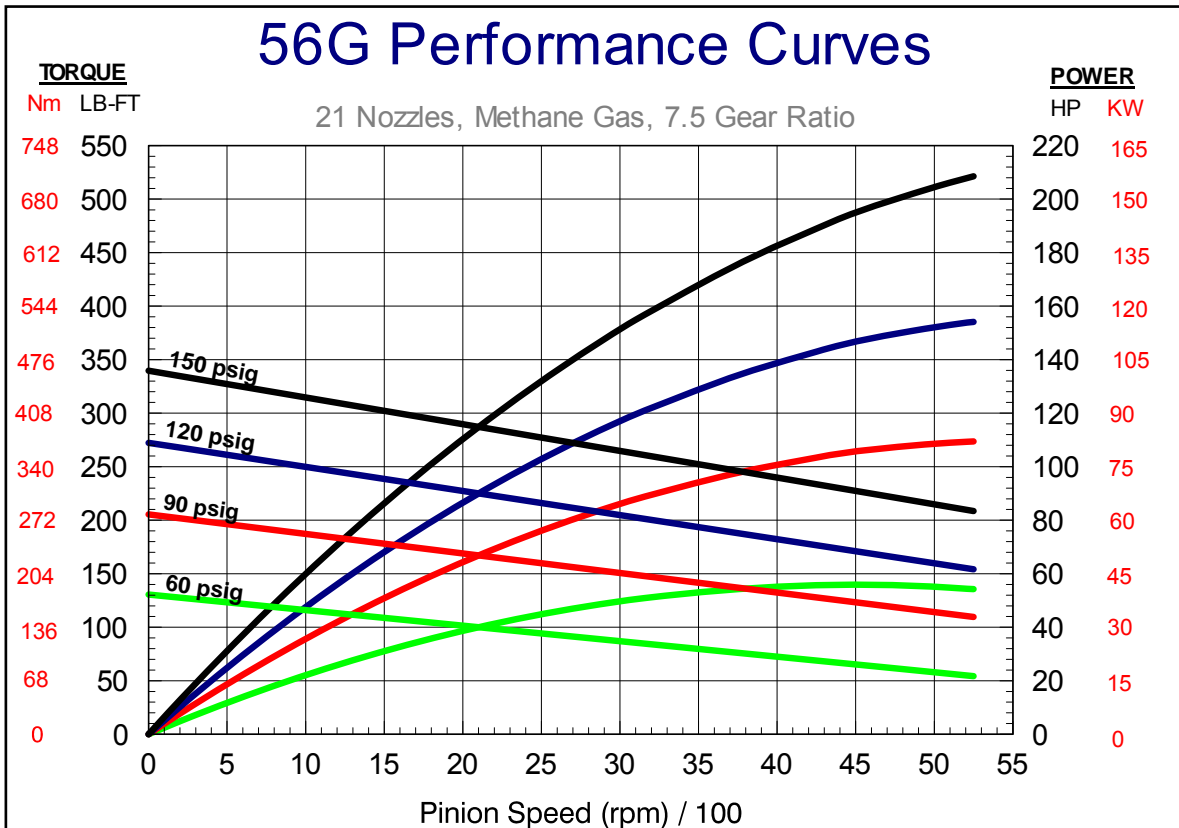
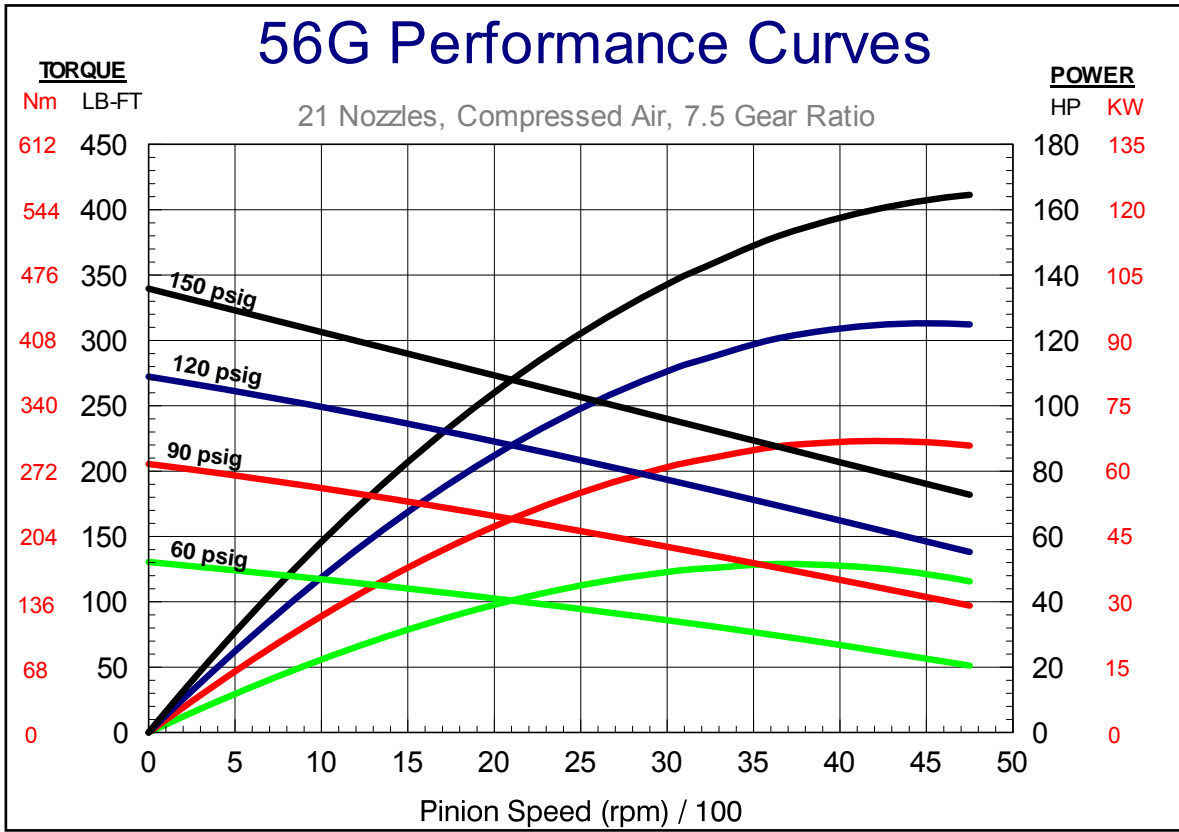
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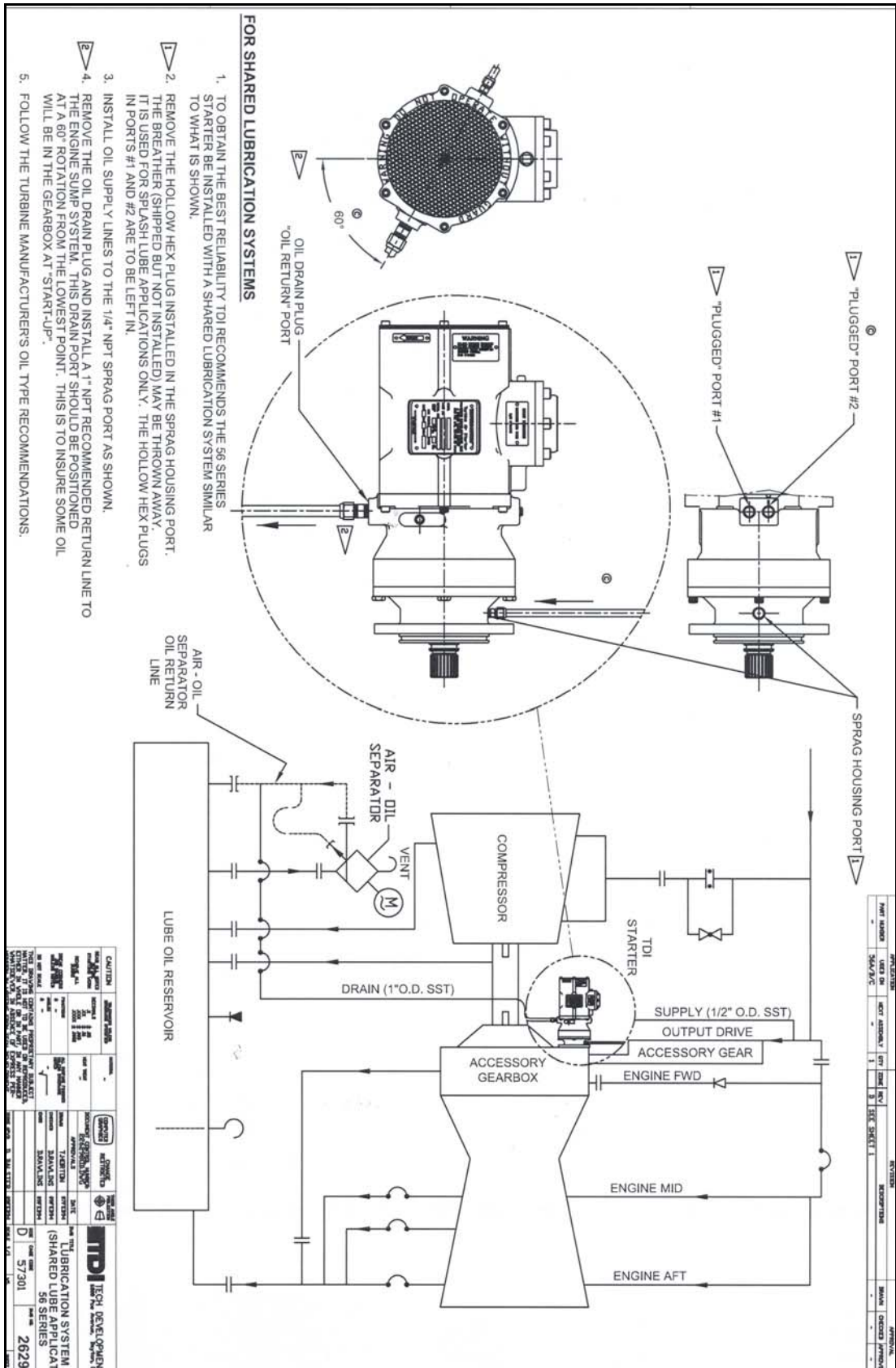
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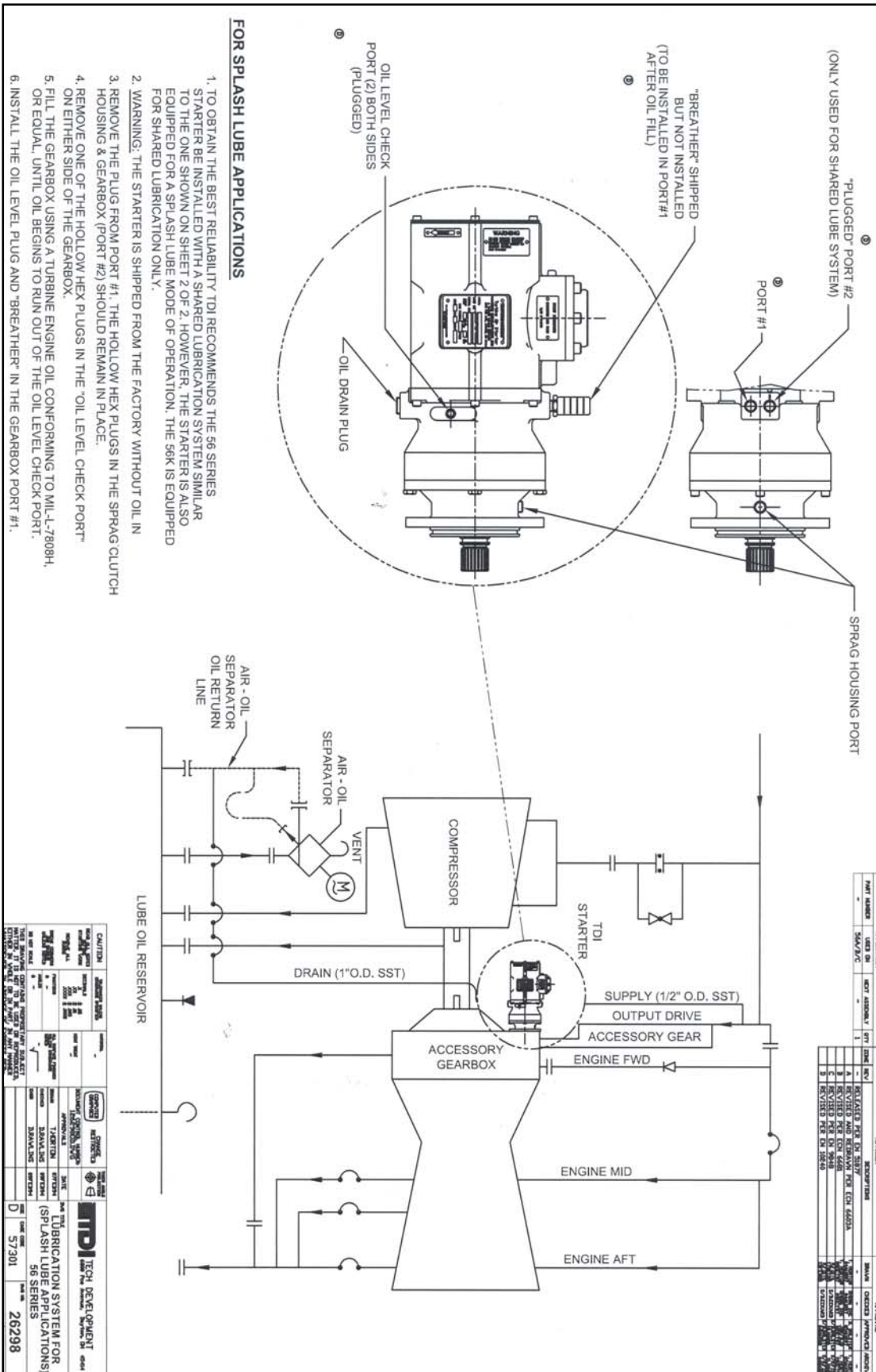
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56K	56K	2	1			REVISION FOR 56K
56K	56K	3	1			REVISION FOR 56K
56K	56K	4	1			REVISION FOR 56K
56K	56K	5	1			REVISION FOR 56K

CAUTION		REVISIONS		APPROVALS		DATE		DESCRIPTION	
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