

DETROIT DIESEL

DDC/MTU SERIES 2000™



8V/12V/16V Construction, Industrial and Generator Set Operator's Guide

OPERATOR'S GUIDE

DDC®/MTU® Series 2000™ Construction, Industrial and Generator Set 8/12/16V Engines

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CALIFORNIA
Proposition 65 Warning

**Diesel engine exhaust and some of its
constituents are known to the State of
California to cause cancer, birth
defects, and other reproductive harm.**

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These Safety Instructions must be read and followed by any persons operating or carrying out maintenance on the engine.

A-1 – BASIC SAFETY PRECAUTIONS

The following cautions must be observed by the operator of the unit in which this engine is installed and/or by those performing basic engine preventive maintenance. Failure to read and heed these cautions and exercise reasonable care for personal safety and the safety of others when operating the unit or performing basic engine preventive maintenance may result in injury as well as engine and/or unit damage.

A-2 – CORRECT USE

The engine is intended solely for the application specified in the contract. Any other use is considered improper. The manufacturer will accept no liability for any resultant damage. The responsibility is borne by the user alone.

Correct use also includes observation of and compliance with the maintenance instructions.

A-3 – PERSONNEL REQUIREMENTS

Service on the engine must be carried out only by trained personnel.

A-4 – MODIFICATIONS OR CONVERSIONS

Modifications made by the customer to the engine may affect safety. No modifications or conversions should be implemented without prior consent from Detroit Diesel product support personnel.

Liability will not be accepted for damage resulting from unauthorized modifications.

A-5 – ORGANIZATIONAL MEASURES

The *Series 2000 C & I Engine Operator's Guide* (6SE2011) must be made available to the equipment user. It must be kept at hand near the engine and accessible to the operating and maintenance personnel at all times.

The operator should become familiar with the contents of this manual before operating the engine or carrying out the maintenance procedures.

A-6 – AUXILIARY MATERIALS



CAUTION:

To avoid injury when using any chemical substances, it is essential to observe the manufacturer's instructions for use, safety instructions and waste disposal specifications.

Fluids and lubricants must be kept in properly designated containers. When using fluids, lubricants and other chemical substances, follow the safety instructions applicable to the product. Take special care when using hot and caustic materials.



CAUTION:

To avoid injury, when using inflammable materials, avoid all sparks and do not smoke.

Use only fluids and lubricants that have been tested and approved by DDC and are listed in *Engine Service Fluid and Filter Requirements, DDC/MTU Series 2000, MTU/DDC Series 4000 (7SE273)*.

A-7 – SPARE PARTS

Spare parts must at least satisfy performance requirements specified by the manufacturer. This is guaranteed when original components are used.

A-8 – WORKING CLOTHES

Safe work clothing fits and is in good condition. Work shoes are sturdy and rough-soled. Bare feet, sandals or sneakers are not acceptable footwear when adjusting and/or servicing an engine.



CAUTION:

To avoid injury when working near the engine, do not wear jewelry or loose fitting clothing. Any of these items could catch on moving parts and cause serious injury. Safety glasses and hearing protection must be worn.

A-9 – TRANSPORT

Lift the engine only with the lifting eye brackets provided. Use only the transport and lifting equipment approved by DDC. The engine must only be transported in the installation position.

A-10 – ENGINE OPERATION

Follow the safety procedures in this section when in the engine room.

 CAUTION:
To avoid injury, ear protectors must be worn in the engine room when the engine is running.

The engine room must be well-ventilated.

 CAUTION:
The exhaust products of an internal combustion engine are toxic. They may cause injury or death if inhaled. All engine installations, especially those within enclosed spaces, should be equipped with an exhaust discharge pipe so that exhaust gases are delivered into the outside air. An enclosed space must be adequately vented. Some means of providing fresh air into an enclosed space must be ensured.

Immediately clean up any spills.

 CAUTION:
To avoid injury, immediately clean up or absorb with an appropriate bonding agent, any leaked or spilled engine oil and coolant.

Inadequate protection of electrical components can lead to electric shocks and serious injuries.

 CAUTION:
To avoid injury, do not touch battery terminals, generator terminals or cables during engine operation.

A-11 – MAINTENANCE AND REPAIR

Compliance with maintenance specifications is an important safety factor.



CAUTION:

To avoid injury, no maintenance work should be carried out with the engine running unless expressly permitted. Before maintenance work is permitted the engine must be secured against inadvertent starting and the battery disconnected.

Persons not involved in the maintenance procedures must keep clear.

Never attempt to rectify faults or carry out repairs if you do not have the special tools required.
Check power tools before using.



CAUTION:

To avoid injury, do not use defective portable power tools. Check for frayed cords prior to use. Ensure all electric tools are grounded. Using defective electrical equipment can cause severe injury. Improper use of electrical equipment can result in electrical shock, fire, or explosion under certain conditions which may cause severe injury.

Before starting work, relieve pressure in systems and high pressure lines which are to be opened.



CAUTION:

To avoid injury, use care when dealing with fluids under pressure. Fluids under pressure have enough force to penetrate the skin. These fluids can cause a minor cut or opening in the skin. If injured by escaping fluid, see a doctor immediately. Serious infection or adverse reaction to the fluid can result if not treated immediately.

The cooling system fill pressure cap must not be opened until the engine has cooled. Allow pressure to escape before removing the cap.

 CAUTION:
Engine coolant is hot and under pressure. To avoid injury, wear protective gloves and do not open the cooling system fill (pressure) cap until the engine has cooled. Loosen the cooling system fill (pressure) cap and allow the pressure to escape, before cap removal.

Take special care when draining hot fluids to avoid risk of injury. Drain the fluids into a suitable container and wipe up any spillages.

 CAUTION:
To avoid injury, take special care when draining hot fluids. Drain the fluids into a suitable container and wipe up any spillages.

When changing engine oil or working on the fuel system, ensure that the engine room is adequately ventilated.

When working with compressed air, always wear protective goggles.

 CAUTION:
To avoid an eye injury when using compressed air, wear adequate eye protection (safety glasses or faceplate) and do not exceed 276 kPa (40 lb/in. ²) air pressure.

When working with liquid nitrogen, always wear protective clothing.



CAUTION:

To avoid injury when using liquid nitrogen, wear protective clothing, gloves and closed shoes. Do not allow the liquid nitrogen to come into contact with exposed body parts. Danger of freezing body parts and suffocation could occur.

Use suitable ladders and work platforms when working high on the engine. Ensure components are placed on stable surfaces.

Do not place tools on the battery.



CAUTION:

Explosive gas may remain in or around the battery for several hours after it has been charged. Sparks or flames can ignite this gas causing an internal explosion which could shatter the battery. Flying pieces of the battery structure and splash of the electrolyte can cause injury. The battery electrolyte is an acid. Extreme care should be exercised to avoid skin or eye contact with the electrolyte. If you come in contact with battery electrolyte:

- ☐ **Flush your skin with water.**
- ☐ **Apply baking soda or lime to help neutralize the acid.**
- ☐ **Flush your eyes with water.**
- ☐ **Get medical attention immediately.**

Before connecting the cable to the battery, check battery polarity.



CAUTION:

To avoid injury, check battery polarity before connecting the cable to the battery. Battery pole reversal may lead to injury through the sudden discharge of acid or bursting of the battery body. Wear safety glasses.

Before barring the engine, make sure that nobody is standing in the danger zone. After working on the engine, check that all guards have been reinstalled and that all tools and loose components have been removed from the engine.

A-12 – ENVIRONMENTAL PROTECTION

Dispose of used fluids and lubricants and filters in accordance with local environmental regulations.

Manipulation of the injection or control system can influence the engine performance and exhaust emissions. As a result, compliance with environmental regulations may no longer be guaranteed.

A-13 – FIRE PREVENTION

Fix any fuel or oil leaks immediately.

 CAUTION:
To avoid injury, rectify any fuel or oil leaks immediately. A splash of either on a hot component could cause a fire. Do not leave oil-soaked cloths on the engine. Do not store combustible fluids near the engine. Do not allow dirt or foreign matter to accumulate near the engine. All of these constitute a fire hazard.

Before welding, clean with a noncombustible fluid.

 CAUTION:
To avoid injury, do not weld on pipes and components containing oil.

Welding work must not be carried out on pipes and components containing oil.

 CAUTION:
To avoid injury, never mix gasoline with diesel fuel. There is increased risk of fire when gasoline is added to diesel fuel.

Never mix gasoline with diesel fuel.

When starting the engine with an external power source, connect the ground lead last and remove it first. To avoid sparks in the vicinity of the battery, connect the ground lead from the external power source to the ground lead of the engine or to the ground terminal of the starter.

Always keep a fire extinguisher at hand for the appropriate fire hazard conditions, and learn how to operate it.

A-14 – WARNING SIGNS

Before putting the engine into service and before working on the engine, read and follow all warning signs. Do not paint on warning signs. Replace illegible signs.

A-15 – SAFETY INSTRUCTIONS IN THE TEXT

Section "F" of this Publication contains especially emphasized safety instructions in accordance with the American Standard ANSI Z535, which begin with one of the following signal words according to the degree of danger:

	CAUTION:
This is a CAUTION. The contents contain information and directions that must be followed to avoid injury.	
NOTICE:	
This is a NOTICE. The contents warn of conditions that can cause damage to the machinery.	

B – PRODUCT SUMMARY

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B-1 – ENGINE LAYOUT

See Figure 1 for the full view of the Series 2000 8V engine.

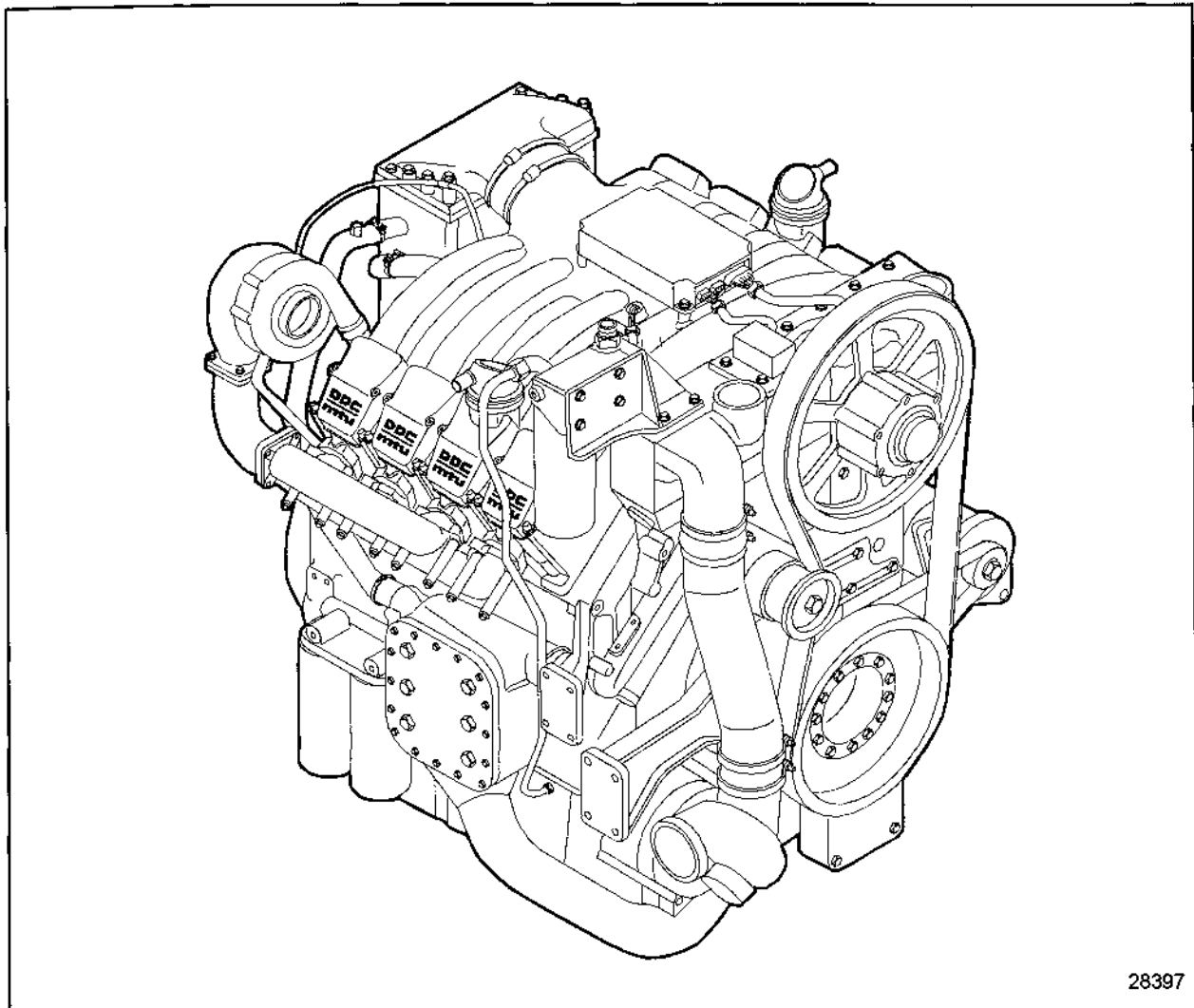
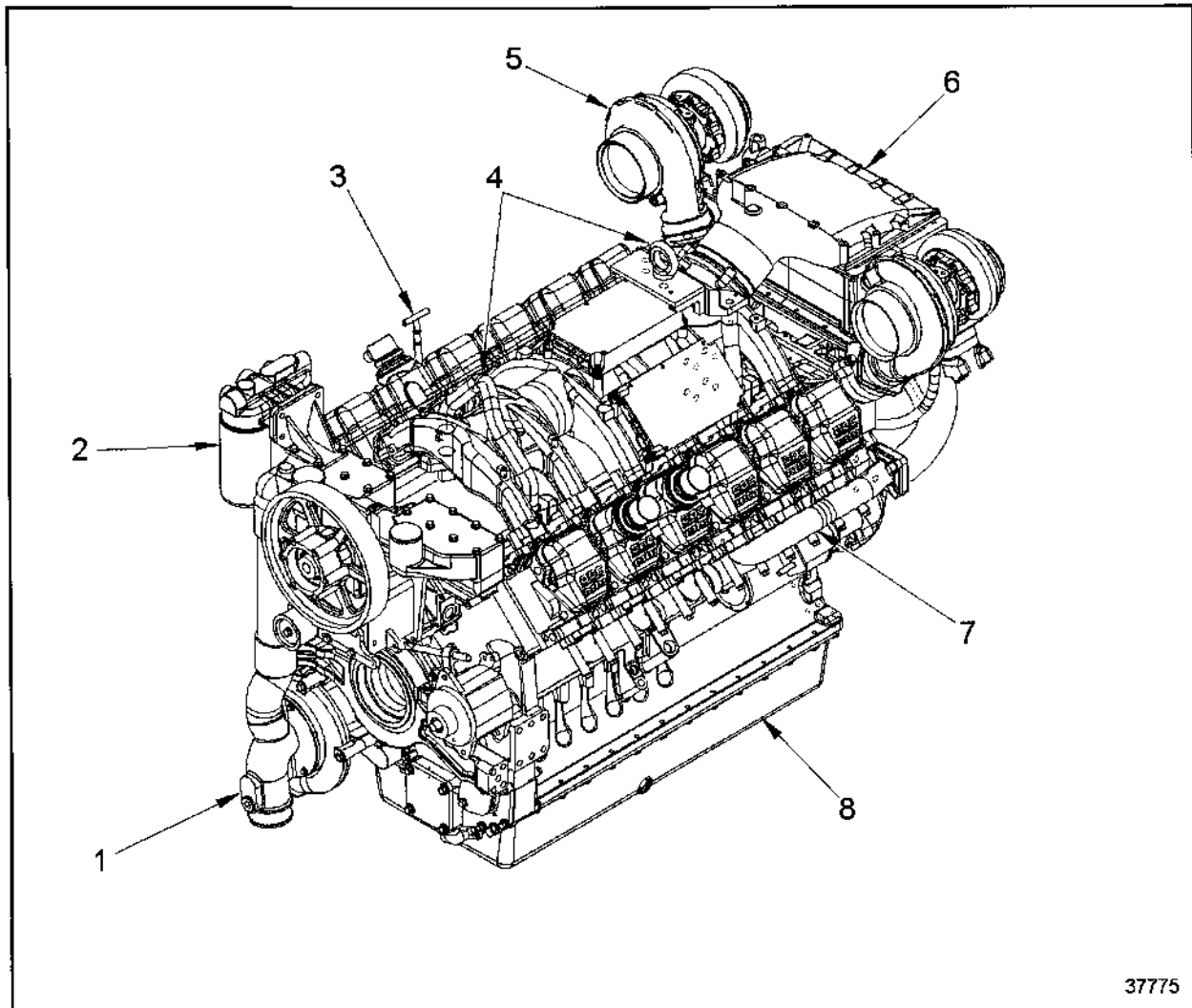


Figure 1 **Full View, 8V Engine**

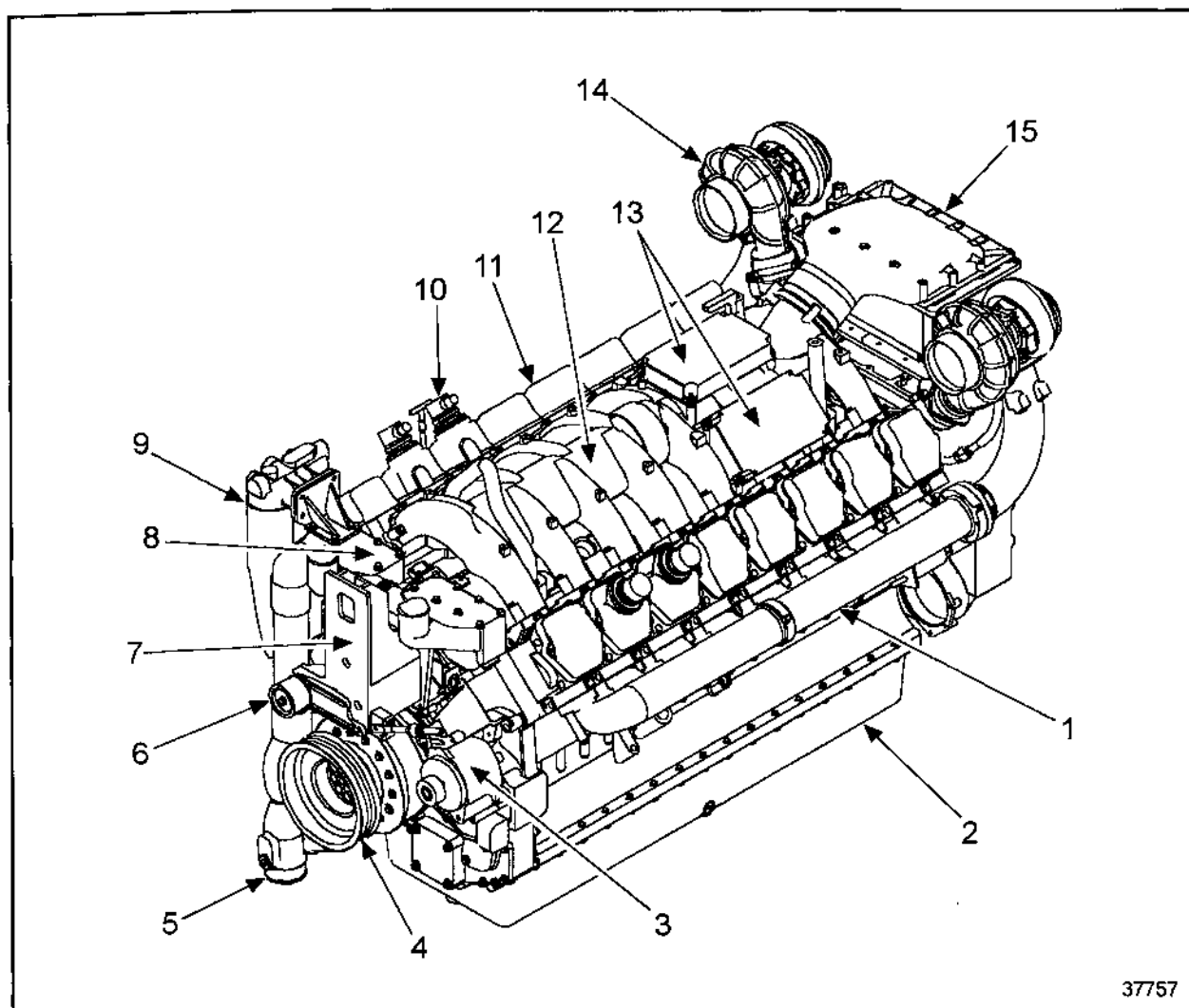
See Figure 2 for the full view of the Series 2000 12V engine.



- | | |
|---------------------------|----------------------|
| 1. Water Pump Inlet | 5. Turbocharger |
| 2. Fuel Filter | 6. Charge Air Cooler |
| 3. Dipstick | 7. Exhaust Manifold |
| 4. Engine Lifter Brackets | 8. Oil Pan |

Figure 2 **Full View, 12V Engine**

See Figure 3 for the full view of the Series 2000 16V engine.



- | | |
|-----------------------------------|--|
| 1. Exhaust Manifold | 9. Fuel Filter Assembly |
| 2. Oil Pan | 10. Cylinder Head Breather |
| 3. Alternator Drive | 11. Cylinder Head Cover |
| 4. Crankshaft Pulley | 12. Intake Housing (Manifold) |
| 5. Water Pump Inlet | 13. DDEC Electronic (ECM) Control Unit |
| 6. Alternator Belt Tension Pulley | 14. Turbocharger |
| 7. Fan Mount | 15. Charge Air Cooler |
| 8. Thermostat Housing | |

Figure 3 Full View 16V Engine

B-2 – ENGINE MODEL DESIGNATION

For the key to engine model designation for the 8V, 12V and 16V engines, refer to Table 1.
Example of a Series 2000 engine model number is R1237K00, for the DDC model numbering format:

Series	Cylinders	Application	Rotation and Type	Design Variation	Specific Model Number
Position 1	Position 2, 3	Position 4	Position 5	Position 6	Position 7, 8
R- 2000	08	0 - Incomplete	0 - LH	K - DDEC III, IV	00 - Basic
	12	2 - Marine	7 - RC*		32 - Underground Mining
	16	3 - Industrial and Genset			33 - Nonroad Certified
		4 - Power Base			35 - Nonroad Cert. Genset
		5 - Generator			

* Code stands for right hand engine.

Table 1 DDC Model Numbering Format

B-3 – ENGINE SIDE AND CYLINDER DESIGNATIONS

Engine sides are always designated as viewed from the driving end.

The left bank of cylinders is marked "A" and the right bank "B" (as per DIN ISO 1204).

Each cylinder bank is numbered consecutively from No. 1, starting at the driving end of the engine.

Other components and assemblies are also numbered consecutively starting with No. 1 at the driving end. See Figure 4.

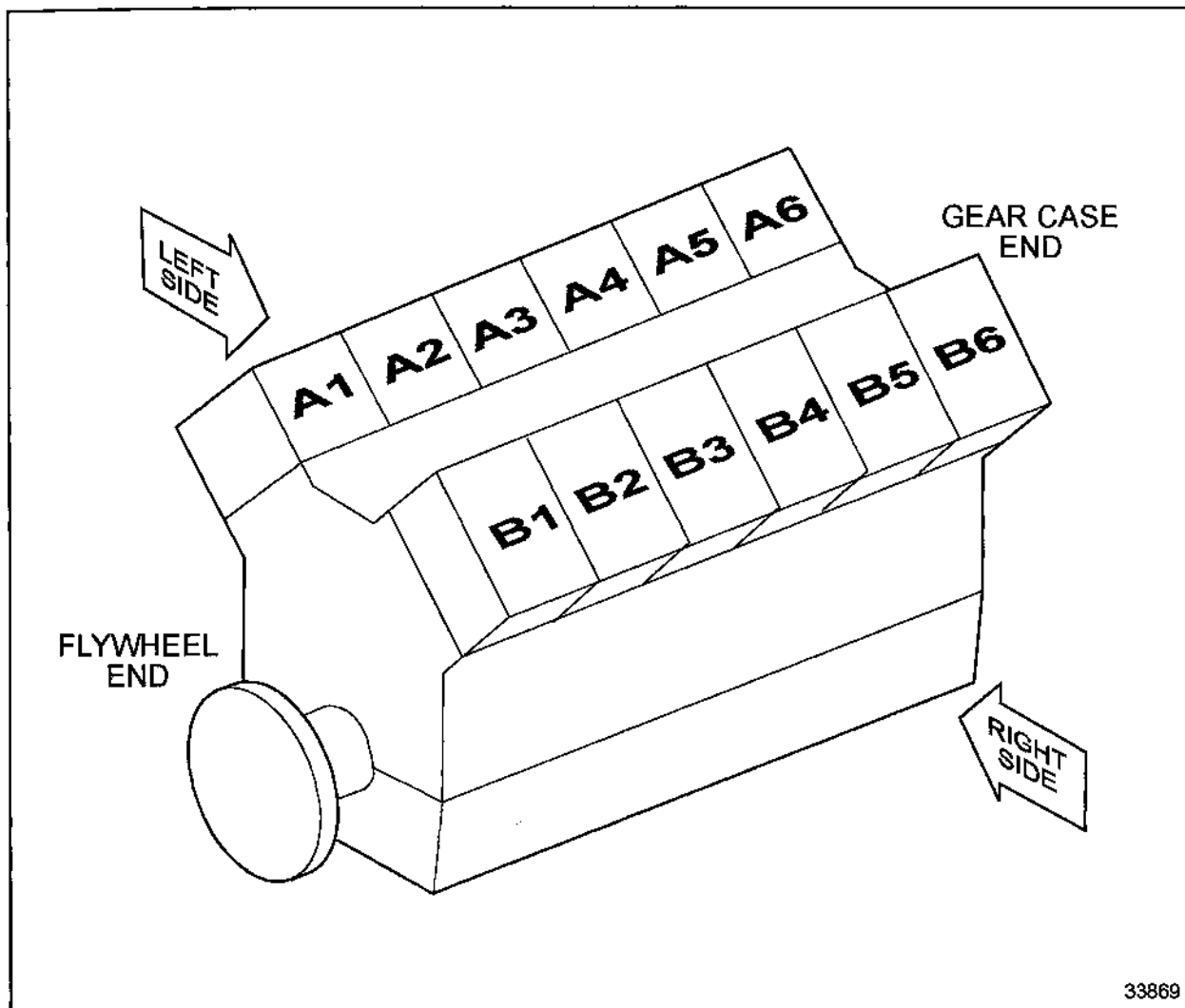


Figure 4 Cylinder Designations, 12V Engine

Firing Order

The MTU method looks from the rear (flywheel end) of the engine with the A bank on the left and the B bank on the right. The MTU cylinder locations or firing order are numbered starting from the rear (flywheel end) forward.

8V Firing Order : A1-B4-A4-A2-B3-A3-B2-B1 (Left is A bank and Right is B bank.)

12V: A1-B2-A5-B4-A3-B1-A6-B5-A2-B3-A4-B6

16V: A1-B5-A3-A5-B2-B8-A2-A8-B3-A7-B4-B6-A4-A6-B1-B7

Detroit Diesel method of cylinder designations looks from the rear (flywheel end) of the engine, with the L on the left hand side and the R on the right hand side. Note that the DDC cylinder call out method numbers the cylinders from the front to the rear.

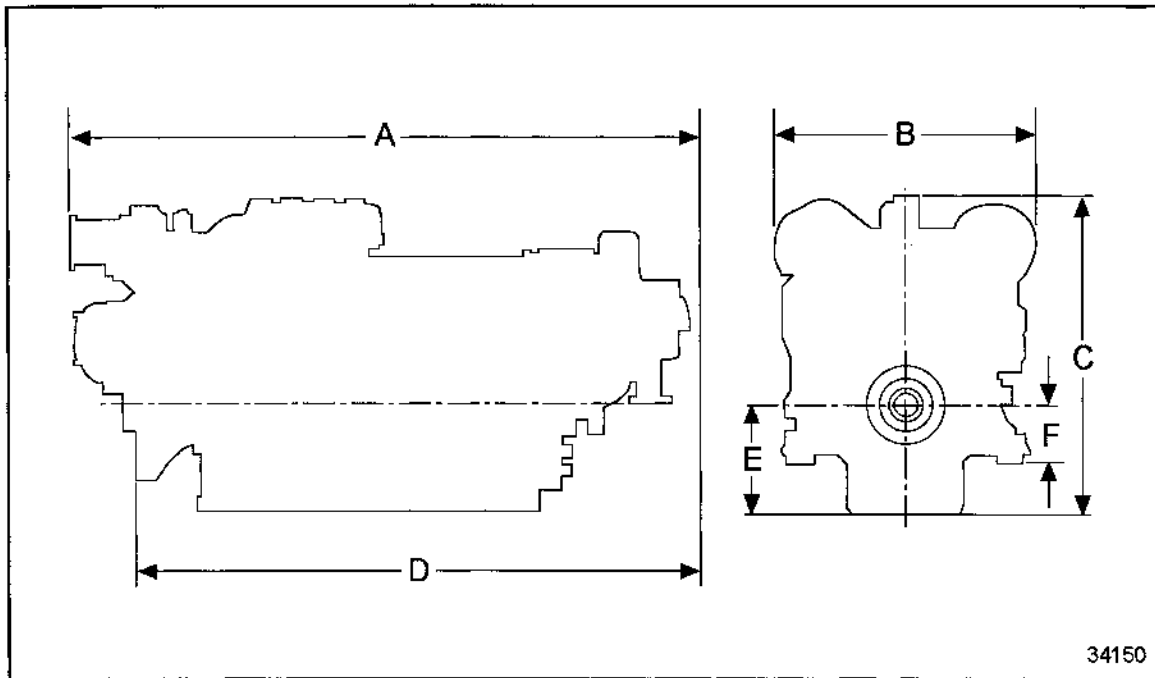
8V Firing Order: L4-R1-L1-L3-R2-L2-R3-R4

12V: L6-R5-L2-R3-L4-R6-L1-R2-L5-R4-L3-R1

16V: 8L-4R-6L-4L-7R-1R-7L-1L-6R-2L-5R-3R-5L-3L-8R-2R

B-4 – MAIN ENGINE DIMENSIONS

See Figure 5, for the main dimension measurements.



A - Overall Length

B - Overall Width

C - Overall Height

D - Engine Length to Flange-mounting Surface

E - Crankshaft CL to Oil Pan Bottom

F - Crankshaft CL to Engine Mount

Figure 5 Main Engine Dimensions

Dimensions	8V	12 V	16 V
Length - A	1460 mm 57.5 in.	2230 mm 87.8 in.	2605 mm 102.6 in.
Width - B	1047 mm 41.2 in.	1400 mm 55.1 in.	1400 mm 55.1 in.
Height - C	1238 mm 48.7 in.	1275 mm 50.2 in.	1275 mm 50.2 in.
To flange surface - D	1353 mm 53.3 in.	1927 mm 75.9 in.	2291 mm 90.2 in.
Centerline to oil pan bottom - E	508 mm 20.0 in.	508 mm 20.0 in.	508 mm 20.0 in.
Centerline to engine mount - F	N/A	290 mm 11.4 in.	290 mm 11.4 in.

Table 2 Main Engine Dimensions

The general engine specifications for the Series 2000 8, 12 and 16V engine are listed on sheet 2 of the performance curves and may be found at the end of this book, refer to section P-1. Consult a DDC distributor for updates. Specifications do change with product modification.

B-5 – ENGINE INCLINATIONS

The permissible inclinations for the Series 2000 engines are listed in Table 3.

Inclinations (referenced to water line)	8V	12V	16V
Longitudinal, driving end down, permanent	N/A	15 degrees max	13.55 degrees max
Longitudinal, free end down, permanent	N/A	0 degrees	0 degrees
Transverse, permanent	N/A	22.5 degrees max	22.55 degrees max

Table 3 Engine Inclinations

B-6 – GENERAL ENGINE SPECIFICATIONS

The general engine specifications for the Series 2000 8V, 12V and 16V engine are listed on sheet 2 of the performance curves and may be found at the end of this book, refer to section P-1.

Specifications do change with product modification. Consult a DDC distributor for updates.

Listed in Table 4 are the available construction and industrial performance curves:

Engine	Rated Power bhp (kW) @ r/min	Peak Torque lb-ft (N-m) @ r/min	Curve Number
8V	650 (485) @ 2100	2017 (2734) @ 1500	E4-2083-31-11 , page 147 Sheet 2 , page 148
8V	525 (392) @ 1800	1708 (2316) @ 1350	E4-2083-31-6 , page 149 Sheet 2 , page 150
8V	525 (392) @ 2100	1708 (2316) @ 1350	E4-2083-31-4 , page 151 Sheet 2 , page 152
8V	575 (429) @ 1800	1871 (2535) @ 1350	E4-2083-31-3 , page 153 Sheet 2 , page 154
8V	575 (429) @ 2100	1871 (2535) @ 1350	E4-2083-31-5 , page 155 Sheet 2 , page 156
8V	605 (451) @ 1800	2076 (2815) @ 1350	E4-2083-31-9 , page 157 Sheet 2 , page 158
8V	605 (451) @ 2100	2076 (2815) @ 1350	E4-2083-31-7 , page 159 Sheet 2 , page 160
8V	650 (485) @ 1800	2076 (2815) @ 1350	E4-2083-31-10 , page 161 Sheet 2 , page 162
8V	650 (485) @ 2100	2076 (2815) @ 1350	E4-2083-31-8 , page 163 Sheet 2 , page 164
12V	760 (567) @ 2100	2300 (3118) @ 1200	E4-2123-31-4 , page 165 Sheet 2 , page 166
12V	1005 (750) @ 2100	3100 (4203) @ 1350	E4-2123-31-13 , page 167 Sheet 2 , page 168
12V	1110 (828) @ 2100	3200 (4339) @ 1500	E4-2123-31-15 , page 169 Sheet 2 , page 170
12V	850 (634) @ 1800	2715 (3681) @ 1350	E4-2123-31-12 , page 171 Sheet 2 , page 172
12V	850 (634) @ 2100	2715 (3681) @ 1350	E4-2123-31-11 , page 173 Sheet 2 , page 174
12V	905 (675) @ 1800	2890 (3918) @ 1350	E4-2123-31-10 , page 175 Sheet 2 , page 176
12V	905 (675) @ 2100	2890 (3918) @ 1350	E4-2123-31-9 , page 177 Sheet 2 , page 178
12V	700 (522) @ 1800	2275 (3085) @ 1200	E4-2123-31-8 , page 179 Sheet 2 , page 180

Engine	Rated Power bhp (kW) @ r/min	Peak Torque lb-ft (N-m) @ r/min	Curve Number
12V	700 (522) @ 2100	2275 (3085) @ 1200	E4-2123-31-7, page 181 Sheet 2, page 182
12V	750 (559) @ 1800	2440 (3309) @ 1200	E4-2123-31-6, page 183 Sheet 2, page 184
12V	750 (559) @ 2100	2440 (3309) @ 1200	E4-2123-31-5, page 185 Sheet 2, page 186
16V	1050 (783) @ 1800	3415 (4630) @ 1350	E4-2163-31-7, page 187 Sheet 2, page 188
16V	1050 (783) @ 2100	3415 (4630) @ 1350	E4-2163-31-4, page 189 Sheet 2, page 190
16V	1205 (900) @ 1800	3918 (5312) @ 1350	E4-2163-31-8, page 191 Sheet 2, page 192
16V	1205 (900) @ 2100	3918 (5312) @ 1350	E4-2163-31-5, page 193 Sheet 2, page 194
16V	1340 (1000) @ 2100	4204 (5700) @ 1500	E4-2163-31-6, page 195 Sheet 2, page 196

Performance curves are subject to change without notice.

Table 4 Available Construction and Industrial Performance Curves

Listed in Table 5 are the available genset performance curves:

Engine	Standby Power bhp (kW) @ r/min	Prime Power bhp (kW) @ r/min	Continuous Power bhp (kW) @ r/min	Curve Number
8V	610 (455) @ 1800	550 (410) @ 1800	-	E4-2085-31-1*, page 197 Sheet 2, page 198 Sheet 3, page 199
8V	489 (365) @ 1500	443 (330) @ 1500	-	E4-2085-31-2, page 201 Sheet 2, page 202 Sheet 3, page 203
8V	-	489 (365) @ 1500	-	E4-2085-31-3†, page 205 Sheet 2, page 206
8V	543 (405) @ 1500	489 (365) @ 1500	-	E4-2085-31-4, page 207 Sheet 2, page 208 Sheet 3, page 209
8V	685 (511) @ 1800	623 (465) @ 1800	-	E4-2085-31-5*, page 211 Sheet 2, page 212 Sheet 3, page 213
8V	-	-	496 (370) @ 1800	E4-2085-31-6, page 215 Sheet 2, page 216

Engine	Standby Power bhp (kW) @ r/min	Prime Power bhp (kW) @ r/min	Continuous Power bhp (kW) @ r/min	Curve Number
8V	765 (571) @ 1800 549 (410) @ 1500	-	-	E4-2085-31-7, page 217 Sheet 2, page 218 Sheet 3, page 219
8V	610 (455) @ 1500	549 (410) @ 1500	-	E4-2085-31-8, page 221 Sheet 2, page 222 Sheet 3, page 219
12V	910 (679) @ 1800	823 (614) @ 1800	-	E4-2125-31-1, page 225 Sheet 2, page 226 Sheet 3, page 227
12V	730 (545) @ 1500	656 (489) @ 1500	-	E4-2125-31-2, page 229 Sheet 2, page 230 Sheet 3, page 231
12V	-	730 (545) @ 1500	-	E4-2125-31-3†, page 233 Sheet 2, page 234
12V	804 (600) @ 1500	730 (545) @ 1500	-	E4-2125-31-4, page 235 Sheet 2, page 236 Sheet 3, page 237
12V	-	-	752 (561) @ 1800	E4-2125-31-5, page 239 Sheet 2, page 240
12V	1120 (836) @ 1800	-	-	E4-2125-31-6, page 241 Sheet 2, page 242
12V	912 (680) @ 1500	830 (619) @ 1500	-	E4-2125-31-7, page 243 Sheet 2, page 244 Sheet 3, page 245
16V	1200 (895) @ 1800	1086 (810) @ 1800	- -	E4-2165-31-1, page 247 Sheet 2, page 248 Sheet 3, page 249
16V	985 (735) @ 1500	895 (668) @ 1500	- -	E4-2165-31-2, page 251 Sheet 2, page 252 Sheet 3, page 253
16V	-	965 (720) @ 1500	- -	E4-2165-31-3†, page 255 Sheet 2, page 256
16V	1066 (795) @ 1500	965 (720) @ 1500	- -	E4-2165-31-4, page 257 Sheet 2, page 258 Sheet 3, page 259
16V	1495 (1115) @ 1800	-	- -	E4-2165-31-5, page 261 Sheet 2, page 262

Engine	Standby Power bhp (kW) @ r/min	Prime Power bhp (kW) @ r/min	Continuous Power bhp (kW) @ r/min	Curve Number
16V	1350 (1007) @ 1800	1227 (915) @ 1800	- -	E4-2165-31-6 , page 263 Sheet 2 , page 264 Sheet 3 , page 265
16V	1200 (895) @ 1500	1091 (814) @ 1500	- -	E4-2165-31-7 , page 267 Sheet 2 , page 268 Sheet 3 , page 269

Performance curves are subject to change without notice

* U.S. Nonroad Certified Models;

† T. A. Luft Certified Models

Table 5 Available Genset Performance Curves

B-8 – VALVE CLEARANCES

Listed in Table 6 are the valve clearances with engine cold, 20°C (68°F).

Engine Cold	Clearance
Inlet Valve	0.40 mm (1.57 in.)
Exhaust Valve	0.60 mm (2.36 in.)

Table 6 Valve Clearance

B-9 – OIL CAPACITY

Oil capacity is listed in Table 7. All quantities are approximate.

	8V	12V	16V C & I	16V Genset
Oil capacity, oil pan				
To lower mark on oil dipstick	37.9 L (40.0 qt)	57.0 L (60.2 qt)	79.0 L (83.5 qt)	79.5 L (84.0 qt)
To upper mark on dipstick	46.4 L (49.0 qt)	69.0 L (72.9 qt)	96.1 L (101.5 qt)	96.5 L (102.0 qt)
Total capacity				
For initial fill	46.0 L (48.6 qt)	113.0 L (119.4 qt)	130.0 L (137.4 qt)	130.0 L (137.4 qt)
For oil change		88.0 L (93.0 qt)	117.0 L (123.6 qt)	117.0 L (123.6 qt)

Table 7 Oil Capacity

C – OPERATING INSTRUCTIONS

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C-1 – OPERATING INSTRUCTIONS - INTRODUCTION

Low operating and maintenance costs as well as operational reliability and availability depend on maintenance and servicing being carried out in compliance with our specifications and instructions.

It is essential that:

- ☐ Trained personnel be employed.
- ☐ Suitable tools be used.
- ☐ Fluids and lubricants used should be those specified by DDC publication *Engine Service Fluid and Filter Requirements, DDC/MTU Series 2000, MTU/DDC Series 4000 (7SE273)*.
- ☐ Only MTU/DDC oil filters, P/N: 23550401, should be used. Certain aftermarket filters do not meet MTU/DDC requirements for filtration and/or flow.
- ☐ The maintenance tasks be carried out as per the MTU/DDC Maintenance Schedule; refer to section D-2.

Our Product Support Service is available at all times should assistance be needed.

Prior to engine start-up it must be determined whether start-up is:

- ☐ After a short, scheduled operational shutdown
- ☐ After an extended out-of-service period
- ☐ Initial start-up of a new engine

Accordingly the Before-Operation Services are subdivided into:

- ☐ B1 - Before-Operation Services after a short, scheduled operational shutdown
- ☐ B2 - Before-Operation Services after an extended operational shutdown (exceeding 1 week)
- ☐ B3 - Before-Operation Services before initial start-up of a new or preserved engine

Correct engine installation and alignment according to MTU / DDC regulations are basic requirements for initial engine start-up.

Prior to engine shutdown it must be determined whether shutdown is for:

- ☐ A short, scheduled operational shutdown
- ☐ An extended out-of-service period

If the engine malfunctions, a decision must be made to either:

- ☐ Shut down the engine.
- ☐ Continue engine operation for a short period, using emergency measures, until the fault can be rectified.

NOTE:

The section numbers on the following pages refer to Section F of this manual.

NOTE:

These operating instructions may include components which are not installed on your engine; these may be disregarded.

C-2 – BEFORE-OPERATION SERVICES

The tasks to be performed for before-operation services B1, B2, and B3 and the numbers of the sections containing task descriptions are listed in Table 8.

Section	Task Description		B1	B2	B3
Refer to section F-39	Air filter	Check restriction indicator*	x	x	x
Refer to F-92	Air system	Check drain bore for water discharge††	x	x	x
Refer to section F-47	Engine oil	Check level	x	x	x
Refer to section F-56	Engine coolant	Check level	x	x	x
Refer to section F-61	Engine coolant	Preheat††	x	x	x
Refer to section F-65	Charge air coolant	Check level††			
Refer to section F-84	Fuel	Check supply	x	x	x
Refer to section F-86	DDEC	Switch ON	x	x	x
Refer to section F-3	Running gear	Bar engine manually		x	x
Refer to section F-60	Fuel H.P. pump	Check weep hole for obstructions		x	x
Refer to section F-82	Mechanical accessories	Ensure that guards are correctly installed		x	x
Refer to section F-90	DDEC	Check wiring for security and condition; check plug		x	x
Refer to section G-4	Removal from storage	Carry out before-operation services			x
Refer to section	Fuel system	Vent			x
Refer to section F-38	Air system	Check			x
Refer to section F-42	Exhaust system	Check			x
Refer to section F-48	Engine oil	Fill system			x
Refer to section F-55	Engine coolant system	Fill system			x
Refer to section F-63	Engine Coolant System	Check vent line for obstructions††			x
Refer to section F-64	Charge air coolant	Fill system††			x

Section	Task Description	B1	B2	B3
Refer to section F-67	Charge air coolant system			x
Refer to section F-86	DDEC Switch ON			x

* 8V procedure

†12V procedure

‡16V procedure

Table 8 Before-Operation Procedures

C-3 – INITIAL OPERATION

The tasks to be performed for initial operation and the numbers of the sections containing task descriptions are listed in Table 9.

Section	Task Description	
-		Carry out before-operation services
Refer to section F-4	Engine	Crank engine: ☐ after 1st start-up ☐ after engine oil change ☐ after engine oil filter change ☐ after extended out-of-service period (exceeding one month)
Refer to section F-5	Engine	Start engine
Refer to section F-6	Engine operation	Carry out warm-up procedure
Refer to section F-7	Engine operation	Check speed
Refer to section F-8	Engine operation	Check pressures (where gages are installed)
Refer to section F-9	Engine operation	Check temperatures (where gages are installed)
Refer to section F-10	Engine operation	Check running noises
Refer to section F-11	Engine operation	Check engine and external pipelines for leaks
	On initial start-up of a new or preserved engine or after a complete overhaul, the following additional tasks must be performed:	
Refer to section F-44	Engine test run	Check exhaust overpressure
Refer to section F-88	DDEC	Switch ON

Table 9 Initial Engine Operation Procedures

C-4 – OPERATIONAL CHECKS — MAINTENANCE PROCEDURES

Carry out tasks specified in Maintenance Schedule. Refer to section D.

C-5 – ENGINE SHUTDOWN

The tasks to be performed for engine shutdown and the numbers of the sections containing task descriptions are listed in Table 10.

Section	Task Description	
Refer to section F-12	Engine	Shut down engine

Table 10 Engine Shutdown Procedures

C-6 – AFTER-SHUTDOWN SERVICES

The tasks to be performed after engine shutdown and the numbers of the sections containing task description are listed in Table 11.

Section	Task Description	
Refer to section F-47	Engine oil	Check level
Refer to section F-58	Engine coolant	Drain - Only when freezing temperatures are expected and the engine is to remain out of service for an extended period and: ☐ the coolant has no antifreeze additive ☐ the engine room cannot be heated ☐ the coolant temperature cannot be maintained at a suitable level ☐ the antifreeze concentration is insufficient for the engine room temperature ☐ or with an antifreeze concentration of 50% and at an engine room temperature below -40°C, if the antifreeze additive conforms to specifications, refer to <i>Engine Service Fluid and Filter Requirements, DDC/MTU Series 2000, MTU/DDC Series 4000 7SE273</i>
Refer to section F-66	Charge air coolant	Drain - Only when freezing temperatures are expected and the engine is to remain out of service for an extended period and: ☐ the coolant has no antifreeze additive ☐ the engine room cannot be heated ☐ the coolant temperature cannot be maintained at a suitable level ☐ the antifreeze concentration is insufficient for the engine room temperature ☐ or with an antifreeze concentration of 50% and at an engine room temperature below -40°C, if the antifreeze additive conforms to specifications, refer to <i>Engine Service Fluid and Filter Requirements, DDC/MTU Series 2000, MTU/DDC Series 4000 7SE273</i>
Refer to section F-84	Fuel supply	Close supply line
Refer to section F-87	DDEC	Switch OFF

Table 11 After Engine Shutdown Procedures

C-7 – OUT-OF-SERVICE PERIOD

If the engine is to remain out of service for a period exceeding two weeks, seal the engine air and exhaust systems.

If the engine is to remain out-of-service for more than three months, store and preserve the engine as described. Refer to section G.

C-8 – ENGINE TRANSPORTATION

Before transporting the engine, the transportation locking devices for the crankshaft must be installed. The engine must only be lifted using the lifting eyes provided.

D – MAINTENANCE SCHEDULE

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D-5 Preventive Maintenance Items	41

D-1 – INTRODUCTION

Low operating and maintenance costs as well as operational reliability and availability depend on maintenance and servicing being carried out in compliance with our specifications and instructions.

The overall system, of which the engine is an integral part, must be maintained in a manner that ensures trouble free engine operation. The following criteria will help ensure this.

- ☐ Sufficient fuel is available.
- ☐ Combustion air is dry and clean (prevents hydrostatic lock).
- ☐ Trained personnel are employed.
- ☐ Suitable tools are used.
- ☐ Detroit Diesel approved replacement parts are used.
- ☐ Fluids and lubricants used per DDC publication *Engine Service Fluid and Filter Requirements, DDC/MTU Series 2000, MTU/DDC Series 4000 (7SE273)*.

Contact the local distributor for technical service.

D-2 – MAINTENANCE SYSTEM

The following is intended as a guide for establishing preventive maintenance intervals. The recommendations given should be followed as closely as possible to obtain long life and optimum performance from Series 2000 engines. Intervals indicated in the table are time (hours) of actual operation.

The DDC maintenance concept features maintenance at the levels listed in Table 12.

Maintenance Period	Description
Daily	Operational Checks.
Scheduled Services	Periodic maintenance services to be performed during out-of-service periods without the need for engine disassembly.

Table 12 Maintenance Periods

NOTE:

Disregard the maintenance schedule for components not installed on your engine.

D-3 – APPLICATION GROUP

The application group for the Series 2000 construction and industrial engine are: heavy vehicles and heavy-duty machinery. Refer to Detroit Diesel Sales and Application information for a full description of application guidelines.

D-4 – MAINTENANCE SCHEDULES

The initial operation services performed after the first 50 operating hours are listed in Table 13.

Item No.	Daily Checks	
1	Lubricating Oil	I
2	Fuel Tank	I
3	Fuel Lines and Flexible Hoses	I
4	Cooling System	I
5	Turbocharger	I

R — Replace.

I — Inspect, service, correct or replace as necessary.

Table 13 Daily Maintenance Schedule

The tasks listed in Table 14 should be performed every 100 hours.

Item No.	100 Hours	
6	Battery	I
7	Drive Belts	I

Table 14 Maintenance Checks for 100 Hours

The tasks listed in Table 15, should be performed after the first 150 hours and after 200 hours. The maintenance tasks for 500 to 3,000 hours are listed in Table 16. The maintenance tasks for 3,500 to 6,000 hours are listed in Table 17.

Item No.	150 Hours	
1	Lubricating Oil	R
8	Air Compressor	I
9	Air Cleaner	I
10	Lubricating Oil Filter	R
11	Fuel Filters	R
Item No.	200 Hours	
12	Coolant / Inhibitor Level	I

R — Replace.

I — Inspect, service, correct or replace as necessary.

Table 15 Checks for 150 and 200 Hours

The maintenance tasks for 500 to 3,000 hours are listed in Table 16.

Item No.	Item	Every 500 Hours	Every 1000 Hours	Every 1500 Hours	Every 2000 Hours	Every 2500 Hours	Every 3000 Hours
1	Lubricating oil	R	R	R	R	R	R
2	Fuel Tank	I	I	I	I	I	I
4	Cooling System	I	I	I	I	I	I
8	Air Compressor	I	I	I	I	I	I
10	Lubricating oil Filter	R	R	R	R	R	R
11	Fuel filter	R	R	R	R	R	R
12	Coolant Pump/Inhibitor Level	I	I	I	I	I	I
13	Cranking Motor	Follow OEM Recommendations					
14	Air System	I	I	I	I	I	I
15	Exhaust System	I	I	I	I	I	I
16	Engine Steam Clean				I		
17	Radiator	I	I	I	I	I	I
18	Oil Pressure	I	I	I	I	I	I
19	Battery Charging Alternator	I	I	I	I	I	I
20	Engine and Trans Mounts	I	I	I	I	I	I
21	Crankcase Pressure	I	I		I		I
22	Fan Hub		I		I		I
23	Thermostat and Seals						
24	Crankcase Breather		I	I	I	I	I
25	Valve Lash						
26	Injector Nozzles						
27	Coolant Level Sensor						

R — Replace. For item number explanations, refer to D-5.

I — Inspect, service, correct or replace as necessary. For item number explanations, refer to D-5.

Table 16 Maintenance Schedule, 500 Hours to 3,000 Hours

The maintenance tasks for 3,500 to 6,000 hours are listed in Table 17.

Item No.	Item	Every 3500 Hours	Every 4000 Hours	Every 4500 Hours	Every 5000 Hours	Every 5500 Hours	Every 6000 Hours
1	Lubricating oil	R	R	R	R	R	R
2	Fuel Tank	I	I	I	I	I	I
4	Cooling System	I	I	I	I	I	I
8	Air Compressor	I	I	I	I	I	I
10	Lubricating oil Filter	R	R	R	R	R	R
11	Fuel filter	R	R	R	R	R	R
12	Coolant Pump/Inhibitor Level	I	I	I	I	I	I
13	Cranking Motor	Follow OEM Recommendations					
14	Air System	I	I	I	I	I	I
15	Exhaust System	I	I	I	I	I	I
16	Engine Steam Clean				I		I
17	Radiator	I	I	I	I	I	I
18	Oil Pressure	I	I	I	I	I	I
19	Battery Charging Alternator	I	I	I	I	I	I
20	Engine and Trans Mounts	I	I	I	I	I	I
21	Crankcase Pressure	I	I		I		I
22	Fan Hub		I		I		I
23	Thermostat and Seals		R				
24	Crankcase Breather	I	I	I	I	I	I
25	Valve Lash						I
26	Injector Nozzles						I
27	Coolant Level Sensor						R

R — Replace. For item number explanations, refer to D-5.

I — Inspect, service, correct or replace as necessary. For item number explanations, refer to D-5.

Table 17 Maintenance Schedule, 3,500 Hours to 6,000 Hours

D-5 – PREVENTIVE MAINTENANCE ITEMS

Item 1 — Lubricating Oil

Check the oil level daily with the engine stopped. If the engine has been stopped and is warm, wait approximately 20 minutes to allow the oil to drain back to the oil pan before checking. Add the proper grade of oil to maintain the correct level on the dipstick.

NOTICE:

Do not overfill. Oil may be blown out through the crankcase breather if the crankcase is overfilled.
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NOTICE:

If the oil level is constantly above normal and excess lube oil has not been added to the crankcase, consult with an authorized Detroit Diesel service outlet for the cause. Fuel or coolant dilution of lube oil can result in serious engine damage.
--

For further information about oil, refer to section F-50.

Item 2 — Fuel and Fuel Tank

Keep the fuel tank filled to reduce condensation.

Refill the tank at the end of the operation each day to prevent condensation from contaminating the fuel. Condensation formed in a partially filled tank promotes the growth of microorganisms that can clog fuel filters and restrict fuel flow. To prevent microbe growth, add a biocide to the fuel tank or primary fuel supply. Follow recommendations of the manufacturer for usage, handling, and safety.

Water accumulation can be controlled by mixing isopropyl alcohol (dry gas) into the fuel oil at a ratio of one pint (0.5 L) per 125 gallons (473 L) fuel (or 0.10 % by volume).

Open the drain at the bottom of the fuel tank every 300 hours (for industrial applications) to drain off any water or sediment.

Every 12 months or 600 hours for industrial applications, tighten all fuel tank mountings and brackets. At the same time, check the seal in the fuel tank cap, the breather hole in the cap and the condition of the flexible fuel lines. Repair or replace the parts, as necessary.

NOTICE:

A galvanized steel tank should never be used for fuel storage, because the fuel oil reacts chemically with the zinc coating to form powdery flakes that can quickly clog the fuel filters and damage the fuel pump and injectors.

Item 3 — Fuel Lines, Flexible Hoses

Check hoses daily as part of the pre-start inspection. Examine hoses for leaks, and check all fittings, clamps and ties carefully. Ensure hoses are not resting on or touching shafts, couplings, heated surfaces including exhaust manifolds, any sharp edges, or other obviously hazardous areas. Since all machinery vibrates and moves to a certain extent, clamps and ties can fatigue with age. To ensure continued proper support, inspect fasteners frequently and tighten or replace them as necessary.

Service Life — A hose has a finite service life. With this in mind, all hoses should be thoroughly inspected at least every 500 operating hours (1,000 hours for fire-resistant fuel and lubricating oil hoses) and/or annually. Look for cover damage and/or indications of twisted, worn, crimped, brittle, cracked, or leaking lines. Hoses with their outer cover worn through or damaged metal reinforcement should be considered unfit for further service.

Item 4 — Cooling System



CAUTION:

Do not remove the pressure control cap from the radiator or attempt to drain the coolant until the engine has cooled. Once the engine has cooled, use extreme caution when removing the cap. The sudden release of pressure from a heated cooling system can result in a loss of coolant and possible personal injury (scalding, eye injury, etc.) from the hot liquid.

Refer to section F-55, for further information about changing coolant.

Item 5 — Turbocharger



CAUTION:

To avoid personal injury or turbocharger damage, do not remove, attach, or tighten turbocharger air intake ducting while the engine is operating or operate the engine with the ducting removed.

Visually inspect the mountings, intake and exhaust ducting and connections for leaks daily. Check the oil inlet and outlet lines for leaks or restrictions to oil flow. Check for unusual noise or vibration and, if excessive, stop the engine and do not operate until the cause is determined.

Item 6 — Battery

Refer to section F-83.

Item 7 — Drive Belts

If a belt tension gage is not available, adjust the belt tension so that a firm push with the thumb, at a point midway between the two pulleys, will depress the belt 12.70—19.05 mm (0.50 in.—0.75 in.). For wear patterns, refer to section F-73.

Item 8 — Air Compressor

All air compressor air intake parts should be removed and cleaned at 150 hours. Check mounting bolts every 300 hours.

To clean either the hair-type or polyurethane-type compressor air strainer element, saturate and squeeze it in fuel oil, or any other cleaning agent that would not be detrimental to the element, until it is dirt-free. Then, dip the element in lubricating oil and squeeze it dry before placing it back in the air strainer.

Item 9 — Air Cleaner

Inspect every 150 hours, or more often if the engine is operated under severe dust conditions. Replace the element if necessary.

Item 10 — Lubricating Oil Filters

For information, refer to section F-54.

Item 11 — Fuel Filters

For information, refer to section F-33.

Item 12 — Water Pump and Coolant Inhibitor Element

Test at required intervals. Refer to section E-12.

Item 13 — Cranking Motor

Contact an authorized starter OEM Service Center for information.

Item 14 — Air System

All the connections in the air system should be checked to ensure they are tight. Check all hoses and ducting for punctures, deterioration or other damage and replace, if necessary.

For further information about the air system, refer to section F-39.

Item 15 — Exhaust System

Check exhaust manifold retaining bolts and other connections for tightness. Refer to section F-41.

Item 16 — Engine, Steam Clean

Steam clean the engine and engine compartment every 2,000 hours.

NOTICE:

Do not apply steam or solvent directly on the battery-charging alternator, starting motor, DDEC components, sensors, or other electrical components as damage to electrical equipment may result.

Item 17 — Radiator

Inspect the exterior of the radiator core. If necessary, clean with a quality grease solvent, such as mineral spirits and dry with compressed air. If operated in extremely dusty or dirty areas, clean more frequently than every 500 hours.

Item 18 — Oil Pressure

Under normal operation, oil pressure is noted each time the engine is started. If equipped with warning lights rather than pressure indicators, check every 500 hours.

Item 19 — Battery-Charging Alternator

Check terminals for corrosion and loose connections. Inspect wiring for damaged or frayed insulation. Repair or replace as required. Refer to section F-73.

Item 20 — Engine and Transmission Mounts

Refer to section F-78.

Item 21 — Crankcase Pressure

Crankcase pressure should be checked and recorded every 1,000 hours.

Item 22 — Fan Hub

If the fan bearing hub assembly has a grease fitting, use a hand grease gun and lubricate the bearings with one shot of Mobilgrease HP, or an equivalent lithium-base multi-purpose grease every 1,000 hours of operation. Do not overfill the housing.

Item 23 — Thermostats and Seals

Replace the thermostats and seals every 4,000 hours or 24 months, whichever comes first.

Item 24 — Crankcase Breather

Refer to section F-19.

Item 25 — Set Valve Lash

Refer to section F-23.

Item 26 — Check and Replace Nozzles

Remove, replace and code again. Refer to section F-30.

Item 27 — Coolant Level Sensor

Replace the coolant level sensor (CLS) every 6,000 hours.

E – TROUBLESHOOTING

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E-1 – GENERAL

The following sections contain directions for troubleshooting.

Internal Coolant Leakage

Subsequential cooling system damage caused by corrosion must be avoided. If the engine cannot be repaired immediately, carry out the following operations:

NOTICE:

These corrosion-prevention measures are only effective for a few days. Repair of the engine and thorough cleaning of all components should, therefore, be carried out as soon as possible.

1. Drain coolant and engine oil.
2. Pour corrosion-inhibitor oil, kerosene, or diesel fuel into the cylinder block via the oil filler tube until the highest possible level of the filler neck is reached.
3. Disconnect charge air/coolant manifolds.
4. Remove the fuel injectors. Refer to section C 075.05.05 *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines).
5. Bar the engine manually and spray corrosion-inhibitor oil, kerosene, or diesel fuel into the combustion chambers via the opening inlet valves.

Before restarting the repaired engine, fill with new oil and coolant in compliance with the current specification *Engine Service Fluid and Filter Requirements, DDC/MTU Series 2000, MTU/DDC Series 4000* (7SE273).

It is essential to change the engine oil after 50 operating hours as the new oil may be contaminated by coolant residues left in the cylinder block.

Engine Oil Dilution by Fuel

When engine oil has been diluted by fuel, it is essential to change the engine oil before restarting the engine. Remove the old oil from the cylinder block with particular care. Replace the engine oil filter.

After Servicing Engine

If running gear components, e.g. pistons, piston rings, cylinder liners, etc. have been replaced, carry out the engine running-in procedure; refer to section B006 in the *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines).

E-2 – ENGINE DOES NOT TURN

Start with the first probable cause for engine not turning when the starter switch/button is pushed, listed in Table 18. Perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete. If the problem still persists, call for technical assistance.

Probable Causes	Check	Remedial Action
Battery	Battery charge state	Charge battery, replace if necessary
	Cable connections	Connect, replace if necessary
Starter	Starter / engine wiring	Connect; replace if necessary
	Starter	Replace
	Ring gear	Replace
Vehicle Monitoring (DDEC)	Vehicle monitoring start release	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)
Running gear blocked	Whether engine can be turned by hand	Repair running gear

Table 18 Engine Does Not Turn

E-3 – ENGINE TURNS BUT DOES NOT FIRE

Start with the first probable cause for engine turns when operating the starter switch but does not fire or stops after a few revolutions, listed in Table 19. Perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Engine receiving insufficient combustion air	Air filter	Replace. Refer to section F-39
	Intercooler	Clean; replace if necessary
	Charge pressure control valve	Replace
	Air supply lines	Seal lines
	Air flow control flap	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)
	Exhaust turbocharger control	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)
Engine receiving insufficient fuel	Refer to section E-8	Refer to section E-17
Compression pressure too low	Refer to section E-7	Refer to section E-7
Engine does not reach firing speed	Battery	Charge, replace if necessary
	Starter	Replace
Electronics wiring loose or faulty	Voltage supply	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)
DDEC not working	Engine monitoring system	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)

Table 19 Engine Turns but Does Not Fire

E-4 – ENGINE FIRES ERRATICALLY AFTER START

Start with the first probable cause for engine fires erratically after start listed in Table 20, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Engine receiving insufficient fuel	Refer to section E-8	Refer to section E-17
Fuel injection equipment faulty	Injection timing	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)
	Injectors	Replace
	Injection pumps	Replace
	Pressure maintaining valve	Replace
DDEC	Engine monitoring system	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)
	Wiring	Tighten connections
	Injection pump solenoid valve	Replace

Table 20 Probable Causes and Action for Engine Fires Erratically

E-5 – ENGINE DOES NOT REACH FULL-LOAD SPEED

Start with the first probable cause for engine not reaching full-load speed listed in Table 21, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Engine receiving insufficient combustion air	Air Filter	Replace
	Air supply lines	Seal lines
	Intercooler	Clean; replace if necessary
	Exhaust turbocharger	Repair
	Charge pressure control valve	Replace
	Air flow control flap control; turbocharger control	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)
	Exhaust turbocharger control	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)
Fuel injection equipment faulty	Injector timing	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)
	Injectors	Replace
	Injection pumps	Replace
	Pressure maintaining valve	Replace
Overloading	Gearbox	Repair
Engine receiving insufficient fuel	Refer to section E-8	Refer to section E-8
Charge air temperature too high	Refer to section E-8	Refer to section E-8
Electronics	Engine governor	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)
	Injection pump solenoid valve	Replace

Table 21 Engine Does not Reach Full-Load Speed

E-6 – ENGINE SPEED NOT STEADY

Start with the first probable cause for engine speed not steady listed in Table 22, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Fuel injection equipment faulty	Injection timing	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)
	Injectors	Replace
	Injection pumps	Replace
	Pressure maintaining valve	Replace
Electronics	Voltage supply	Repair
DDEC	Engine monitoring system	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)

Table 22 Engine Speed Not Steady**E-7 – COMPRESSION PRESSURE TOO LOW**

Start with the first probable cause for compression pressure too low listed in Table 23, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Cylinder head gasket leaking	Cylinder head gasket	Replace
Valve seats in cylinder head worn	Cylinder head	Repair
Valves do not close	Valve clearances	Adjust
	Valves	Recondition; replace if necessary
Piston rings worn	Piston rings	Replace

Table 23 Compression Pressure Too Low

E-8 – LOW PRESSURE FUEL PUMP PRESSURE TOO LOW

Start with the first probable cause for fuel pressure too low listed in Table 24, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Fuel supply blocked	Shutoff valve in fuel system	Open
Fuel level too low	Fuel supply	Replenish
Fuel line leaking	Seals	Replace seal if necessary
Fuel filter contaminated	Fuel filters	Replace filter; Refer to section F-33
Fuel delivery pump faulty	Fuel delivery pump and drive	Repair; replace if necessary

Table 24 Fuel Pressure Low

E-9 – TURBOCHARGER - ABNORMAL RUNNING NOISES

Start with the first probable cause for exhaust turbocharger — abnormal running noises listed in Table 25, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Turbocharger dirty	Exhaust turbocharger	Clean
Turbocharger faulty	Turbocharger bearing	Replace
	Rotor assembly	Replace

Table 25 Abnormal Running Noises

E-10 – CHARGE AIR TEMPERATURE TOO HIGH

Start with the first probable cause for charge air temperature too high listed in Table 26, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Charge air cooler dirty	Intercooler	Clean
Charge air coolant temperature too high	Coolant thermostat	Check, replace if necessary
Antifreeze concentration too high	Engine coolant Charge air coolant	Rectify concentration as per specifications
Incorrect corrosion inhibitor (deposits in CAC charge air cooler)	Charge air coolant Coolant inhibitor	Clean coolant system. Treat engine coolant (<i>Oil, Fuel, and Filter Requirements, DDC/MTU Series 2000, MTU/DDC Series 4000 7SE273</i> . Replace CAC charge air cooler if necessary.

Table 26 Charge Air Temperature Too High

E-11 – CHARGE AIR PRESSURE TOO LOW

Start with the first probable cause for charge air pressure too low listed in Table 27, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Engine receiving insufficient combustion air	Air filter	Replace
	Air supply lines	Seal lines
	CAC charge air cooler	Clean, replace if necessary
	Intercooler	Clean; replace if necessary
	Charge pressure control valve	—
	Exhaust turbocharger	Repair
DDEC electronics	Engine monitoring system	Refer to <i>DDEC III/IV Single ECM Troubleshooting (6SE497)</i>

Table 27 Charge Air Pressure Too Low

E-12 – CHARGE AIR COOLER, COOLANT DISCHARGE AT WEEP HOLE

Start with the first probable cause for the charge air cooler, coolant discharge at the weep hole, listed in Table 28, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Charge air cooler leaking	Coolant discharge from intake manifold elbow weep holes	Replace charge air cooler

Table 28 Coolant Discharge at Intake Manifold Weep Holes

E-13 – EXHAUST GASES BLACK

Start with the first probable cause for exhaust gases black listed in Table 29, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Engine receiving insufficient combustion air	Air supply line	Seal lines
	Air filter	Replace.
	CAC intercooler	Clean; replace if necessary
	Turbocharger control	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)
Fuel injection equipment faulty	Refer to section E-4	Refer to section E-4
Too high resistance in exhaust system	Exhaust back pressure Exhaust system	Clean exhaust silence
Engine overload; power take-off too high	Gearbox	Repair.
DDEC electronics	Engine monitoring system	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)

Table 29 Exhaust Gases Black

E-14 – EXHAUST GASES BLUE

Start with the first probable cause of exhaust gases blue listed in Table 30, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Too much oil in combustion chambers	Engine oil level	Correct oil level. Refer to section F-47
	Exhaust turbocharger	Repair
	Crankcase breather / ventilation	Replace
	Valve stem seals	Replace
	Piston rings	Replace
	Valve guides	Replace
	Cylinder liners	Replace
Compression pressure too low	Refer to section E-7	Refer to section E-7

Table 30 Exhaust Gases Blue**E-15 – EXHAUST GASES WHITE**

Start with the first probable cause of exhaust gases white listed in Table 31, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Fuel injection equipment	Injectors	Replace
	Injection pump	Replace
	Fuel injection equipment	Contact DDC Technical Service
Engine cold	Engine coolant temperature	Refer to section E-23
Unburned fuel	Coolant in fuel	Drain fuel tank
Water coolant in combustion chambers	Charge air cooler Intercooler	Replace
	Exhaust turbocharger	Repair
	Cylinder head gaskets	Replace
	Cylinder heads cracked	Replace
	Cylinder liners	Replace

Table 31 Exhaust Gases White

E-16 – STARTER POWER SUPPLY FAULTY

Start with the first probable cause for starter power supply faulty listed in Table 32, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Battery not or insufficiently charged	Poly-vee belt	Adjust tension; replace if necessary
	Generator / alternator	Repair or replace
	Battery	Replace
Wiring harnesses	Harnesses and connectors shorted or damaged pins/wires	Secure; repair or replace as necessary
	Open circuit	Repair
Charge Indicator Lamp	Connection cable to indicator lamp	Secure
	Fuses	Replace
	Charge indicator lamp	Replace
	Battery	Replace
	Generator voltage regulator	Replace
	Generator / alternator	Tighten cable fixtures Replace
	Connection cable on starter	Secure
DDEC	Engine monitoring system	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)

Table 32 Starter Power Supply Faulty

E-17 – ENGINE OIL CONSUMPTION ABNORMALLY HIGH

Start with the first probable cause for engine oil consumption abnormally high listed in Table 33, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Crankcase ventilation faulty	Crankcase breather	Replace
Engine oil system leaking externally	External subassemblies	Seal pipework
	External pipework	Check connections; tighten if necessary
	Engine oil drains	Seal
	Shaft seals	Replace
	Oil pan	Seal pipework
	Crankcase	Repair
Intake air depression too high	Contamination indicator	Replace air filter
Engine oil system leaking internally	Oil in coolant system	Replace sealing rings
Exhaust turbocharger leaking	Exhaust turbocharger	Replace turbocharger
Engine wear	Valve stem seal	Replace
	Piston rings	Replace
	Valve guides	Replace
	Cylinder liners	Replace

Table 33 Engine Oil Consumption Abnormally High

E-18 – ENGINE OIL LEVEL ABNORMALLY HIGH

Start with the first probable cause for engine oil level abnormally high listed in Table 34, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Fuel or water in engine oil	Engine oil quality	—
Fuel in engine oil	Injectors	Replace seals to cylinder head
	Injection pump	Replace seals to crankcase
Water in engine oil	Exhaust turbocharger	Replace
	Crankcase	Repair
	Cylinder heads	Replace
	Cylinder liner seals	Replace
	Cylinder liners	Replace
	Lower connection	Replace
	Coolant distribution housing	Replace

Table 34 Engine Oil Level Abnormally High

E-19 – ENGINE OIL TEMPERATURE TOO HIGH

Start with the first probable cause of engine oil temperature too high, listed in Table 35, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Engine oil heat exchanger dirty	Engine oil heat exchanger	Clean; replace if necessary
Coolant temperature too high	Refer to section E-22	Refer to section E-22
DDEC electronics	Engine monitoring system	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)

Table 35 Engine Oil Temperature High

E-20 – ENGINE OIL PRESSURE TOO HIGH

Start with the first probable cause for engine oil pressure too high listed in Table 36, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Oil viscosity too high	Engine oil viscosity	Change engine oil
Engine oil system	Engine oil pressure relief valve	Replace
Coolant in engine oil	Refer to section E-18	Refer to section E-18
Electronics (DDEC)	Engine monitoring system	Replace; refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)

Table 36 Engine Oil Pressure High**E-21 – ENGINE OIL PRESSURE TOO LOW**

Start with the first probable cause of engine oil pressure too low listed in Table 37, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Engine oil filter dirty	Engine oil filter	Replace filter
Engine oil level too low	Engine oil level	Replenish
Electronics (DDEC)	Engine monitoring system	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)
Engine oil system leaking externally	Refer to section E-17	Refer to section E-17
Fuel in engine oil	Engine oil quality	Refer to section E-18
Engine oil pressure relief valve	Opening pressure	Adjust, or replace
Engine oil pump	Engine oil pump	Repair; replace if necessary
Pressure loss in running gear	Running gear lubrication points	Replace bearings

Table 37 Engine Oil Pressure Too Low

E-22 – ENGINE COOLANT TEMPERATURE TOO HIGH

Start with the first probable cause for engine coolant temperature too high listed in Table 38, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Engine coolant level too low	Engine coolant level	Add engine coolant
Engine coolant system dirty	Engine coolant system	Clean
	Vent lines	Clean
	Engine coolant heat exchanger	Clean; replace if necessary
Coolant distribution in engine	Restrictor beneath thermostat housing	Install
DDEC	Indicator lamp	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)
Engine coolant thermostat	Engine coolant thermostat	Replace
Engine coolant pressure too low	Refer to section E-24	Refer to section E-24
Electronics (DDEC)	Engine monitoring system	Repair; replace if necessary. Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)

Table 38 Engine Coolant Temperature High

E-23 – ENGINE COOLANT TEMPERATURE TOO LOW

Start with the first probable cause for engine coolant temperature too low listed in Table 39, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Engine coolant thermostat faulty	Engine coolant thermostat	Replace
Electronics (DDEC)	Engine monitoring system	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)

Table 39 Engine Coolant Temperature Low

E-24 – ENGINE COOLANT PRESSURE TOO LOW

Start with the first probable cause for engine coolant pressure too low listed in Table 40, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Coolant system not sealed	Cover closed	Close cover
	Breather valve	Replace cover
Engine coolant system leaking externally	External pipework	Check connections; tighten if necessary
	External subassemblies	Check connections; tighten if necessary
	Coolant drain points	Seal
	Crankcase	Check for leaks; replace if necessary
	Engine coolant heat exchanger	Repair
Engine coolant level too low	Engine coolant level	Add engine coolant
Engine coolant pump faulty	Engine coolant pump	Replace
Engine coolant system leaking internally	Oil quality	Change engine oil
	Cylinder heads	Replace
	Cylinder liner gaskets	Replace
Electronics (DDEC)	Engine monitoring system	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)

Table 40 Engine Coolant Pressure Low**E-25 – ENGINE COOLANT LOSS**

Start with the first probable cause for engine coolant loss listed in Table 41, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Engine coolant system leaking externally	Refer to section E-24	Refer to section E-24
Engine coolant system leaking internally	Refer to section E-24	Refer to section E-24
Engine coolant pump leaking	Engine coolant pump	Repair

Table 41 Engine Coolant Loss

E-26 – ENGINE COOLANT LEVEL RISING

Start with the first probable cause engine coolant level rising listed in Table 42, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Engine oil in engine coolant	Engine oil heat exchanger	Repair; replace if necessary
	Engine coolant quality	Refer to section E-24
Air in engine coolant	Vent lines	Clean
	Compression pressures	Replace cylinder head gaskets

Table 42 Engine Coolant Level Rising

E-27 – ENGINE COOLANT PUMP LEAKING AT WEEP HOLE

Start with the first probable cause for engine coolant pump leaking at the weep hole listed in Table 43, perform the check and take the suggested remedial action. If the problem persists, go to the next probable cause, perform the check, etc., until troubleshooting is complete.

Probable Causes	Check	Remedial Action
Engine coolant pump leaking	For oil discharge	Replace sealing ring
	Engine coolant discharge	Replace slip ring; replace engine coolant pump if necessary

Table 43 Engine Coolant Pump Leaking

E-28 – LAMP TEST — INDICATOR LAMP DOES NOT LIGHT

Start with the first probable cause for an indicator lamp not lighting listed in Table 44, perform the check and take the suggested remedial action.

Probable Causes	Check	Remedial Action
Electronics (DDEC)	Indicator lamp	Refer to <i>DDEC III/IV Single ECM Troubleshooting</i> (6SE497)

Table 44 Indicator Lamp Does Not Light

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F-1 – DISABLING ENGINE START

When performing certain engine checks and before engine storage, disable engine start as follows:

1. Switch off the ignition and remove the key.

 CAUTION:
Explosive gas may remain in or around the battery for several hours after it has been charged. Sparks or flames can ignite this gas causing an internal explosion which could shatter the battery. Flying pieces of the battery structure and splash of the electrolyte can cause injury. The battery electrolyte is an acid. Extreme care should be exercised to avoid skin or eye contact with the electrolyte. If you come in contact with battery electrolyte: ☐ Flush your skin with water. ☐ Apply baking soda or lime to help neutralize the acid. ☐ Flush your eyes with water. ☐ Get medical attention immediately.

1. Disconnect the battery.
2. Shut off fuel supply to engine. Refer to section F-84.
3. Attach safety lockout tag.

F-2 – ENABLING ENGINE START

After engine checks are performed, enable engine start as follows:

1. Before connecting the cable to the battery, check battery polarity.

 CAUTION:
To avoid injury, check battery polarity before connecting the cable to the battery. Battery pole reversal may lead to injury through the sudden discharge of acid or bursting of the battery body. Wear safety glasses.

2. Connect the battery.
3. Open the fuel supply to the engine. Refer to section F-84.
4. Remove safety lockout tag.
5. Switch on the ignition.

F-3 – MANUAL ENGINE BARRING

Manually bar the engine as follows:



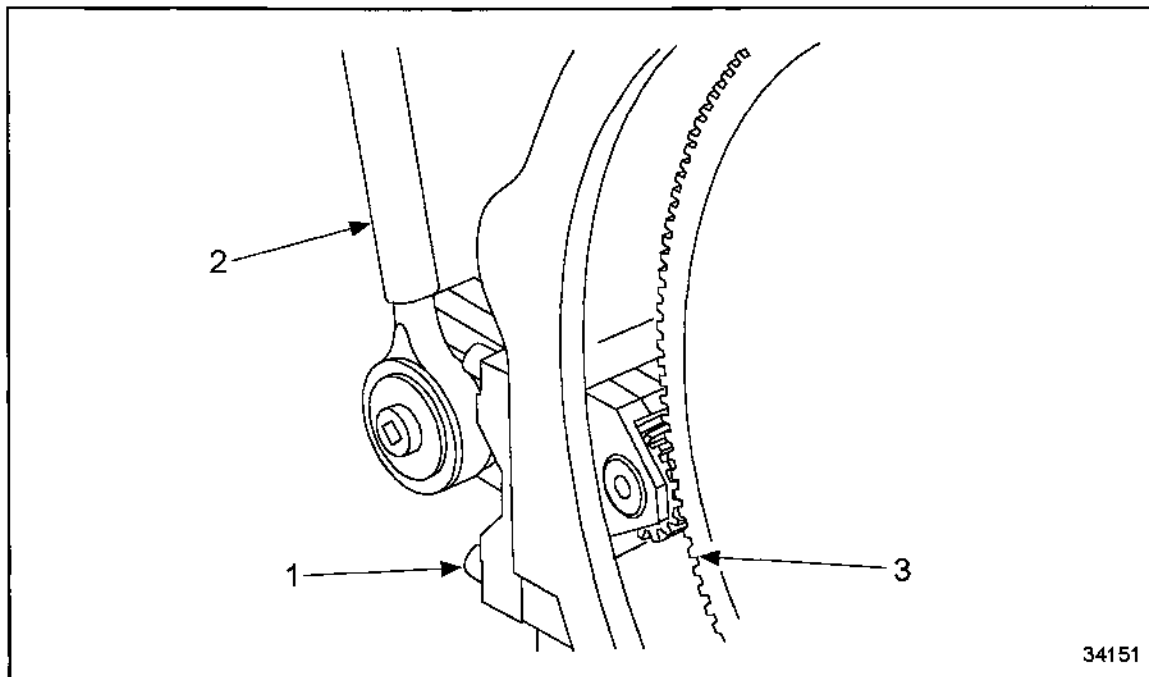
CAUTION:

Unguarded rotating and moving engine components can cause injury. After working on the engine, check that all protective devices have been reinstalled and all tools removed from the engine. Before barring or starting the engine, ensure that nobody is in the danger zone.

NOTE:

Apart from the normal compression resistance, there should be no abnormal resistance when barring the engine.

1. Disable engine start; refer to section F-1.
2. Install engine barring tool (1).
3. Attach ratchet (2) to engine barring tool (1). See Figure 6.



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1. Engine Barring Tool
2. Ratchet

3. Ring Gear

Figure 6 Engine Barring

4. Bar engine manually.
5. Remove ratchet.
6. Remove engine barring tool. Refer to section F-21.
7. Enable engine start. Refer to section F-2.

F-4 – ENGINE CRANKING WITH STARTER



CAUTION:

Unguarded rotating and moving engine components can cause injury. After working on the engine, check that all protective devices have been reinstalled and all tools removed from the engine. Before barring or starting the engine, ensure that nobody is in the danger zone.

Activate the starter for 10 seconds maximum, no longer. Before repeating a start attempt, wait at least 20 seconds so that the starter cools down. For engine cranking without firing, refer to the *DDEC III/IV Single ECM Troubleshooting Manual*, (6SE497).

F-5 – ENGINE STARTING



CAUTION:

Unguarded rotating and moving engine components can cause injury. After working on the engine, check that all protective devices have been reinstalled and all tools removed from the engine. Before barring or starting the engine, ensure that nobody is in the danger zone.

When the preparatory work has been carried out in accordance with the Operating Instructions, refer to section C-1, the engine can be restarted.

NOTE:

Always start the engine under no-load conditions.

Carry out engine start (refer to the *DDEC III/IV Single ECM Troubleshooting Manual*, (6SE497).

Activate the starter for 10 seconds maximum, no longer. Before repeating a start attempt, wait at least 20 seconds so that the starter cools down.

Do not increase engine speed until oil pressure is displayed.

F-6 – ENGINE WARM-UP

NOTICE:
Do not operate the engine at full speed until engine coolant temperature reaches 40°C (104°F).

Increase engine load as slowly as possible until coolant temperature of 40°C (104°F) is reached.

F-7 – ENGINE SPEED CHECK

Check idle and full-load speeds.

F-8 – ENGINE PRESSURE CHECK

Check engine oil pressure for specified values.

For specified values, refer to the performance curves. Refer to section B-5.

F-9 – ENGINE TEMPERATURE CHECK

Check engine coolant temperature for specified values.

For specified values, refer to the performance curves. Refer to section B-5.

F-10 – ENGINE RUNNING NOISE CHECK



CAUTION:
Exhaust products of an internal combustion engine may cause illness, injury, or death if inhaled in certain quantities. Always start and operate an engine in a well-ventilated area. If the vehicle is inside a building or other enclosed area, engine exhaust should be vented into the outside air. Do not modify or tamper with the exhaust system.

Run engine at idling speed.

No abnormal sounds should be heard apart from the usual running noises.

F-11 – ENGINE AND EXTERNAL PIPELINE LEAK CHECK

Check for leaks as follows:

 CAUTION:
Exhaust products of an internal combustion engine may cause illness, injury, or death if inhaled in certain quantities. Always start and operate an engine in a well-ventilated area. If the vehicle is inside a building or other enclosed area, engine exhaust should be vented into the outside air. Do not modify or tamper with the exhaust system.

1. Run engine under load.
2. Check engine and all lines for leaks.
3. If leaks are found, shut down the engine.
4. When the engine has cooled, repair or replace the leaking lines.

NOTE:

Never tighten lines when under pressure.

F-12 – ENGINE SHUTDOWN

NOTICE:
Never shut down the engine directly from full-load operation, as this may result in overheating and wear of the engine components.

Before shutting down the engine, disengage the gearbox and run the engine at idling speed watching the temperature decrease. Do not press the Engine Shutdown button until a constant temperature is indicated.

Press Engine Shutdown button at the control station or on the driver's console.

F-13 – EMERGENCY SHUTDOWN

Press the Emergency Shutdown button at the control station or on the driver's console.

F-14 – ATTACHMENTS — SECURING BOLT TIGHTNESS CHECK

Check the securing bolt tightness for exhaust system. Refer to section F-45.

Check the securing bolt tightness for the PTO system, front end. Refer to section F-80.

Check engine bolts. Check tightness of all securing bolts using a torque wrench.

F-15 – ATTACHMENTS — HOSE AND HOSE CONNECTIONS CHECK

Check all hoses and hose connections on the engine for condition and leaks. Immediately replace hoses showing signs of scuffing, aging or cracking.

F-16 – COMPRESSION PRESSURE CHECK

Follow these steps to check the compression pressure.

1. Shut off fuel supply to engine. Refer to section F-84.
2. Remove cylinder head cover. Refer to section F-25.
3. Remove injector. Refer to section C 075.05.05 *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines) for the procedure to install fuel injectors.
4. Bar engine with starting system to remove any loose carbon deposits from the combustion chambers. Refer to section F-4.
5. Install adaptor with sealing ring in the injector bore and tighten with the clamping element.
6. Connect the compression pressure recorder to the adaptor.
7. Bar engine with starting system until no further pressure rise is indicated.
8. Read off and record the values.
9. Actuate vent valve.
10. Carry out check in the same way on all other cylinders.
11. Determine mean value of the compression pressures:
 - ☐ The difference between the mean value and the individually measured compression pressures must not exceed 3 bar (300 kPa).
12. Install injectors. Refer to section C 075.05.11, *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines) for the procedure to install fuel injectors.
13. Install cylinder head valve cover. Refer to section F-26.
14. Open fuel supply to the engine. Refer to section F-84.

F-17 – COMBUSTION CHAMBER BORESCOPE EXAMINATION

A borescope examination allows visual assessment of cylinder liners, piston crowns, and cylinder heads and valves.

NOTE:

For engines in service, If possible carry out a combustion chamber borescope examination after operation under load.

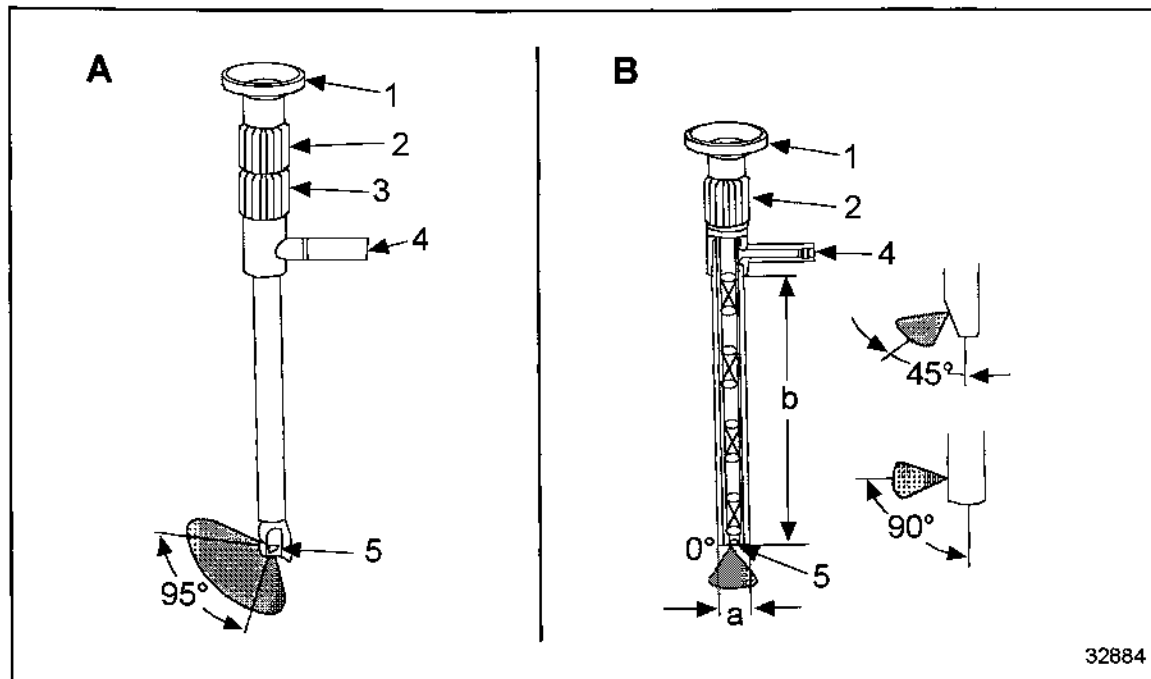
Before the Borescope Examination

Prepare for the borescope examination as follows:

1. Remove injector.
2. Crank engine with starting system.
3. Disable engine start; refer to section F-1.
4. Install engine barring tool.
5. Use engine barring tool to turn engine until, for the respective cylinder:
 - [a] The piston is at BDC for cylinder liner inspection.
 - [b] The piston is in a position which allows unrestricted examination of the piston crown, lower side of the cylinder head and valves.
 - [c] All valves are open and closed for inspection of valves and valve seats.

NOTE:

Use a borescope with an adequate light rating and a prism (5) which pivots 95 degrees (total viewing angle 140 degrees). See Figure 7A. If a borescope with pivoting system is not available, individual borescopes with prism settings of 0, 45 and 90 degrees are required. See Figure 7B.



1. Eyepiece
2. Focus Device
3. Adjuster Ring

4. Light Source
5. Prism

Figure 7 **Types of Borescopes**

NOTE:

Maximum possible diameter of *a* in the illustration is 16 mm (0.6 in.). See Figure 7B.

Borescope Examination:

Follow these steps to examine with a borescope:

1. Connect borescope to light source (4) and insert it through the cylinder head (fuel injector bore) into the combustion chamber.
2. Use the focus device (2) to focus the eyepiece (1) and adjuster ring (3) to align the prism (5) with the area under inspection.
3. Visually assess the cylinder liners, piston crowns, underside of the cylinder heads and valves. To do the visual assessment, rotate the borescope through 360 degrees in each case and set the prism accordingly.

Assessment:

Cylinder liners may be used again when:

1. The honing pattern is clearly visible.
2. Locally limited polished areas are evident in the honing structure.
3. Minor scoring is evident (minor scoring can be caused during piston installation).
4. Minor corrosion is evident (film rust after extended out-of-service periods is possible).

Piston crowns may be used again when:

- ☐ Fuel injector spray pattern is clearly visible.
- ☐ Minor carbon or oil deposits are evident.
- ☐ Minor corrosion is evident.

Cylinder heads and valves may be used again when:

- ☐ Minor carbon or oil deposits are evident.
- ☐ Minor corrosion is evident.
- ☐ Minor pitting is evident on valves and valve seats.
- ☐ The valves close fully.

NOTE:

If extensive wear or damage due to mechanical, chemical or thermal action is found, or the problems still exist, remove the affected cylinder heads and check again. Repair or replace the individual components as necessary.

After the Borescope Examination

Perform the following after the borescope examination:

1. Remove engine barring tool. Refer to section F-21.
2. Install injector. Refer to section C 075.05.11, *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines) for the procedure to install fuel injectors.
3. Enable engine start. Refer to section F-2.

F-18 – ENGINE EXTERNAL CLEANING

NOTICE:

When removing deposits and/or cleaning, use only non-chemical cleaning agents which do not damage light-alloy, nonferrous metal, steel, gray cast iron and elastomers.
--

For environmental reasons, clean the engine only at places with a suitable oil separator.

Use a high-pressure or steam jet for cleaning. Read through the appropriate operating instructions, paying particular attention to the safety instructions before initial operation.

NOTICE:

For exterior cleaning with the high-pressure jet, use a fan jet nozzle only.
--

Cleaning the engine externally as follows:



CAUTION:

To avoid injury when working with high-pressure and steam jets, never aim at persons, animals, electrical or electronic equipment. Wear protective clothing, protective gloves and protective goggles or safety mask.

1. Disable engine start. Refer to section F-1.



CAUTION:

To avoid injury, do not go any closer than 20 cm (8 in.) to the object that is being sprayed.



CAUTION:

To avoid injury and damage to the equipment, the temperature of the cleaning agent must not rise above a maximum of 80°C (176°F).

NOTICE:

The jet pressure must not exceed 10 bar (150 psi) during exterior engine cleaning with a high-pressure cleaner or steam jet.

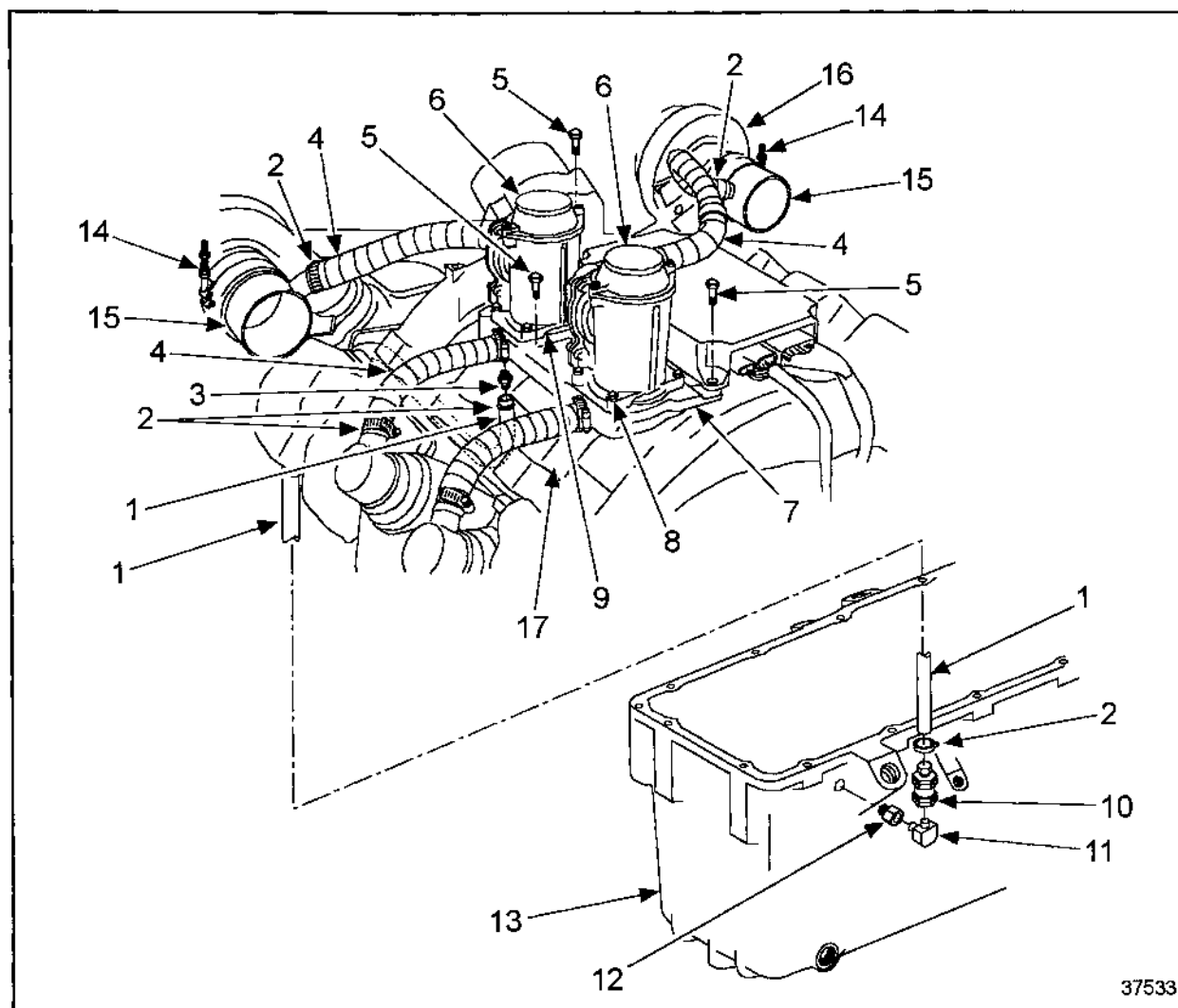
NOTICE:

Ensure that the electrical components do not become moist as this can lead to engine malfunctions and failure.

2. Loosen the dirt by spraying on a thin coating of cleaning agent and allow one to five minutes, depending on the degree of contamination, for it to react.
3. Remove the dirt by spraying off the dirt that has been loosened.
4. Enable engine start. Refer to section F-2.

F-19 – CRANKCASE BREATHER — OIL SEPARATOR CHECK

Visually check the oil separator for external damage and oil discharge from the breather. See Figure 8.

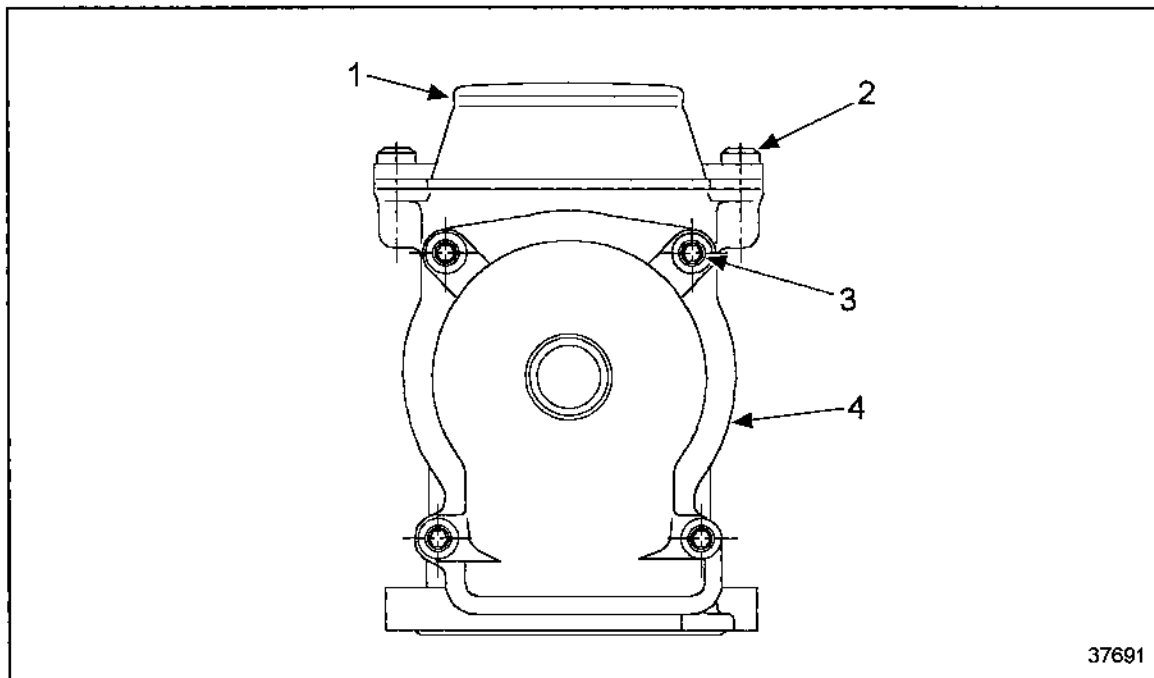


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- | | |
|-------------------|-------------------------|
| 1. Oil Drain Line | 10. Check Valve |
| 2. Hose Clamp | 11. Elbow |
| 3. Adaptor | 12. Adaptor |
| 4. Hose | 13. Oil Pan |
| 5. Bolt | 14. Clamp |
| 6. Oil Separator | 15. Adaptor |
| 7. Breather Base | 16. Turbocharger |
| 8. Bolt | 17. Air Intake Manifold |
| 9. Gasket | |

Figure 8 General View of Crankcase Breather

If external damage is detected, or if oil emerges through defective rubber diaphragms, always replace the oil separator. See Figure 9.



1. Cover

2. Bolt

3. Bolt

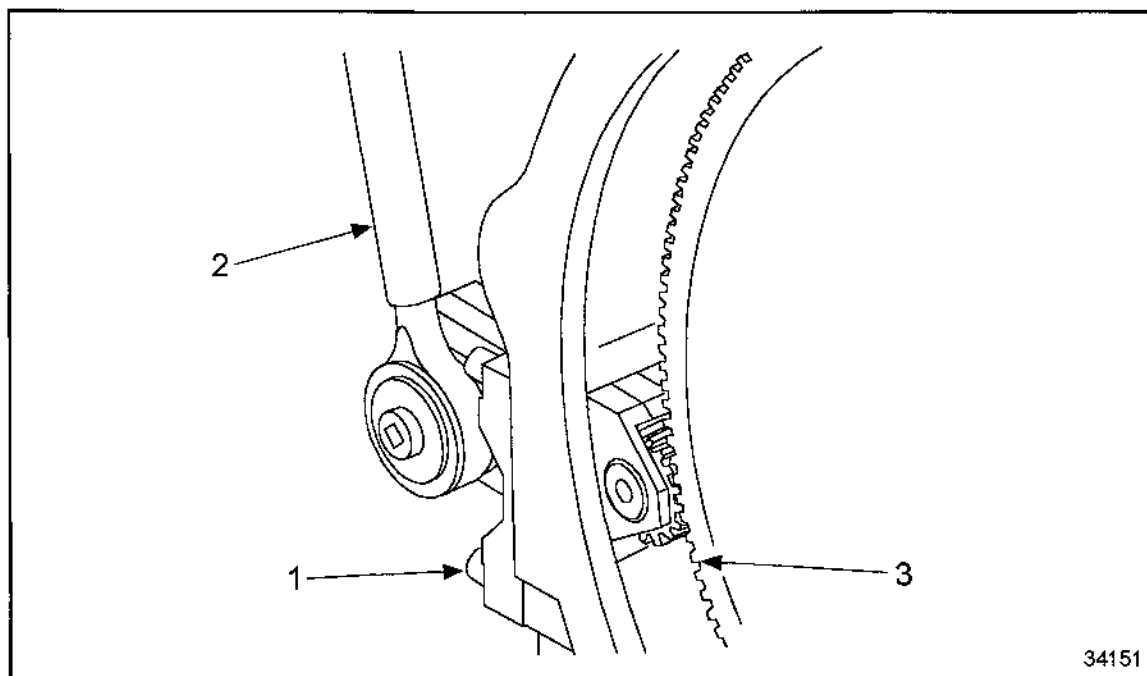
4. Cover

Figure 9 Oil Separator

F-20 – ENGINE BARRING TOOL INSTALLATION

Install the engine barring tool as follows:

1. Disable engine start. Refer to section F-1.
2. Remove cover from flywheel housing.
3. Engage engine barring tool (1) with ring gear (3) and attach to flywheel housing. See Figure 10.



1. Engine Barring Tool

3. Ring Gear

2. Ratchet

Figure 10 Barring the Engine Manually

F-21 – ENGINE BARRING TOOL REMOVAL

Remove the engine barring tool as follows:

1. Remove ratchet (2) and engine barring tool (1) from flywheel housing. See Figure 10.
2. Bolt cover to flywheel housing.
3. Enable engine start. Refer to section F-2.

F-22 – VALVE OPERATING MECHANISM OIL SUPPLY CHECK

Check the valve operating mechanism oil supply as follows:

1. Shut down engine. Refer to section F-12.
2. Disable engine start. Refer to section F-1.
3. Remove rocker cover. Refer to section F-25.
4. Check that the rocker arms and the rocker cover (inside) are coated with oil.
5. Install rocker cover. Refer to section F-26.
6. Enable engine start. Refer to section F-2.

F-23 – VALVE CLEARANCE CHECK

The procedures to check the valve clearance can be found in section C055.05.11 of the *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines).

F-24 – VALVE CLEARANCE ADJUSTMENT

The procedures to adjust the valve clearance can be found in section C055.05.11 of the *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines).

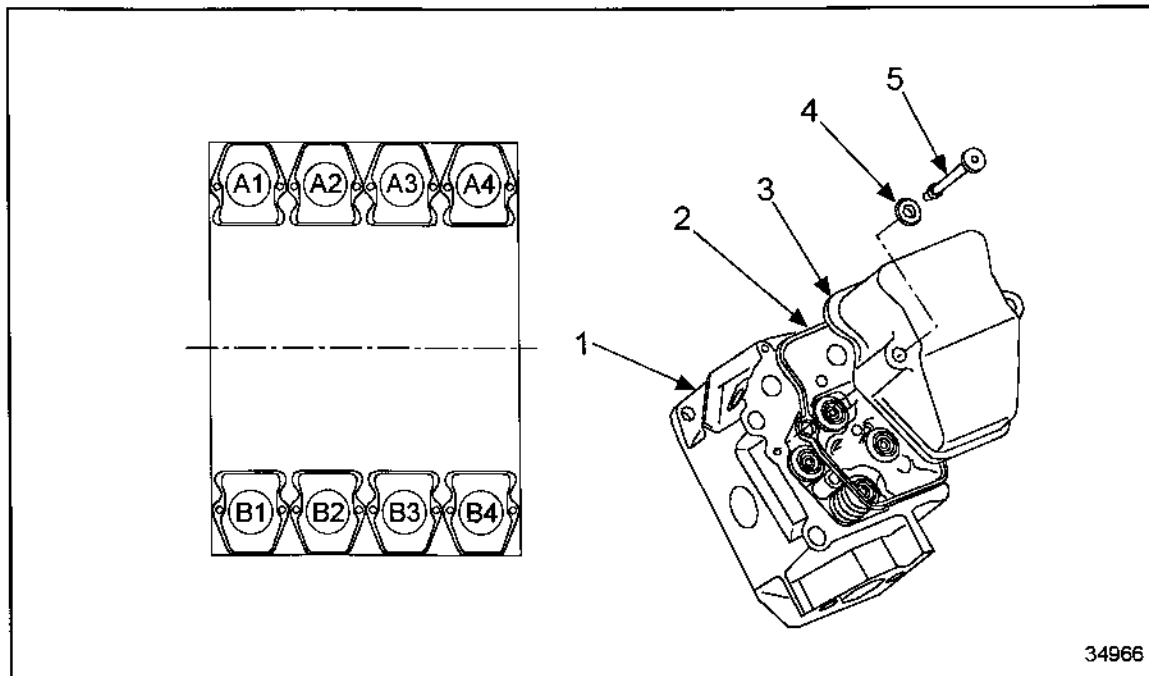
These procedures cover:

- ☐ Valve clearance adjustment in two crankshaft positions
- ☐ Valve bridge adjustment

F-25 – CYLINDER HEAD ROCKER COVER REMOVAL

Remove the cylinder head cover as follows: (This procedure can also be found in section C055.101.05 of the *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines).

1. Disable engine start. Refer to section F-1.
2. Remove collar screws (5).
3. Remove cylinder head rocker cover (3) and gasket (2). See Figure 11.



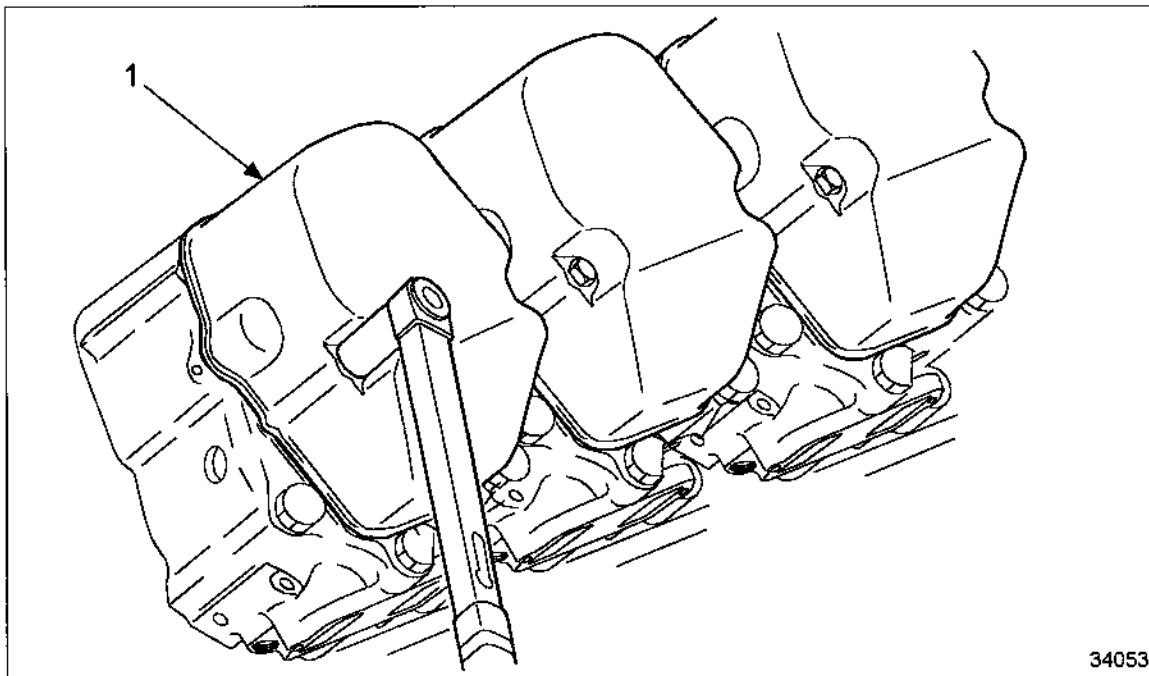
- | | |
|------------------------|-------------------|
| 1. Cylinder Head | 4. Sealing Washer |
| 2. Profile Gasket | 5. Collar Screw |
| 3. Cylinder Head Cover | |

Figure 11 Removing Cylinder Head Rocker Cover

F-26 – CYLINDER HEAD ROCKER COVER INSTALLATION

Install the cylinder head cover as follows: (This procedure can also be found in section C055.101.11 of the *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines).

1. Clean the mating faces.
2. Check that the profile gasket in the cover is in perfect condition, replace if necessary.
3. Place the cylinder head rocker cover (1) on the cylinder head.
4. Insert bolts with new sealing washers and torque to 25 N·m (18 lb·ft). See Figure 12. Use engine oil as lubricant.



1. Cylinder Head Rocker Cover

Figure 12 **Installing Cylinder Head Rocker Cover**

5. Enable engine start. Refer to section F-2.

F-27 – INJECTION PUMP REMOVAL

Remove the injection pump. This procedure can be found in section C073.051.05 of the *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines).

F-28 – INJECTION PUMP INSTALLATION

Install the injection pump. This procedure can be found in section C073.051.11 of the *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines).

F-29 – FUEL INJECTOR REMOVAL

Refer to section C 075.05.05 *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines) for the procedure to remove fuel injectors.

F-30 – INJECTOR INSPECTION

Refer to section C 075.05.08 *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines) for the procedure to inspect fuel injectors.

F-31 – INJECTOR REPLACEMENT

The fuel injectors can be ordered from DDC. The engine control system must be coded again after installing the new injectors. Refer to the *DDEC III/IV Single ECM Troubleshooting Manual*, (6SE497).

F-32 – FUEL INJECTOR INSTALLATION

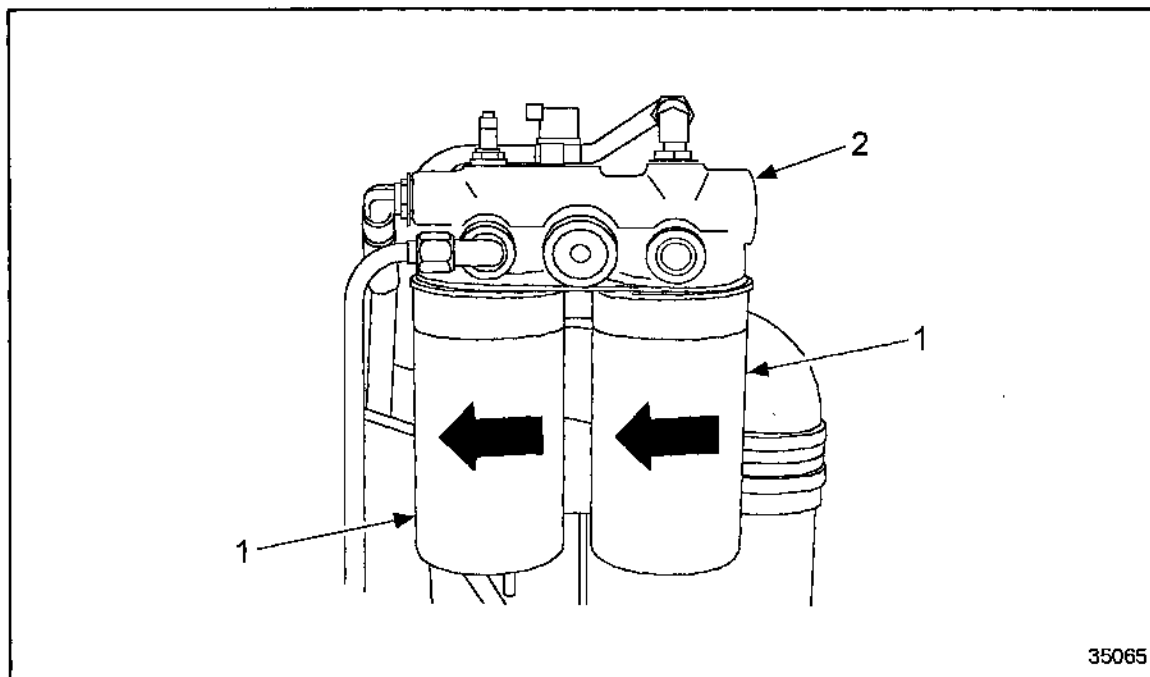
Refer to section C 075.05.11 *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines) for the procedure to install fuel injectors.

F-33 – FUEL FILTER REPLACEMENT

Replace the fuel filters as follows:

 CAUTION:
Diesel fuel is a combustible fluid. To avoid injury when working on the fuel system, do not smoke, use open flame, or electrical equipment. Risk of a fire is probable. Perform maintenance in a well-ventilated work area with access to a fire extinguisher.

1. Disable engine start. Refer to section F-1.
2. Remove filter and dispose of it in accordance with local regulations. See Figure 13.



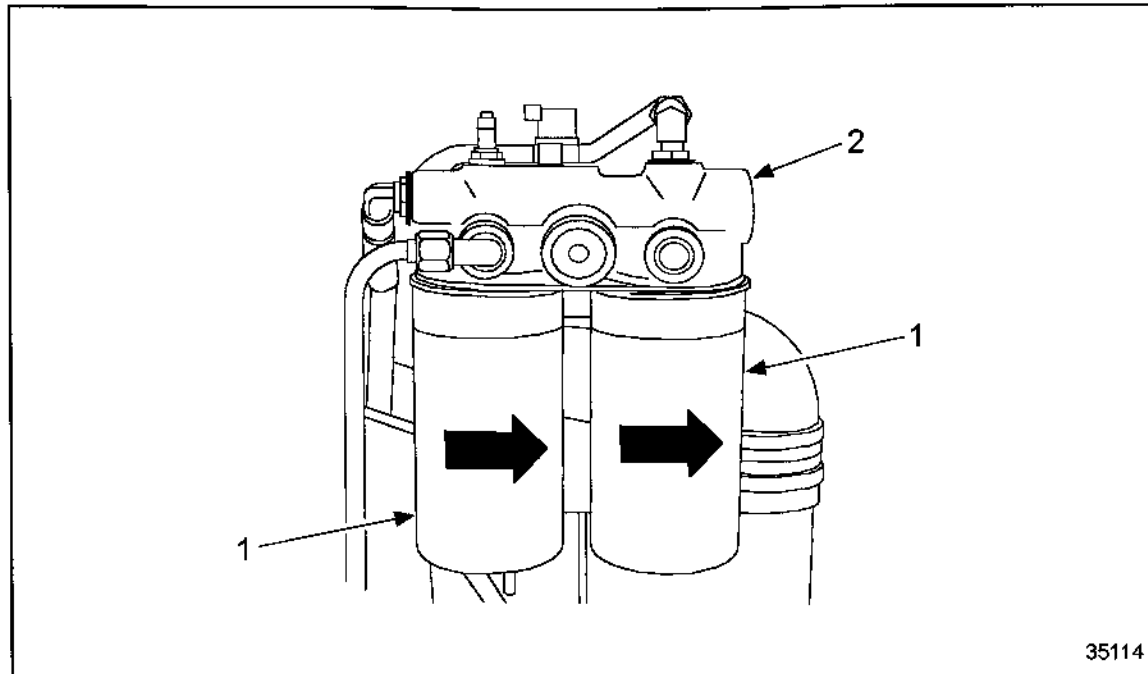
1. Filter Cartridge

2. Fuel Filter Adaptor

Figure 13 Removing Fuel Filters

3. Clean the sealing surface at the connector.
4. Clean the sealing ring of the new filter and moisten with fuel.

5. Install filter and tighten by hand. See Figure 14.



1. Filter Cartridge

2. Fuel Filter Adaptor

Figure 14 Installing Fuel Filters

6. Replace the second filter in the same manner.
7. Enable engine start. Refer to section F-2.

F-34 – ENGINE OPERATION WITH FAULTY TURBOCHARGER

If the turbocharger fails, determine the cause and assess whether the engine can continue in operation without risk.

NOTICE:
Run the engine in this condition only until it is possible to replace or repair the turbocharger.

Run the engine only under partial load if the engine must continue in operation and there is a turbocharger failure (e.g. if rotor is seized).

F-35 – EXHAUST TURBOCHARGER CONNECTION CHECK

Check exhaust connections for leaks.

Check oil supply and return lines for leaks.

F-36 – CHARGE AIR COOLER — DRAIN LINE CHECK

If the coolant is continuously discharged and the coolant level falling, the charge air cooler could be leaking. If the leaking charge air cooler cannot be repaired immediately, before starting the engine, follow this procedure.



CAUTION:

To avoid possible injury (scalding, eye damage) from the hot coolant, wear adequate safety equipment such as rubber gloves, rubber apron, boots, and face plate when draining coolant from the engine.

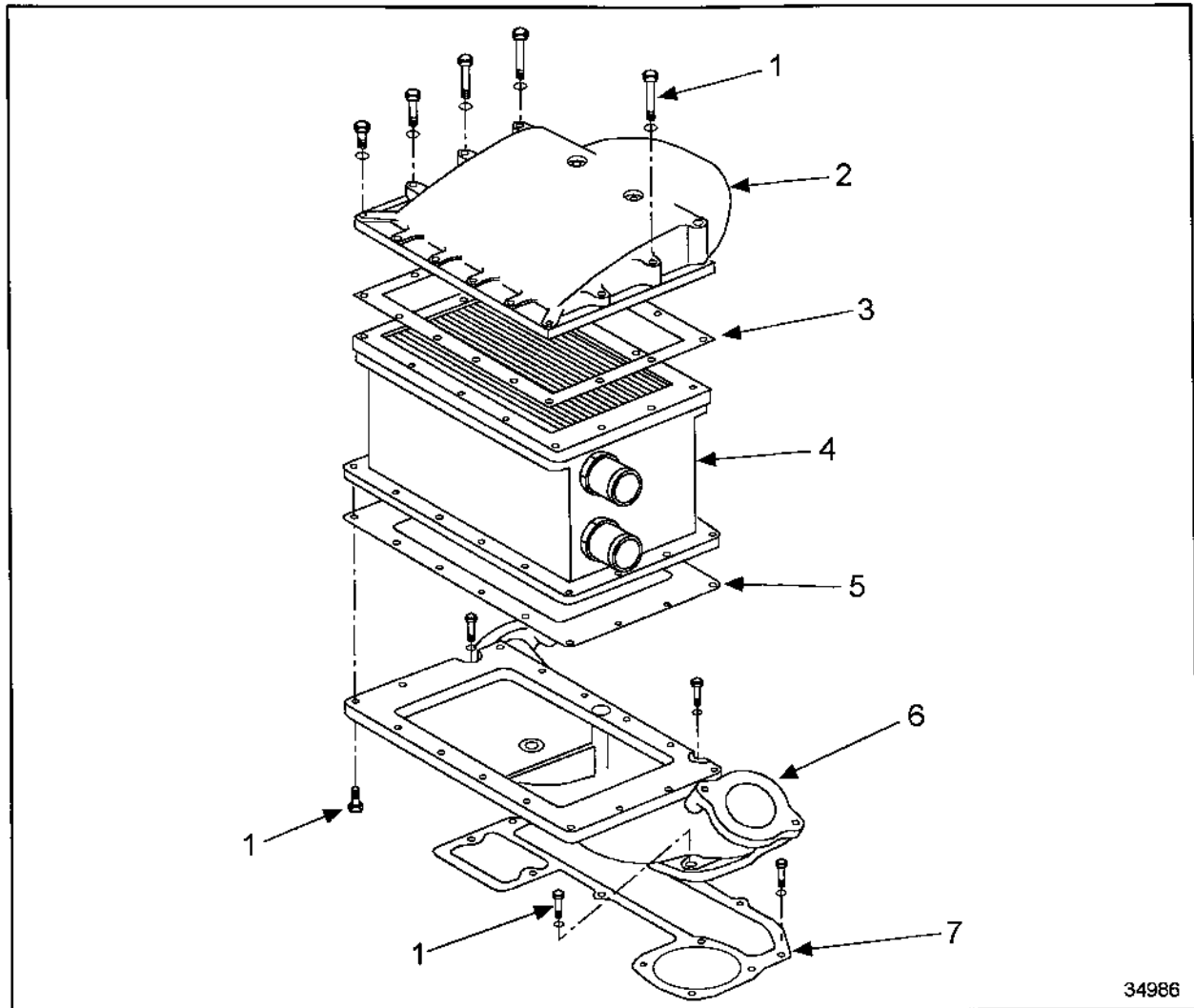
NOTICE:

If the charge air cooler is leaking, activate the engine only in an emergency.

1. Remove the injectors. Refer to section C 075.05.05 of the *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines) for the procedure to remove fuel injectors.
2. Bar the engine manually. Refer to section F-3.
3. Bar the engine with starting system, and blow out combustion chambers. Refer to section F-3.

Obstruction Check

Check for obstructions with the engine running. Oil-contaminated air must emerge at the drain opening. See Figure 15.



- 1. Hex Screw
- 2. Top Connecting Housing
- 3. Gasket
- 4. Intercooler, Charged Air Cooler (CAC)

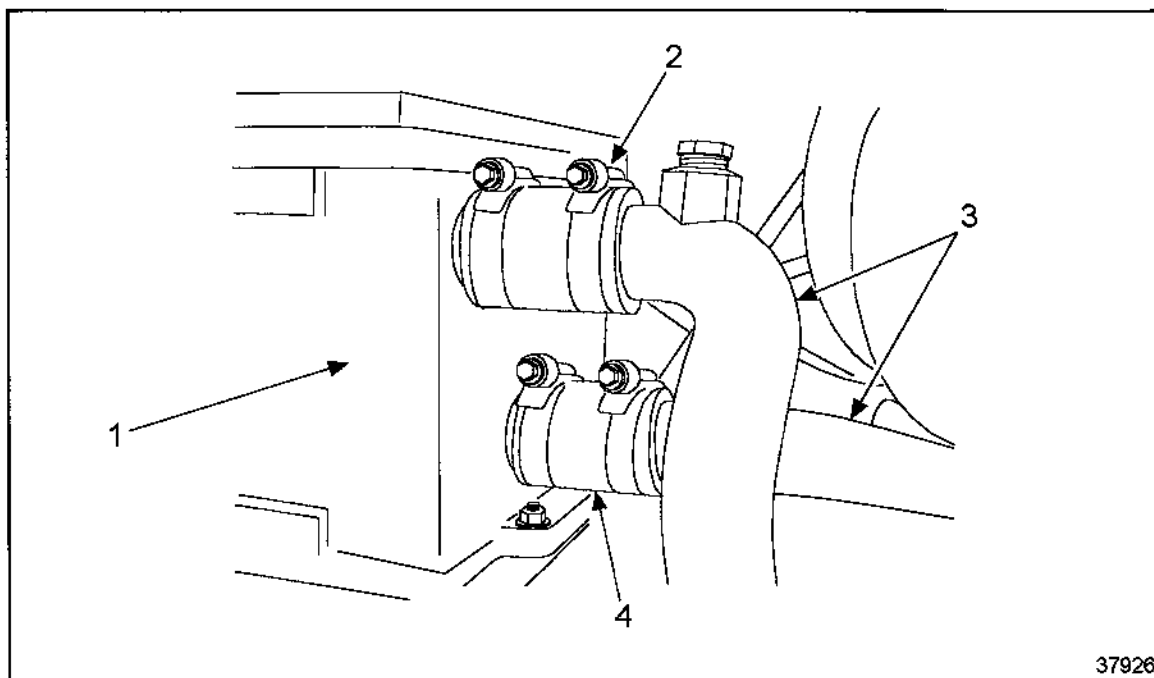
- 5. Gasket
- 6. CAC Base Housing
- 7. CAC Base Gasket

Figure 15 Intercooler

F-37 – CHARGE AIR COOLER — DRAIN CLEANING

Clean the drain as follows:

1. Disable engine start. Refer to section F-1.
2. Remove lines from charge air cooler. See Figure 16.



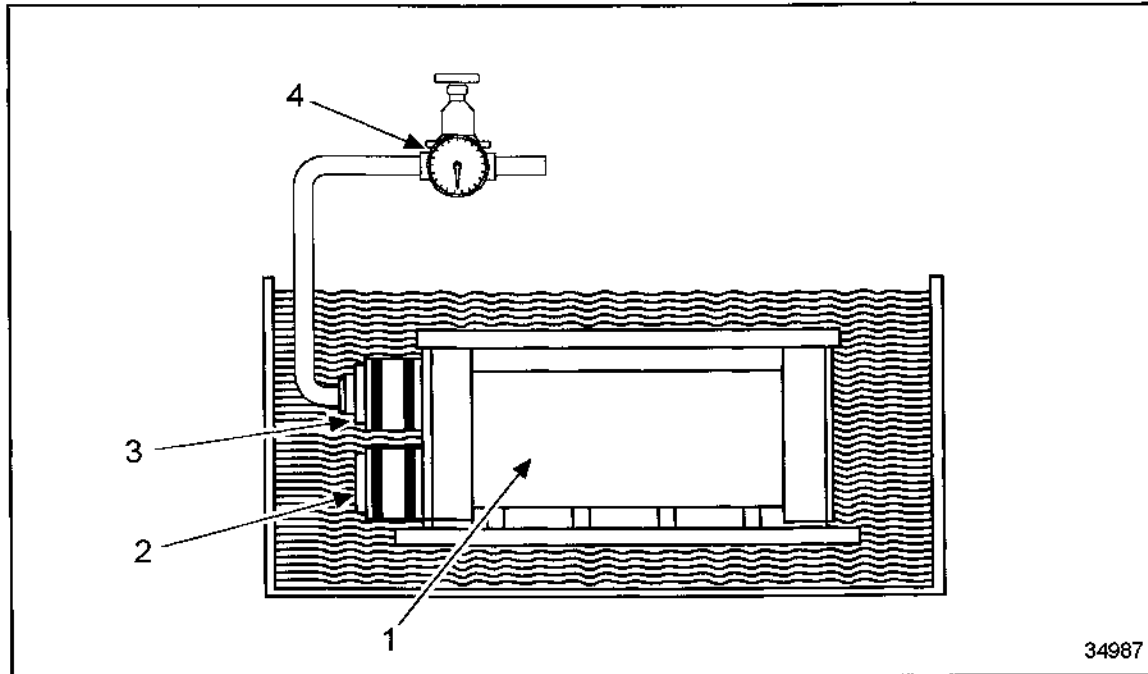
- | | |
|----------------------|---------|
| 1. Charge Air Cooler | 3. Line |
| 2. Clamp | 4. Hose |

Figure 16 Remove Lines from Charge Air Cooler

3. Remove drain line and union from the intercooler. See Figure 17.

**CAUTION:**

To avoid an eye injury when using compressed air, wear adequate eye protection (safety glasses or faceplate) and do not exceed 276 kPa (40 lb/in. ²) air pressure.



- | | |
|----------------|---------------------|
| 1. Intercooler | 3. Connection |
| 2. Blank Plug | 4. Pressure Reducer |

Figure 17 Intercooler Leak Check

4. Clean all components. Blow out drain bores from inside to outside with compressed air and check for obstructions.
5. Install drain line.
6. Enable engine start. Refer to section F-2.
7. For further information about the charge air cooling system, refer to section F-66.

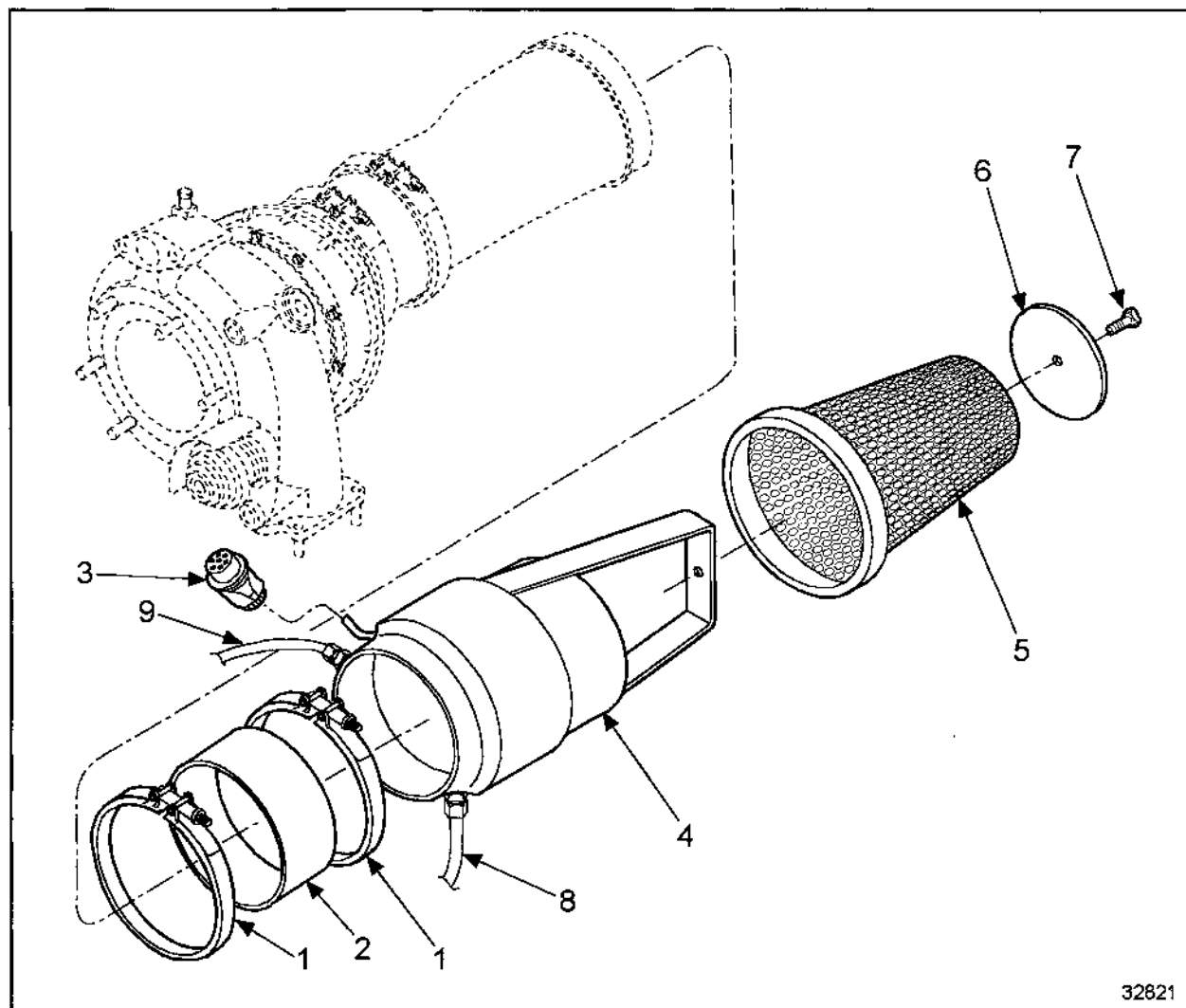
F-38 – INTAKE AIR SYSTEM CHECK

Check whether the covers have been removed from the air filters and check for cleanliness.

F-39 – AIR FILTER REPLACEMENT

Follow these steps to replace the air filter:

1. Remove the restriction indicator.
2. Release the clamp. See Figure 18.



1. Intake Housing-to-air Filter Bracket Clamp
2. Rubber Sleeve
3. Restriction Indicator
4. Air Filter Bracket
5. Air Filter

6. Air Filter Disk
7. Bolt
8. Hose to Oil Pan
9. Hose to Crankcase Breather System

Figure 18 Air Filter Replacement

3. Remove the air filter and dispose of filter in accordance with local regulations.

4. Clean the connection on the air flow-control flap housing.
5. Install new air filter with clamp. Refer to section C 121.05.11 of the *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines) for further information.
6. Install the restriction indicator with reset signal ring.

F-40 – RESTRICTION INDICATOR CHECK

Follow these steps to check the restriction indicator.

1. Check the position of the signal ring. See Figure 19.

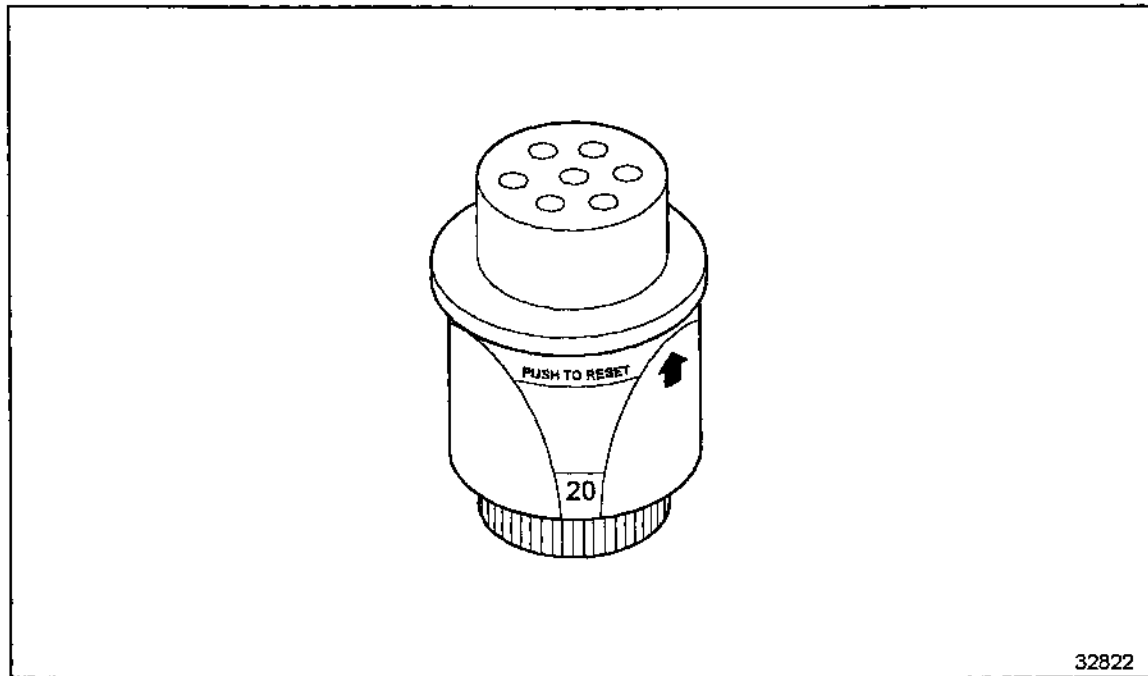


Figure 19 **Restriction Indicator**

2. If the signal ring is completely visible, replace the air filter.
3. Actuate the reset button to return the signal ring to its initial position. Refer to section C 0121.05.08 of the *Series 2000 Service Manual* (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines) for further information.

F-41 – EXHAUST SYSTEM CHECK

Visually check engine exhaust system for leaks and damage.

Check for cleanliness.

F-42 – EXHAUST SYSTEM — SECURITY CHECK

When the engine is cold, check tightness of securing bolts with a torque wrench.

F-43 – EXHAUST SYSTEM — EXHAUST GAS COLOR CHECK

The color check for exhaust gas is listed in Table 45.

Exhaust Gas Color	Description
Light Gray	Good Combustion
Black	Incomplete Combustion
Blue	Excessive Engine Oil in Combustion Chamber
White	Unburned Fuel

Table 45 Exhaust Gas Color Check

F-44 – EXHAUST SYSTEM — CHECK EXHAUST BACK PRESSURE

Check the exhaust back pressure as follows:

1. Connect the manometer pressure gage to the exhaust manifold.
2. Run engine at full load and take gage reading.
3. For specified pressure, refer to section B-6.
4. Remove the manometer pressure gage.

F-45 – EXHAUST SYSTEM — EXHAUST PIPEWORK SECURITY AND INSULATION CHECK

Check tightness of the exhaust system securing bolts with a torque wrench. Visually inspect the insulation for damage. For torque information, refer to *Series 2000 Fastener Torque Specifications* 028T2000. The torque specifications are also listed in A 003 of the Series 2000 Service Manual (6SE2000 for 12V and 16V engines, 6SE2005 for 8V engines).

F-46 – STARTER, CABLE SECURITY AND CONDITION CHECK

To check cable security and condition of the starter, follow this procedure:

1. Disable engine start. Refer to section F-1.
2. Disconnect battery.
3. Check all plug-in connections for security and damage.
4. Check all mechanical fixtures and electrical connections.
5. Connect battery.
6. Enable engine start. Refer to section F-2.

F-47 – ENGINE OIL LEVEL CHECK

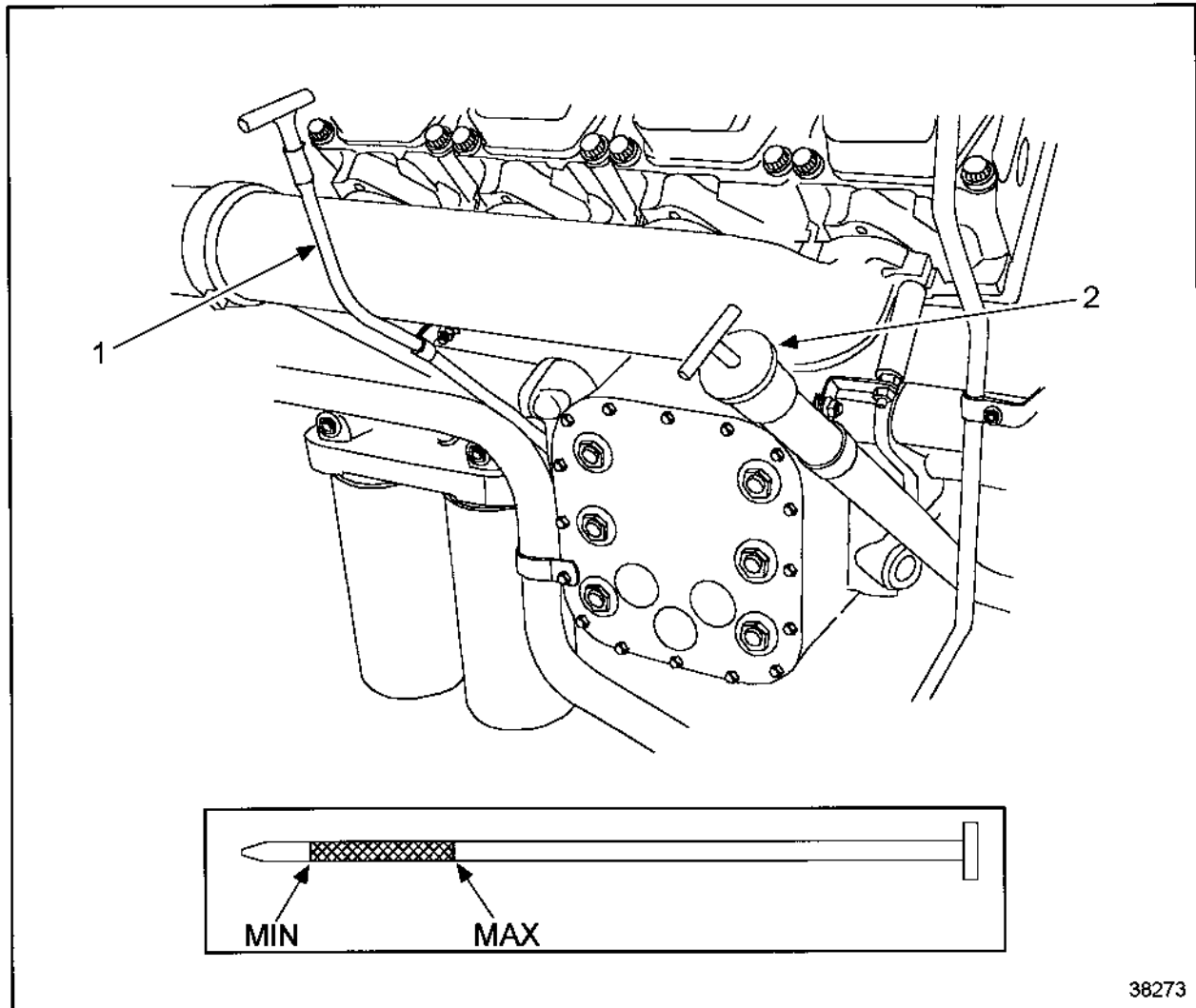
The engine oil level may be checked before starting the engine and after engine shutdown.

Checking before starting engine

Check the oil before starting the engine as follows:

1. Withdraw dipstick from guide tube and wipe.
2. Carry out oil level check.

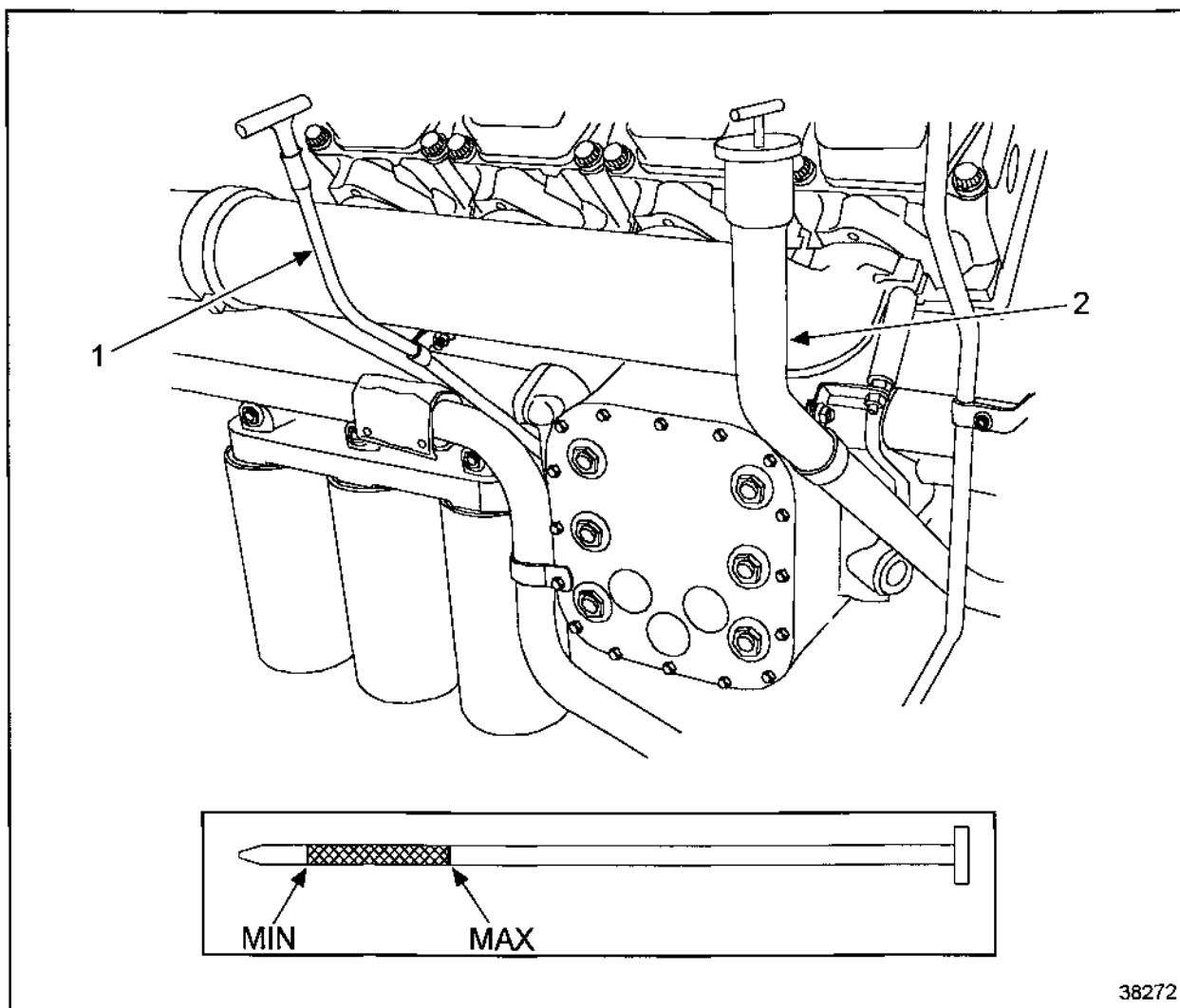
3. Engine oil level must be between minimum and maximum marks. See Figure 20 for the 8V dipstick and oil fill location. See Figure 21 for the location of dipstick and oil fill tube 12V and 16V Engine. See Figure 22 for the alternate location of dipstick and oil fill tube 12V and 16V Engine.



1. Oil Dipstick

2. Oil Fill Tube

Figure 20 **Location of Dipstick and Oil Fill Tube, 8V Engine**

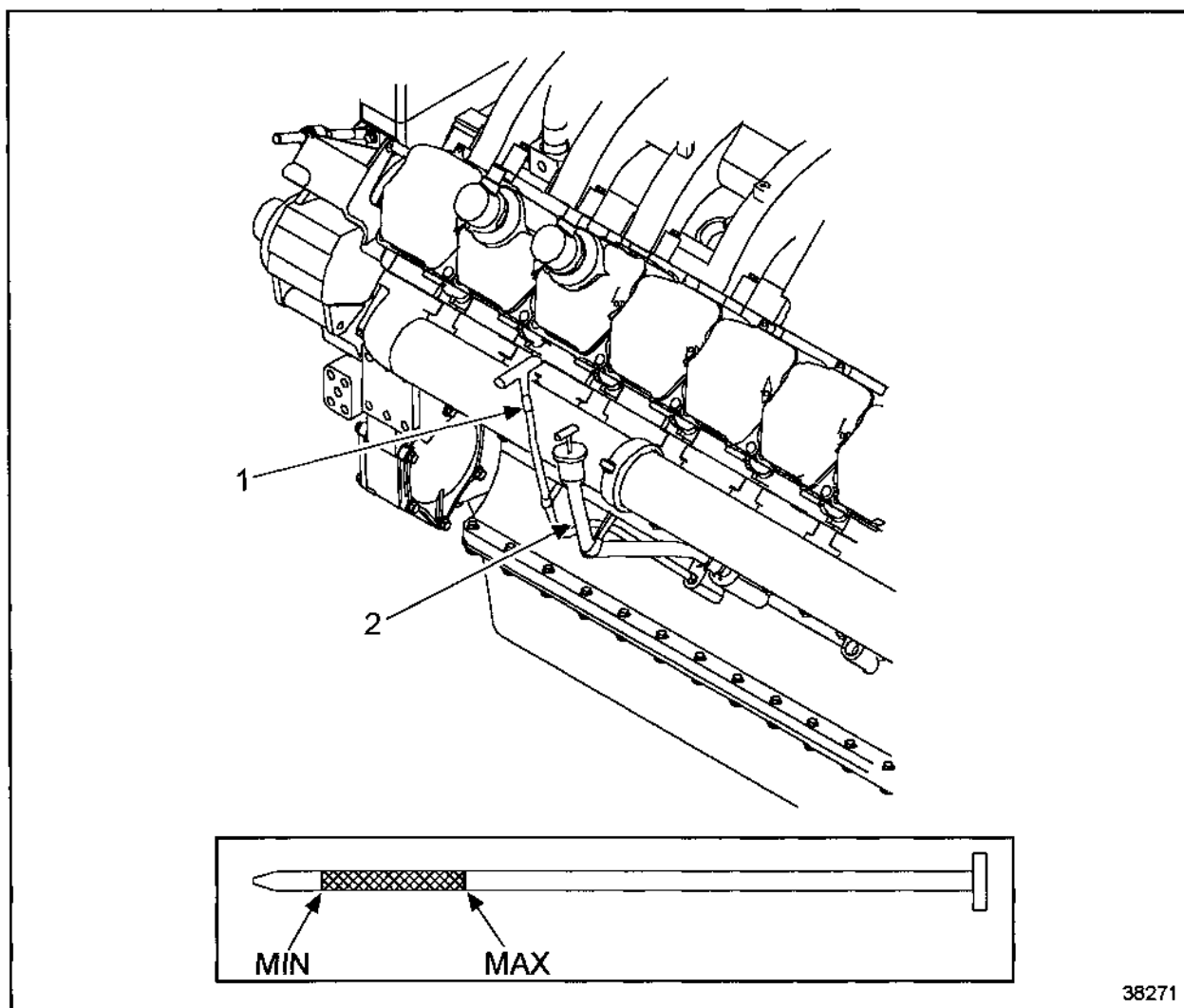


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1. Oil Dipstick

Oil Fill Tube

Figure 21 Location of Dipstick and Oil Fill Tube, 12V and 16V Engine



1. Oil Dipstick

2. Oil Fill Tube

Figure 22 Alternate Location of Dipstick and Oil Fill Tube, 12V and 16V Engine

4. If necessary, add oil to MAX mark.
5. Insert dipstick into guide tube.

Checking after engine shutdown

Check the oil level after engine shutdown as follows:

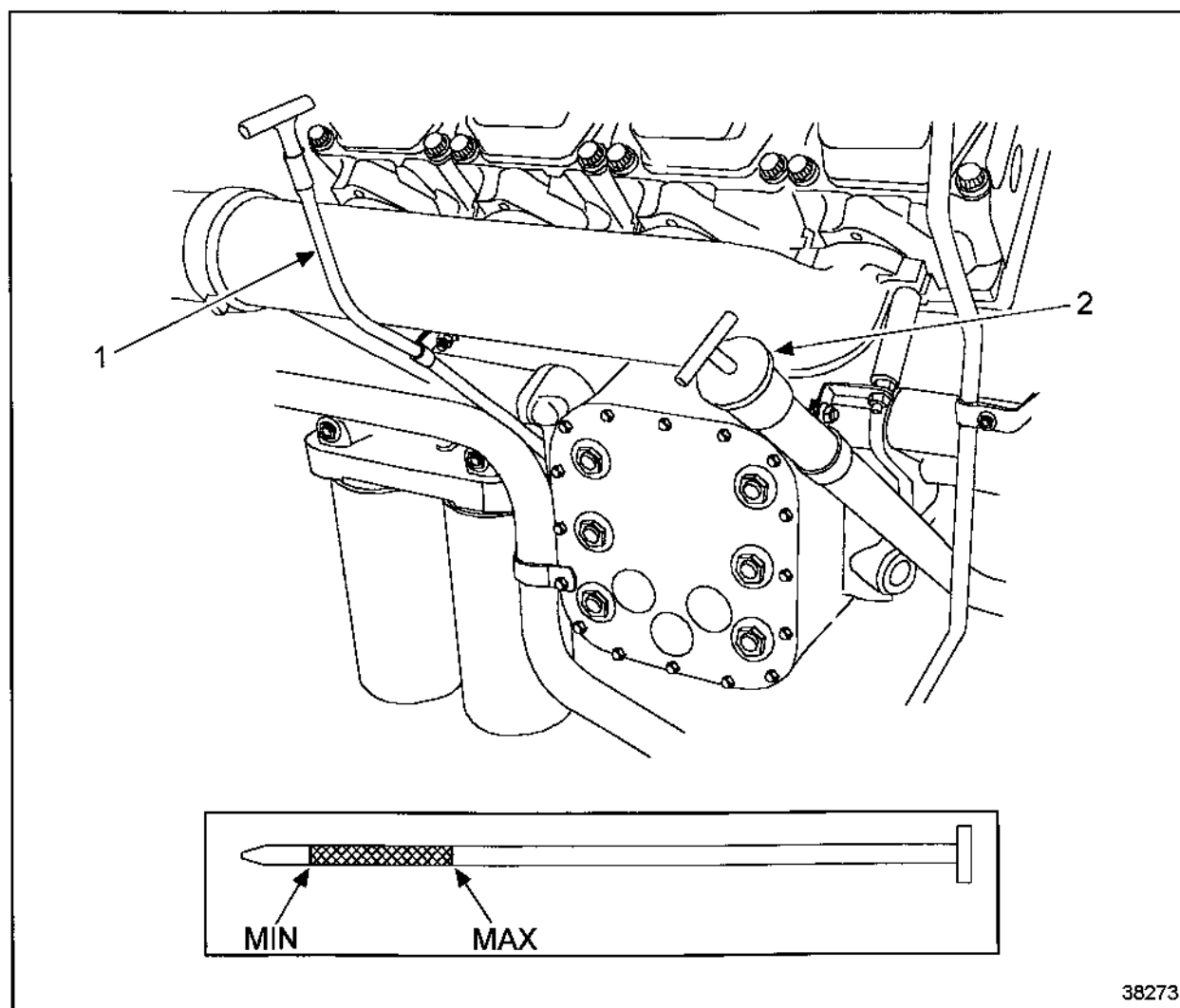
1. Remove the oil dipstick from the guide tube five minutes after engine shutdown.
2. Engine oil must be between MIN and MAX marks.
3. If necessary, top off the oil to the MAX mark.
4. Insert the dipstick into the guide tube.

F-48 – ENGINE OIL FILLING**NOTE:**

Always use only new, DDC/MTU-approved engine oil — per DDC publication *Engine Service Fluid and Filter Requirements, DDC/MTU Series 2000, MTU/DDC Series 4000* (7SE273).

Fill engine oil as follows:

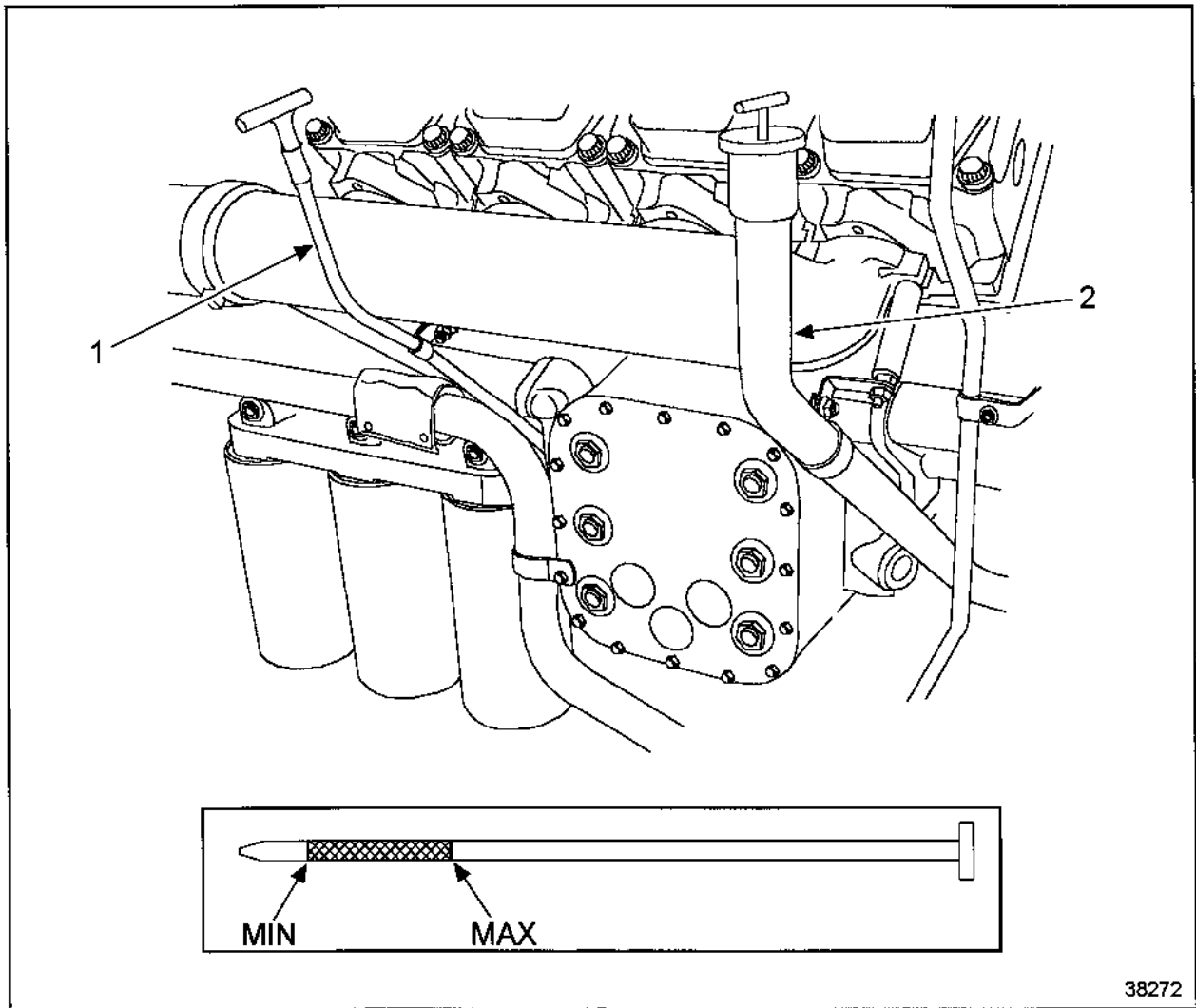
1. Turn the oil filler tube cover counterclockwise until it can be removed. See Figure 23, for the location of the dipstick and oil fill tube for the 8V engines. See Figure 24 for the location of dipstick and oil fill tube for one of the 12V and 16V configurations. See Figure 25 for another configuration used for the 12V and 16V engines.



1. Oil Dipstick

2. Oil fill Tube

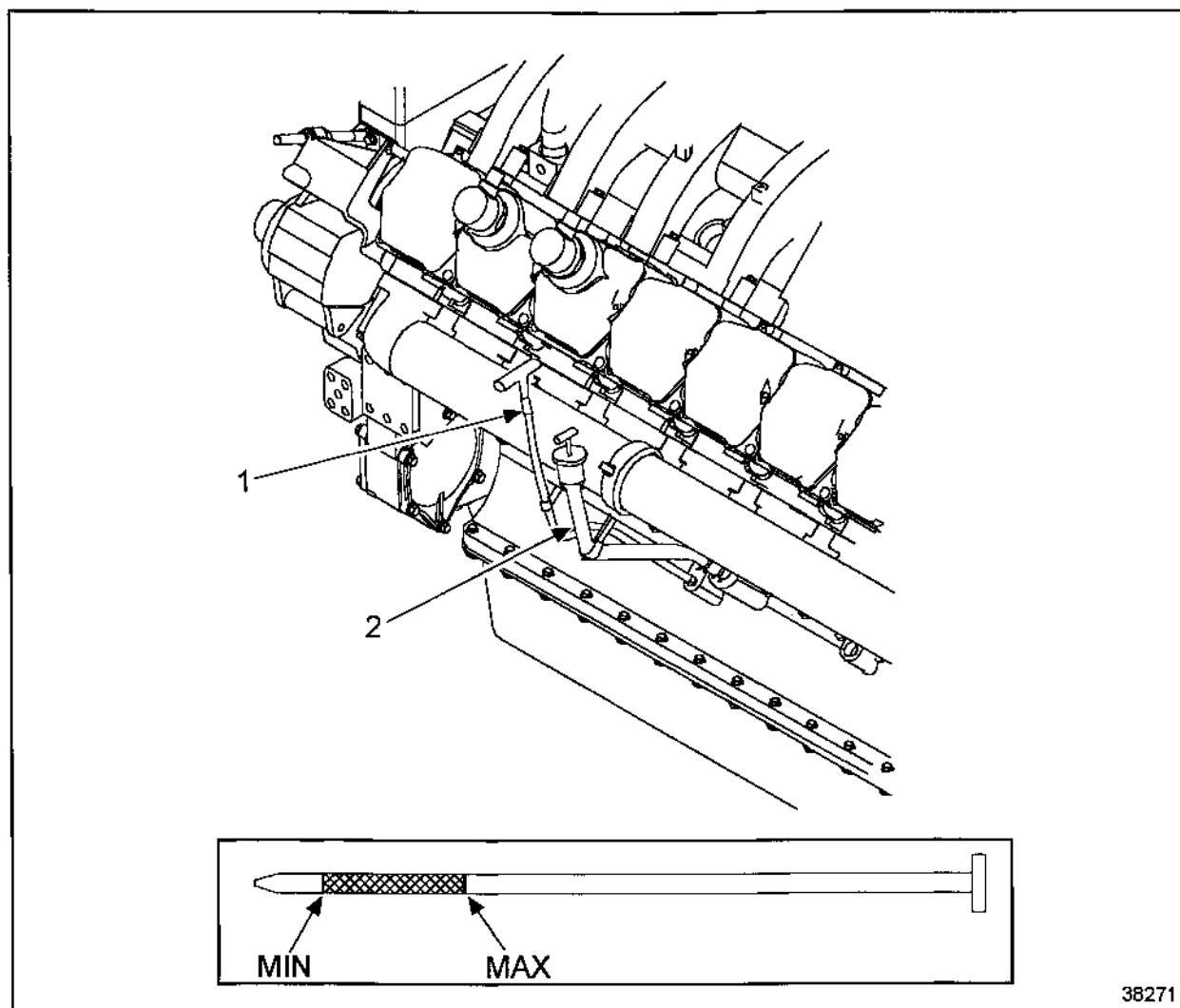
Figure 23 8V Engine, Dipstick Location



1. Oil Dipstick

2. Oil Fill Tube

Figure 24 12V and 16V Engine, Dipstick Location



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1. Oil Dipstick

2. Oil Fill Tube

Figure 25 12V and 16V Engine, Alternate Dipstick Location

2. Pour engine oil in at oil filler tube up to MAX mark when checked with the dipstick.
3. Start engine and run at idle for approximately one to two minutes.
4. Shut down engine; after approximately five minutes withdraw dipstick from guide tube and wipe.
5. Carry out oil level check.

6. Engine oil must be between minimum and maximum marks. If necessary, add oil to MAX mark.

NOTE:

Do not fill engine oil above the MAX mark.

7. Insert dipstick in guide tube.
8. Replace oil filler tube cover.

F-49 – ENGINE OIL — SAMPLE EXTRACTION AND ANALYSIS



CAUTION:

Engine oil is hot and can contain combustion residues which are harmful to health. To avoid injury, wear protective gloves. Avoid extended and intensive contact with skin. Do not inhale oil vapor.

NOTE:

An oil sample should be analyzed at each 250 hour interval.

Use the directions from the Power Trac® Oil Analysis Kit, P/N: 23520989. Take an oil sample and mail it, using the preaddressed container, to the Power Trac analysis center. Analysis reports are available within 24 hours of sample receipt.

F-50 – ENGINE OIL CHANGE

Change engine oil as follows:

1. Disable engine start. Refer to section F-1.
2. Drain engine oil. Refer to section F-51.
3. Replace engine oil filter. Refer to section F-54.
4. Add new engine oil. Refer to section F-48.
5. Enable engine start. Refer to section F-2.
6. Check for leaks.

F-51 – ENGINE OIL DRAINING

Drain the engine oil as follows:



CAUTION:

Engine oil is hot and can contain combustion residues which are harmful to health. To avoid injury, wear protective gloves. Avoid extended and intensive contact with skin. Do not inhale oil vapor.



CAUTION:

To avoid injury when using the chemical substances and materials listed below, it is essential to observe the manufacturer's instructions for use, safety instructions and waste disposal specifications.

- ☐ Oils
- ☐ Greases
- ☐ Treated engine coolant
- ☐ Fuels
- ☐ Cleaning agents

NOTE:

Drain engine oil with the engine at operating temperature. Oil must be drained from both the gear case and the oil pan to remove all oil.

See Figure 26 for the oil pan drain on the 8V engine.

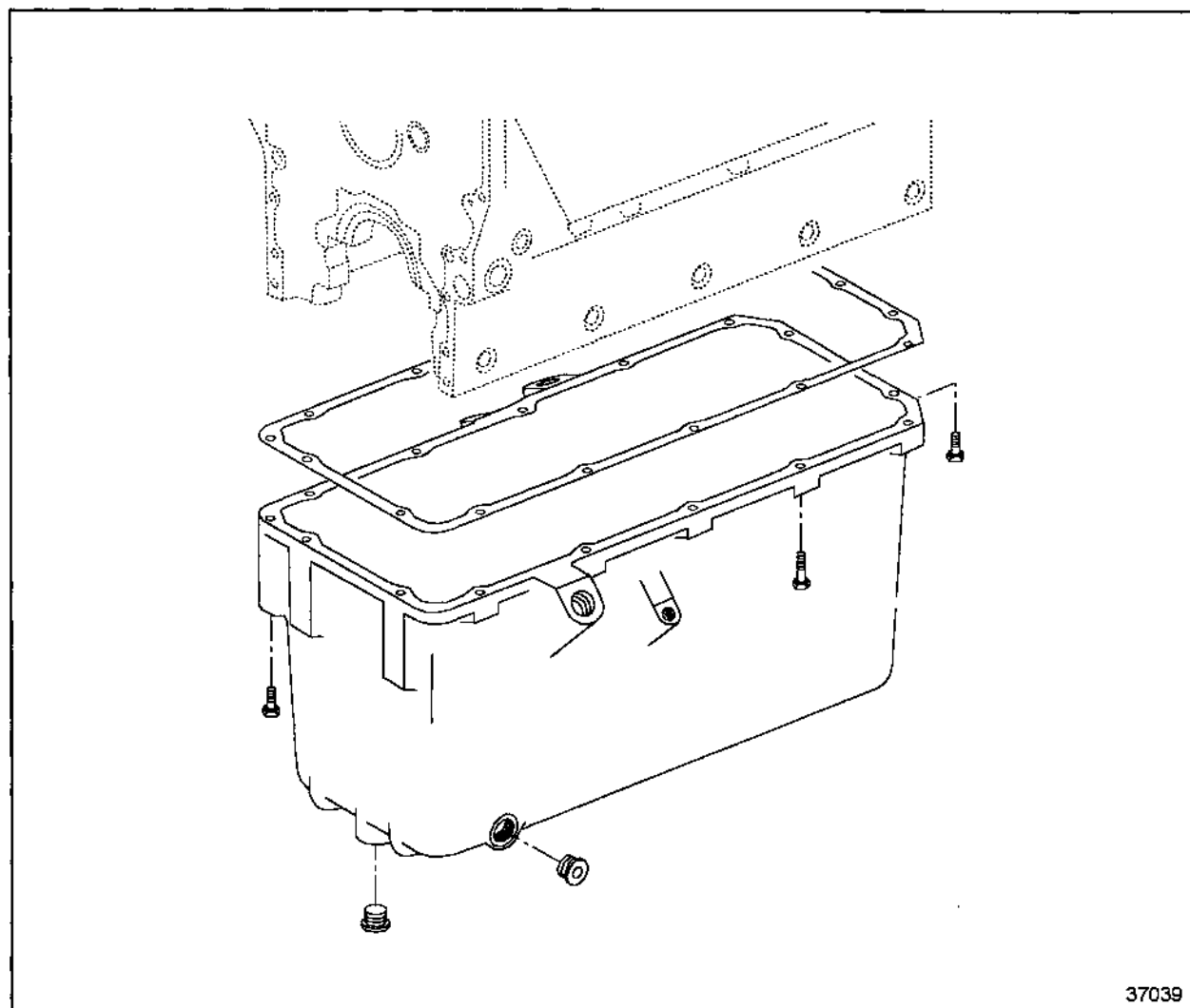


Figure 26 Oil Pan, 8V Engine

1. Drain both engine oil filters. Refer to section F-54.
2. Drain used oil from the oil pan at the oil drain plug. Open the plug and drain oil into a suitable container
3. If a three-way cock on the drain plug, set it accordingly.
4. Install a new sealing ring at the oil drain plug.

F-52 – CORROSION INHIBITOR OIL FILLING

NOTE:

Always use only new, DDC/MTU-approved corrosion inhibitor oil — per DDC publication *Engine Service Fluid and Filter Requirements, DDC/MTU Series 2000, MTU/DDC Series 4000* (7SE273).

Fill engine with corrosion inhibitor oil in same way as engine oil. Refer to section F-48.

F-53 – CORROSION INHIBITOR OIL EXTRACTION

Drain corrosion inhibitor oil in same way as engine oil. Refer to section F-51.

NOTE:

Drain corrosion inhibitor oil with the engine at operating temperature.

F-54 – ENGINE OIL FILTER REPLACEMENT

NOTE:

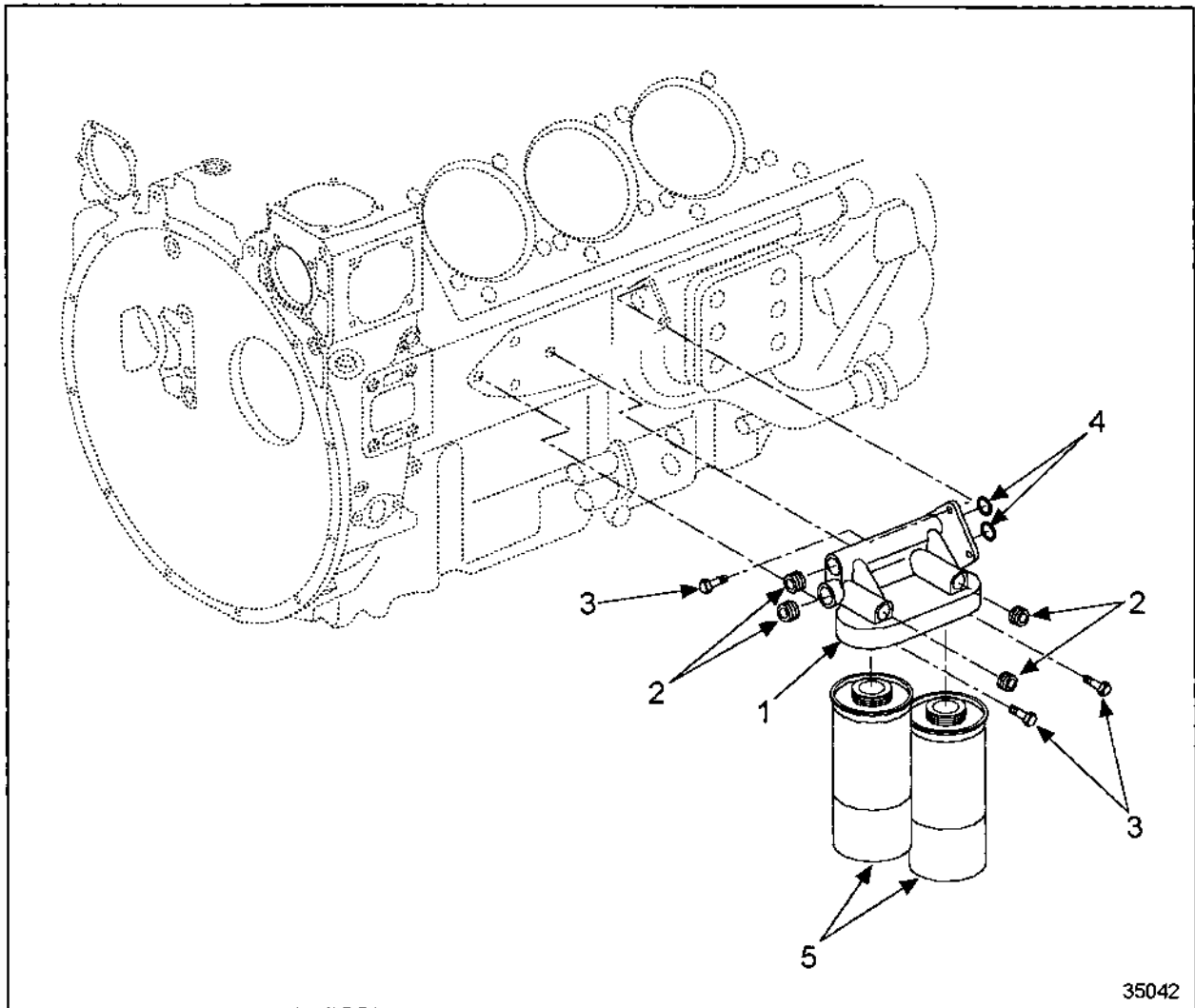
Oil filters should be serviced per DDC publication *Engine Service Fluid and Filter Requirements, DDC/MTU Series 2000, MTU/DDC Series 4000* (7SE273), at the end of this book.



CAUTION:

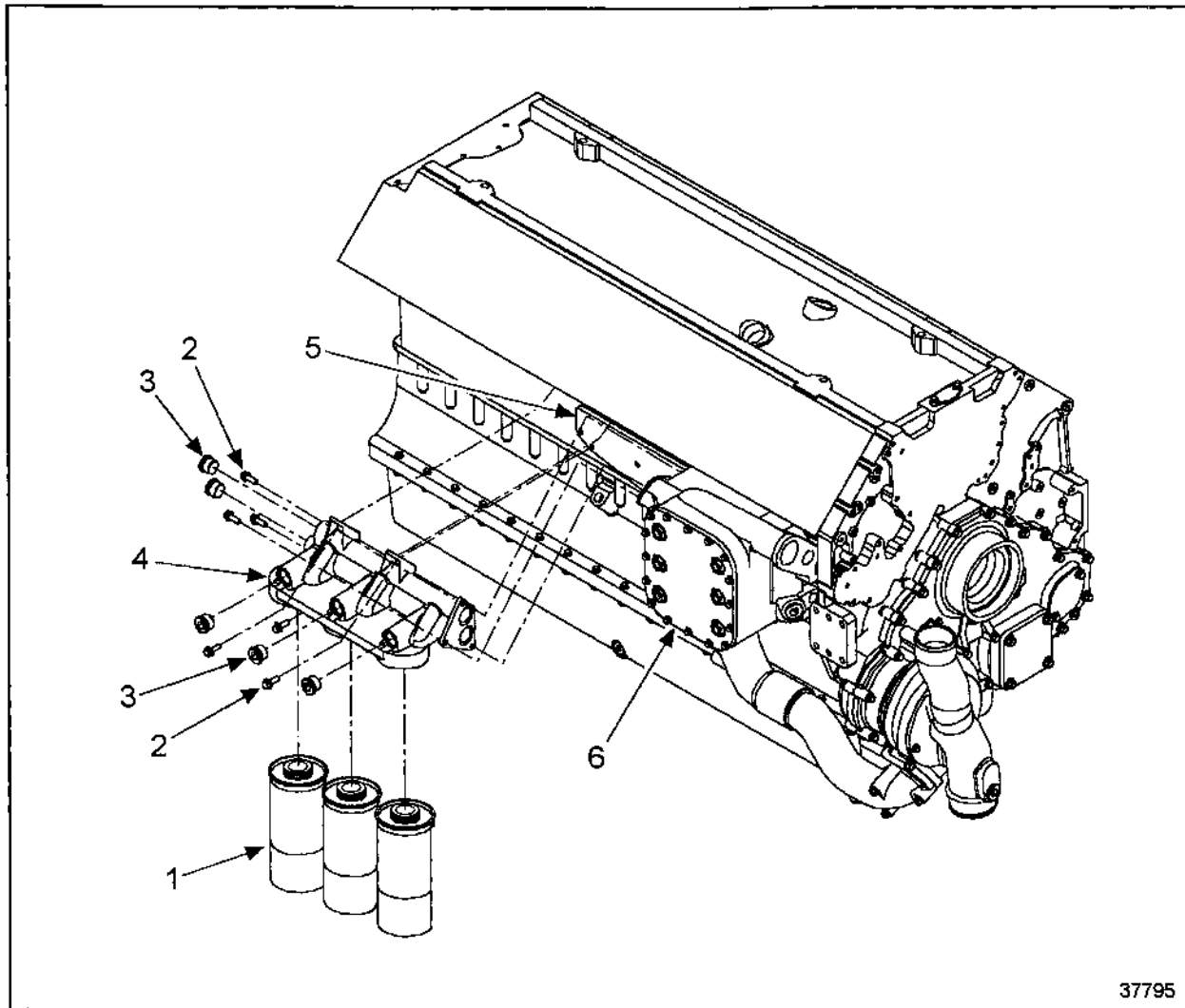
Engine oil is hot and can contain combustion residues which are harmful to health. To avoid injury, wear protective gloves. Avoid extended and intensive contact with skin. Do not inhale oil vapor.

Remove oil filters with a strap wrench. Follow this procedure when removing the filters: see Figure 27 for the 8V engine filters. See Figure 28 for the 12V and 16V engine filters.



- | | |
|-----------------------|-----------------|
| 1. Oil Filter Housing | 4. Sealing Ring |
| 2. Plug | 5. Oil Filter |
| 3. Hex Head Bolt | |

Figure 27 Oil Filters, 8V Engine



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- | | |
|---------------|------------------------|
| 1. Oil Filter | 4. Oil Filter Housing |
| 2. Bolt | 5. Mounting Plate |
| 3. Plug | 6. Oil Cooler Assembly |

Figure 28 Oil Filters, 12V and 16V Engines



CAUTION:

To avoid injury when using the chemical substances and materials listed below, it is essential to observe the manufacturer's instructions for use, safety instructions and waste disposal specifications.

- ☐ **Oils**
- ☐ **Greases**
- ☐ **Treated engine coolant**
- ☐ **Fuels**
- ☐ **Cleaning agents**

1. Drain remaining oil from the filters into a container.
2. Clean the sealing surface at the connector.
3. Check the sealing ring of the new engine oil filter, and coat with oil.
4. Install new engine oil filter and hand-tighten.
5. Replace other engine oil filters in the same way.

F-55 – ENGINE COOLANT FILLING

NOTE:

Always use only treated coolants in accordance with *Engine Service Fluid and Filter Requirements, DDC/MTU Series 2000, MTU/DDC Series 4000 (7SE273)*, at the back of this book.

NOTE:

For additional information about coolants, silicate-free supplemental coolant additives, refer to *Detroit Diesel Coolant Selections 7SE298*.

Fill engine coolant as follows:

1. Ensure engine is cold.
2. Open coolant pressure cap (arrow). Refer to section F-70.

**CAUTION:**

To avoid injury when using the chemical substances and materials listed below, it is essential to observe the manufacturer's instructions for use, safety instructions and waste disposal specifications.

- ☐ Oils
- ☐ Greases
- ☐ Treated engine coolant
- ☐ Fuels
- ☐ Cleaning agents

1. Pour in treated engine coolant via the filter neck. See Figure 29.

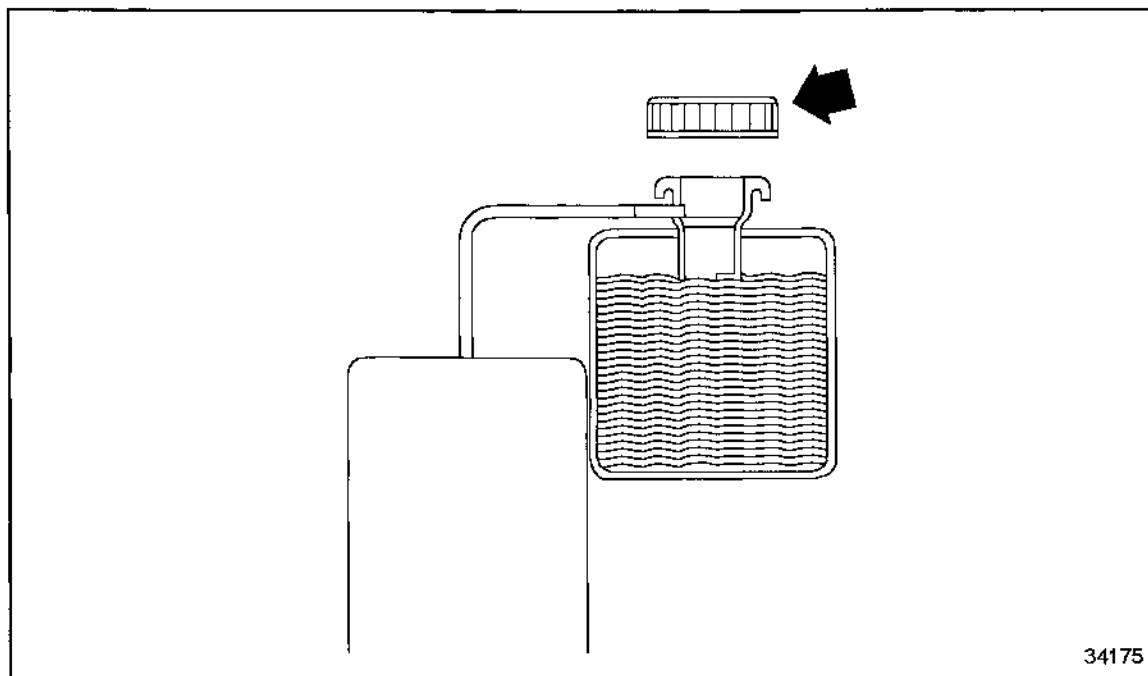


Figure 29 Filling Engine Coolant

2. Check coolant level; refer to section F-56.
3. Close pressure cap (arrow). Refer to section F-71.
4. Run engine a number of minutes at idling speed.
5. Check coolant level; refer to section F-56.

F-56 – ENGINE COOLANT LEVEL CHECK

NOTE:

The MIN coolant level is automatically monitored by DDEC.

Via level sensor: Switch on the engine control system and check the indicator. Refer to *DDEC III/IV Single ECM Troubleshooting Manual*, (6SE497).

Manual check: Refer to OEM operating instructions.

Via filler neck: Follow this procedure to check engine coolant level via the filler neck:

1. Open coolant pressure cap. Refer to section F-70.
2. Coolant must reach the bottom of the filling neck. See Figure 30.

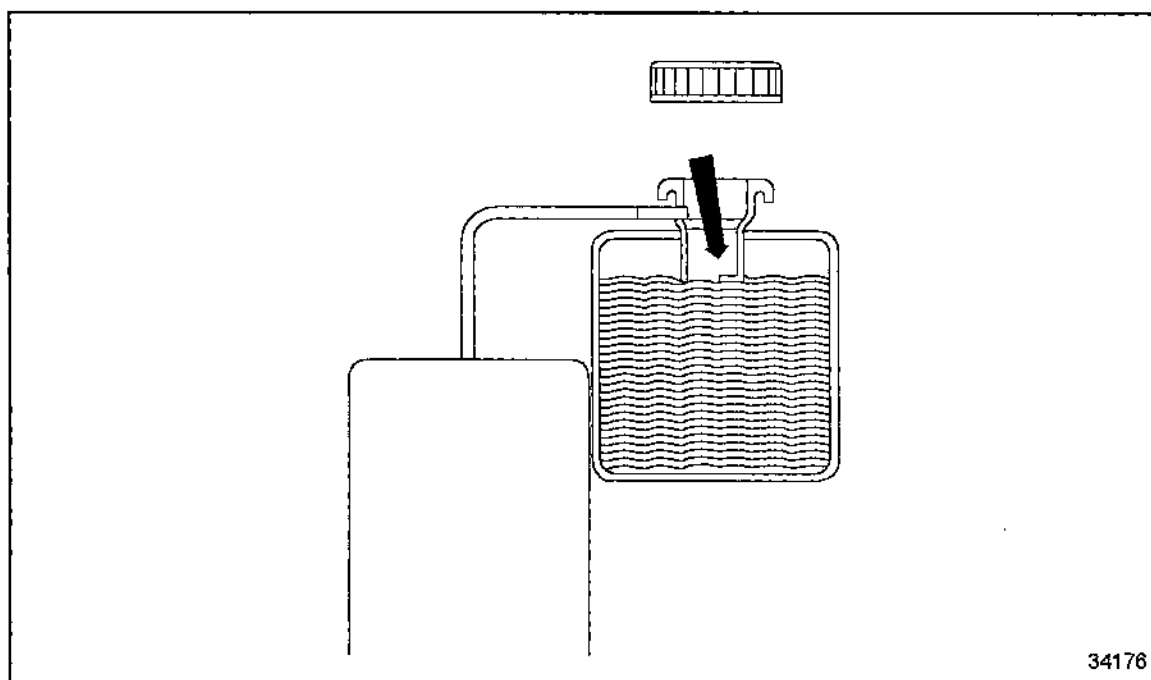


Figure 30 Check Coolant Level

NOTICE:

Never pour cold coolant into a hot engine.

NOTICE:

If untreated water is used to top up the coolant system in an emergency, the coolant concentration must be checked and rectified at the earliest opportunity.

3. Add only treated engine coolant, as necessary.
4. Close the coolant pressure cap. Refer to section F-71.

F-57 – COOLANT — SAMPLE EXTRACTION AND ANALYSIS



CAUTION:

Engine coolant is hot and under pressure. To avoid injury, wear protective gloves.

Extract and analyze the coolant as follows:

1. Disable engine start. Refer to section F-1.
2. Open the breather valve. Refer to section F-70.
3. Draw off precipitated corrosion inhibitor oil from the expansion tank via the filler neck, and dispose of oil in environmentally safe manner.
4. Drain approximately one liter of engine coolant into a clean container.
5. Using the DDC test kit, P/N: 23523398, mail the required sample to the Power Trac analysis center in the preaddressed container. The analysis will measure:
 - [a] Coolant condition
 - [b] Inhibitor strength
 - [c] Water quality
 - [d] Corrosion products
6. Check engine coolant level. Refer to section F-56.
7. Enable engine start. Refer to section F-2.

F-58 – ENGINE COOLANT DRAINING



CAUTION:

Engine coolant is hot and under pressure. To avoid injury, wear protective gloves.

Drain engine coolant as follows:

1. Disable engine start. Refer to section F-1.
2. Allow engine to cool.

3. Before draining coolant, open pressure cap (arrow) on coolant expansion tank. See Figure 31.

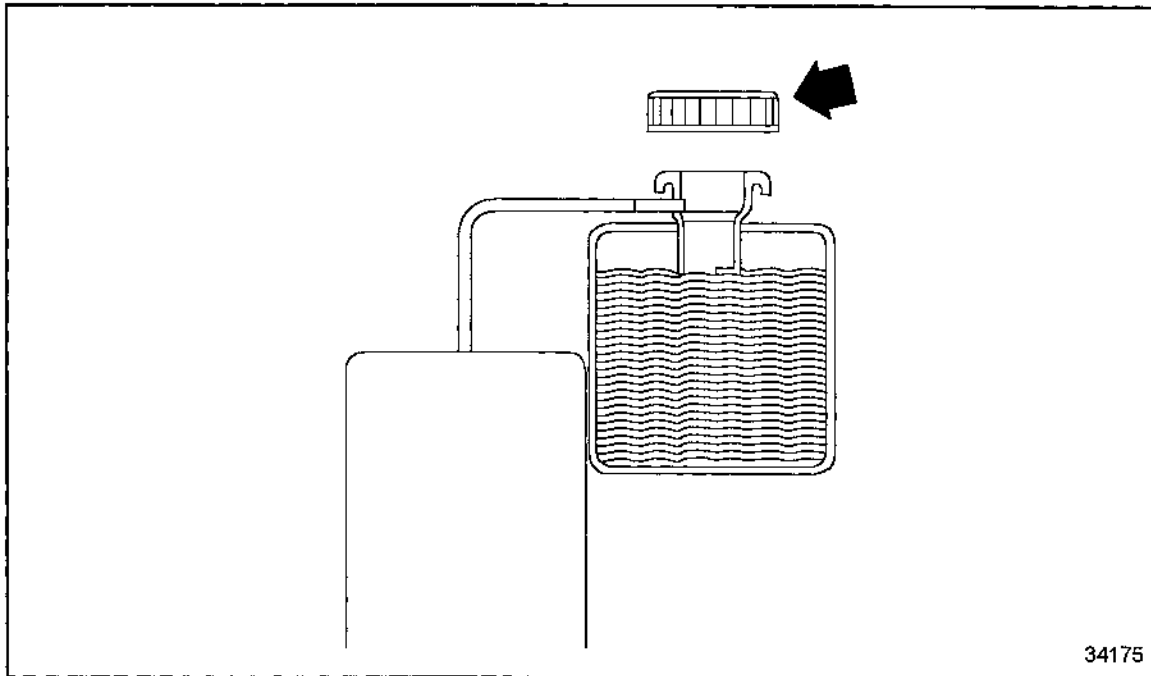


Figure 31 Open Coolant Pressure Cap

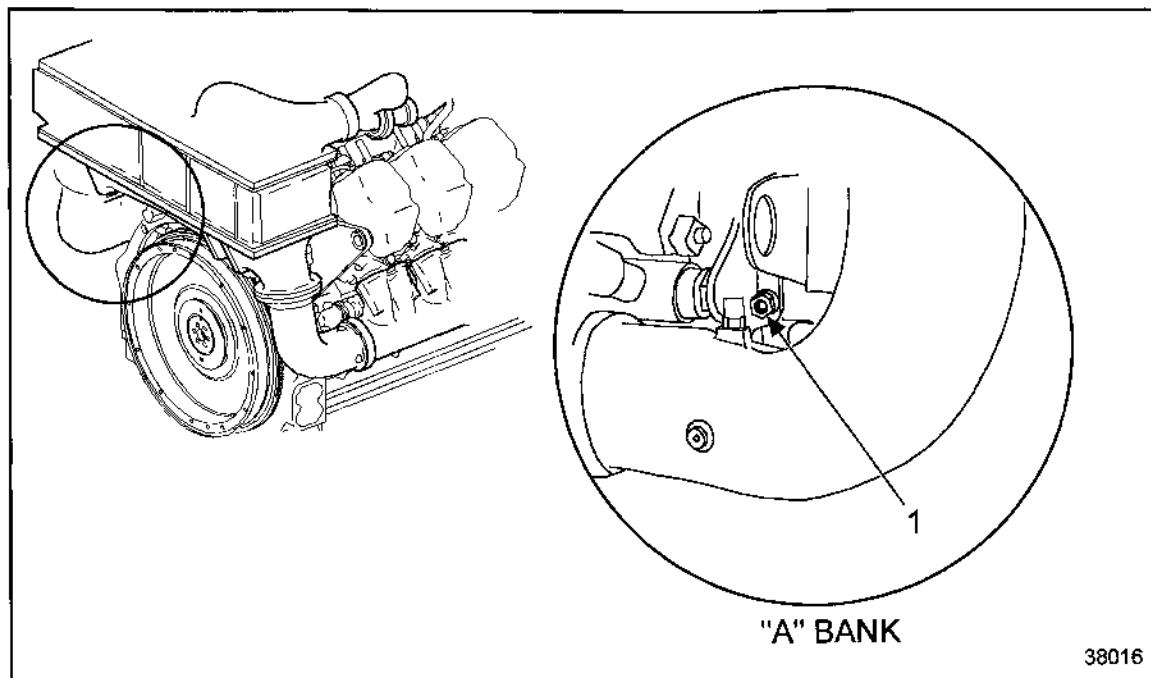

CAUTION:

To avoid injury when using the chemical substances and materials listed below, it is essential to observe the manufacturer's instructions for use, safety instructions and waste disposal specifications.

- ☐ **Oils**
- ☐ **Greases**
- ☐ **Treated engine coolant**
- ☐ **Fuels**
- ☐ **Cleaning agents**

1. Provide a suitable container to collect and dispose of the coolant.
2. Drain the coolant expansion tank via the filler neck.
3. Drain into a container for disposal in an environmentally safe manner.

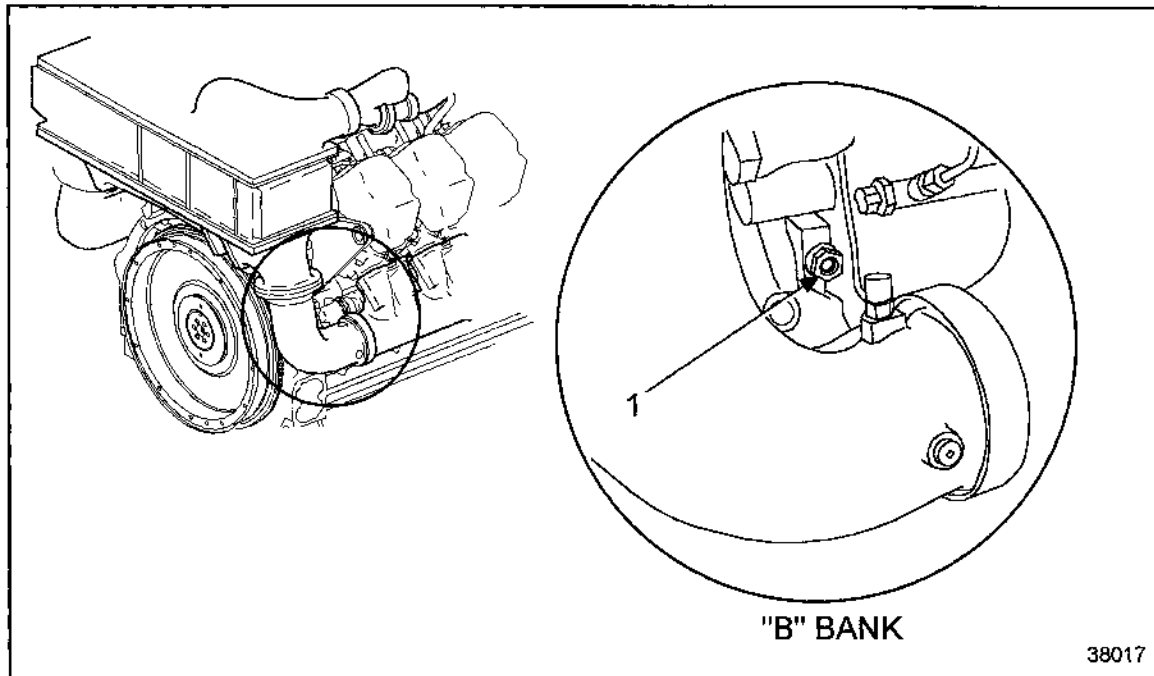
4. Drain engine coolant at the blanking plug on engine A bank at flywheel housing. Seal all drain points. See Figure 32.



1. Blanking Plug

Figure 32 Engine A Bank Blanking Plug

5. Drain engine coolant at the blanking plugs on engine B bank at flywheel housing. Seal all drain points. See Figure 33.



1. Blanking Plug

Figure 33 Engine B Bank Blanking Plug

6. Close the pressure cap.
7. Enable engine start. Refer to section F-2.

F-59 – ENGINE COOLANT CHANGE

Change the engine coolant as follows:

- ☐ Drain engine coolant. Refer to section F-58.
- ☐ Fill engine coolant system. Refer to section F-55.

F-60 – ENGINE COOLANT PUMPS — WEEP HOLE CHECK (RELIEF BORE)

Check weep hole (arrow) for oil and/or coolant discharge (visual inspection) on both the high temperature and low temperature engine coolant pumps. See Figure 34.

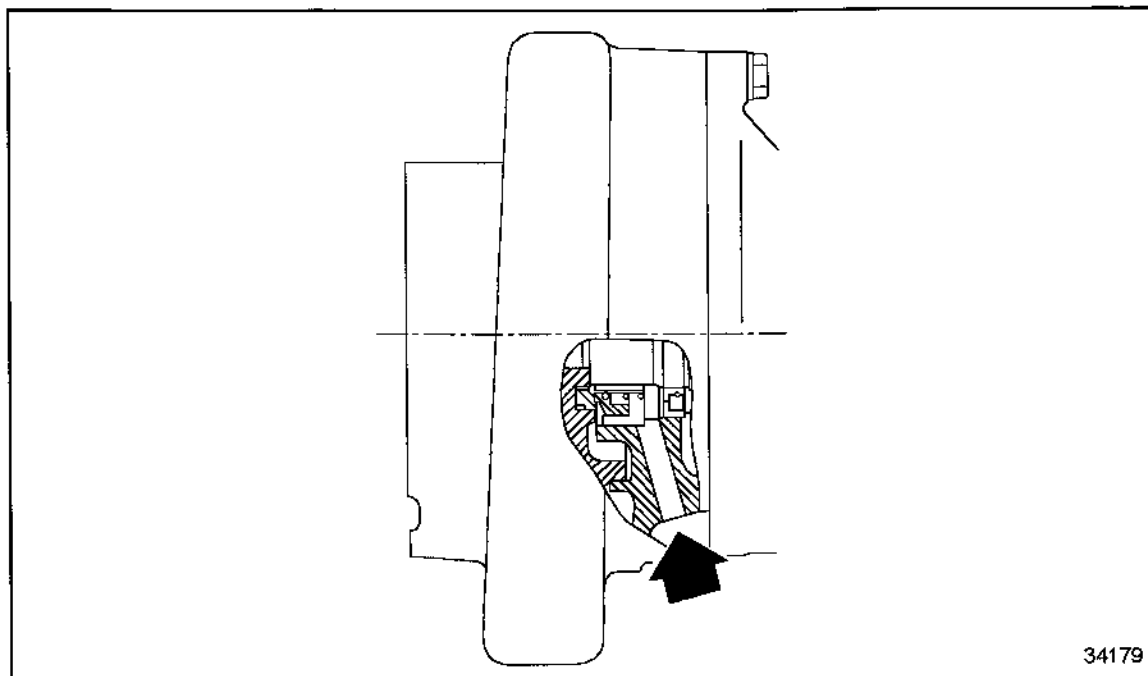


Figure 34 Weep Hole Check

Clean the weep hole if it is dirty.

NOTE:

If oil and/or coolant drip from the weep hole, repair the engine coolant pump.

F-61 – ENGINE COOLANT PREHEATING

Switch ON the preheater.

Check the function of the coolant circulating pump.

Preheat the engine coolant to the preheat temperature. Refer to section B-6.

Switch the preheating unit OFF.

F-62 – ENGINE COOLANT PREHEATER OPERATION

The engine coolant preheater is not supplied by DDC. Refer to OEM manuals for unit operation.

F-63 – ENGINE COOLANT SYSTEM — VENT LINE OBSTRUCTION CHECK



CAUTION:

To avoid an eye injury when using compressed air, wear adequate eye protection (safety glasses or faceplate) and do not exceed 276 kPa (40 lb/in. ²) air pressure.

Remove vent lines and blow out with compressed air.

Install vent lines.

F-64 – CHARGE AIR COOLANT SYSTEM FILLING

Follow this procedure to fill the charge air coolant system:

NOTE:

Always use only treated coolants in accordance with *Engine Service Fluid and Filter Requirements, DDC/MTU Series 2000, MTU/DDC Series 4000 (7SE273)*.

1. Open the pressure cap. Refer to section F-70.
2. Pour in treated engine coolant via the filler neck.
3. Check charge air coolant level. Refer to section F-56.
4. Close the pressure cap. Refer to section F-70.
5. Run the engine a number of minutes at idling speed.
6. Check the charge air coolant level. Refer to section F-56.

F-65 – CHARGE AIR COOLANT LEVEL CHECK

NOTE:

The MIN coolant level is automatically monitored by the engine control system.



CAUTION:

Engine coolant is hot and under pressure. To avoid injury, wear protective gloves and do not open the cooling system fill (pressure) cap until the engine has cooled. Loosen the cooling system fill (pressure) cap and allow the pressure to escape, before cap removal.

Via level sensor: Switch on the engine control system and check indicator. Refer to *DDEC III/IV Single ECM Troubleshooting Manual*, (6SE497).

Manual Checks: Refer to OEM vehicle operating instructions.

Open pressure cap of radiator expansion tank. Refer to section F-70.

If coolant level dropped, only fill with treated engine coolant.

NOTICE:

Never pour cold coolant into a hot engine.

NOTICE:

If untreated water is used to top up the coolant system in an emergency, the coolant concentration must be checked and rectified at the earliest opportunity.

Close pressure cap of radiator expansion tank. Refer to section F-71.

F-66 – CHARGE AIR COOLANT DRAINING

Follow this procedure to drain the charge air coolant:

1. Disable engine start. Refer to section F-1.
2. Allow engine to cool.



CAUTION:

To avoid injury when using the chemical substances and materials listed below, it is essential to observe the manufacturer's instructions for use, safety instructions and waste disposal specifications.

- ☐ Oils
- ☐ Greases
- ☐ Treated engine coolant
- ☐ Fuels
- ☐ Cleaning agents

1. Before draining the coolant, remove the pressure cap on the radiator expansion tank. Refer to section F-70.
2. Drain the radiator expansion tank via the filler neck.
3. Collect the coolant in a suitable container and dispose in an environmentally safe manner.
4. Drain engine coolant at the drain plug.
5. Drain remaining engine coolant at the charge air cooler.
6. Seal all drain points.
7. Fill charge air coolant. Refer to section F-64.
8. Replace pressure cap.
9. Enable engine start. Refer to section F-2.

F-67 – CHARGE AIR COOLANT SYSTEM VENT LINE OBSTRUCTION CHECK



CAUTION:

To avoid an eye injury when using compressed air, wear adequate eye protection (safety glasses or faceplate) and do not exceed 276 kPa (40 lb/in. ²) air pressure.

Remove vent lines and blow out with compressed air.

Install vent lines.

F-68 – ENGINE COOLANT RADIATOR CORE EXTERNAL CONTAMINATION CHECK

Coolant radiator is not provided by DDC.

Follow OEM instructions.

F-69 – CHARGE AIR COOLANT RADIATOR ELEMENTS EXTERNAL CONTAMINATION CHECK

Coolant radiator is not provided by DDC.

Follow OEM instructions.

F-70 – COOLANT PRESSURE CAP — RADIATOR EXPANSION TANK OPENING



CAUTION:

Engine coolant is hot and under pressure. To avoid injury, wear protective gloves.

Remove the pressure cap as follows:

1. Turn pressure cap counterclockwise to first stop (arrow). See Figure 35.

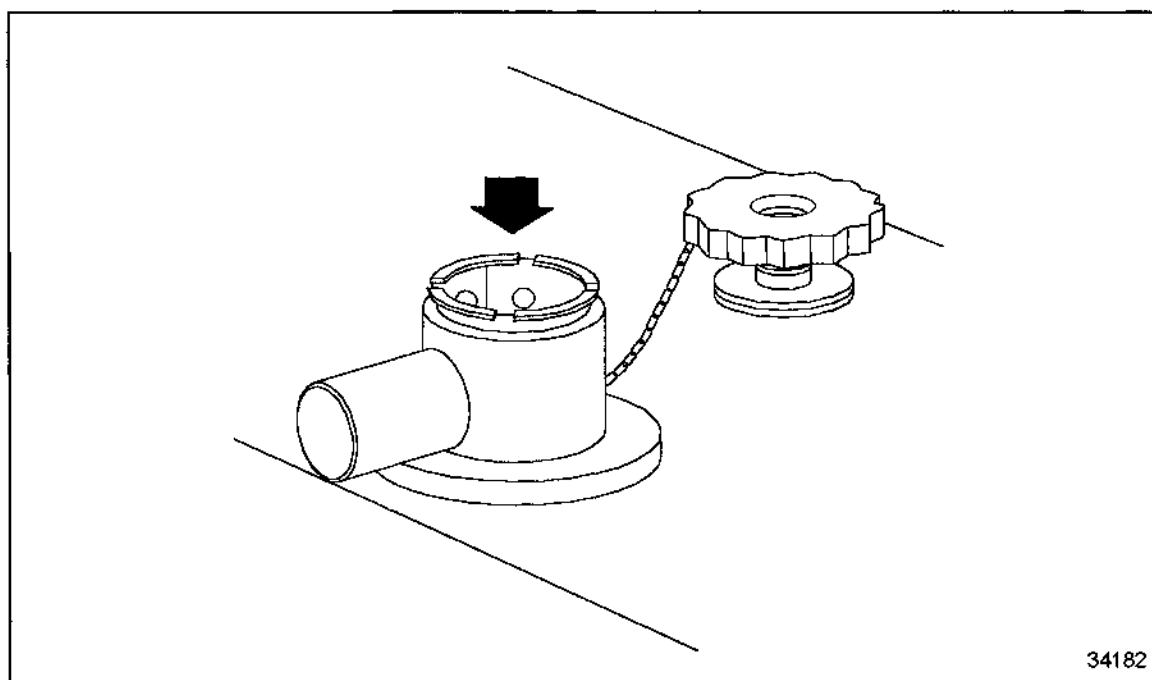


Figure 35 Pressure Cap Stop

2. Allow pressure to escape.
3. Continue to turn pressure cap counterclockwise and remove.
4. To close pressure cap, refer to section F-71.

F-71 – COOLANT PRESSURE CAP — RADIATOR EXPANSION TANK CLOSING

Check and close the pressure cap as follows:

1. Check that the pressure cap is in perfect condition.
2. Clean sealing surfaces.
3. Fit pressure cap and turn clockwise as far as it will go.

F-72 – WIRING — SECURITY AND CONDITION CHECK

1. Disable engine start. Refer to section F-1.
2. Disconnect the battery.
3. Check all plug-in connections for security and damage at:
 - [a] Speed, pressure and temperature transmitters
 - [b] Level Sensor
 - [c] Actuating solenoid on electronic unit pump (EUP)
4. Check all mechanical fixtures and electrical connections at the:
 - [a] Starter
 - [b] Alternator / generator
 - [c] Battery
 - [d] Turbocharger control
5. Connect the battery.
6. Enable engine start. Refer to section F-2.

F-73 – ALTERNATOR DRIVE — VEE-RIBBED BELT CONDITION AND TENSION CHECK

Perform the following steps to check condition of the vee-ribbed belt:

1. Disable engine start. Refer to section F-1.
2. Remove guard plate.
3. Check vee-ribbed belts for cracks, oil, overheating and wear.
 - [a] Clean the vee-ribbed belts.
 - [b] Replace the belts if damaged.
4. Enable engine start. Refer to section F-2.

Damage Pattern of Vee-ribbled Belts

Inspect the belts for the following wear patterns.

1. Normal wear would have one or two cracks measuring approximately 25 mm (1 in.). Cracks usually appear after long-term use. The vee-ribbled belts can continue to be used. See Figure 36.

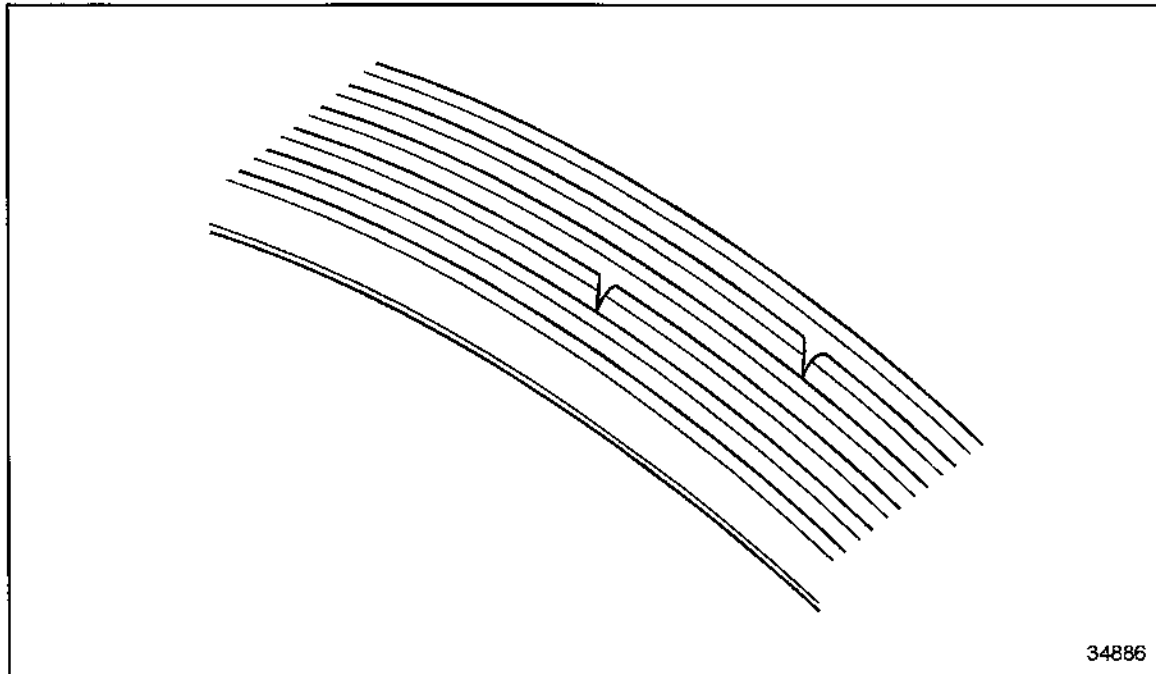


Figure 36 **Normal Wear**

2. The vee-ribbed belts must be replaced if the ribs are broken around the entire circumference. See Figure 37.

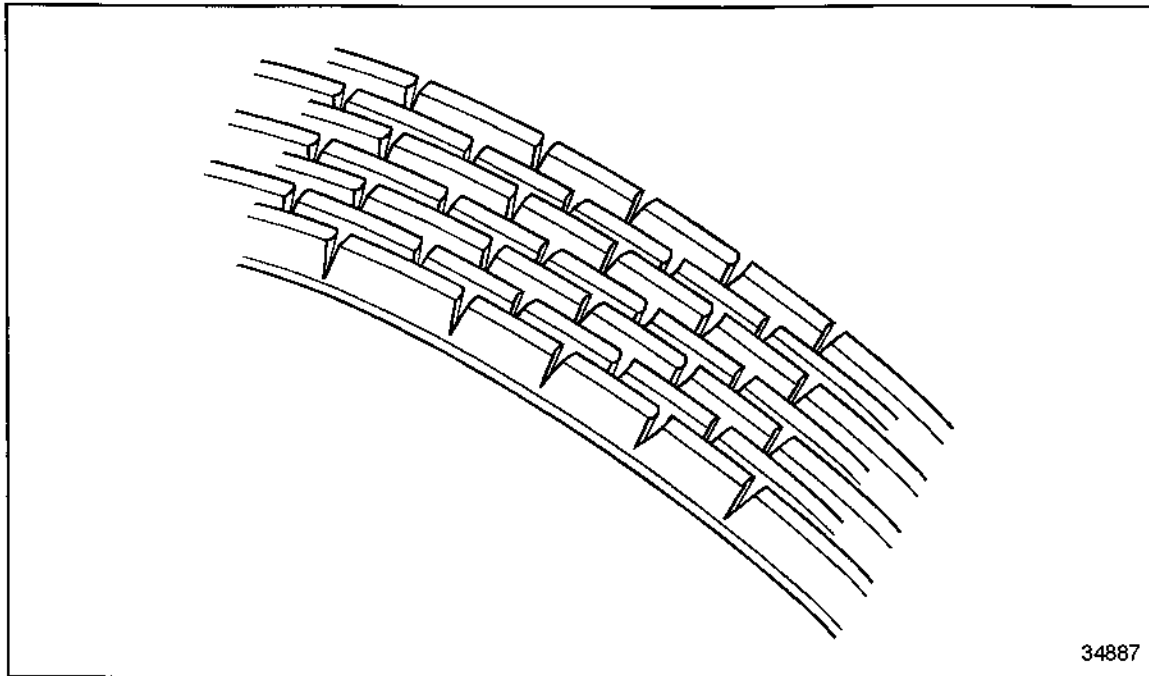


Figure 37 **Broken Ribs**

3. The vee-ribbed belt must be replaced immediately if the ribs are cracked around the entire circumference and ribbed material has broken off. See Figure 38.

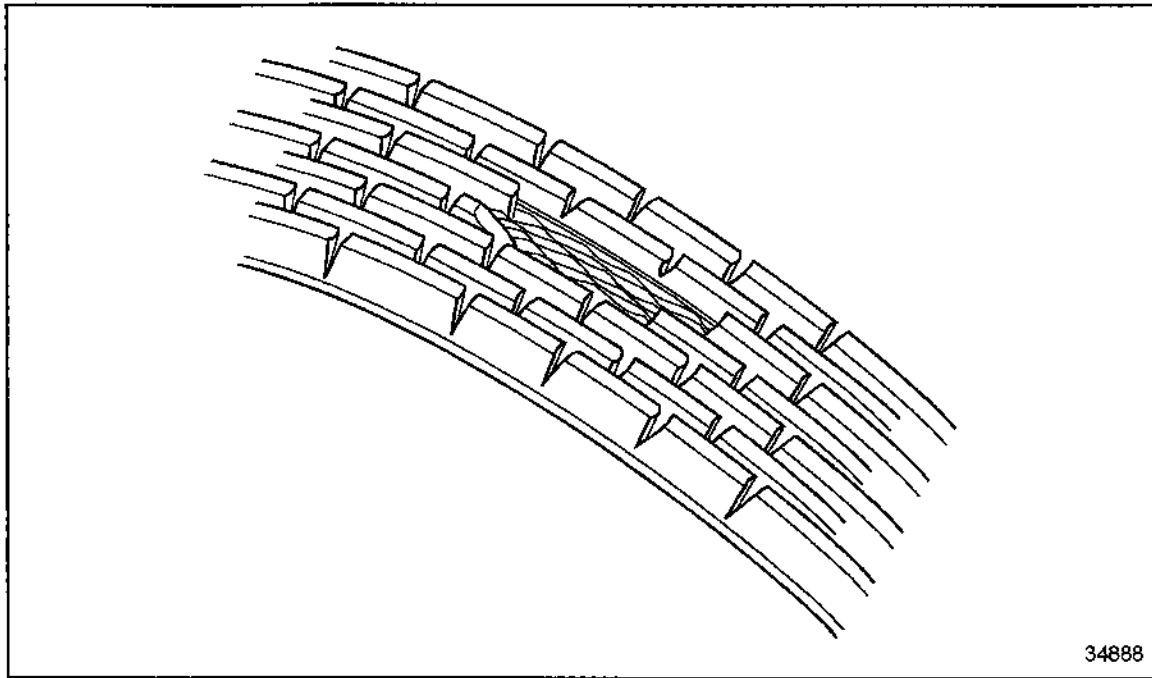


Figure 38 Rib Material Broken Away

Tension Check

Position the vee-ribbed belt tension tester on the vee-ribbed belt, midway between the belt pulleys. Read off the belt tension indicated where the pointer crosses the gage scale.

For new or used vee-ribbed belts, tension for the alternator drive should be 57–70 kg (125–155 lb).

1. The vee-ribbed belt tension must be correctly adjusted if the value measured does not correspond to the required value.
2. Release locknut and securing screws.
3. Adjust vee-ribbed belt tension with clamping nut.
4. Check vee-ribbed belt tension.
5. Tighten locknut.
6. Tighten securing screws.
7. Install guard plate.
8. Enable engine start. Refer to section F-2.

F-74 – ALTERNATOR DRIVE — VEE-RIBBED BELT REPLACEMENT

Perform the following steps to replace the vee-ribbed belt.

1. Disable engine start. Refer to section F-1.
2. Remove guard plate.
3. Release securing screws.
4. Release locknut and clamping nut to remove both vee-ribbed belts.
5. Check that belt pulleys are clean; clean if necessary.
6. Fit new vee-ribbed belts and secure with clamping nut.
7. Set belt tension. Refer to section F-73.
8. Tighten locknut.
9. Tighten securing screws.
10. Install guard plate.
11. Enable engine start. Refer to section F-2.

NOTE:

After the engine has run for 30 minutes, again check the vee-ribbed belt tension and readjust if necessary. After the engine has run for eight hours, again check the tension and readjust if necessary.

F-75 – SECURITY CHECK

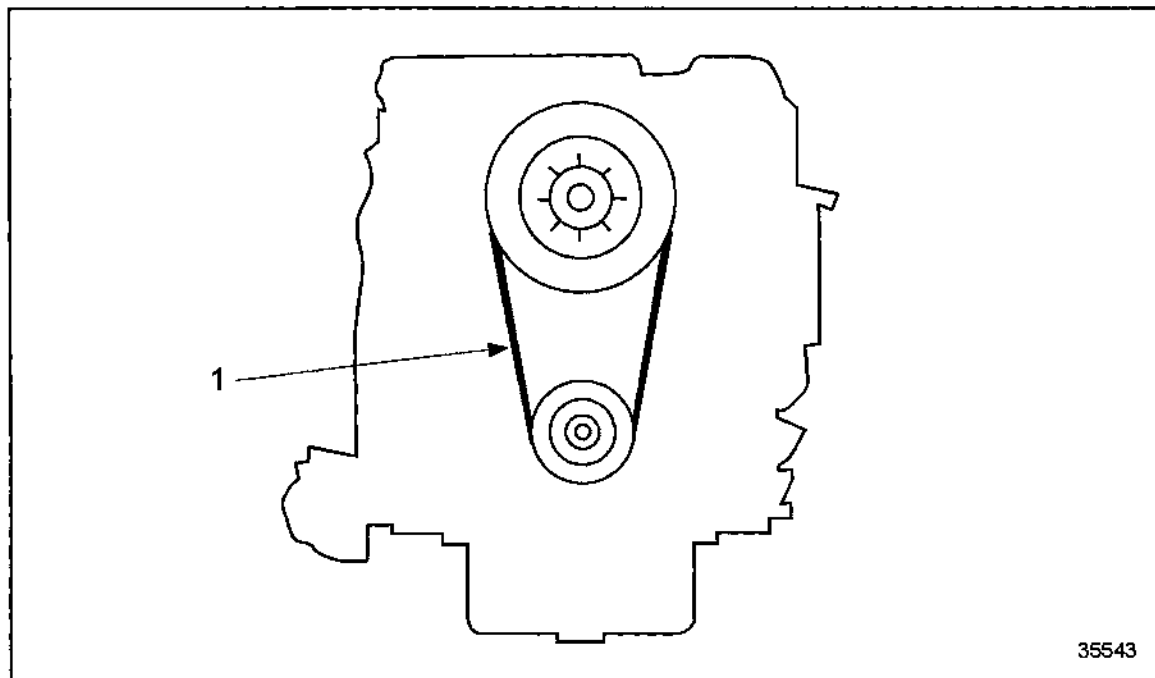
Perform these steps to check the cable security and condition:

1. Disable engine start. Refer to section F-1.
2. Disconnect battery.
3. Check all plug-in connections for security and damage at:
 - ☐ Mechanical fixtures
 - ☐ Electrical connections
4. Connect battery.
5. Enable engine start. Refer to section F-2.

F-76 – FAN DRIVE — VEE-RIBBED BELT CONDITION AND TENSION CHECK

Perform the following steps to check condition of the vee-ribbed belt:

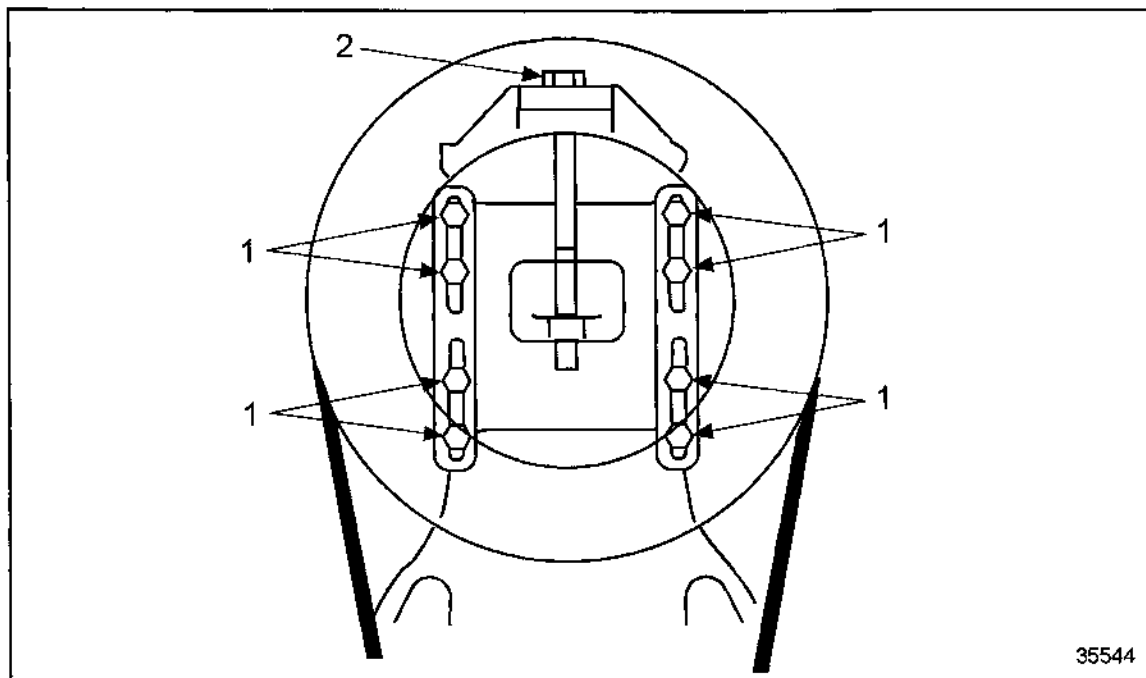
1. Disable engine start. Refer to section F-1.
2. Check vee-ribbed belts for cracks, oil, overheating and wear; clean or replace as necessary.
3. Refer to section F-73 for belt condition checks.
4. Settings for new or used vee-ribbed belts for the fan drive should be 250–259 kg. (550–650 lb.)
5. To check tension, position the belt tension tester on the belt midway between the pulleys. See Figure 39.



1. Tension Tester Position

Figure 39 Tension Check

6. See Figure 40 to adjust the vee-ribbed belt tension if it does not correspond to the required value.



1. Securing Bolts

2. Adjusting Bolt

Figure 40 Tension Check

- [a] Release fan coupling securing bolts (1).
 - [b] Adjust tension with adjusting bolt (2).
 - [c] After adjustment, tighten fan coupling securing bolts (1) to 100 N·m (74 ft·lb).
7. Enable engine start. Refer to section F-2.

F-77 – FAN DRIVE — VEE-RIBBED BELT REPLACEMENT

Perform these steps to replace the vee-ribbed fan drive belt:

1. Disable engine start. Refer to section F-1.
2. Release fan coupling securing bolts (1).
3. Release adjusting bolt (2) to remove the vee-ribbed belt.
4. Check pulleys on the fan coupling and crankshaft for cleanliness; clean if necessary.
5. Fit new vee-ribbed belt and secure with the adjusting bolt (2).
6. Set tension.
 - [a] Release fan coupling adjusting bolt (1).
 - [b] Adjust tension with adjusting bolt (2).
 - [c] After adjustment, tighten fan coupling securing bolts (1) to 100 N·m (74 ft·lb).
7. Enable engine start. Refer to section F-2.

NOTE:

After the engine has run for 30 minutes under low load, again check the vee-ribbed belt tension and readjust if necessary. After the engine has run for eight hours, again check the tension and readjust if necessary.

F-78 – ENGINE MOUNT — SECURITY CHECK

Check tightness of all securing bolts using a torque wrench.

F-79 – ENGINE MOUNT — RESILIENT MOUNT CONDITION CHECK

Visually check resilient mounts for cracks and deformation.

Replace cracked rubber elements.

NOTE:

Wipe rubber surfaces with dry cloth only; never clean with organic detergents.

F-80 – CRANKSHAFT PULLEY — SECURITY CHECK

Perform the following security checks:

1. Disable engine start. Refer to section F-1.
2. Remove protective guard from crankshaft pulley.
3. Check tightness of crankshaft pulley. Use a torque wrench to check securing bolts.
4. Install protective guard to the crankshaft pulley.
5. Enable engine start. Refer to section F-2.

F-81 – AIR COMPRESSOR DRIVE

Contact the OEM for information about the air compressor drive, belts and tension checks.

F-82 – GUARD CHECK

Check that all guards are correctly installed on the generator/alternator and PTO systems. The protective guards are OEM supplied.

F-83 – BATTERY CHECK



CAUTION:

Explosive gas may remain in or around the battery for several hours after it has been charged. Sparks or flames can ignite this gas causing an internal explosion which could shatter the battery. Flying pieces of the battery structure and splash of the electrolyte can cause injury. The battery electrolyte is an acid. Extreme care should be exercised to avoid skin or eye contact with the electrolyte. If you come in contact with battery electrolyte:

- ☐ **Flush your skin with water.**
- ☐ **Apply baking soda or lime to help neutralize the acid.**
- ☐ **Flush your eyes with water.**
- ☐ **Get medical attention immediately.**

The battery is OEM supplied. Use the manufacturer's specifications to check the battery.

F-84 – FUEL SUPPLY CHECK



CAUTION:

Diesel fuel is a combustible fluid. To avoid injury when working on the fuel system, do not smoke, use open flame, or electrical equipment. Risk of a fire is probable. Perform maintenance in a well-ventilated work area with access to a fire extinguisher.

Check fuel supply in the fuel tank. Top up if necessary.

NOTE:

A full fuel tank reduces condensation and the growth of bacteria.

F-85 – EXHAUST SYSTEM DRAINLINE OBSTRUCTION CHECK

The exhaust system is supplied by an OEM. Refer to vehicle manufacturer's operating instructions.

F-86 – ENGINE CONTROL SYSTEM CUT IN

The vehicle monitoring system is supplied by the OEM.

Move the power supply master switch to ON.

F-87 – ENGINE CONTROL SYSTEM CUT OUT

The vehicle monitoring system is supplied by the OEM.

Move the power supply master switch to OFF.

F-88 – PREPARATION FOR WELDING OPERATIONS

NOTE:

Before starting welding operations, disconnect the negative and positive battery cables.

NOTICE:

Never use the engine as a ground connection. Grounding through the engine can result in burning or scorching and lead to bearing pitting. The ground connection for the welding unit must not be attached more than 60 cm (2 ft) from the welding point.

NOTICE:

Never carry out welding work on the engine or engine-mounted units. If welding must be performed on components (e.g. exhaust pipe), remove these components from the engine prior to welding.

NOTICE:

Never position the welding power supply cable adjacent to, or crossing the wiring harnesses. (The welding current can be induced in the wiring harness, which could damage the DDEC III/IV electronic control modules (ECM)).

F-89 – DDEC — OPERATION

For information on DDEC, refer to the *DDEC III/IV Single ECM Troubleshooting Manual*, (6SE497).

F-90 – DDEC CONNECTION CHECKS

For information on DDEC, refer to the *DDEC III/IV Single ECM Troubleshooting Manual*, (6SE497).

F-91 – MONITORING SYSTEM

Check operation of level sensor on the engine coolant expansion tank. Refer to *DDEC III/IV Single ECM Troubleshooting Manual*, (6SE497).

The temperature transmitter, speed transmitter and pressure transmitter are continuously monitored with the Integrated Test System (ITS) in the Engine Control System. If a monitoring unit fails, a warning is given.

Refer to the *DDEC III/IV Single ECM Troubleshooting Manual*, (6SE497).

F-92 – AIR SYSTEM — INTAKE DEPRESSION CHECK

Check the intake depression as follows:

1. Connect the manometer pressure gages to turbocharger air intake housings.
2. Run engine at full load and read measurement on the manometer pressure gage.
Refer to section B-6.
3. Remove gage.

G – PRESERVATION

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G-3 Extended Preservation and Storage	138
G-4 Restore to Service	139
G-5 Task Descriptions with Three-Digit Codes	139

G-1 – PRESERVATION — INTRODUCTION

Low operating and maintenance costs as well as operational reliability and availability depend on maintenance and servicing being carried out in compliance with DDC/MTU specifications and instructions.

These instructions differentiate between preservation procedures for storage, preservation procedures for extended storage and restoration to service of MTU/DDC diesel engines.

Preservation procedures must be carried out on:

- ☐ New or overhauled engines, following the test run (storage is carried out by MTU/DDC, but may be omitted if the engine is to be put into immediate operation).
- ☐ Engines being withdrawn from operation for a period exceeding three months, as soon after the final operating period as possible.

Preservation procedures are adequate for storage for a period up to:

- ☐ Twelve (12) months under favorable storage conditions
- ☐ Six (6) months under unfavorable storage conditions, e.g. high humidity, salt-laden atmosphere, pronounced temperature fluctuations, etc.

On conclusion of the storage period, carry out the extended preservation procedures at the required intervals.

Extended storage is adequate for a storage period of up to:

- ☐ Six (6) months under favorable storage conditions
- ☐ Three (3) months under unfavorable conditions, e.g. high humidity, salt-laden atmosphere, pronounced temperature fluctuations, etc.

Engines in special packing do not need the extended preservation procedures as long as the permissible relative humidity is not exceeded in the packaging enclosure; refer to the current specification for DDC/MTU Special Packing A060374.

Only DDC/MTU-approved storage agents may be used for storage and extended storage. Refer to DDC publication *Engine Service Fluid and Filter Requirements, DDC/MTU Series 2000, MTU/DDC Series 4000* (7SE273).

These services may be omitted if:

- ☐ They cannot be completed due to operationally required special equipment (e.g. test stand).
- ☐ The specified component is not fitted on the diesel engine.

Before- and after-operation services on the engine must be carried out in accordance with the Operating Instructions.

The preservation, storage and restoration operations and tasks must be carried out in the recommended sequence. The preservation, storage and restoration operations are the following:

- ☐ Preservation and storage (listed in Table 46)
- ☐ Extended preservation and extended storage (listed in Table 47)
- ☐ Restoration to service (listed in Table 48)

The procedures in all three tables are specified by three-digit and alpha-digit codes.

The three-digit code procedures can be found in this chapter. Refer to section G-5.

The alpha-digit code procedures can be found in the previous chapter, and carry the prefix F. They are tasks that are covered in detail in the numbered sections.

G-2 – PRESERVATION AND STORAGE

The operations and tasks required for preservation and storage must be carried out in the recommended sequence listed in Table 46.

Section	Task Description
Refer to section F-12	Shut down engine
Refer to section F-1	Disable engine start
Refer to section F-54	Drain engine oil
Refer to section 001 Clean engine	Clean engine
Refer to section F-52	Fill corrosion inhibitor oil into engine
Refer to section 002 Preserve fuel system	Preserve fuel system
Refer to section F-2	Release engine start
Refer to section F-5	Start engine
Refer to section 003 Preserve engine coolant system	Preserve engine coolant system
Refer to section 004 Perform preservation run	Perform preservation run
Refer to section F-12	Shut down engine
Refer to section F-1	Disable engine start
Refer to section 005 Spray corrosion inhibitor oil into air manifolds	Spray corrosion inhibitor oil into air manifolds
Refer to section 006 Spray corrosion inhibitor oil onto turbocharger compressor wheels	Spray corrosion inhibitor oil onto turbocharger compressor wheels
-	Connect fuel suction line to fuel system
Refer to section F-53	Draw off corrosion inhibitor oil from engine
Refer to section 007 Seal engine exhaust system	Seal engine exhaust system
Refer to section 008 Seal engine air system	Seal engine air system
Refer to section 009 Preserve engine externally	Preserve engine externally

Table 46 Storage Procedures

G-3 – EXTENDED PRESERVATION AND STORAGE

The operations and tasks required for extended preservation and extended storage must be carried out in the recommended sequence listed in Table 47.

Section	Task Description
Refer to section 001 Clean engine	Clean engine
Refer to F-3	Bar engine manually, and
Refer to section 006 Spray corrosion inhibitor oil onto turbocharger compressor wheels	Spray corrosion inhibitor oil into air manifolds
Refer to section 006 Spray corrosion inhibitor oil onto turbocharger compressor wheels	Spray corrosion inhibitor oil onto turbocharger compressor wheels
Refer to section 009 Preserve engine externally	Preserve engine externally

Table 47 Extended Storage Procedures

G-4 – RESTORE TO SERVICE

The operations and tasks required for restoration to service must be carried out in the recommended sequence listed in Table 48.

Section	Task Description
Refer to section 001 Clean engine	Clean engine
Refer to section F-25	Remove cylinder head covers
Refer to section F-4	Turn engine on starter, and
Refer to section 011 Inspect and preserve valve gear	Check valve gear
Refer to section 012 Remove seals from engine air system	Remove seals from engine air system
Refer to section 013 Remove seals from engine exhaust system	Remove seals from engine exhaust system
—	For other services see Operating Instructions

Table 48 Restore to Service Procedures

G-5 – TASK DESCRIPTIONS WITH THREE-DIGIT CODES

The task description with three-digit codes are described in the following sections.

001 Clean engine

Clean engine externally and check for corrosion. If necessary, remove rust spots and renew paint.

NOTE:

Do not use organic detergents to clean rubber or synthetic components. Wipe with a dry cloth only.

002 Preserve fuel system

Connect the fuel delivery pump suction line to a separate tank, which should be filled with:

- ☐ Injection pump testing oil, to DIN ISO 4113 or
- ☐ Diesel fuel with 10% corrosion inhibitor oil, for internal preservation

If possible, store the fuel system when the engine is hot. (Storage is carried out during the pre-storage run, refer to section G-1.)

003 Preserve engine coolant system

NOTE:

Engine coolant systems are usually filled with prepared engine coolant and, therefore, protected from corrosion.

Fill engine coolant system with coolant containing 2% soluble corrosion inhibitor oil or 50% antifreeze. The coolant preserves the engine during the pre-storage run.

The coolant should be allowed to remain in the engine to provide protection against corrosion.

Only drain the coolant for ambient temperatures.

- ☐ Below 0°C for coolant/corrosion inhibitor oil emulsions
- ☐ Below 40°C for coolant/antifreeze emulsions

004 Perform preservation run

Run the engine approximately 20 minutes at idling speed.

005 Spray corrosion inhibitor oil into air manifolds

Spray corrosion inhibitor oil into the air manifolds as follows:

1. Remove plugs from air manifolds.
2. Turn engine on starter.
3. Spray corrosion inhibitor oil into air manifolds.

NOTICE:
Use only sealing rings which are in perfect condition.

4. Insert plugs into air manifolds.

006 Spray corrosion inhibitor oil onto turbocharger compressor wheels

Spray corrosion inhibitor oil into the turbocharger compressor wheels as follows:

1. Disconnect air pipework from turbochargers.
2. Spray compressor wheels and compressor housing with corrosion inhibitor oil while rotating the compressor wheels.
3. Reconnect air pipework.

007 Seal engine exhaust system

Cover the exhaust outlets at the turbocharger with blanking plates so that they are sealed against air and moisture penetration.

NOTE:

In order to ensure that these plates are not overlooked when the engine is returned to service, they must be shaped in such a way as to project beyond the flanges at a certain point. Paint the projections bright red and fold them back.

008 Seal engine air system

Cover the air filter with plastic sheet.

009 Preserve engine externally

Spray or brush preservation agent on all exposed metalwork.

NOTE:

Do not apply grease to the sealing lips of radial-lip oil seals.

NOTE:

Seal all openings in pipework, housings and turbochargers, with suitable, plugs or plates.

011 Inspect and preserve valve gear

Check valve gear and fuel injection components for moisture, corrosion or other evidence of damage.

Spray corrosion inhibitor oil into housing and onto valve gear and fuel injection system components.

NOTE:

When removing the plugs, ensure that no foreign particles fall into the engine.

Connect the bellows.

012 Remove seals from engine air system

Remove plastic sheet from air filters.

013 Remove seals from engine exhaust system

Remove blanking plugs from exhaust outlets.

NOTE:

When removing the plugs, ensure that no foreign particles fall into the engine.

Connect the bellows.

P – PERFORMANCE CURVES

Section	Page
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P-1 – PERFORMANCE CURVES

Applicable performance curves follow:

Industrial Power

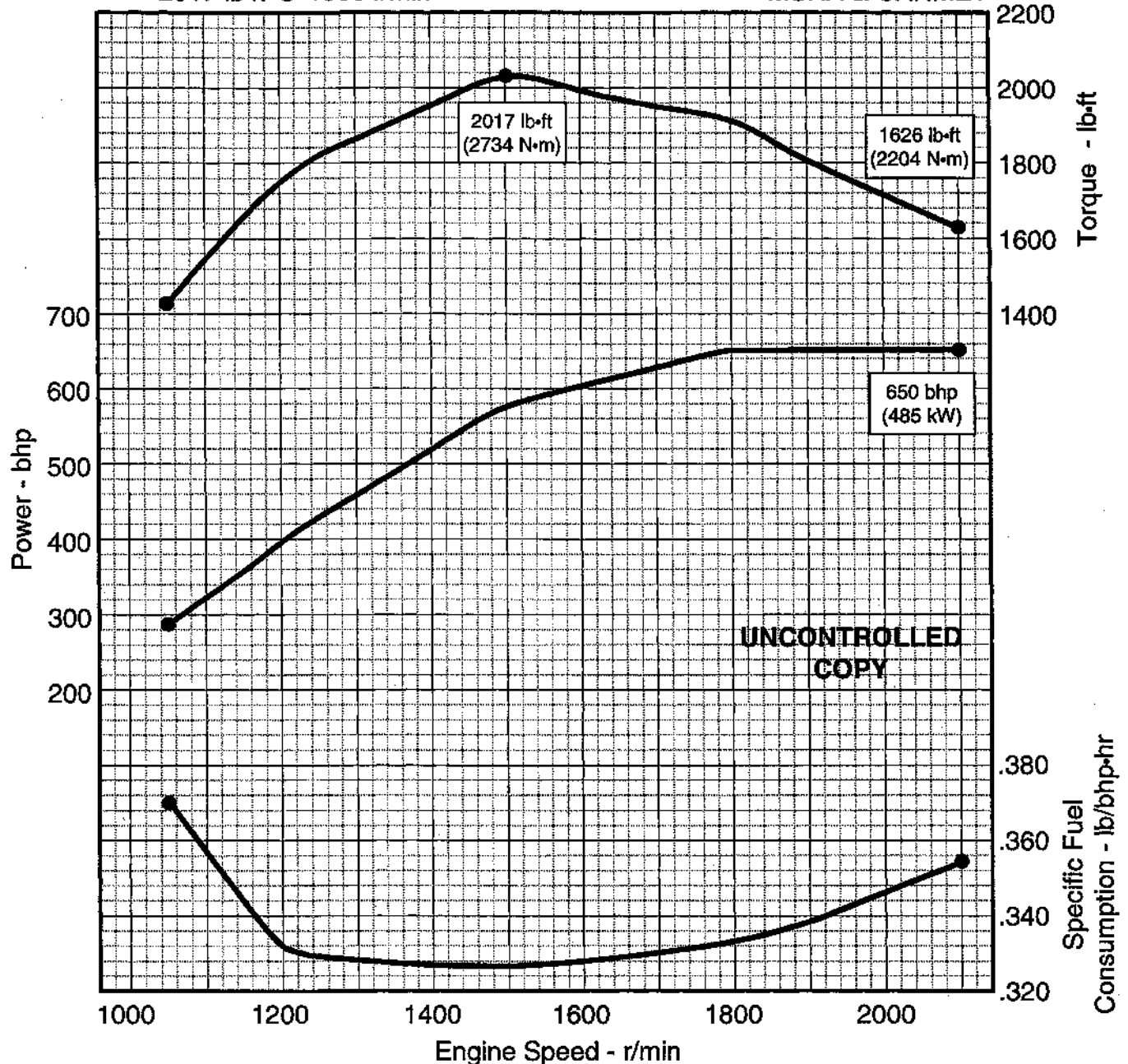
Model: 8V-2000TA DDEC®

Rating: 650 bhp @ 2100 r/min
2017 lb·ft @ 1500 r/min

Certification:

1998 - 1999

MSHA & CANMET



Power output guaranteed within -0/+2% at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: kg/kW · hr = lb/bhp · hr x 0.608

Torque: N · m = lb · ft x 1.356

Turbo : K31

6N4M : 1290

Certified by:

Curve No. E4-2083-31-11

Rev. / Date: 2 / 2-19-99

Sheet No. 1 of 2

Performance Curve

Construction and Industrial Specification Sheet

General Data

Model.....	R083-7K32
Number of Cylinders.....	8
Bore and Stroke - in. x in. (mm x mm).....	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L).....	972 (15.93)
Compression Ratio.....	16.0:1
Piston Speed - ft/min (m/min).....	2067 (630)
Intake Valves Per Cylinder.....	2
Exhaust Valves Per Cylinder.....	2
Combustion System.....	Direct Injection
Engine Type.....	90° VEE 4 Cycle
Aspiration.....	Turbocharged

Configuration

Injection Device.....	EUP
Turbocharger.....	K31
Charge Air Cooling.....	SOCC
Low Idle Speed - r/min.....	600
High Idle Speed - r/min.....	2250
Engine Crankcase Vent System.....	Open

Physical Data

Size:	
Length - in. (mm).....	57.5 (1460)
Width - in. (mm).....	43.7 (1109)
Height - in. (mm).....	48.8 (1238)
Weight, Dry - lb (kg), Approximate.....	3560 (1615)
Weight, Wet - lb (kg), Approximate.....	3765 (1708)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm).....	16.7 (424)
Above Crankshaft (y axis) - in. (mm).....	6.2 (157)
Right of Crankshaft (z axis) - in. (mm).....	1.18 (30.0)
Installation Drawing.....	5310100301 & SK-11255

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N).....	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N).....	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m).....	1000 (1356)
Additional Mechanical Data.....	Not Available

Fuel System

Fuel Pump.....	5235920
Fuel Consumption - lb/hr (kg/hr).....	230.0 (104.3)
Fuel Consumption - gal/hr (L/hr).....	32.9 (124.5)
Fuel Spill - lb/hr (kg/hr).....	1437 (651.8)
Fuel Spill - gal/hr (L/hr).....	205.6 (778.2)
Total Fuel Flow - lb/hr (kg/hr).....	1667.0 (756.1)
Total Fuel Flow - gal/hr (L/hr).....	238.5 (902.7)
Heat Rejection to Fuel - Btu/min (kW).....	450 (7.91)
Maximum Fuel Inlet Temperature - °F (°C).....	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa).....	6 (20.3)
Dirty System - in. Hg (kPa).....	12 (41)
Fuel Filter Size, Primary - microns.....	20
Fuel Filter Size, Secondary - microns.....	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa).....	53-64 (365-441)
Oil Pressure at Low Idle - lb/in. ² (kPa).....	20 (138)
In Pan Oil Temperature - °F (°C).....	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L).....	49 (46.4)
Low Limit - qt (L).....	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L).....	57 (53.9)
Engine Angularity Limits, Front Up - Degrees.....	30
Engine Angularity Limits, Front Down - Degrees.....	30
Engine Angularity Limits, Side Tilt - Degrees.....	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
12 Volt System.....	Not Recommended
24 Volt System, Above 32°F / (0°C).....	950
24 Volt System, Below 32°F / (0°C).....	1250
Maximum Resistance of Starting Circuit:	
12 Volt System - ohms.....	Not Recommended
24 Volt System - ohms.....	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW).....	11480 (201.9)
Charge Air Cooler Heat Rejection - Btu/min (kW).....	6420 (112.9)
Engine Radiated Heat - Btu/min (kW).....	4190 (73.7)
Primary Circuit	
Coolant Flow - gal/min (L/min).....	235 (890)
Max. External Pressure Differential - lb/in. ² (kPa).....	8 (55.2)
Separate Circuit	
Coolant Flow - gal/min (L/min).....	113 (427.8)
Max. External Pressure Differential - lb/in. ² (kPa).....	12 (82.7)
Thermostat:.....	Full Blocking
Start to Open - °F (°C).....	165 (74)
Fully Open - °F (°C).....	188.6 (87)
Minimum Water Pump Inlet Pressure.....	Positive
Engine Coolant Capacity - qt (L).....	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa).....	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa).....	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa).....	33 (227.5)
Maximum Top Tank Temperature - °F (°C).....	210 (99)
Minimum Top Tank Temperature - °F (°C).....	160 (71)
Maximum Ambient to Intercooler Out	
Temperature Rise - °F (°C).....	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C).....	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min).....	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min).....	0.8 (0.023)
Minimum Drawdown Requirement.....	8% of Cooling System
Deaeration Time - Minutes.....	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C).....	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa).....	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa).....	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min).....	1585 (44.9)
Engine Air Box/Manifold Pressure - in. Hg (kPa).....	61.5 (207.7)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm).....	Not Applicable
Dual - in. (mm).....	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa).....	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min).....	3960 (112.1)
Exhaust Temperature - °F (°C).....	840 (449)
Maximum Back Pressure - in. Hg (kPa).....	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm).....	6.0 (152)
Dual - in. (mm).....	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa).....	252.2 (1739)
Friction Power:	
Rated Speed - hp (kW).....	95.5 (71)
Peak Torque Speed - hp (kW).....	Not Available
Altitude Capability - ft (m).....	8800 (2680)
Torque Available at 800 r/min - lb-ft (N-m).....	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
2100	650 (485)	1628 (2204)	0.354 (215)
1950	650 (485)	1751 (2374)	0.344 (209)
1800	650 (485)	1897 (2571)	0.335 (204)
1650	615 (458)	1956 (2652)	0.331 (201)
1500	578 (430)	2017 (2734)	0.329 (200)
1350	488 (364)	1899 (2574)	0.330 (200)
1200	398 (297)	1742 (2362)	0.334 (210)
1050	285 (213)	1426 (1933)	0.370 (223)

Emissions Data

Smoke, Rated Speed - Bosch Number.....	0.9
Smoke, Peak Torque Speed - Bosch Number.....	0.6
Noise - dB(A) @ 1m.....	102.5
Additional Noise Data.....	N1-2083-31-8
MSHA Certificate Number.....	7E-B032-0
CANMET Approval Number.....	1103
(CWC) Certification Word Code.....	5216

MSHA certified Category B engine ventilation requirement under Part 7, subpart E, Title 30 of the CFR - 45,000ft³/min (cfm)

**UNCONTROLLED
COPY**

All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

	2100 r/min g/hr	8 Mode Cycle g/bhp-hr
NO _x	3825	5.925
CO.....	133	0.360
HC.....	65	0.127
Particulates.....	29.0	0.045

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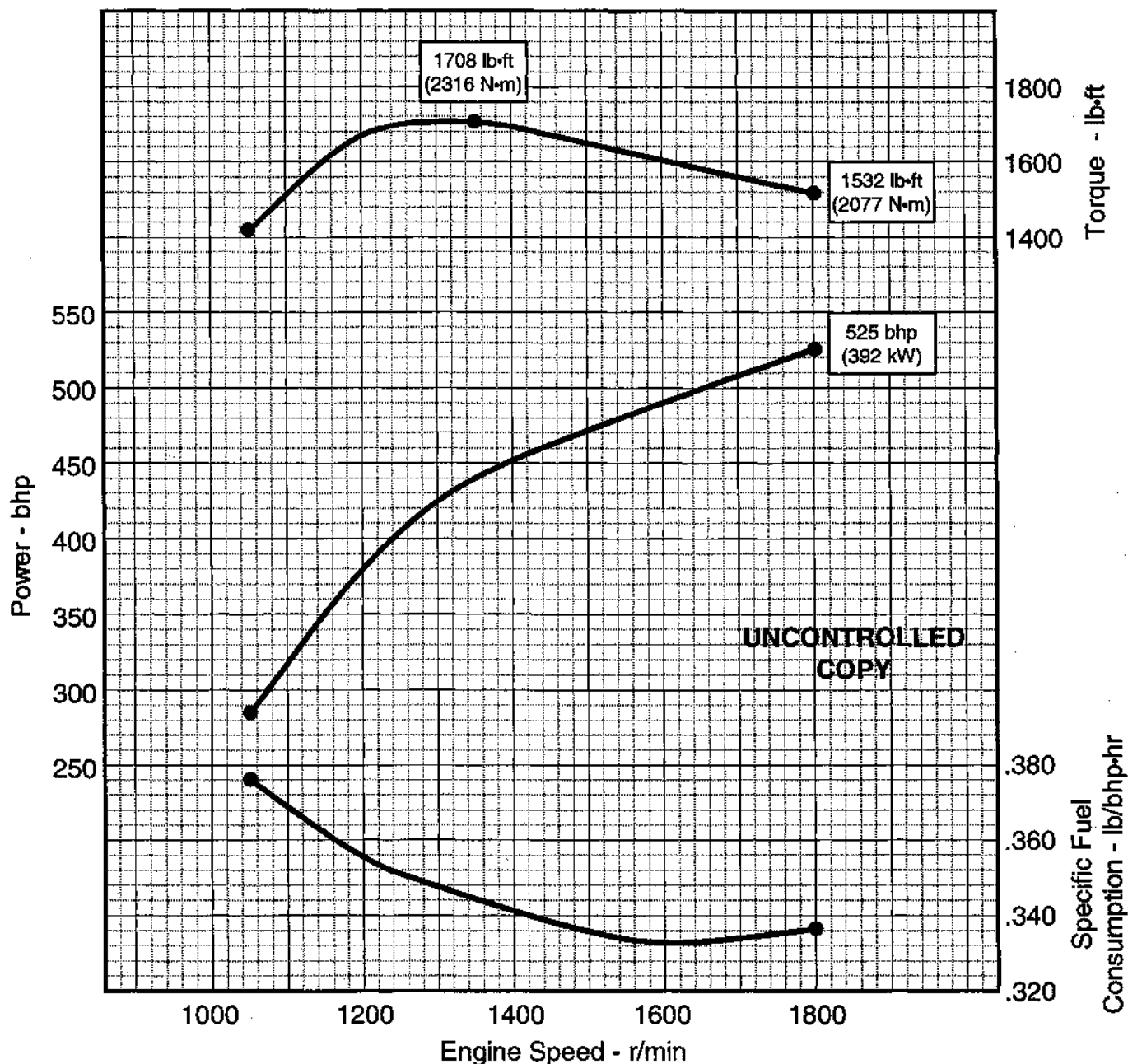
Industrial Power

Model: 8V-2000TA DDEC®

Rating: 525 bhp @ 1800 r/min
1708 lb·ft @ 1350 r/min

Certification:

1997-99 Nonroad



Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; 853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746
Fuel: kg/kW·hr = lb/bhp·hr x 0.608
Torque: N·m = lb·ft x 1.356

Turbo: K31
6N4M: 1258

Certified by:

Curve No. E4-2083-31-06

Rev. / Date: 5 / 2-19-99

Sheet No. 1 of 2

Performance Curve

Construction and Industrial Specification Sheet

General Data

Model	R083-7K33
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.93)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	K31
Charge Air Cooling	JWAC
Low Idle Speed - r/min	600
High Idle Speed - r/min	1950
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1236)
Weight, Dry - lb (kg), approximate	3530 (1601)
Weight, Wet - lb (kg), approximate	3735 (1694)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (424)
Above Crankshaft (y axis) - in. (mm)	6.2 (157)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	177.2 (80.4)
Fuel Consumption - gal/hr (L/hr)	25.3 (95.9)
Fuel Spill - lb/hr (kg/hr)	1490 (675.9)
Fuel Spill - gal/hr (L/hr)	211.4 (800.4)
Total Fuel Flow - lb/hr (kg/hr)	1655.2 (750.8)
Total Fuel Flow - gal/hr (L/hr)	236.8 (896.4)
Heat Rejection to Fuel - Btu/min (kW)	365 (6.42)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	20
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	47-57 (324-393)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
12 Volt System	Not Recommended
24 Volt System, Above 32°F / (0°C)	950
24 Volt System, Below 32°F / (0°C)	1250
Maximum Resistance of Starting Circuit:	
12 Volt System - ohms	Not Recommended
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	12790 (224.9)
Engine Radiated Heat - Btu/min (kW)	3230 (56.8)
Coolant Flow - gal/min (L/min)	249 (943)
Max. External Pressure Differential - lb/in. ² (kPa)	6.0 (41.4)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure:	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	33 (227.5)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	995 (28.2)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	41.0 (138.5)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	2700 (76.5)
Exhaust Temperature - °F (°C)	940 (504)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	237.7 (1639)
Friction Power:	
Rated Speed - hp (kW)	70 (52)
Peak Torque Speed - hp (kW)	Not Available
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
1800	525 (392)	1532 (2077)	0.337 (205)
1650	500 (373)	1592 (2158)	0.334 (203)
1500	471 (351)	1649 (2236)	0.337 (205)
1350	439 (327)	1708 (2316)	0.345 (210)
1200	379 (283)	1659 (2249)	0.356 (216)
1050	284 (212)	1421 (1926)	0.376 (229)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.4
Smoke, Peak Torque Speed - Bosch Number	0.6
Noise - dB(A) @ 1m	100.7
Additional Noise Data	N1-2083-31-1
(CWC) Certification Word Code	5210

	1800 r/min g/hr	8 Mode Cycle g/bhp-hr
NO _x	3940	6.442
CO	330	1.565
HC	62.7	0.162
Particulates	18.7	0.067

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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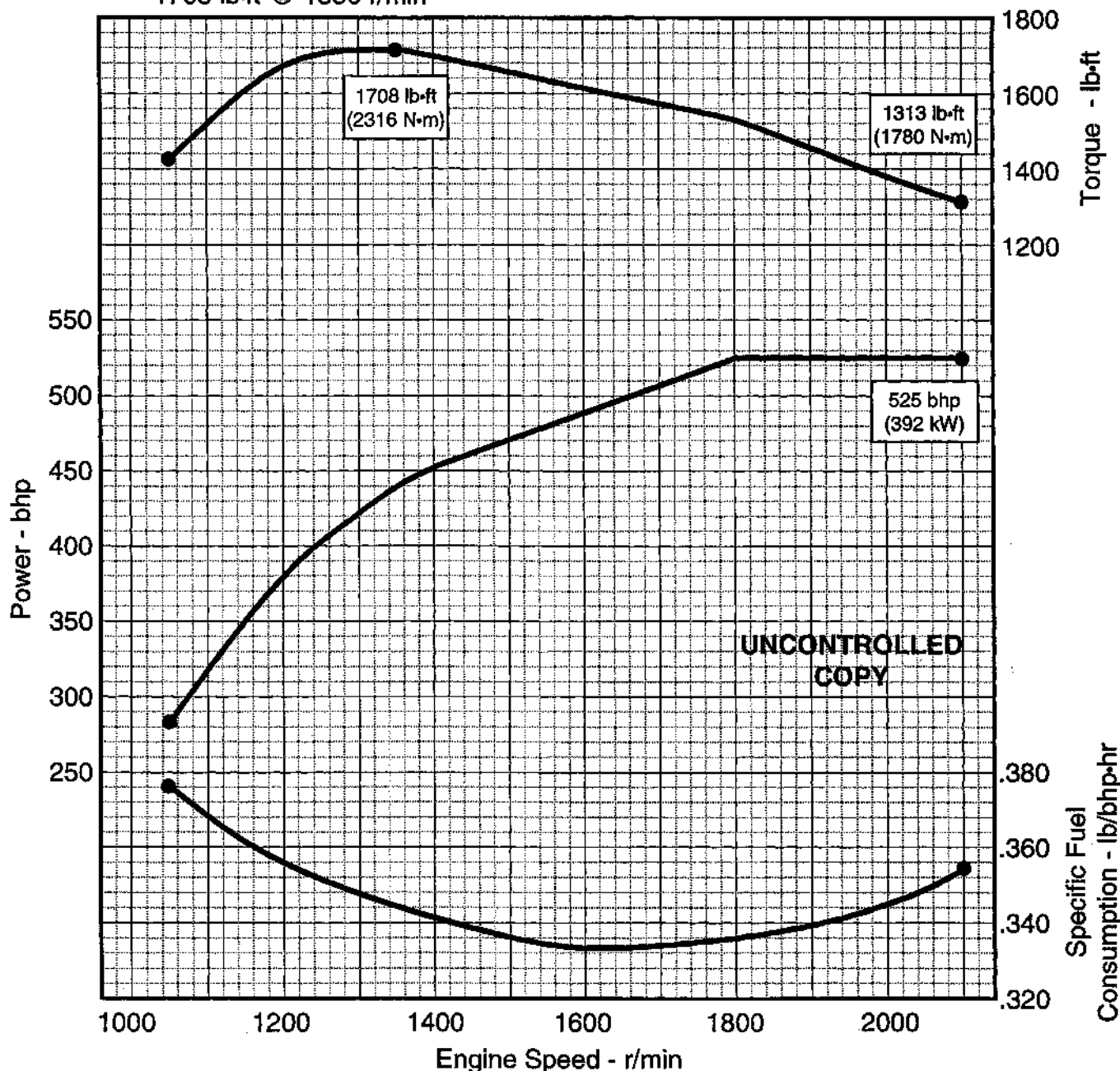
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Industrial Power

Model: 8V-2000TA DDEC®

Rating: 525 bhp @ 2100 r/min
1708 lb·ft @ 1350 r/min

Certification:
1997-99 Nonroad



Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

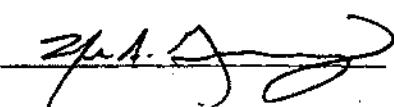
Power: kW = bhp x 0.746

Fuel: kg/kW·hr = lb/bhp·hr x 0.608

Torque: N·m = lb·ft x 1.356

Turbo : K31

6N4M : 1259

Certified by: 

Curve No. E4-2083-31-04
Rev. / Date: 6 / 2-19-99
Sheet No. 1 of 2

Performance Curve

Construction and Industrial Specification Sheet

General Data

Model	R083-7K33
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.93)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	2067 (630)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	K31
Charge Air Cooling	JWCC
Low Idle Speed - r/min	600
High Idle Speed - r/min	2250
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg), approximate	3530 (1601)
Weight, Wet - lb (kg), approximate	3735 (1694)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	18.7 (424)
Above Crankshaft (y axis) - in. (mm)	6.2 (157)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	186.0 (84.4)
Fuel Consumption - gal/hr (L/hr)	26.6 (100.7)
Fuel Spill - lb/hr (kg/hr)	1478 (670.4)
Fuel Spill - gal/hr (L/hr)	211.4 (800.4)
Total Fuel Flow - lb/hr (kg/hr)	1664.1 (754.8)
Total Fuel Flow - gal/hr (L/hr)	238.1 (901.2)
Heat Rejection to Fuel - Btu/min (kW)	450 (7.91)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	20
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	53-64 (365-441)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity, > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
12 Volt System	Not Recommended
24 Volt System, Above 32°F / (0°C)	950
24 Volt System, Below 32°F / (0°C)	1250
Maximum Resistance of Starting Circuit:	
12 Volt System - ohms	Not Recommended
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	13740 (241.6)
Engine Radiated Heat - Btu/min (kW)	3390 (59.6)
Coolant Flow - gal/min (L/min)	305 (1156)
Max. External Pressure Differential - lb/in. ² (kPa)	8.0 (55.2)
Thermostat	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure	Positive
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	33 (227.5)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1270 (36.0)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	50.6 (170.9)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	3150 (89.2)
Exhaust Temperature - °F (°C)	830 (443)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	203.7 (1405)
Friction Power:	
Rated Speed - hp (kW)	95.5 (71)
Peak Torque Speed - hp (kW)	Not Available
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
2100	525 (392)	1313 (1780)	0.354 (216)
1950	525 (392)	1414 (1917)	0.343 (208)
1800	525 (392)	1532 (2077)	0.337 (205)
1650	500 (373)	1592 (2158)	0.334 (203)
1500	471 (351)	1649 (2236)	0.337 (205)
1350	439 (327)	1708 (2316)	0.346 (210)
1200	379 (283)	1659 (2249)	0.356 (216)
1050	284 (212)	1421 (1926)	0.376 (229)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.6
Smoke, Peak Torque Speed - Bosch Number	0.6
Noise - dB(A) @ 1	103.1
Additional Noise Data	N1-2083-31-2

	2100 r/min g/hr	8 Mode Cycle g/bhp-hr
NO _x	3754	6.257
CO	98.4	0.840
HC	65.8	0.159
Particulates	17.3	0.046

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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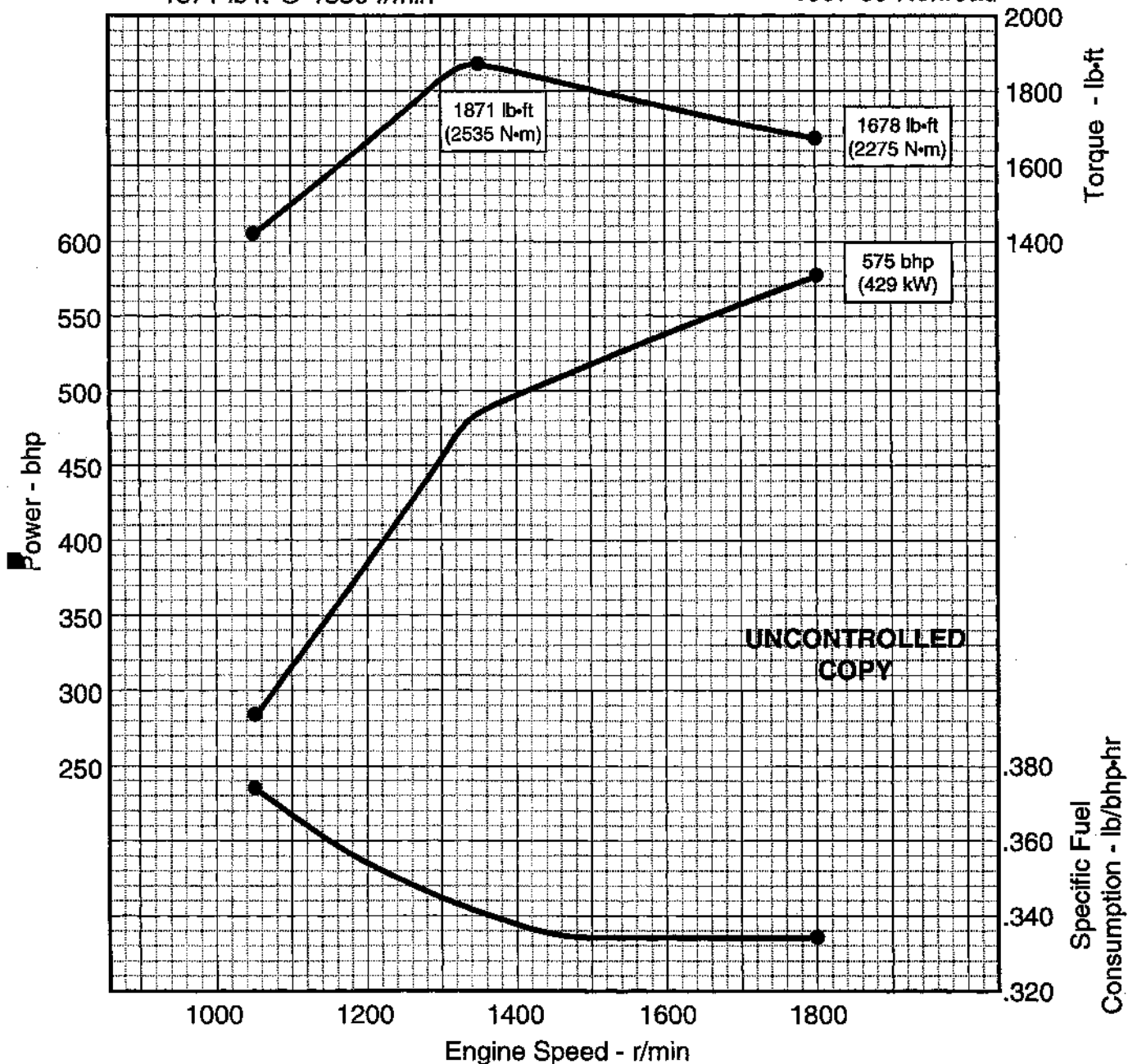
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Industrial Power

Model: 8V-2000TA DDEC®

Rating: 575 bhp @ 1800 r/min
1871 lb·ft @ 1350 r/min

Certification:
1997-99 Nonroad



Power output guaranteed at SAE J1995 conditions: 77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer; 100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F. Air intake restriction: 10 in. H₂O (2.6 kPa) Exhaust Back Pressure: 16 in. H₂O (3.7 kPa)	Conversion Factors: Power: kW = bhp x 0.746 Fuel: kg/kW·hr = lb/bhp·hr x 0.608 Torque: N·m = lb·ft x 1.356	Turbo : K31 6N4M : 1260
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Certified by:

Curve No. E4-2083-31-03
Rev. / Date: 6 / 2-19-99
Sheet No. 1 of 2

Performance Curve

Construction and Industrial Specification Sheet

General Data

Model	R083-7K33
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.93)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	K31
Charge Air Cooling	JWAC
Low Idle Speed - r/min	600
High Idle Speed - r/min	1950
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	57.5 (1480)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg), approximate	3530 (1601)
Weight, Wet - lb (kg), approximate	3735 (1694)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (424)
Above Crankshaft (y axis) - in. (mm)	6.2 (157)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	191.9 (87.1)
Fuel Consumption - gal/hr (L/hr)	27.5 (103.9)
Fuel Spill - lb/hr (kg/hr)	1478 (670.4)
Fuel Spill - gal/hr (L/hr)	211.4 (800.4)
Total Fuel Flow - lb/hr (kg/hr)	1670.0 (757.5)
Total Fuel Flow - gal/hr (L/hr)	238.9 (904.4)
Heat Rejection to Fuel - Btu/min (kW)	365 (6.42)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	20
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	47-57 (324-393)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity, > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
12 Volt System	Not Recommended
24 Volt System, Above 32°F / (0°C)	950
24 Volt System, Below 32°F / (0°C)	1250
Maximum Resistance of Starting Circuit:	
12 Volt System - ohms	Not Recommended
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	13820 (243.0)
Engine Radiated Heat - Btu/min (kW)	3500 (61.5)
Coolant Flow - gal/min (L/min)	249 (943)
Max. External Pressure Differential - lb/in. ² (kPa)	6.0 (41.4)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure:	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	33 (227.5)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1090 (30.9)
Intake Manifold Pressure - in. Hg (kPa)	48.0 (160.4)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	2980 (84.4)
Exhaust Temperature - °F (°C)	950 (510)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	260.3 (1795)
Friction Power:	
Rated Speed - hp (kW)	70 (52)
Peak Torque Speed - hp (kW)	Not Available
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
1800	575 (429)	1678 (2275)	0.334 (203)
1650	547 (408)	1741 (2361)	0.334 (203)
1500	516 (385)	1807 (2450)	0.334 (203)
1350	481 (359)	1871 (2535)	0.342 (208)
1200	379 (283)	1659 (2249)	0.354 (215)
1050	284 (212)	1421 (1926)	0.374 (227)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.4
Smoke, Peak Torque Speed - Bosch Number	0.6
Noise - dB(A) @ 1	101.3
Additional Noise Data	N1-2083-31-3
(CWC) Certification Word Code	5211

	1800 r/min g/hr	8 Mode Cycle g/bhp-hr
NO _x	4135	6.176
CO	511	1.694
HC	55.1	0.134
Particulates	36.1	0.068

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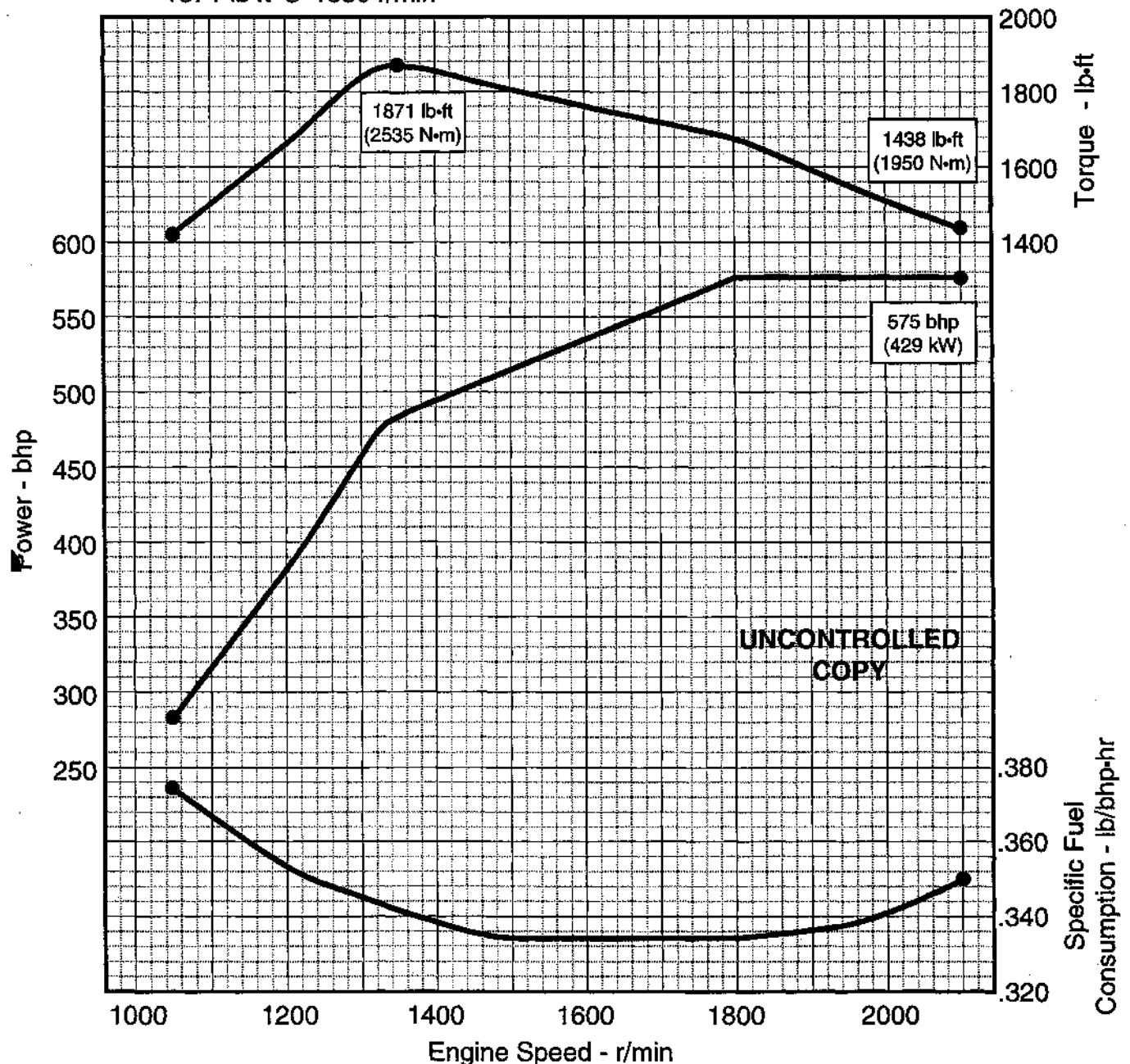
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Industrial Power

Model: 8V-2000TA DDEC®

Rating: 575 bhp @ 2100 r/min
1871 lb-ft @ 1350 r/min

Certification:
1997-99 Nonroad



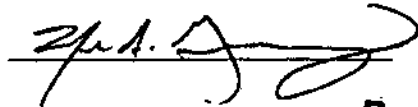
Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.91 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; 853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746
Fuel: kg/kW · hr = lb/bhp · hr x 0.608
Torque: N · m = lb · ft x 1.356

Turbo: K31

6N4M: 1261

Certified by: 

Curve No. E4-2083-31-05
Rev. / Date: 7 / 2-19-99
Sheet No. 1 of 2

Performance Curve

Construction and Industrial Specification Sheet

General Data

Model	R083-7K33
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.93)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	2067 (630)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	K31
Charge Air Cooling	JWAC
Low Idle Speed - r/min	600
High Idle Speed - r/min	2250
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg), approximate	3530 (1601)
Weight, Wet - lb (kg), approximate	3735 (1694)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (424)
Above Crankshaft (y axis) - in. (mm)	6.2 (157)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	200.7 (91.0)
Fuel Consumption - gal/hr (L/hr)	28.7 (108.7)
Fuel Spill - lb/hr (kg/hr)	1475 (669)
Fuel Spill - gal/hr (L/hr)	213.2 (806.9)
Total Fuel Flow - lb/hr (kg/hr)	1675.0 (766.9)
Total Fuel Flow - gal/hr (L/hr)	239.8 (915.6)
Heat Rejection to Fuel - Btu/min (kW)	450 (7.91)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	20
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	53-64 (365-441)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
12 Volt System	Not Recommended
24 Volt System, Above 32°F / (0°C)	950
24 Volt System, Below 32°F / (0°C)	1250
Maximum Resistance of Starting Circuit:	
12 Volt System - ohms	Not Recommended
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	14845 (237.5)
Engine Radiated Heat - Btu/min (kW)	3660 (64.4)
Coolant Flow - gal/min (L/min)	305 (1155)
Max. External Pressure Differential - lb/in. ² (kPa)	8.0 (55.2)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	33 (227.5)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1350 (38.2)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	51.4 (174.0)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	3460 (98.0)
Exhaust Temperature - °F (°C)	870 (466)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	223.1 (1538)
Friction Power:	
Rated Speed - hp (kW)	95.5 (71)
Peak Torque Speed - hp (kW)	Not Available
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
2100	575 (429)	1438 (1950)	0.349 (212)
1950	575 (429)	1549 (2100)	0.338 (206)
1800	575 (429)	1678 (2275)	0.334 (205)
1650	547 (408)	1741 (2361)	0.334 (203)
1500	516 (385)	1807 (2450)	0.334 (203)
1350	481 (359)	1871 (2536)	0.342 (208)
1200	379 (283)	1659 (2249)	0.354 (215)
1050	284 (212)	1421 (1926)	0.374 (227)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.7
Smoke, Peak Torque Speed - Bosch Number	0.6
Noise - dB(A) @ 1	102.8
Additional Noise Data	N1-2083-31-4
(CWC) Certification Word Code (Nonroad)	5211

	2100 r/min g/hr	8 Mode Cycle g/bhp-hr
NO _x	4495	6.254
CO	89.3	0.805
HC	53.2	0.140
Particulates	15.6	0.044

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Curve No. E4-2083-31-05
Rev. / Date: 7 / 2-19-99
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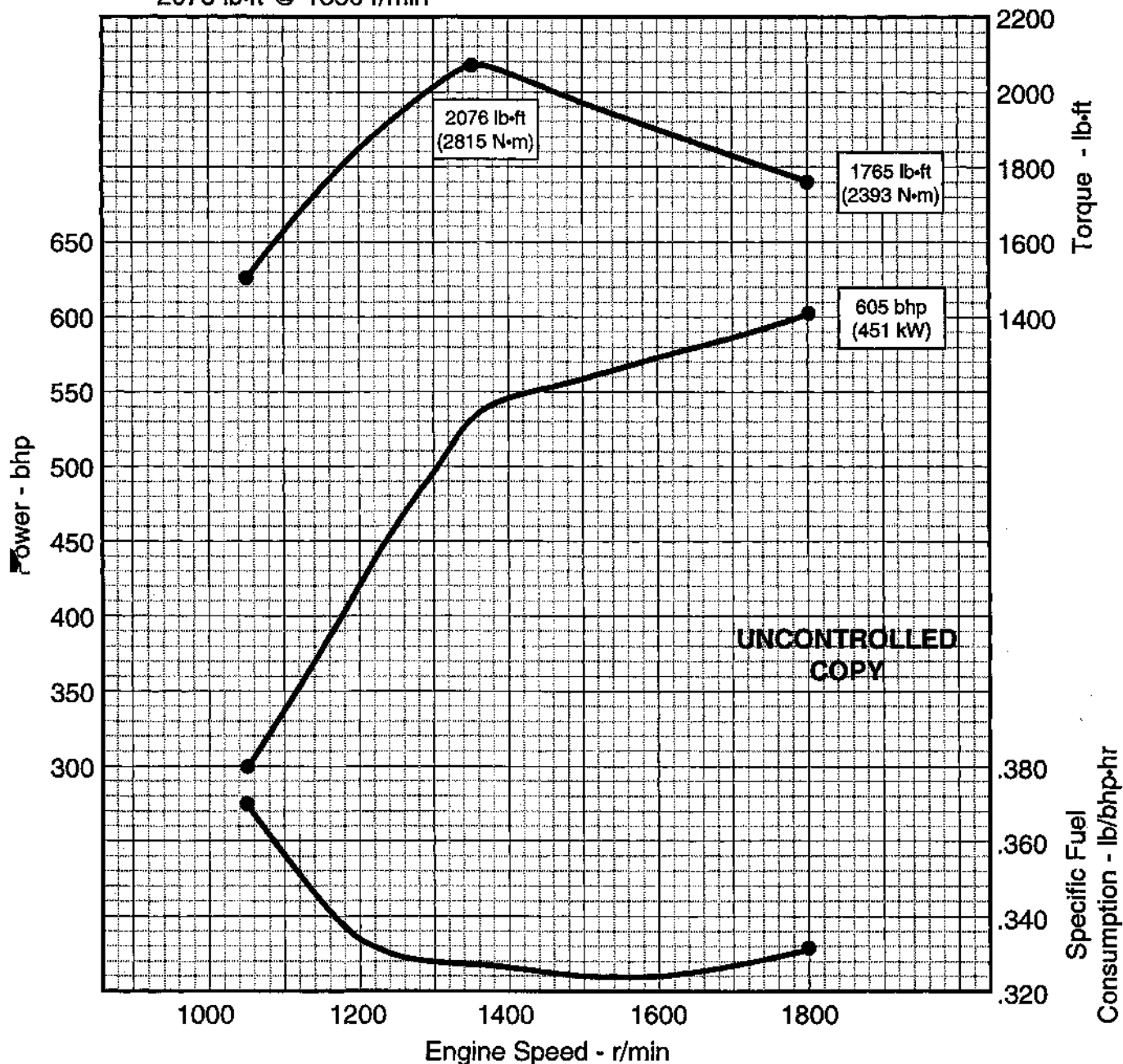
Series 2000TM

Industrial Power

Model: 8V-2000TA DDEC®

Rating: 605 bhp @ 1800 r/min
2076 lb·ft @ 1350 r/min

Certification:
1997-99 Nonroad



Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: kg/kW·hr = lb/bhp·hr x 0.608

Torque: N·m = lb·ft x 1.356

Turbo: K31

6N4M: 1264

Certified by:

Curve No. E4-2083-31-09

Rev. / Date: 6 / 2-19-99

Sheet No. 1 of 2

Performance Curve

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model	R083-7K37
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.93)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	K31
Charge Air Cooling	SCCC
Low Idle Speed - r/min	600
High Idle Speed - r/min	1950
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg), approximate	3560 (1615)
Weight, Wet - lb (kg), approximate	3765 (1708)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (424)
Above Crankshaft (y axis) - in. (mm)	6.2 (157)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100301 & SK11255

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	200.3 (90.9)
Fuel Consumption - gal/hr (L/hr)	28.7 (108.5)
Fuel Spill - lb/hr (kg/hr)	1466 (665.0)
Fuel Spill - gal/hr (L/hr)	209.7 (793.9)
Total Fuel Flow - lb/hr (kg/hr)	1666.3 (755.8)
Total Fuel Flow - gal/hr (L/hr)	238.4 (902.4)
Heat Rejection to Fuel - Btu/min (kW)	365 (8.42)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	20
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	47-57 (324-393)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
12 Volt System	Not Recommended
24 Volt System, Above 32°F / (0°C)	950
24 Volt System, Below 32°F / (0°C)	1250
Maximum Resistance of Starting Circuit:	
12 Volt System - ohms	Not Recommended
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	10370 (182.3)
Charge Air Cooler Heat Rejection - Btu/min (kW)	4670 (82.1)
Engine Radiated Heat - Btu/min (kW)	3650 (64.2)
Primary Circuit	
Coolant Flow - gal/min (L/min)	187 (708)
Max. External Pressure Differential - lb/in. ² (kPa)	6.0 (41.4)
Separate Circuit	
Coolant Flow - gal/min (L/min)	79 (299)
Max. External Pressure Differential - lb/in. ² (kPa)	8.0 (55.2)
Thermostat:	
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.8 (87)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (98.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	33 (227.5)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1210 (34.3)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	48.7 (157.7)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	3250 (92.0)
Exhaust Temperature - °F (°C)	930 (499)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	273.9 (1888)		
Friction Power:			
Rated Speed - hp (kW)	70.0 (52)		
Peak Torque Speed - hp (kW)	Not Available		
Altitude Capability - ft (m)	10200 (3110)		
Torque Available at 800 r/min - lb-ft (N-m)	Not Available		
Engine Speed	Rated Power	Rated Torque	Rated BSFC
r/min	bhp (kW)	lb-ft (N-m)	lb/bhp-hr (g/kW-hr)
1800	605 (451)	1765 (2393)	0.331 (201)
1650	587 (438)	1869 (2535)	0.325 (198)
1500	583 (420)	1972 (2674)	0.324 (197)
1350	534 (398)	2076 (2815)	0.327 (201)
1200	424 (316)	1855 (2515)	0.334 (210)
1050	300 (224)	1501 (2035)	0.370 (223)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.6
Smoke, Peak Torque Speed - Bosch Number	1.0
Noise - dB(A) @ 1	101.7
Additional Noise Data	N1-2083-31-5
(CWC) Certification Word Code (Nonroad)	5215

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2083-31-09
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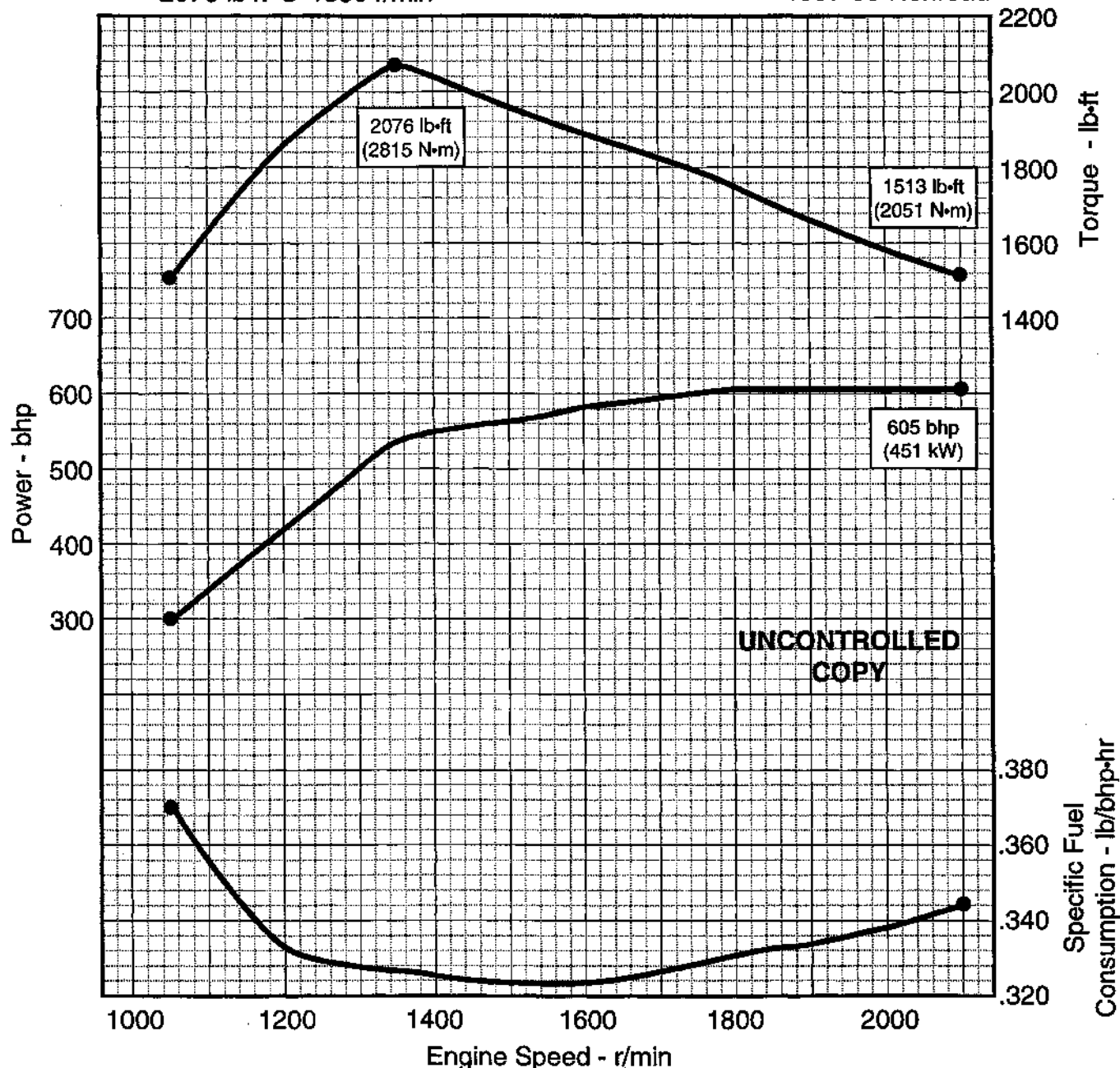
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Industrial Power

Model: 8V-2000TA DDEC®

Rating: 605 bhp @ 2100 r/min
2076 lb·ft @ 1350 r/min

Certification:
1997-99 Nonroad



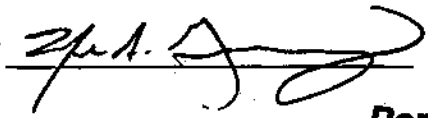
Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746
Fuel: kg/kW·hr = lb/bhp·hr x 0.608
Torque: N·m = lb·ft x 1.356

Turbo: K31

6N4M: 1263

Certified by: 

Curve No. E4-2083-31-07

Rev. / Date: 8 / 2-19-99

Sheet No. 1 of 2

Performance Curve

Construction and Industrial Specification Sheet

General Data

Model	R083-7K37
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.93)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	2067 (630)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	K31
Charge Air Cooling	SCCC
Low Idle Speed - r/min	600
High Idle Speed - r/min	2250
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg), approximate	3560 (1615)
Weight, Wet - lb (kg), approximate	3765 (1708)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (424)
Above Crankshaft (y axis) - in. (mm)	6.2 (157)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawings	5310100301 & SK-11255

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	208.1 (94.4)
Fuel Consumption - gal/hr (L/hr)	29.8 (112.7)
Fuel Spill - lb/hr (kg/hr)	1458 (661.3)
Fuel Spill - gal/hr (L/hr)	208.6 (789.6)
Total Fuel Flow - lb/hr (kg/hr)	1666.1 (755.7)
Total Fuel Flow - gal/hr (L/hr)	238.4 (902.3)
Heat Rejection to Fuel - Btu/min (kW)	450 (7.91)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	20
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	53-64 (365-441)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
12 Volt System	Not Recommended
24 Volt System, Above 32° / (0°C)	950
24 Volt System, Below 32° / (0°C)	1250
Maximum Resistance of Starting Circuit:	
12 Volt System - ohms	Not Recommended
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	10390 (182.7)
Charge Air Cooler Heat Rejection - Btu/min (kW)	5560 (97.8)
Engine Radiated Heat - Btu/min (kW)	3790 (66.6)
Primary Circuit	
Coolant Flow - gal/min (L/min)	235 (890)
Max. External Pressure Differential - lb/in. ² (kPa)	8 (55.2)
Separate Circuit	
Coolant Flow - gal/min (L/min)	113 (427.8)
Max. External Pressure Differential - lb/in. ² (kPa)	12 (82.7)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	33 (227.5)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1455 (41.2)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	51.5 (173.9)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	3610 (102.2)
Exhaust Temperature - °F (°C)	830 (443)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	234.8 (1619)
Friction Power:	
Rated Speed - hp (kW)	95.5 (71)
Peak Torque Speed - hp (kW)	Not Available
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
2100	605 (451)	1513 (2051)	0.344 (209)
1950	605 (451)	1630 (2209)	0.336 (204)
1800	605 (451)	1785 (2393)	0.331 (201)
1650	587 (438)	1869 (2535)	0.325 (198)
1500	563 (420)	1972 (2674)	0.324 (197)
1350	534 (398)	2076 (2815)	0.327 (201)
1200	424 (316)	1855 (2515)	0.334 (203)
1050	300 (224)	1501 (2035)	0.370 (225)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.9
Smoke, Peak Torque Speed - Bosch Number	1.0
Noise - dB(A) @ 1	102.6
Additional Noise Data	N1-2083-31-6
(CWC) Certification Word Code (Nonroad)	5215

	2100 r/min g/hr	8 Mode Cycle g/bhp-hr
NO _x	4181	6.187
CO	115	0.752
HC	67.2	0.151
Particulates	27.1	0.048

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Curve No. E4-2083-31-07

Rev. / Date: 8 / 2-19-99

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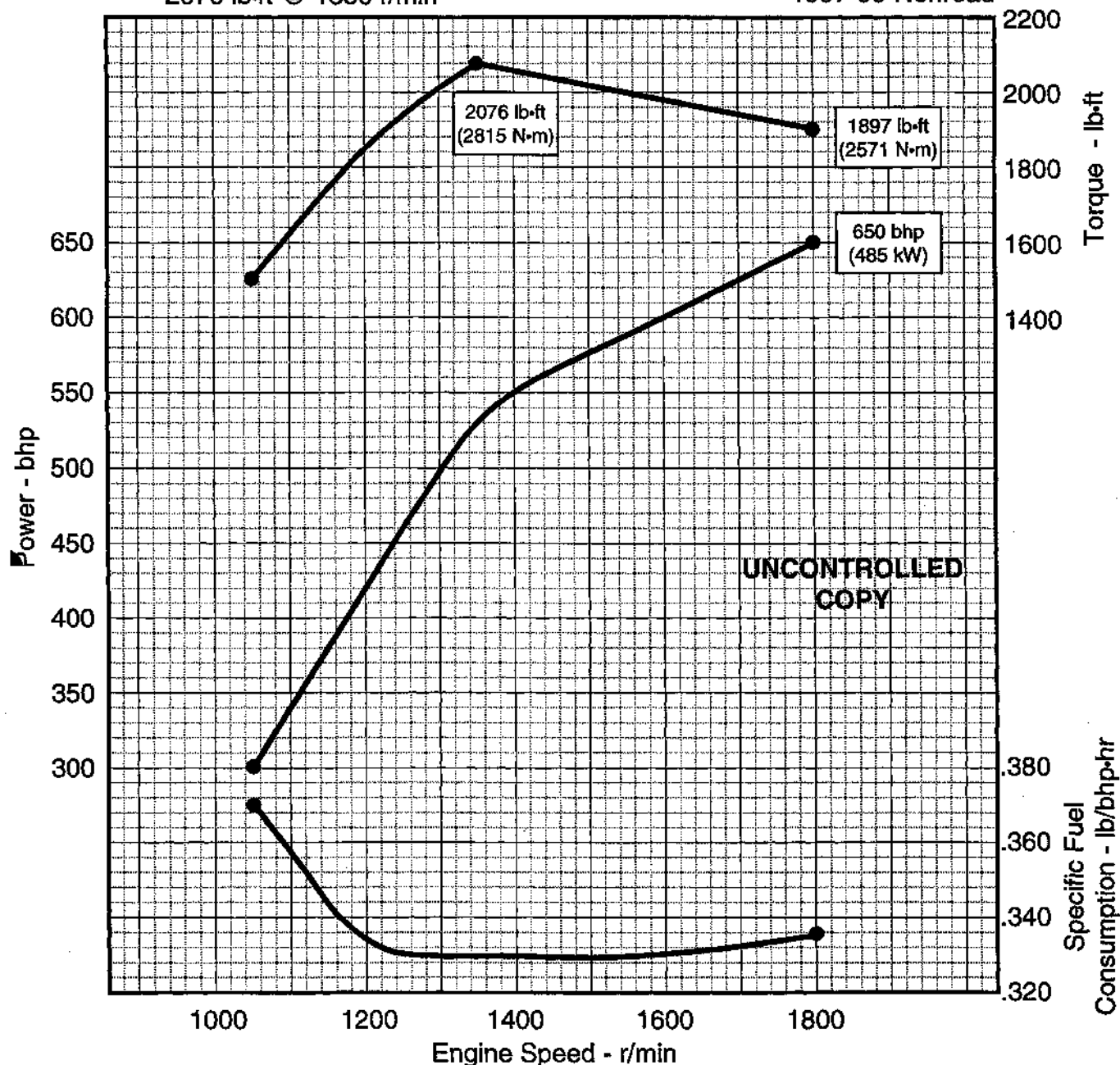
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Industrial Power

Model: 8V-2000TA DDEC®

Rating: 650 bhp @ 1800 r/min
2076 lb-ft @ 1350 r/min

Certification:
1997-99 Nonroad



Power output guaranteed at SAE J1995 conditions: 77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer; 100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F. Air intake restriction: 10 in. H₂O (2.5 kPa) Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)	Conversion Factors: Power: kW = bhp x 0.746 Fuel: kg/kW · hr = lb/bhp · hr x 0.608 Torque: N · m = lb · ft x 1.356	Turbo : K31 6N4M : 1266
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Certified by:

Performance Curve

Curve No. E4-2083-31-10
Rev. / Date: 5 / 2-19-99
Sheet No. 1 of 2

Construction and Industrial Specification Sheet

General Data

Model	R083-7K37
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.9)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	K31
Charge Air Cooling	SCCC
Low Idle Speed - r/min	600
High Idle Speed - r/min	1950
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg), approximate	3560 (1615)
Weight, Wet - lb (kg), approximate	3765 (1708)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (424)
Above Crankshaft (y axis) - in. (mm)	6.2 (157)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100301 & SK11255

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	217.5 (98.6)
Fuel Consumption - gal/hr (L/hr)	31.1 (117.8)
Fuel Split - lb/hr (kg/hr)	1449 (657.3)
Fuel Split - gal/hr (L/hr)	207.3 (784.7)
Total Fuel Flow - lb/hr (kg/hr)	1668.5 (755.9)
Total Fuel Flow - gal/hr (L/hr)	238.4 (902.4)
Heat Rejection to Fuel - Btu/min (kW)	365 (8.42)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	20
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	47-57 (324-393)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
12 Volt System	Not Recommended
24 Volt System, Above 32°F / (0°C)	950
24 Volt System, Below 32°F / (0°C)	1250
Maximum Resistance of Starting Circuit:	
12 Volt System - ohms	Not Recommended
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	10850 (190.8)
Charge Air Cooler Heat Rejection - Btu/min (kW)	5265 (92.6)
Engine Radiated Heat - Btu/min (kW)	3960 (69.0)
Primary Circuit	
Coolant Flow - gal/min (L/min)	187 (708)
Max. External Pressure Differential - lb/in. ² (kPa)	6.0 (41.4)
Separate Circuit	
Coolant Flow - gal/min (L/min)	79 (299)
Max. External Pressure Differential - lb/in. ² (kPa)	8.0 (55.2)
Thermostat:	
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	33 (227.5)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1310 (37.1)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	58.5 (190.8)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	3480 (98.6)
Exhaust Temperature - °F (°C)	915 (491)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	6.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	294.3 (2029)
Friction Power:	
Rated Speed - hp (kW)	70.0 (52)
Peak Torque Speed - hp (kW)	Not Available
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
1800	650 (485)	1897 (2571)	0.335 (204)
1650	615 (458)	1956 (2652)	0.331 (201)
1500	576 (430)	2017 (2734)	0.329 (200)
1350	534 (398)	2076 (2815)	0.330 (200)
1200	424 (316)	1855 (2515)	0.334 (210)
1050	300 (224)	1501 (2035)	0.370 (223)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.7
Smoke, Peak Torque Speed - Bosch Number	1.0
Noise - dB(A) @ 1	101.6
Additional Noise Data	N1-2083-31-7
(CWC) Certification Word Code (Nonroad)	5216

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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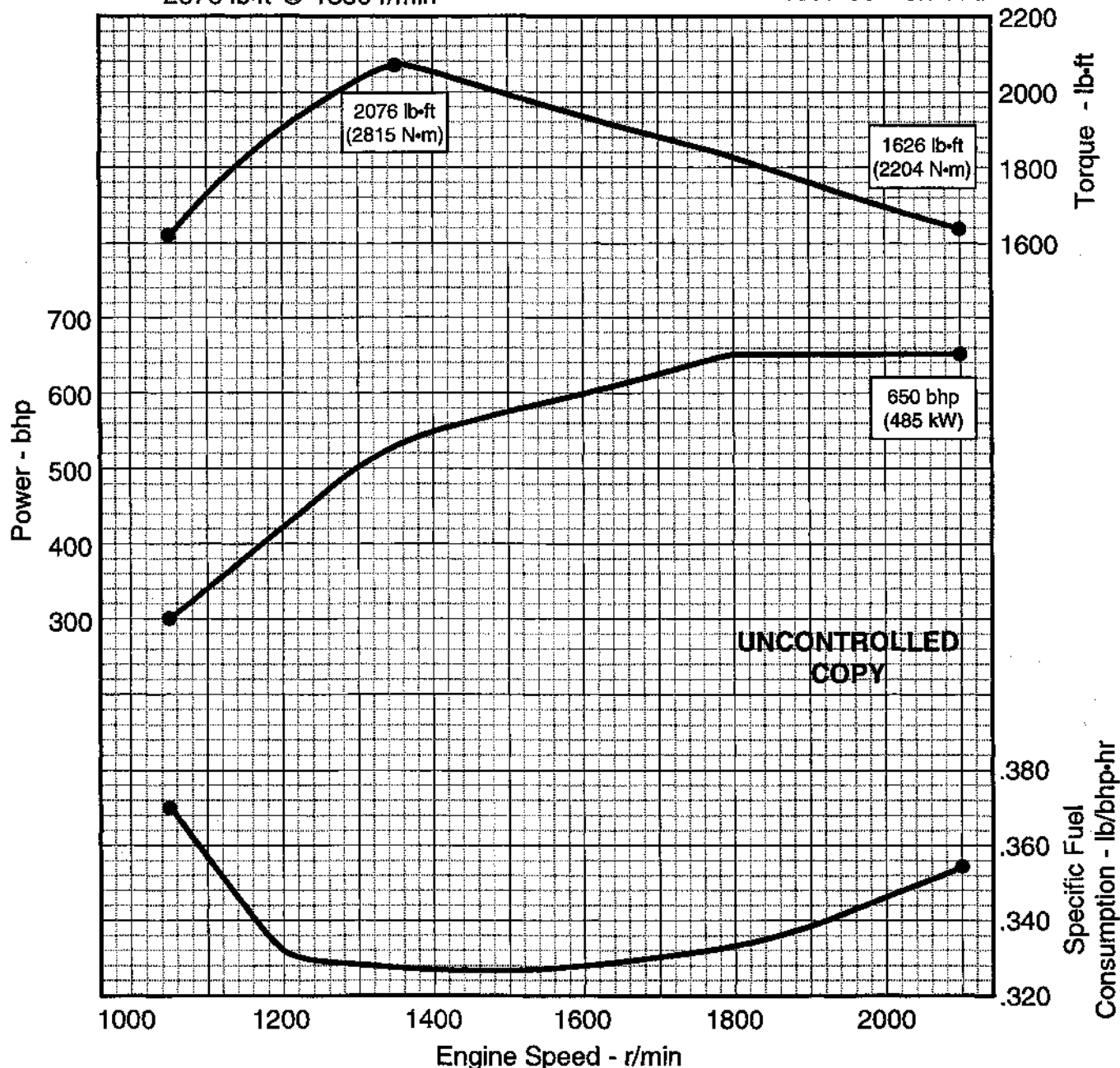
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Industrial Power

Model: 8V-2000TA DDEC®

Rating: 650 bhp @ 2100 r/min
2076 lb·ft @ 1350 r/min

Certification:
1997-99 Nonroad

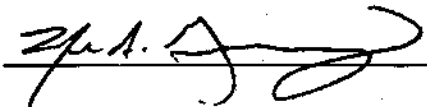


Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746
Fuel: kg/kW·hr = lb/bhp·hr x 0.608
Torque: N·m = lb·ft x 1.356

Turbo: K31
6N4M: 1267

Certified by: 

Curve No. E4-2083-31-08
Rev. / Date: 7 / 2-19-99
Sheet No. 1 of 2

Performance Curve

Construction and Industrial Specification Sheet

General Data

Model	R083-7K37
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.93)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	2067 (630)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	K31
Charge Air Cooling	SCCC
Low Idle Speed - r/min	600
High Idle Speed - r/min	2250
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg), approximate	3560 (1615)
Weight, Wet - lb (kg), approximate	3765 (1708)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (424)
Above Crankshaft (y axis) - in. (mm)	6.2 (157)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100301 & SK-11255

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	230.0 (104.3)
Fuel Consumption - gal/hr (L/hr)	32.9 (124.5)
Fuel Spill - lb/hr (kg/hr)	1437 (651.8)
Fuel Spill - gal/hr (L/hr)	205.6 (778.2)
Total Fuel Flow - lb/hr (kg/hr)	1667.0 (756.1)
Total Fuel Flow - gal/hr (L/hr)	238.5 (902.7)
Heat Rejection to Fuel - Btu/min (kW)	450 (7.91)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	20
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	53-64 (365-441)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
12 Volt System	Not Recommended
24 Volt System, Above 32°F / (0°C)	950
24 Volt System, Below 32°F / (0°C)	1250
Maximum Resistance of Starting Circuit:	
12 Volt System - ohms	Not Recommended
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	11480 (201.9)
Charge Air Cooler Heat Rejection - Btu/min (kW)	6420 (112.9)
Engine Radiated Heat - Btu/min (kW)	4190 (73.7)
Primary Circuit	
Coolant Flow - gal/min (L/min)	235 (890)
Max. External Pressure Differential - lb/in. ² (kPa)	8 (55.2)
Separate Circuit	
Coolant Flow - gal/min (L/min)	113 (427.8)
Max. External Pressure Differential - lb/in. ² (kPa)	12 (82.7)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	33 (227.5)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1585 (44.9)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	61.5 (207.7)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	3960 (112.1)
Exhaust Temperature - °F (°C)	840 (449)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	252.2 (1739)		
Friction Power:			
Rated Speed - hp (kW)	95.5 (71)		
Peak Torque Speed - hp (kW)	Not Available		
Altitude Capability - ft (m)	8800 (2680)		
Torque Available at 8800 ft (2680 m) - lb-ft (N-m)	Not Available		
Speed r/min	Power bhp (kW)	Torque lb-ft (N-m)	BSFC lb/bhp-hr (g/kW-hr)
2100	650 (485)	1626 (2204)	0.354 (215)
1950	650 (485)	1751 (2374)	0.344 (209)
1800	650 (485)	1897 (2571)	0.335 (204)
1650	615 (458)	1956 (2652)	0.331 (201)
1500	576 (430)	2017 (2734)	0.329 (200)
1350	534 (398)	2076 (2815)	0.330 (200)
1200	424 (316)	1855 (2515)	0.334 (210)
1050	300 (224)	1501 (2035)	0.370 (223)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.9
Smoke, Peak Torque Speed - Bosch Number	1.0
Noise - dB(A) @ 1	102.5
Additional Noise Data	N1-2083-31-8
(CWC) Certification Word Code (Nonroad)	5216

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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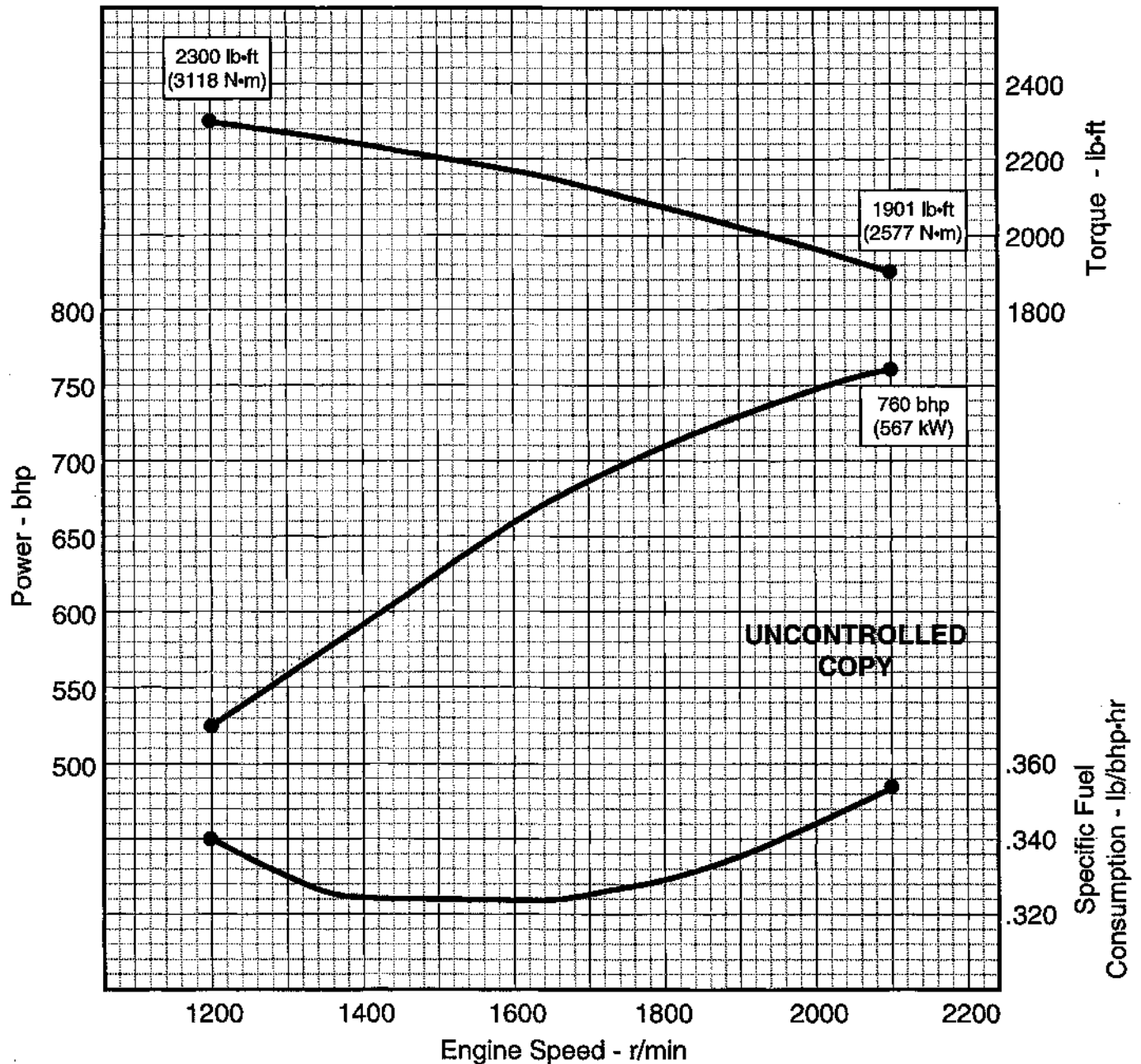
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Industrial Power

Model: 12V-2000TA DDEC®

Rating: 760 bhp @ 2100 r/min

2300 lb·ft @ 1200 r/min



Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: kg/kW·hr = lb/bhp·hr x 0.608

Torque: N·m = lb·ft x 1.356

Turbo: TMF-5505 (1.15 A/R)

Fuel Pump: EUP

Certified by: *[Signature]*

Performance Curve

Curve No. E4-2123-31-4

Rev. / Date: 4 / 8-14-98

Sheet No. 1 of 2

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model	R123-7K00
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.89)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	2067 (630)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	TMF-6505 (1.15 A/R)
Charge Air Cooling	JWAC
Low Idle Speed - r/min	600
High Idle Speed - r/min	2250
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	73.1 (1857)
Width - in. (mm)	44.6 (1132)
Height - in. (mm)	51.7 (1313.5)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	268.0 (121.6)
Fuel Consumption - gal/hr (L/hr)	38.3 (145.1)
Fuel Spill - lb/hr (kg/hr)	2059 (933.7)
Fuel Spill - gal/hr (L/hr)	294.5 (1114.9)
Total Fuel Flow - lb/hr (kg/hr)	2327 (1055.3)
Total Fuel Flow - gal/hr (L/hr)	332.8 (1250)
Heat Rejection to Fuel - Btu/min (kW)	550 (9.7)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	25
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	110-140 (758-965)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200-250 (93-121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	19350 (340.3)
Charge Air Cooler Heat Rejection - Btu/min (kW)	Not Applicable
Engine Radiated Heat - Btu/min (kW)	4920 (86.5)
Coolant Flow - gal/min (L/min)	340 (1287)
Minimum Coolant Flow - gal/min (L/min)	306 (1158)
Coolant Flow Separate Circuit - gal/min (L/min)	Not Applicable
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	70.0 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	40 (275.8)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2120 (60.0)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	57.8 (195.2)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	4690 (132.8)
Exhaust Temperature - °F (°C)	695 (368)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	196.6 (1356)
Friction Power:	
Rated Speed - fhp (kW)	162 (121)
Peak Torque Speed - fhp (kW)	56 (42)
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
2100	760 (567)	1901 (2577)	0.353 (214)
1950	740 (552)	1993 (2702)	0.340 (207)
1800	710 (530)	2072 (2809)	0.330 (201)
1650	678 (506)	2158 (2926)	0.325 (198)
1500	630 (470)	2208 (2991)	0.325 (198)
1350	578 (431)	2249 (3049)	0.327 (199)
1200	525 (392)	2300 (3118)	0.340 (207)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.2
Smoke, Peak Torque Speed - Bosch Number	0.4
Noise - dB(A) @ 1	105.7
Additional Noise Data	N1-2123-31-1
(CWC) Certification Word Code	8411
NO _x - g/hr	6120
CO - g/hr	176
HC - g/hr	235
SO ₂ - g/hr	1216

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

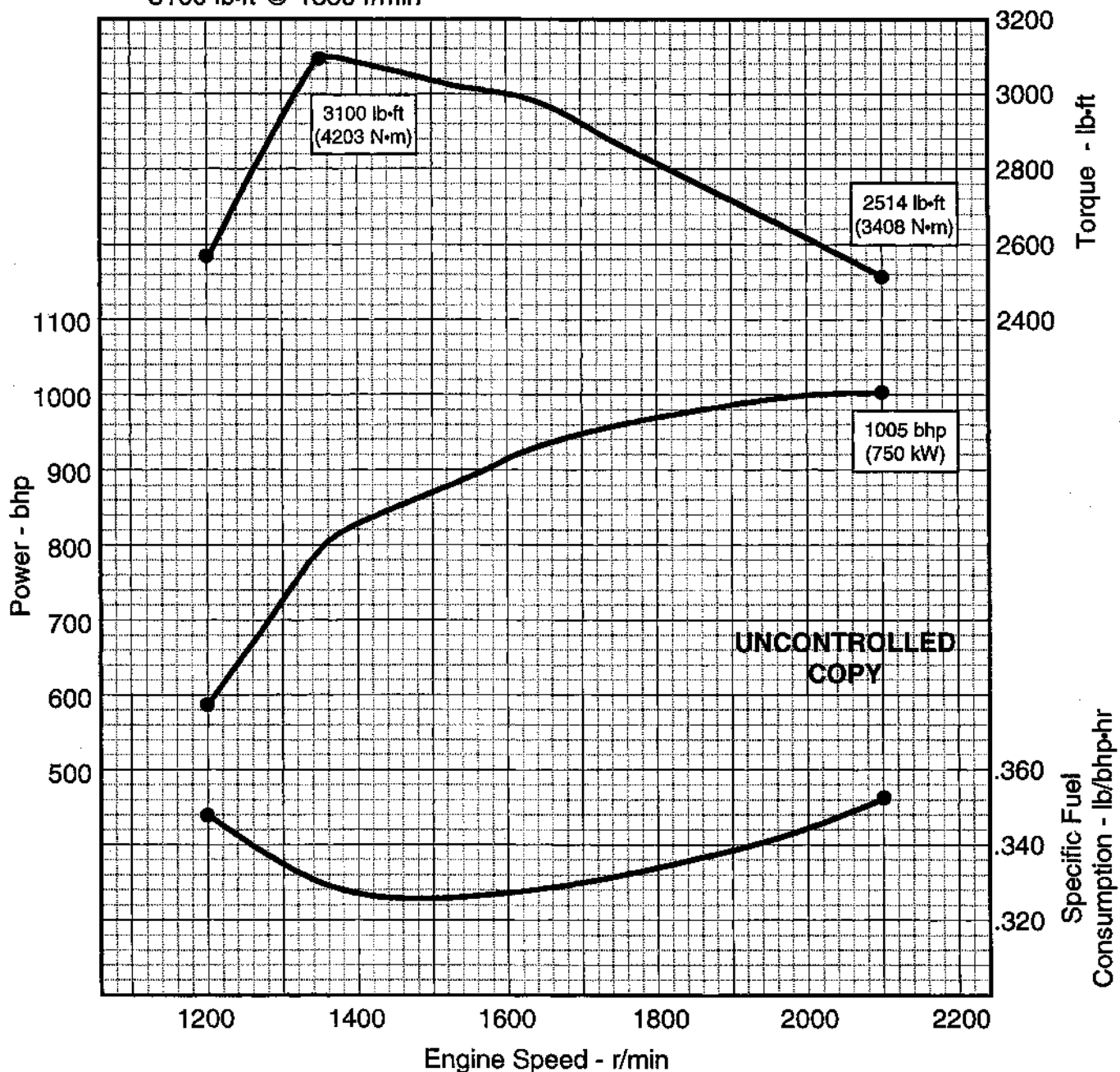
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Industrial Power

Model: 12V-2000TA DDEC®

Rating: 1005 bhp @ 2100 r/min
3100 lb·ft @ 1350 r/min



Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: kg/kW·hr = lb/bhp·hr x 0.608

Torque: N·m = lb·ft x 1.356

Turbo: TMF-5502 1.34 A/R

Fuel Pump: EUP

certified by:

Performance Curve

Curve No. E4-2123-31-13

Rev. / Date: 3 / 8-14-98

Sheet No. 1 of 2

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model	R123-7K07
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.89)
Compression Ratio	14.5:1
Piston Speed - ft/min (m/min)	2067 (630)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	TMF-5505 (1.34 A/R)
Charge Air Cooling	SCCC (TB)
Low Idle Speed - r/min	600
High Idle Speed - r/min	2250
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	73.1 (1857)
Width - in. (mm)	44.6 (1132)
Height - in. (mm)	51.7 (1313.5)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301 & SK11256

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	353.8 (160.5)
Fuel Consumption - gal/hr (L/hr)	50.6 (191.6)
Fuel Spill - lb/hr (kg/hr)	2058.5 (933.7)
Fuel Spill - gal/hr (L/hr)	294.5 (1114.9)
Total Fuel Flow - lb/hr (kg/hr)	2412.3 (1094.2)
Total Fuel Flow - gal/hr (L/hr)	345.1 (1306.4)
Heat Rejection to Fuel - Btu/min (kW)	550 (9.7)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	550.0 (9.67)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	25
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	110-140 (758-965)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200-250 (93-121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	19810 (348.3)
Charge Air Cooler Heat Rejection - Btu/min (kW)	12260 (215.6)
Engine Radiated Heat - Btu/min (kW)	6800 (119.8)
Coolant Flow - gal/min (L/min)	340 (1287)
Max. External Pressure Differential - lb/in. ² (kPa)	9.0 (62.1)
Coolant Flow Separate Circuit - gal/min (L/min)	100 (379)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	12.0 (82.7)
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	70.0 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	40 (275.8)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2510 (71.1)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	64.5 (218.0)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	5940 (168.2)
Exhaust Temperature - °F (°C)	785 (418)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	260.0 (1793)
Friction Power:	
Rated Speed - hp (kW)	162 (121)
Peak Torque Speed - hp (kW)	69 (51.5)
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
2100	1005 (750)	2514 (3408)	0.352 (214)
1950	991 (739)	2669 (3619)	0.342 (208)
1800	967 (721)	2822 (3825)	0.334 (203)
1650	936 (698)	2980 (4041)	0.329 (200)
1500	869 (648)	3043 (4125)	0.326 (198)
1350	797 (594)	3100 (4203)	0.330 (201)
1200	588 (439)	2574 (3489)	0.348 (212)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.4
Smoke, Peak Torque Speed - Bosch Number	0.7
Noise - dB(A) @ 1	105
Additional Noise Data	Not Available
(CWC) Certification Word Code	8414
NO _x - g/hr	6570
CO - g/hr	226
HC - g/hr	172
SO _x - g/hr	1605
Particulates - g/hr	67

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All values are at rated speed and power at SAE J1995
with standard engine hardware, unless otherwise noted.

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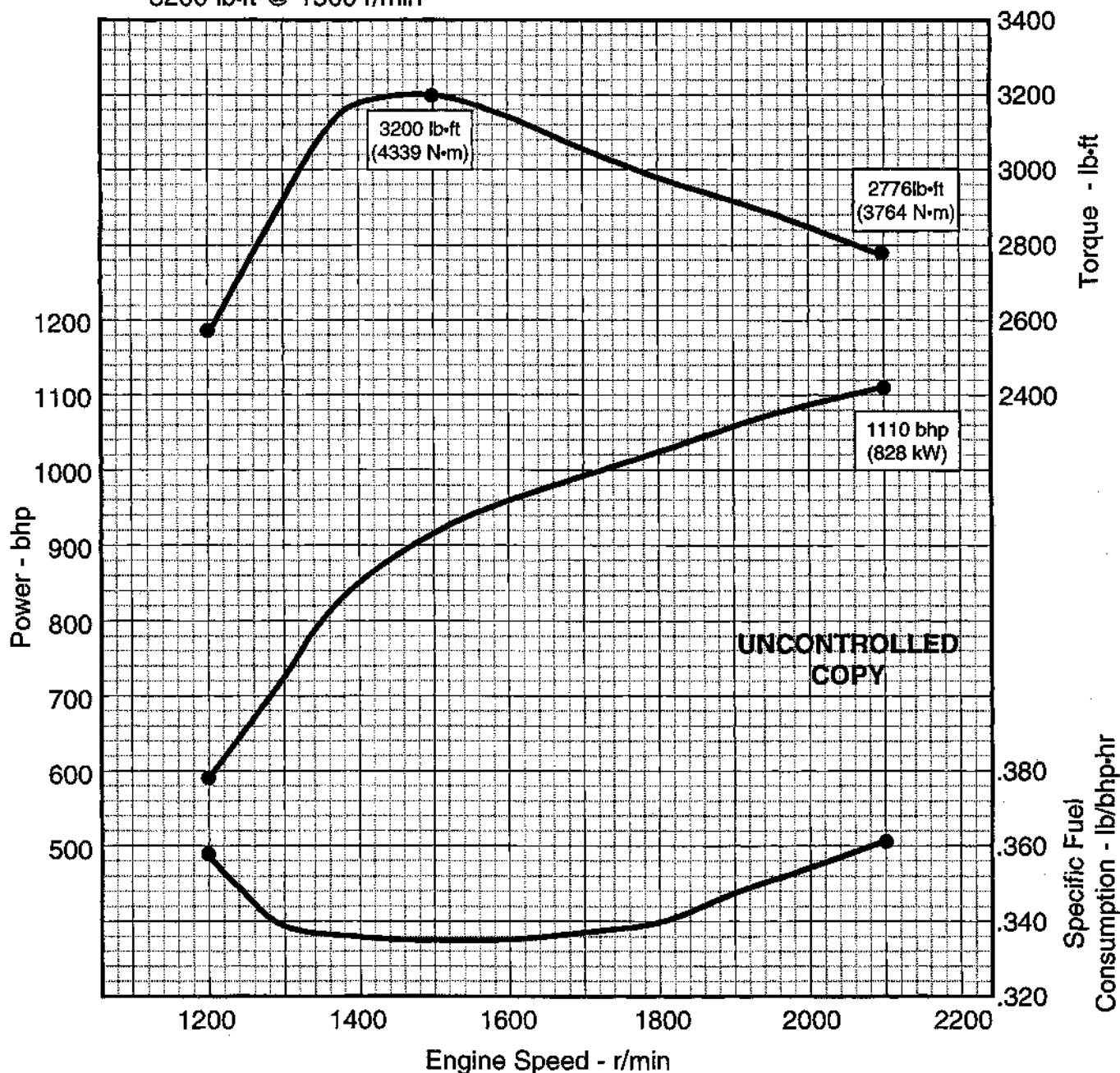
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Industrial Power

Model: 12V-2000TA DDEC®

Rating: 1110 bhp @ 2100 r/min

3200 lb·ft @ 1500 r/min



Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: kg/kW · hr = lb/bhp · hr x 0.608

Torque: N · m = lb · ft x 1.356

Turbo: GT50X 1.34 A/R

Fuel Pump: EUP

Certified by:

Curve No. E4-2123-31-15

Rev. / Date: 1 / 8-14-98

Sheet No. 1 of 2

Performance Curve

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model.....	R123-7K07
Number of Cylinders.....	12
Bore and Stroke - in. x in. (mm x mm).....	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L).....	1458 (23.89)
Compression Ratio.....	14.5:1
Piston Speed - ft/min (m/min).....	2067 (630)
Intake Valves Per Cylinder.....	2
Exhaust Valves Per Cylinder.....	2
Combustion System.....	Direct Injection
Engine Type.....	90° VEE 4 Cycle
Aspiration.....	Turbocharged

Configuration

Injection Device.....	EUP
Turbocharger.....	GT50X (1.34 A/R)
Charge Air Cooling.....	SCCC (TB)
Low Idle Speed - r/min.....	600
High Idle Speed - r/min.....	2250
Engine Crankcase Vent System.....	Open

Physical Data

Size:	
Length - in. (mm).....	73.1 (1857)
Width - in. (mm).....	44.6 (1132)
Height - in. (mm).....	51.7 (1313.5)
Weight, dry - lb (kg).....	4859 (2204)
Weight, wet - lb (kg).....	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm).....	23.4 (594)
Above Crankshaft (y axis) - in. (mm).....	6.3 (160)
Right of Crankshaft (z axis) - in. (mm).....	0.8 (20.3)
Installation Drawing.....	5350100301 & SK11256

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N).....	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N).....	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m).....	1000 (1356)
Additional Mechanical Data.....	Not Available

Fuel System

Fuel Pump.....	5235920
Fuel Consumption - lb/hr (kg/hr).....	400.8 (181.8)
Fuel Consumption - gal/hr (L/hr).....	57.3 (217.1)
Fuel Spill - lb/hr (kg/hr).....	2058.5 (933.7)
Fuel Spill - gal/hr (L/hr).....	294.5 (1114.9)
Total Fuel Flow - lb/hr (kg/hr).....	2459.3 (1115.5)
Total Fuel Flow - gal/hr (L/hr).....	351.8 (1331.8)
Heat Rejection to Fuel - Btu/min (kW).....	550 (9.7)
Maximum Fuel Inlet Temperature - °F (°C).....	140 (60)
Heat Rejection to Fuel - Btu/min (kW).....	550 (9.67)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa).....	6 (20.3)
Dirty System - in. Hg (kPa).....	12 (41)
Fuel Filter Size, Primary - microns.....	25
Fuel Filter Size, Secondary - microns.....	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa).....	110-140 (758-965)
Oil Pressure at Low Idle - lb/in. ² (kPa).....	40 (276)
In Pan Oil Temperature - °F (°C).....	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L).....	72.9 (69.0)
Low Limit - qt (L).....	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L).....	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees.....	30
Engine Angularity Limits, Front Down - Degrees.....	30
Engine Angularity Limits, Side Tilt - Degrees.....	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F.....	950
24 Volt System, Below 32°F.....	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms.....	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW).....	18430 (324.1)
Charge Air Cooler Heat Rejection - Btu/min (kW).....	13990 (246.0)
Engine Radiated Heat - Btu/min (kW).....	7360 (129.5)
Coolant Flow - gal/min (L/min).....	340 (1287)
Minimum Coolant Flow - gal/min.....	306 (1158)
Coolant Flow Separate Circuit - gal/min (L/min).....	100 (379)
Thermostat.....	Full Blocking
Start to Open - °F (°C).....	160 (71)
Fully Open - °F (°C).....	185 (85)
Minimum Water Pump Inlet Pressure.....	Positive
Engine Coolant Capacity - qt (L).....	70.0 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa).....	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa).....	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa).....	40 (275.8)
Maximum Top Tank Temperature - °F (°C).....	210 (99)
Minimum Top Tank Temperature - °F (°C).....	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C).....	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C).....	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min).....	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min).....	1.2 (0.034)
Minimum Drawdown Requirement.....	8% of Cooling System
Deaeration Time - Minutes.....	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C).....	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa).....	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa).....	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min).....	2630 (74.5)
Engine Air Box/Manifold Pressure - in. Hg (kPa).....	69.0 (234.0)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm).....	Not Applicable
Dual - in. (mm).....	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa).....	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min).....	6620 (187.5)
Exhaust Temperature - °F (°C).....	860 (460)
Maximum Back Pressure - in. Hg (kPa).....	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm).....	8.0 (203)
Dual - in. (mm).....	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa).....	287.1 (1980)
Friction Power:	
Rated Speed - fhp (kW).....	162 (121)
Peak Torque Speed - fhp (kW).....	69 (51.5)
Altitude Capability - ft (m).....	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m).....	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
2100	1110 (828)	2776 (3764)	0.361 (220)
1950	1072 (800)	2887 (3915)	0.351 (213)
1800	1023 (763)	2985 (4047)	0.340 (207)
1650	974 (727)	3100 (4203)	0.336 (204)
1500	914 (682)	3200 (4339)	0.335 (204)
1350	796 (594)	3097 (4199)	0.337 (205)
1200	588 (439)	2574 (3489)	0.358 (218)

Emissions Data

Smoke, Rated Speed - Bosch Number.....	1.0
Smoke, Peak Torque Speed - Bosch Number.....	1.4
Noise - dB(A) @ 1 m.....	106
Additional Noise Data.....	Not Available
(CWC) Certification Word Code.....	8457
NO _x - g/hr.....	5925
CO - g/hr.....	504
HC - g/hr.....	217
SO _x - g/hr.....	1820

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All values are at rated speed and power at SAE J1995
with standard engine hardware, unless otherwise noted.

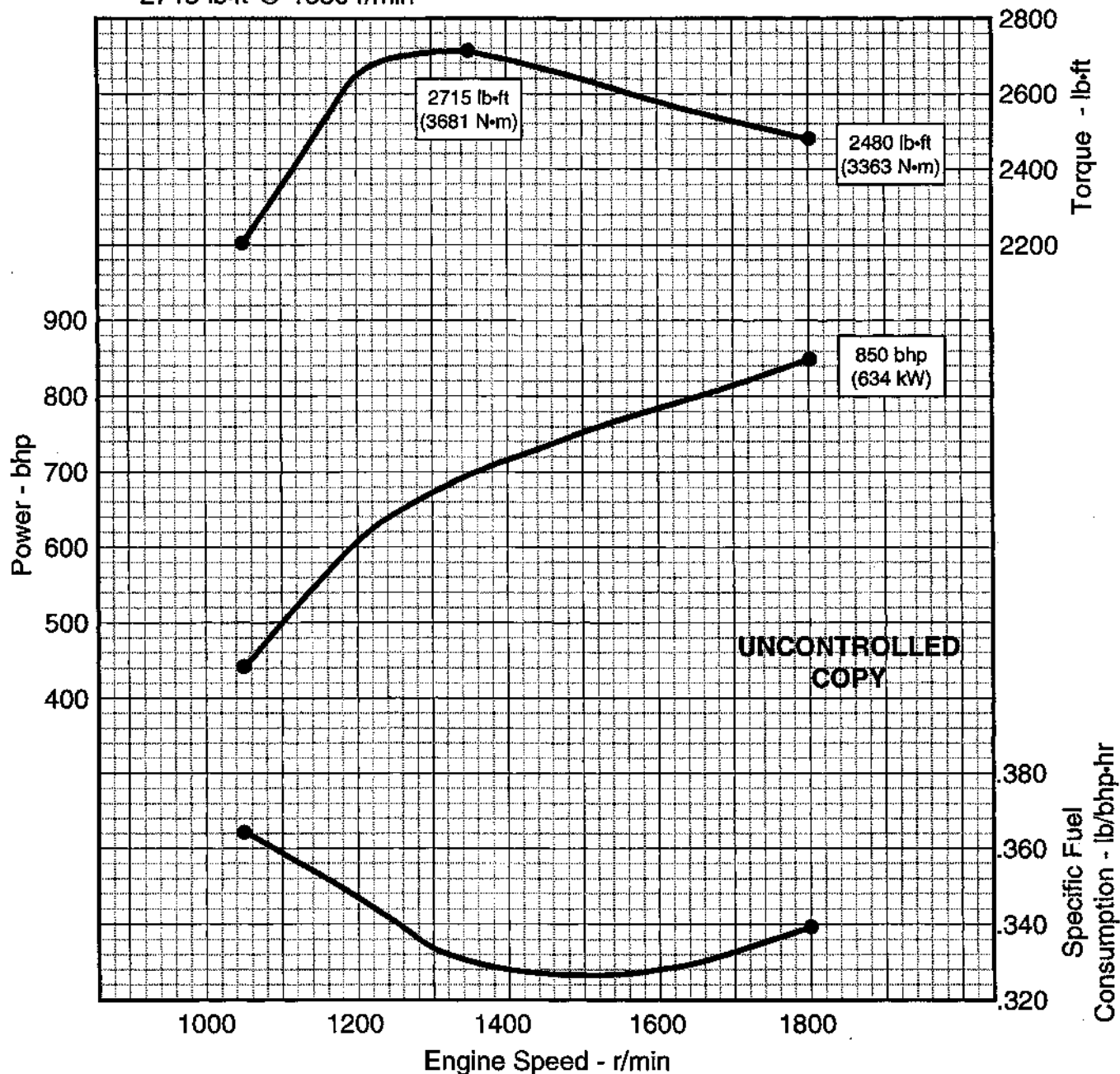
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Industrial Power

Model: 12V-2000TA DDEC®

Rating: 850 bhp @ 1800 r/min
2715 lb·ft @ 1350 r/min



Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air Intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: kg/kW·hr = lb/bhp·hr x 0.608

Torque: N·m = lb·ft x 1.356

Turbo: TMF-5505 (1.34 A/R)

Fuel Pump: EUP

Certified by: *[Signature]*

Curve No. E4-2123-31-12

Rev. / Date: 4 / 8-14-98

Sheet No. 1 of 2

Performance Curve

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model	R123-7K07
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.89)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	TMF-5505 (1.34 A/R)
Charge Air Cooling	SCCC (TB)
Low Idle Speed - r/min	600
High Idle Speed - r/min	1950
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	73.1 (1857)
Width - in. (mm)	44.6 (1132)
Height - in. (mm)	51.7 (1313.5)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301 & SK11256

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	287.3 (130.3)
Fuel Consumption - gal/hr (L/hr)	41.1 (155.6)
Fuel Spill - lb/hr (kg/hr)	1749.5 (793.6)
Fuel Spill - gal/hr (L/hr)	250.3 (947.4)
Total Fuel Flow - lb/hr (kg/hr)	2036.8 (923.9)
Total Fuel Flow - gal/hr (L/hr)	291.4 (1103.0)
Heat Rejection to Fuel - Btu/min (kW)	410 (7.2)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	25
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	100-130 (690-896)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	13620 (239.5)
Charge Air Cooler Heat Rejection - Btu/min (kW)	6020 (105.9)
Engine Radiated Heat - Btu/min (kW)	5280 (92.8)
Coolant Flow - gal/min (L/min)	290 (1098)
Minimum Coolant Flow - gal/min (L/min)	261 (988)
Coolant Flow Separate Circuit - gal/min (L/min)	80 (303)
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	70.0 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	30 (207)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1965 (55.6)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	55.1 (186.6)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	4800 (135.9)
Exhaust Temperature - °F (°C)	810 (432)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	256.5 (1769)
Friction Power:	
Rated Speed - fhp (kW)	119 (89)
Peak Torque Speed - fhp (kW)	69 (51)
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/Kw-hr)
1800	850 (634)	2480 (3363)	0.338 (206)
1650	802 (598)	2553 (3461)	0.328 (200)
1500	753 (562)	2637 (3575)	0.325 (197)
1350	698 (521)	2715 (3681)	0.329 (200)
1200	605 (451)	2648 (3590)	0.347 (211)
1050	440 (328)	2201 (2984)	0.365 (222)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.6
Smoke, Peak Torque Speed - Bosch Number	1.0
Noise - dB(A) @ 1	103.3
Additional Noise Data	N1-2123-31-9
(CWC) Certification Word Code	8418
NO _x - g/hr	4400
CO - g/hr	210
HC - g/hr	115
SO ₂ - g/hr	1303

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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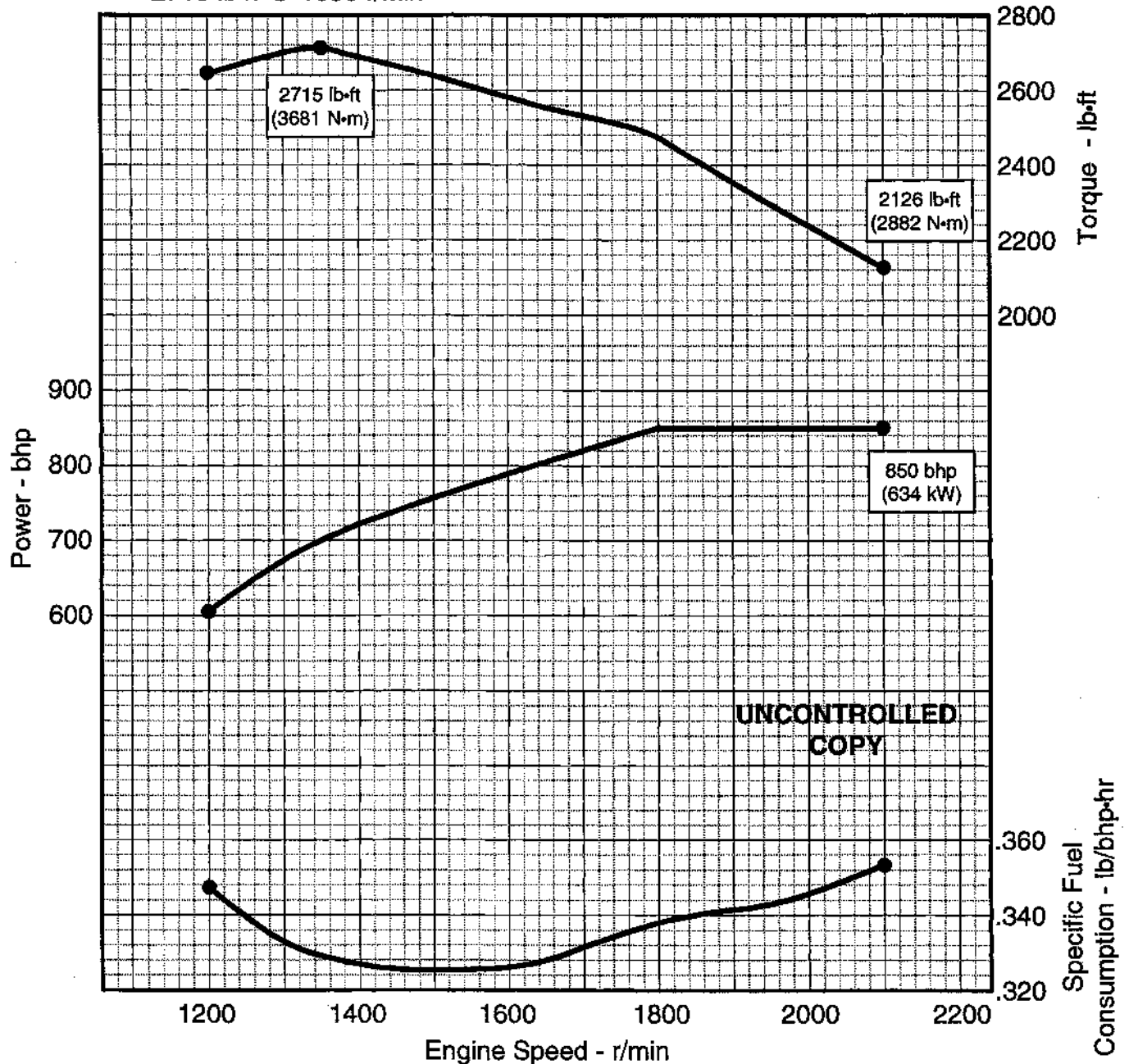
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Industrial Power

Model: 12V-2000TA DDEC®

Rating: 850 bhp @ 2100 r/min

2715 lb·ft @ 1350 r/min



Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: kg/kW·hr = lb/bhp·hr x 0.608

Torque: N·m = lb·ft x 1.356

Turbo: TMF-5505 (1.34 A/R)

Fuel Pump: EUP

Certified by: *[Signature]*

Curve No. E4-2123-31-11

Rev. / Date: 4 / 8-14-98

Sheet No. 1 of 2

Performance Curve

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model	R123-7K07
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.89)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	2067 (630)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	TMF-5505 (1.34 A/R)
Charge Air Cooling	SCCC (TB)
Low Idle Speed - r/min	600
High Idle Speed - r/min	2250
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	73.1 (1857)
Width - in. (mm)	44.6 (1132)
Height - in. (mm)	51.7 (1313.5)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301 & SK11256

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	300.3 (138.2)
Fuel Consumption - gal/hr (L/hr)	43.0 (162.6)
Fuel Spill - lb/hr (kg/hr)	2058.5 (933.7)
Fuel Spill - gal/hr (L/hr)	294.5 (1114.9)
Total Fuel Flow - lb/hr (kg/hr)	2385.3 (1082.0)
Total Fuel Flow - gal/hr (L/hr)	337.5 (1277.4)
Heat Rejection to Fuel - Btu/min (kW)	550 (9.7)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	25
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	110-140 (758-965)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200-250 (93-121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	13625 (239.6)
Charge Air Cooler Heat Rejection - Btu/min (kW)	7250 (127.5)
Engine Radiated Heat - Btu/min (kW)	5520 (97.1)
Coolant Flow - gal/min (L/min)	340 (1287)
Minimum Coolant Flow - gal/min (L/min)	306 (1158)
Coolant Flow Separate Circuit - gal/min (L/min)	100 (379)
Thermostat	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Minimum Water Pump Inlet Pressure	Positive
Engine Coolant Capacity - qt (L)	70.0 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (98.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	40 (275.8)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2255 (63.9)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	55.5 (187.9)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	5240 (148.4)
Exhaust Temperature - °F (°C)	750 (399)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	219.9 (1516)
Friction Power:	
Rated Speed - hp (kW)	162 (121)
Peak Torque Speed - hp (kW)	69 (51)
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
2100	850 (634)	2126 (2882)	0.353 (215)
1950	850 (634)	2289 (3104)	0.343 (208)
1800	850 (634)	2480 (3363)	0.338 (206)
1650	802 (598)	2553 (3461)	0.328 (200)
1500	753 (562)	2637 (3575)	0.325 (197)
1350	698 (521)	2715 (3681)	0.329 (200)
1200	605 (451)	2648 (3590)	0.347 (211)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.7
Smoke, Peak Torque Speed - Bosch Number	1.0
Noise - dB(A) @ 1	105.5
Additional Noise Data	N1-2123-31-8
(CWC) Certification Word Code	8417
NO _x - g/hr	4250
CO - g/hr	220
HC - g/hr	172
SO _x - g/hr	1362

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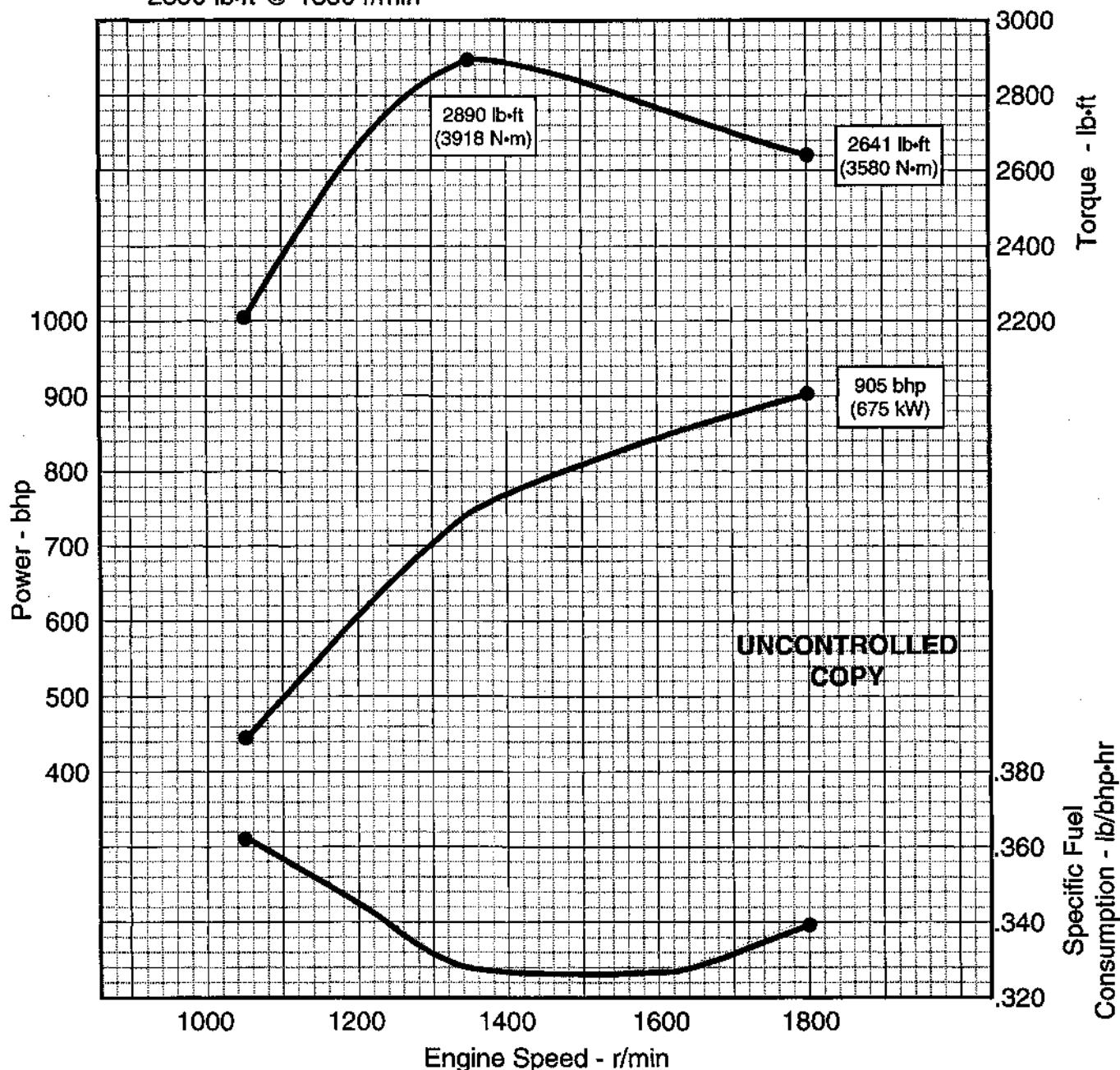
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Industrial Power

Model: 12V-2000TA DDEC®

Rating: 905 bhp @ 1800 r/min
2890 lb·ft @ 1350 r/min



Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: kg/kW·hr = lb/bhp·hr x 0.608

Torque: N·m = lb·ft x 1.356

Turbo: TMF-5505 (1.34 A/R)

Fuel Pump: EUP

Certified by: *[Signature]*

Curve No. E4-2123-31-10

Rev. / Date: 4 / 8-14-98

Sheet No. 1 of 2

Performance Curve

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model	R123-7K07
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.89)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged
Configuration	
Injection Device	EUP
Turbocharger	TMF-5505 (1.34 A/R)
Charge Air Cooling	SCCC (TB)
Low Idle Speed - r/min	600
High Idle Speed - r/min	1950
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	73.1 (1857)
Width - in. (mm)	44.56 (1132)
Height - in. (mm)	51.7 (1313.5)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301 & SK11258

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	306.5 (139.0)
Fuel Consumption - gal/hr (L/hr)	43.8 (166.0)
Fuel Spill - lb/hr (kg/hr)	1749.5 (793.6)
Fuel Spill - gal/hr (L/hr)	250.3 (947.4)
Total Fuel Flow - lb/hr (kg/hr)	2056.0 (932.6)
Total Fuel Flow - gal/hr (L/hr)	294.1 (1113.4)
Heat Rejection to Fuel - Btu/min (kW)	410 (7.2)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	25
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	100-130 (690-896)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	15500 (272.6)
Charge Air Cooler Heat Rejection - Btu/min (kW)	7250 (127.5)
Engine Radiated Heat - Btu/min (kW)	5630 (99.0)
Coolant Flow - gal/min (L/min)	290 (1098)
Minimum Coolant Flow - gal/min (L/min)	261 (988)
Coolant Flow Separate Circuit - gal/min (L/min)	80 (303)
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	70.0 (86.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	30 (207)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	187 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2090 (59.2)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	61.0 (206.5)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	5110 (144.7)
Exhaust Temperature - °F (°C)	810 (432)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	273.1 (1883)
Friction Power:	
Rated Speed - hp (kW)	119 (89)
Peak Torque Speed - hp (kW)	69 (51)
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/Kw-hr)
1800	905 (675)	2641 (3580)	0.339 (206)
1650	860 (642)	2737 (3711)	0.328 (199)
1500	810 (604)	2836 (3845)	0.326 (199)
1350	743 (554)	2890 (3918)	0.328 (200)
1200	610 (455)	2670 (3620)	0.345 (210)
1050	445 (332)	2228 (3018)	0.362 (220)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.7
Smoke, Peak Torque Speed - Bosch Number	1.0
Noise - dB(A) @ 1	103
Additional Noise Data	N1-2123-31-7
(CWC) Certification Word Code	8416
NO _x - g/hr	4300
CO - g/hr	230
HC - g/hr	120.6
SO ₂ - g/hr	1390

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

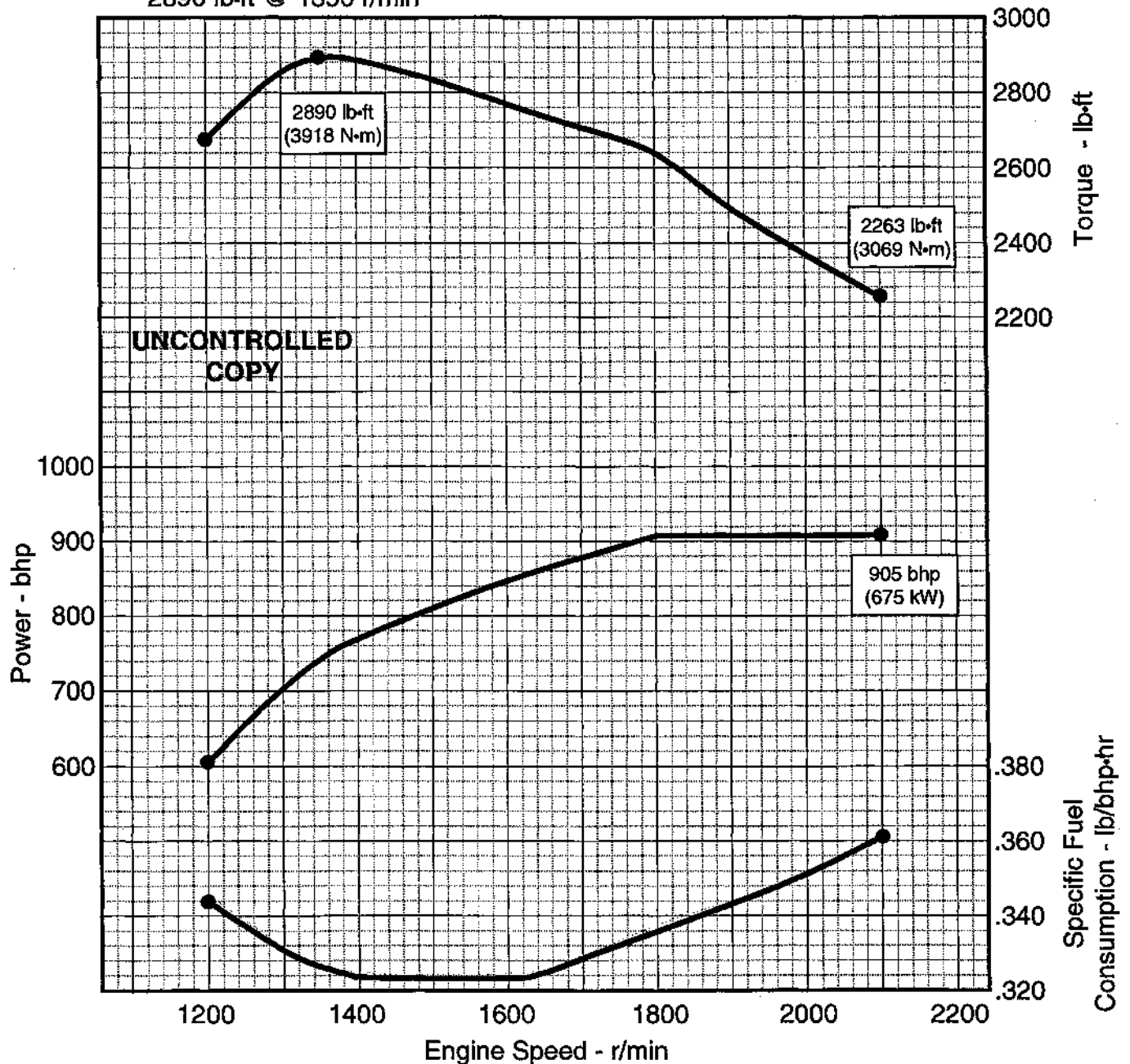
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Industrial Power

Model: 12V-2000TA DDEC®

Rating: 905 bhp @ 2100 r/min
2890 lb-ft @ 1350 r/min



Power output guaranteed within 5% SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: kg/kW·hr = lb/bhp·hr x 0.608

Torque: N·m = lb·ft x 1.358

Turbo: TMF-5505 (1.34 A/R)

Fuel Pump: EUP

Certified by: *[Signature]*

Curve No. E4-2123-31-9

Rev. / Date: 4 / 8-14-98

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Performance Curve

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model	R123-7K07
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.89)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	2067 (630)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	TMF-5505 (1.34 A/R)
Charge Air Cooling	SCCC
Low Idle Speed - r/min	600
High Idle Speed - r/min	2250
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	73.1 (1857)
Width - in. (mm)	44.6 (1132)
Height - in. (mm)	51.7 (1313.5)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	326.8 (148.2)
Fuel Consumption - gal/hr (L/hr)	46.8 (177.0)
Fuel Spill - lb/hr (kg/hr)	2058.5 (933.7)
Fuel Spill - gal/hr (L/hr)	294.5 (1114.9)
Total Fuel Flow - lb/hr (kg/hr)	2385.3 (1082.0)
Total Fuel Flow - gal/hr (L/hr)	341.2 (1291.8)
Heat Rejection to Fuel - Btu/min (kW)	550 (9.7)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	110-140 (758-965)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	18145 (283.9)
Charge Air Cooler Heat Rejection - Btu/min (kW)	8660 (152.3)
Engine Radiated Heat - Btu/min (kW)	6000 (105.4)
Coolant Flow - gal/min (L/min)	340 (1287)
Minimum Coolant Flow - gal/min (L/min)	306 (1158)
Coolant Flow Separate Circuit - gal/min (L/min)	100 (379)
Thermostat	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Minimum Water Pump Inlet Pressure	Positive
Engine Coolant Capacity - qt (L)	70.0 (86.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	40 (275.8)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2415 (68.4)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	62.0 (209.9)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	5730 (162.3)
Exhaust Temperature - °F (°C)	775 (413)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	234.1 (1614)
Friction Power:	
Rated Speed - hp (kW)	162 (121)
Peak Torque Speed - hp (kW)	69 (51)
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
2100	905 (675)	2263 (3089)	0.361 (220)
1950	905 (675)	2438 (3305)	0.348 (211)
1800	905 (675)	2641 (3580)	0.339 (206)
1650	860 (642)	2737 (3711)	0.328 (199)
1500	810 (604)	2836 (3845)	0.326 (199)
1350	743 (554)	2890 (3918)	0.328 (200)
1200	610 (455)	2870 (3620)	0.345 (210)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.7
Smoke, Peak Torque Speed - Bosch Number	1.0
Noise - dB(A) @ 1	104.2
Additional Noise Data	N1-2123-31-6
(CW/C) Certification Word Code	
NO _x - g/hr	3952
CO - g/hr	250
HC - g/hr	178
SO ₂ - g/hr	1482

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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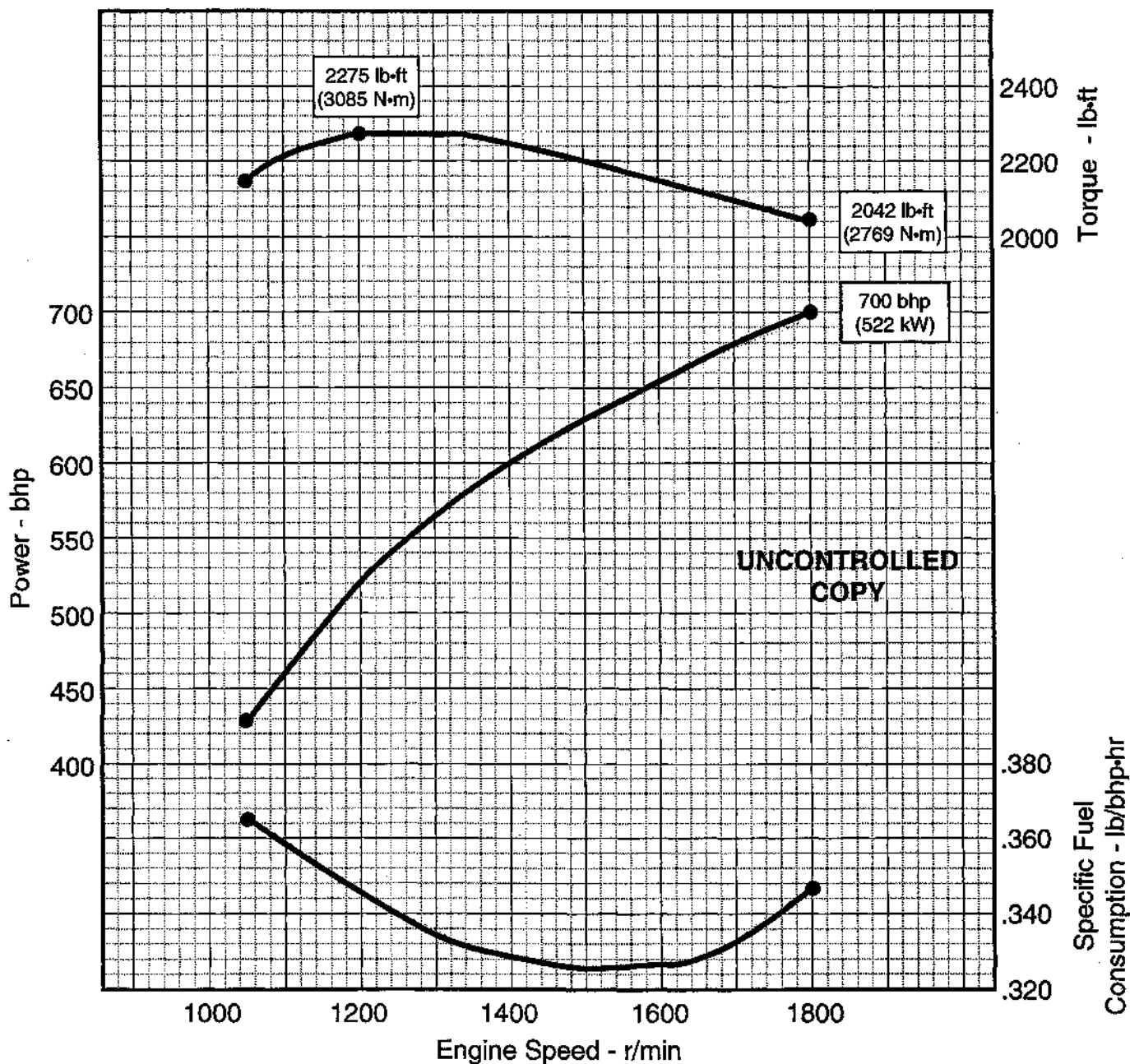
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Industrial Power

Model: 12V-2000TA DDEC®

Rating: 700 bhp @ 1800 r/min
2275 lb·ft @ 1200 r/min

Certification:
1997-98 Nonroad



Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

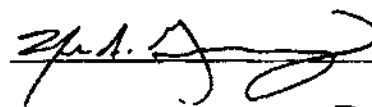
Power: kW = bhp x 0.746

Fuel: kg/kW·hr = lb/bhp·hr x 0.608

Torque: N·m = lb·ft x 1.356

Turbo: TMF-5505 (1.15 A/R)

Fuel Pump: EUP

Certified by: 

Curve No. E4-2123-31-8

Rev. / Date: 4 / 8-14-98

Sheet No. 1 of 2

Performance Curve

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model	R123-7K33
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.89)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	TMF-5505 (1.15 A/R)
Charge Air Cooling	JWAC
Low Idle Speed - r/min	600
High Idle Speed - r/min	1950
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	73.1 (1857)
Width - in. (mm)	44.6 (1132)
Height - in. (mm)	51.7 (1313.5)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	242.4 (110.0)
Fuel Consumption - gal/hr (L/hr)	34.7 (131.3)
Fuel Spill - lb/hr (kg/hr)	1750 (793.6)
Fuel Spill - gal/hr (L/hr)	250.3 (947.4)
Total Fuel Flow - lb/hr (kg/hr)	1992 (903.5)
Total Fuel Flow - gal/hr (L/hr)	285.0 (1079)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	25
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	100-130 (690-896)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	16160 (284.2)
Charge Air Cooler Heat Rejection - Btu/min (kW)	Not Applicable
Engine Radiated Heat - Btu/min (kW)	4450 (78.2)
Coolant Flow - gal/min (L/min)	290 (1098)
Minimum Coolant Flow - gal/min (L/min)	261 (988)
Coolant Flow Separate Circuit - gal/min (L/min)	Not Applicable
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	70.0 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	30 (207)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	9 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1660 (47.0)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	51.5 (173.8)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	3900 (110.4)
Exhaust Temperature - °F (°C)	760 (404)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	211.3 (1457)
Friction Power:	
Rated Speed - hp (kW)	119 (89)
Peak Torque Speed - hp (kW)	56 (42)
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
1800	700 (522)	2042 (2789)	0.346 (211)
1650	667 (498)	2123 (2879)	0.329 (200)
1500	629 (469)	2202 (2986)	0.327 (199)
1350	585 (436)	2273 (3082)	0.332 (202)
1200	520 (388)	2275 (3085)	0.346 (210)
1050	429 (320)	2146 (2909)	0.365 (222)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.1
Smoke, Peak Torque Speed - Bosch Number	0.3
Noise - dB(A) @ 1m	101.8
Additional Noise Data	N1-2123-31-5
(CWC) Certification Word Code	5203

	1800 r/min g/hr	8 Mode Cycle g/bhp-hr
NO _x	4346	6.759
CO	174	0.898
HC	165	0.304
Particulates	Not Available	Not Available

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2123-31-8
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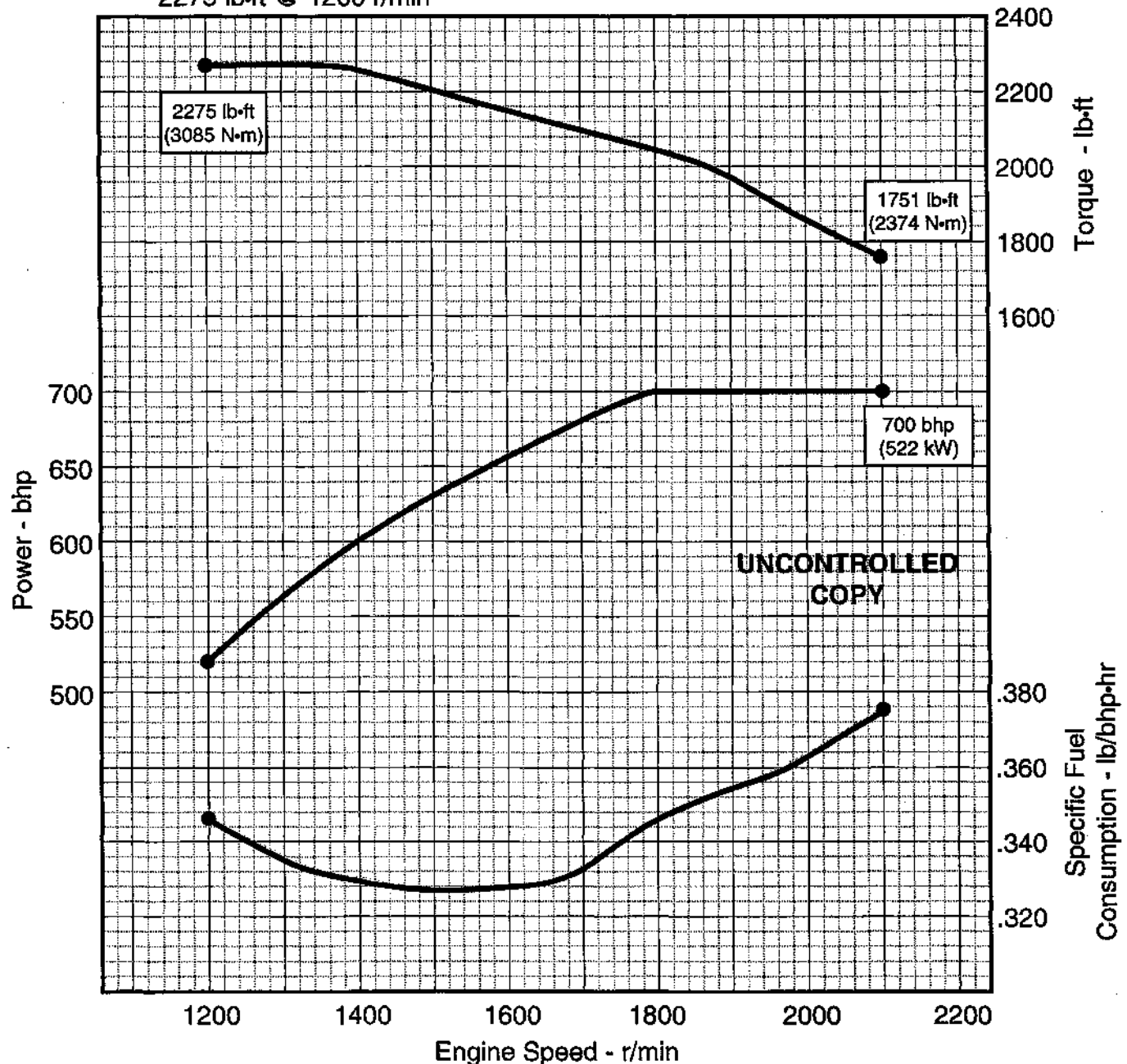
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Industrial Power

Model: 12V-2000TA DDEC®

Rating: 700 bhp @ 2100 r/min
2275 lb·ft @ 1200 r/min

Certification:
1997-98 Nonroad



Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

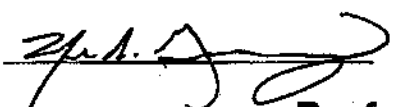
Power: kW = bhp x 0.746

Fuel: kg/kW · hr = lb/bhp · hr x 0.608

Torque: N · m = lb · ft x 1.356

Turbo: TMF-5505 (1.15 A/R)

Fuel Pump: EUP

Certified by: 

Curve No. E4-2123-31-7

Rev. / Date: 4 / 8-14-98

Sheet No. 1 of 2

Performance Curve

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model	R123-7K33
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.89)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	2067 (630)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	TMF-5505 (1.15 A/R)
Charge Air Cooling	JWAC
Low Idle Speed - r/min	600
High Idle Speed - r/min	2250
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	73.1 (1857)
Width - in. (mm)	44.6 (1132)
Height - in. (mm)	51.7 (1313.5)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	262.6 (119.1)
Fuel Consumption - gal/hr (L/hr)	37.6 (142.2)
Fuel Spill - lb/hr (kg/hr)	2059 (933.7)
Fuel Spill - gal/hr (L/hr)	294.5 (1115)
Total Fuel Flow - lb/hr (kg/hr)	2322 (1053)
Total Fuel Flow - gal/hr (L/hr)	332.1 (1257)
Heat Rejection to Fuel - Btu/min (kW)	550 (9.7)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	25
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	110-140 (758-965)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	20040 (352.4)
Charge Air Cooler Heat Rejection - Btu/min (kW)	Not Applicable
Engine Radiated Heat - Btu/min (kW)	4820 (84.8)
Coolant Flow - gal/min (L/min)	340 (1287)
Minimum Coolant Flow - gal/min (L/min)	306 (1158)
Coolant Flow Separate Circuit - gal/min (L/min)	Not Applicable
Thermostat:	Full Blocking
Start to Open - °F (°C)	180 (71)
Fully Open - °F (°C)	185 (85)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	70.0 (68.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	40 (275.8)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement:	8% of Cooling System
Deaeration Time - minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2035 (57.6)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	60.0 (202.6)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	4450 (126.0)
Exhaust Temperature - °F (°C)	680 (360)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	181.1 (1249)
Friction Power:	
Rated Speed - hp (kW)	162 (121)
Peak Torque Speed - hp (kW)	56 (42)
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
2100	700 (522)	1751 (2374)	0.375 (228)
1950	700 (522)	1885 (2556)	0.358 (218)
1800	700 (522)	2042 (2769)	0.346 (211)
1650	667 (498)	2123 (2879)	0.329 (200)
1500	629 (469)	2202 (2986)	0.327 (199)
1350	585 (436)	2273 (3082)	0.332 (202)
1200	520 (388)	2275 (3085)	0.346 (210)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.2
Smoke, Peak Torque Speed - Bosch Number	0.3
Noise - dB(A) @ 1m	104.2
Additional Noise Data	N1-2123-31-4
(CWC) Certification Word Code	5201

	2100 r/min g/hr	8 Mode Cycle g/bhp-hr
NO _x	4184	6.714
CO	186	0.630
HC	220	0.388
Particulates	Not Available	Not Available

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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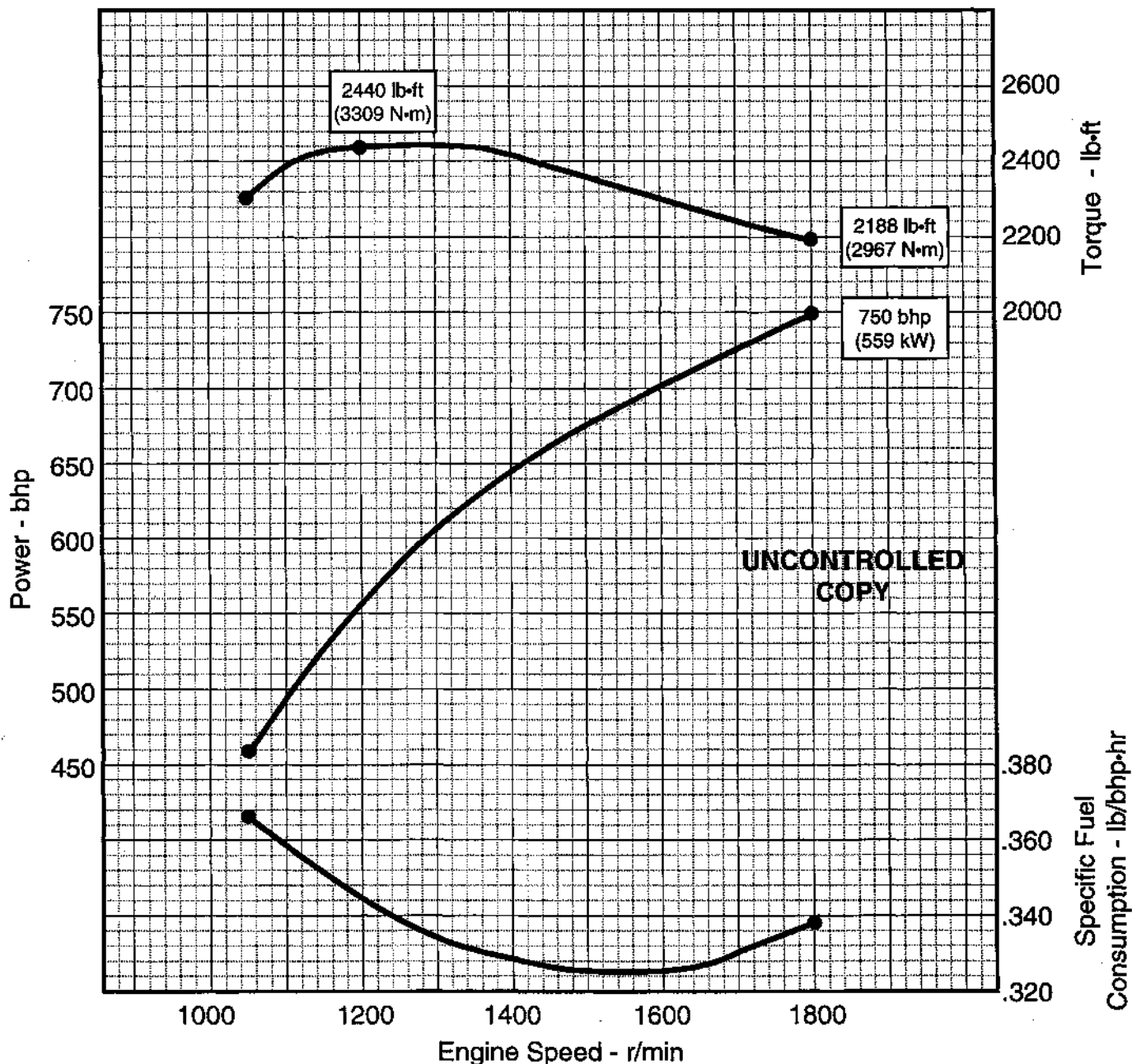
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Industrial Power

Model: 12V-2000TA DDEC®

Rating: 750 bhp @ 1800 r/min
2440 lb·ft @ 1200 r/min

Certification:
1997-98 Nonroad



Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: kg/kW·hr = lb/bhp·hr x 0.608

Torque: N·m = lb·ft x 1.356

Turbo: TMF-5505 (1.15 A/R)

Fuel Pump: EUP

Certified by:

Curve No. E4-2123-31-6

Rev. / Date: 4 / 8-14-98

Sheet No. 1 of 2

Performance Curve

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model.....	R123-7K33
Number of Cylinders.....	12
Bore and Stroke - in. x in. (mm x mm).....	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L).....	1458 (23.89)
Compression Ratio.....	16.0:1
Piston Speed - ft/min (m/min).....	1772 (540)
Intake Valves Per Cylinder.....	2
Exhaust Valves Per Cylinder.....	2
Combustion System.....	Direct Injection
Engine Type.....	90° VEE 4 Cycle
Aspiration.....	Turbocharged
Configuration	
Injection Device.....	EUP
Turbocharger.....	TMF-5505 (1.15 A/R)
Charge Air Cooling.....	JWAC
Low Idle Speed - r/min.....	600
High Idle Speed - r/min.....	1950
Engine Crankcase Vent System.....	Open

Physical Data

Size:	
Length - in. (mm).....	73.1 (1857)
Width - in. (mm).....	44.6 (1132)
Height - in. (mm).....	51.7 (1313.5)
Weight, Dry - lb (kg).....	4859 (2204)
Weight, Wet - lb (kg).....	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm).....	23.4 (594)
Above Crankshaft (y axis) - in. (mm).....	6.3 (160)
Right of Crankshaft (z axis) - in. (mm).....	0.8 (20.3)
Installation Drawing.....	5350100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N).....	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N).....	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m).....	1000 (1358)
Additional Mechanical Data.....	Not Available

Fuel System

Fuel Pump.....	5235920
Fuel Consumption - lb/hr (kg/hr).....	253.8 (115.1)
Fuel Consumption - gal/hr (L/hr).....	36.3 (137.4)
Fuel Split - lb/hr (kg/hr).....	1739 (788.6)
Fuel Split - gal/hr (L/hr).....	248.7 (941.5)
Total Fuel Flow - lb/hr (kg/hr).....	1992 (903.7)
Total Fuel Flow - gal/hr (L/hr).....	285 (1079)
Heat Rejection to Fuel - Btu/min (kW).....	410 (7.2)
Maximum Fuel Inlet Temperature - °F (°C).....	140 (50)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa).....	6 (20.3)
Dirty System - in. Hg (kPa).....	12 (41)
Fuel Filter Size, Primary - microns.....	25
Fuel Filter Size, Secondary - microns.....	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa).....	100-130 (690-896)
Oil Pressure at Low Idle - lb/in. ² (kPa).....	40 (276)
In Pan Oil Temperature - °F (°C).....	200-250 (93-121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L).....	72.9 (69.0)
Low Limit - qt (L).....	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L).....	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees.....	30
Engine Angularity Limits, Front Down - Degrees.....	30
Engine Angularity Limits, Side Tilt - Degrees.....	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F.....	950
24 Volt System, Below 32°F.....	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms.....	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW).....	16350 (287.5)
Charge Air Cooler Heat Rejection - Btu/min (kW).....	Not Applicable
Engine Radiated Heat - Btu/min (kW).....	4660 (81.9)
Coolant Flow - gal/min (L/min).....	290 (1098)
Minimum Coolant Flow - gal/min (L/min).....	261 (988)
Coolant Flow Separate Circuit - gal/min (L/min).....	Not Applicable
Thermostat.....	Full Blocking
Start to Open - °F (°C).....	180 (71)
Fully Open - °F (°C).....	185 (85)
Minimum Water Pump Inlet Pressure.....	Positive
Engine Coolant Capacity - qt (L).....	70.0 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa).....	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa).....	21.7 (149.8)
Pump Discharge Pressure - lb/in. ² (kPa).....	30 (207)
Maximum Top Tank Temperature - °F (°C).....	210 (99)
Minimum Top Tank Temperature - °F (°C).....	180 (71)
Minimum Coolant Filtration - gal/min (L/min).....	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min).....	1.2 (0.034)
Minimum Drawdown Requirement.....	8% of Cooling System
Deaeration Time - minutes.....	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C).....	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa).....	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa).....	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min).....	1850 (52.4)
Engine Air Box/Manifold Pressure - in. Hg (kPa).....	54.0 (182.4)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm).....	Not Applicable
Dual - in. (mm).....	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa).....	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min).....	4330 (122.6)
Exhaust Temperature - °F (°C).....	780 (404)
Maximum Back Pressure - in. Hg (kPa).....	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm).....	8.0 (203)
Dual - in. (mm).....	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa).....	226.4 (1561)
Friction Power:	
Rated Speed - hp (kW).....	119 (89)
Peak Torque Speed - hp (kW).....	58 (42)
Altitude Capability - ft (m).....	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m).....	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
1800	750 (559)	2188 (2967)	0.338 (206)
1650	715 (533)	2276 (3086)	0.326 (198)
1500	674 (503)	2360 (3200)	0.325 (198)
1350	627 (467)	2438 (3305)	0.330 (201)
1200	558 (416)	2440 (3309)	0.344 (209)
1050	460 (343)	2300 (3119)	0.366 (223)

Emissions Data

Smoke, Rated Speed - Bosch Number.....	0.1
Smoke, Peak Torque Speed - Bosch Number.....	0.4
Noise - dB(A) @ 1m.....	102.4
Additional Noise Data.....	N1-2123-31-3
(CWC) Certification Word Code.....	5202

	1800 r/min g/hr	8 Mode Cycle g/bhp-hr
NO _x	4710	6.281
CO.....	157	1.073
HC.....	151	0.263
Particulates.....	Not Available	Not Available

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2123-31-6

Rev. / Date: 4 / 8-14-98

Sheet No. 2 of 2

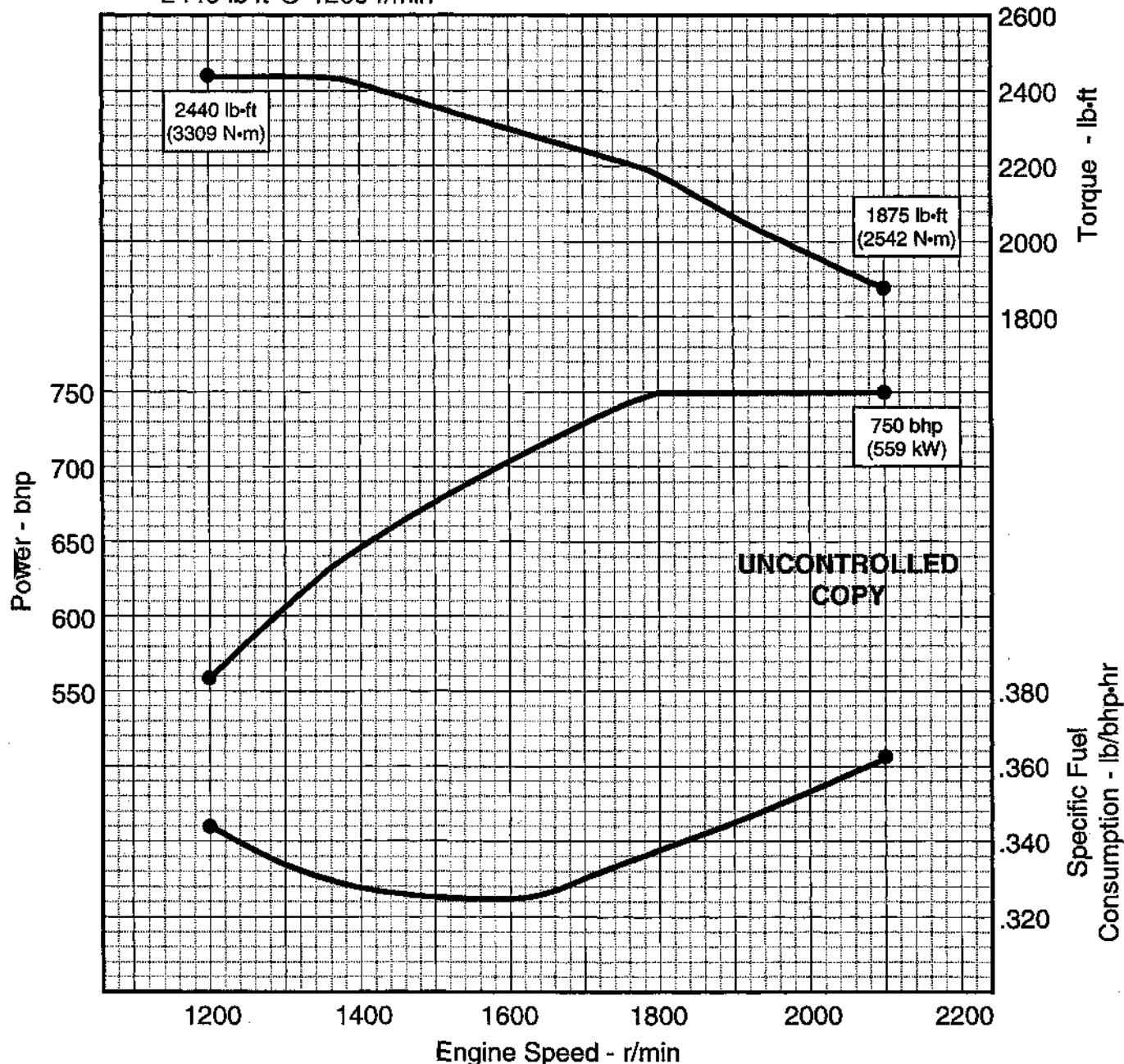
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Industrial Power

Model: 12V-2000TA DDEC®

Rating: 750 bhp @ 2100 r/min
2440 lb·ft @ 1200 r/min

Certification:
1997-98 Nonroad



Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air Intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: kg/kW·hr = lb/bhp·hr x 0.608

Torque: N·m = lb·ft x 1.356

Turbo: TMF-5505 (1.15 A/R)

Fuel Pump: EUP

Certified by: *[Signature]*

Performance Curve

Curve No. E4-2123-31-5

Rev. / Date: 4 / 8-14-98

Sheet No. 1 of 2

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model	R123-7K33
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.89)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	2087 (630)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	TMF-5505 (1.15 A/R)
Charge Air Cooling	JWAC
Low Idle Speed - r/min	600
High Idle Speed - r/min	2250
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	73.1 (1857)
Width - in. (mm)	44.6 (1132)
Height - in. (mm)	51.7 (1313.5)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	8.3 (180)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	271.7 (123.2)
Fuel Consumption - gal/hr (L/hr)	38.9 (147.1)
Fuel Spill - lb/hr (kg/hr)	2059 (933.7)
Fuel Spill - gal/hr (L/hr)	294.1 (1114)
Total Fuel Flow - lb/hr (kg/hr)	2330 (1057)
Total Fuel Flow - gal/hr (L/hr)	332.8 (1260)
Heat Rejection to Fuel - Btu/min (kW)	550 (9.7)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	25
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	110-140 (758-965)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200-250 (93-121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	20315 (357.2)
Charge Air Cooler Heat Rejection - Btu/min (kW)	Not Applicable
Engine Radiated Heat - Btu/min (kW)	4990 (87.7)
Coolant Flow - gal/min (L/min)	340 (1287)
Minimum Coolant Flow - gal/min (L/min)	308 (1158)
Coolant Flow Separate Circuit - gal/min (L/min)	Not Applicable
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	70.0 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	21.7 (149.6)
Pump Discharge Pressure - lb/in. ² (kPa)	40 (275.8)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2035 (57.6)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	60.7 (205.0)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	4490 (127.2)
Exhaust Temperature - °F (°C)	690 (368)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

BMEP - lb/in. ² (kPa)	194.0 (1337)
Friction Power:	
Rated Speed - hp (kW)	162 (121)
Peak Torque Speed - hp (kW)	56 (42)
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
2100	750 (559)	1875 (2542)	0.362 (220)
1950	750 (559)	2020 (2738)	0.349 (212)
1800	750 (559)	2188 (2967)	0.338 (206)
1650	715 (533)	2276 (3086)	0.326 (198)
1500	674 (503)	2360 (3200)	0.325 (198)
1350	627 (467)	2438 (3305)	0.330 (201)
1200	558 (416)	2440 (3308)	0.344 (209)
1050	460 (343)	2300 (3119)	0.366 (223)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.3
Smoke, Peak Torque Speed - Bosch Number	0.4
Noise - dB(A) @ 1m	105.8
Additional Noise Data	N1-2123-31-2
(CWC) Certification Word Code	5200

	2100 r/min g/hr	8 Mode Cycle g/bhp-hr
NO _x	5105	6.676
CO	170	0.757
HC	214	0.353
Particulates	Not Available	Not Available

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

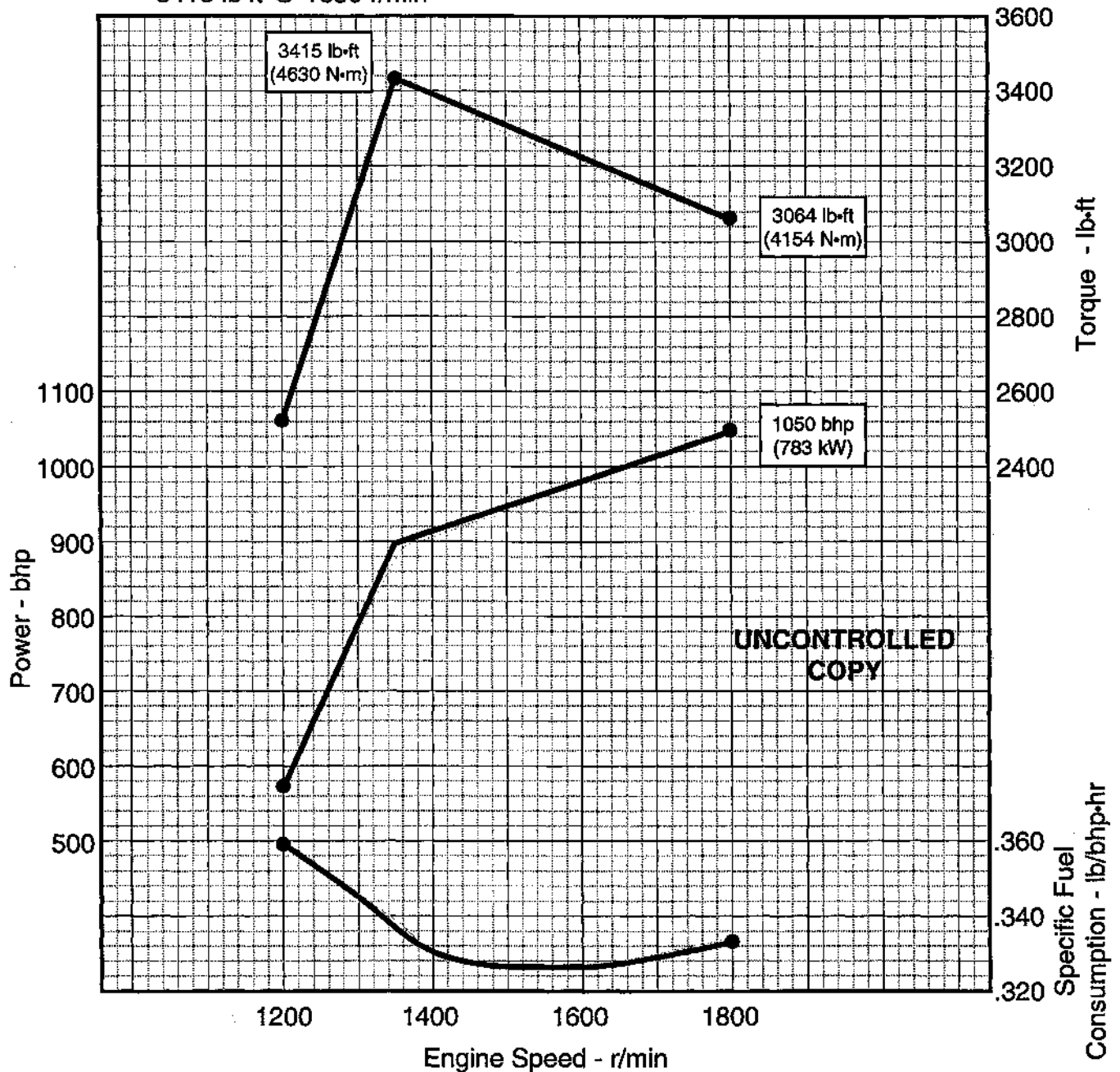
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Industrial Power

Model: 16V-2000TA DDEC®

Rating: 1050 bhp @ 1800 r/min
3415 lb·ft @ 1350 r/min



Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: kg/kW·hr = lb/bhp·hr x 0.608

Torque: N·m = lb·ft x 1.356

Turbo: K37-4671

Fuel Pump: EUP

Certified by:

[Signature]

Curve No. E4-2163-31-7

Rev. / Date: 1 / 5-11-98

Sheet No. 1 of 2

Performance Curve

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model	R163-7K00
Number of Cylinders	16
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1944 (31.86)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	K37-4761
Charge Air Cooling	JWAC
Low Idle Speed - r/min	600
High Idle Speed - r/min	1950
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	86.9 (2207)
Width - in. (mm)	47.4 (1204)
Height - in. (mm)	51.4 (1306)
Weight, Dry - lb (kg)	5600 (2540)
Weight, Wet - lb (kg)	5984 (2714)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	28.8 (732)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5360100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	350.0 (158.8)
Fuel Consumption - gal/hr (L/hr)	50.1 (189.6)
Fuel Spill - lb/hr (kg/hr)	2319 (1052)
Fuel Spill - gal/hr (L/hr)	331.8 (1256)
Total Fuel Flow - lb/hr (kg/hr)	2669 (1211)
Total Fuel Flow - gal/hr (L/hr)	381.8 (1445)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	724.2 (12.7)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	25
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	80-120 (552-827)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	101.5 (96.1)
Low Limit - qt (L)	83.5 (79.0)
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	25830 (454.2)
Charge Air Cooler Heat Rejection - Btu/min (kW)	Not Applicable
Engine Radiated Heat - Btu/min (kW)	5890 (103.6)
Coolant Flow - gal/min (L/min)	300 (1136)
Max. External Pressure Differential - lb/in. ² (kPa)	7.0 (48.3)
Coolant Flow Separate Circuit - gal/min (L/min)	Not Applicable
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	80.3 (76.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure:	
Static Head - ft. (m)	50 (15.2)
Pump Discharge Pressure - lb/in. ² (kPa)	27.1 (187)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.6 (0.045)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2295 (85.0)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	53.5 (180.7)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	5530 (156.6)
Exhaust Temperature - °F (°C)	790 (421)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)

Performance Data

BMEP - lb/in. ² (kPa)	237.7 (1639)
Friction Power:	
Rated Speed - hp (kW)	133 (99)
Peak Torque Speed - hp (kW)	77 (57)
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kw-hr)
1800	1050 (783)	3064 (4154)	0.333 (203)
1650	1000 (746)	3183 (4316)	0.327 (199)
1500	942 (703)	3298 (4472)	0.326 (198)
1350	878 (655)	3415 (4630)	0.338 (206)
1200	576 (430)	2521 (3418)	0.359 (218)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.1
Smoke, Peak Torque Speed - Bosch Number	0.2
Noise - dB(A) @ 1	105.6
Additional Noise Data	N1-2163-31-2
(CWC) Certification Word Code	8423
NO _x - g/hr	7075
CO - g/hr	185
HC - g/hr	153
SO _x - g/hr	1588

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2163-31-7
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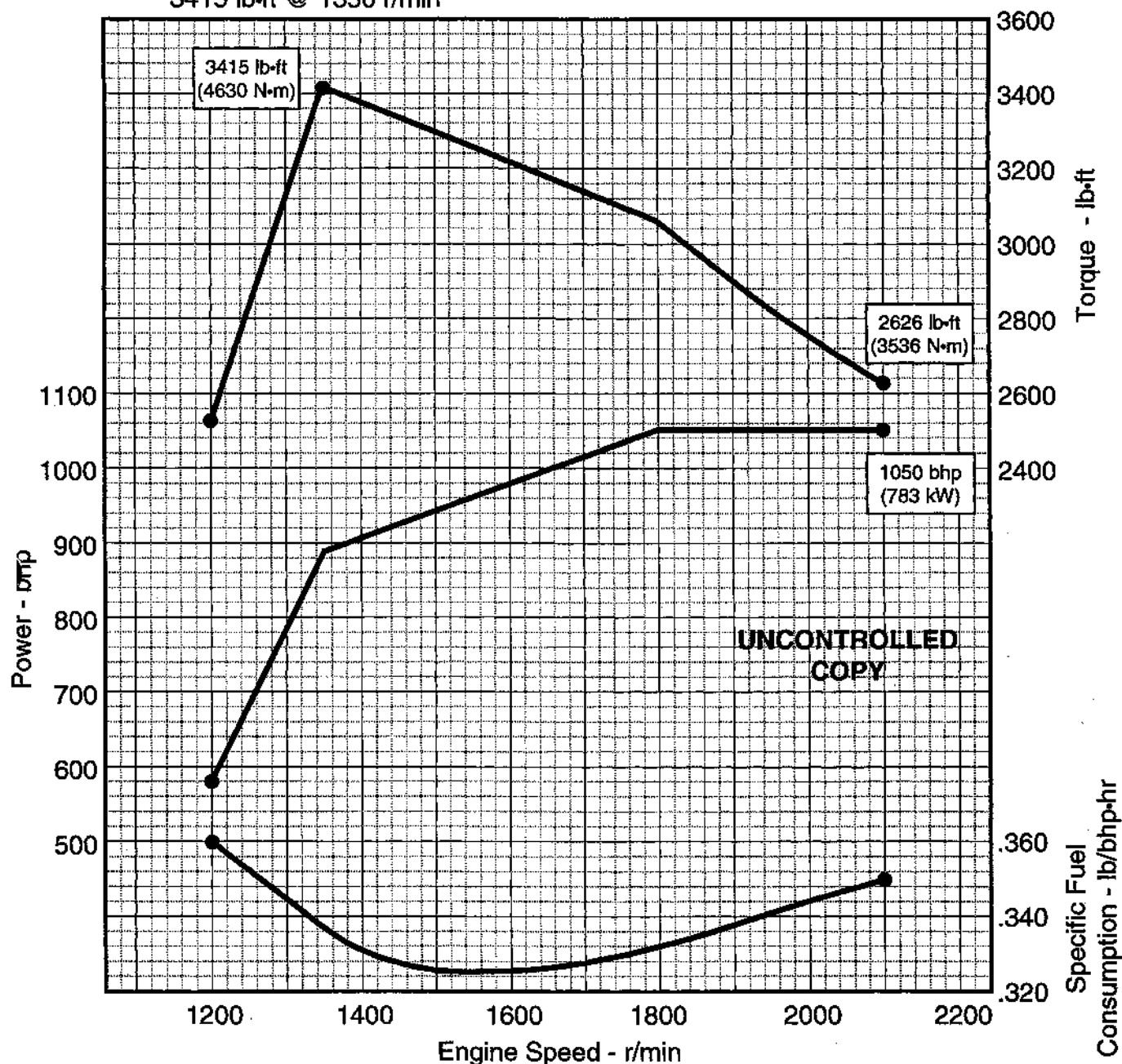
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Industrial Power

Model: 16V-2000TA DDEC®

Rating: 1050 bhp @ 2100 r/min

3415 lb·ft @ 1350 r/min



Power output guaranteed at SAE J1995 conditions:
 77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
 100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
 Air intake restriction: 10 in. H₂O (2.5 kPa)
 Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: kg/kW·hr = lb/bhp·hr x 0.608

Torque: N·m = lb·ft x 1.356

Turbo: K37-4671

Fuel Pump: EUP

Certified by:

Curve No. E4-2163-31-04

Rev. / Date: 5 / 5-11-98

Sheet No. 1 of 2

Performance Curve

Construction and Industrial Specification Sheet

General Data

Model.....	R163-7K00
Number of Cylinders.....	16
Bore and Stroke - in. x in. (mm x mm).....	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L).....	1944 (31.86)
Compression Ratio.....	16.0:1
Piston Speed - ft/min (m/min).....	2067 (630)
Intake Valves Per Cylinder.....	2
Exhaust Valves Per Cylinder.....	2
Combustion System.....	Direct Injection
Engine Type.....	90° VEE 4 Cycle
Aspiration.....	Turbocharged

Configuration

Injection Device.....	EUP
Turbocharger.....	K37-4761
Charge Air Cooling.....	JWAC
Low Idle Speed - r/min.....	600
High Idle Speed - r/min.....	2250
Engine Crankcase Vent System.....	Open

Physical Data

Size:	
Length - in. (mm).....	86.9 (2207)
Width - in. (mm).....	47.4 (1204)
Height - in. (mm).....	51.4 (1308)
Weight, Dry - lb (kg).....	5600 (2540)
Weight, Wet - lb (kg).....	5984 (2714)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm).....	28.8 (732)
Above Crankshaft (y axis) - in. (mm).....	6.3 (160)
Right of Crankshaft (z axis) - in. (mm).....	0.8 (20.3)
Installation Drawing.....	5360100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N).....	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N).....	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m).....	1000 (1356)
Additional Mechanical Data.....	Not Available

Fuel System

Fuel Pump.....	5235920
Fuel Consumption - lb/hr (kg/hr).....	367.8 (166.8)
Fuel Consumption - gal/hr (L/hr).....	52.6 (199.2)
Fuel Spill - lb/hr (kg/hr).....	2502 (1135)
Fuel Spill - gal/hr (L/hr).....	357.9 (1355)
Total Fuel Flow - lb/hr (kg/hr).....	2870 (1302)
Total Fuel Flow - gal/hr (L/hr).....	410.6 (1554)
Maximum Fuel Inlet Temperature - °F (°C).....	140 (60)
Heat Rejection to Fuel - Btu/min (kW).....	935.8 (16.5)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa).....	6 (20.3)
Dirty System - in. Hg (kPa).....	12 (41)
Fuel Filter Size, Primary - microns.....	25
Fuel Filter Size, Secondary - microns.....	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa).....	87-130 (600-896)
Oil Pressure at Low Idle - lb/in. ² (kPa).....	40 (276)
In Pan Oil Temperature - °F (°C).....	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L).....	101.5 (96.1)
Low Limit - qt (L).....	83.5 (79.0)
Total Engine Oil Capacity with Filters - qt (L).....	114 (107.9)
Engine Angularity Limits, Front Up - Degrees.....	30
Engine Angularity Limits, Front Down - Degrees.....	30
Engine Angularity Limits, Side Tilt - Degrees.....	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F.....	950
24 Volt System, Below 32°F.....	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms.....	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW).....	27670 (486.6)
Charge Air Cooler Heat Rejection - Btu/min (kW).....	Not Applicable
Engine Radiated Heat - Btu/min (kW).....	6170 (108.5)
Coolant Flow - gal/min (L/min).....	354 (1340)
Max. External Pressure Differential - lb/in. ² (kPa).....	9.0 (62.1)
Coolant Flow Separate Circuit - gal/min (L/min).....	Not Applicable
Thermostat:	
Start to Open - °F (°C).....	165 (74)
Fully Open - °F (°C).....	188.6 (87)
Minimum Water Pump Inlet Pressure.....	Positive
Engine Coolant Capacity - qt (L).....	80.3 (76.0)
Minimum Pressure Cap - lb/in. ² (kPa).....	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft. (m).....	50 (15.2)
Pump Discharge Pressure - lb/in. ² (kPa).....	38.8 (254)
Maximum Top Tank Temperature - °F (°C).....	210 (99)
Minimum Top Tank Temperature - °F (°C).....	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min).....	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min).....	1.6 (0.045)
Minimum Drawdown Requirement.....	8% of Cooling System
Deaeration Time - Minutes.....	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C).....	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa).....	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa).....	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min).....	2800 (79.3)
Engine Air Box/Manifold Pressure - in. Hg (kPa).....	57.3 (194)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm).....	Not Applicable
Dual - in. (mm).....	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa).....	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min).....	6240 (176.7)
Exhaust Temperature - °F (°C).....	715 (379)
Maximum Back Pressure - in. Hg (kPa).....	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm).....	Not Applicable
Dual - in. (mm).....	8.0 (203)

Performance Data

BMEP - lb/in. ² (kPa).....	203.7 (1405)
Friction Power:	
Rated Speed - hp (kW).....	182 (136)
Peak Torque Speed - hp (kW).....	77 (57)
Altitude Capability - ft (m).....	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m).....	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/Kw-hr)
2100	1050 (783)	2626 (3580)	0.350 (213)
1950	1050 (783)	2828 (3834)	0.341 (207)
1800	1050 (783)	3064 (4154)	0.333 (203)
1650	1000 (746)	3183 (4316)	0.327 (199)
1500	942 (703)	3298 (4472)	0.326 (198)
1350	878 (655)	3415 (4630)	0.338 (206)
1200	576 (430)	2521 (3418)	0.359 (218)

Emissions Data

Smoke, Rated Speed - Bosch Number.....	0.1
Smoke, Peak Torque Speed - Bosch Number.....	0.2
Noise - dB(A) @ 1m.....	105.7
Additional Noise Data.....	N1-2163-31-1
(CWC) Certification Word Code.....	8422
NO _x - g/hr.....	7436
CO - g/hr.....	176
HC - g/hr.....	176
SO _x - g/hr.....	1668

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2163-31-04
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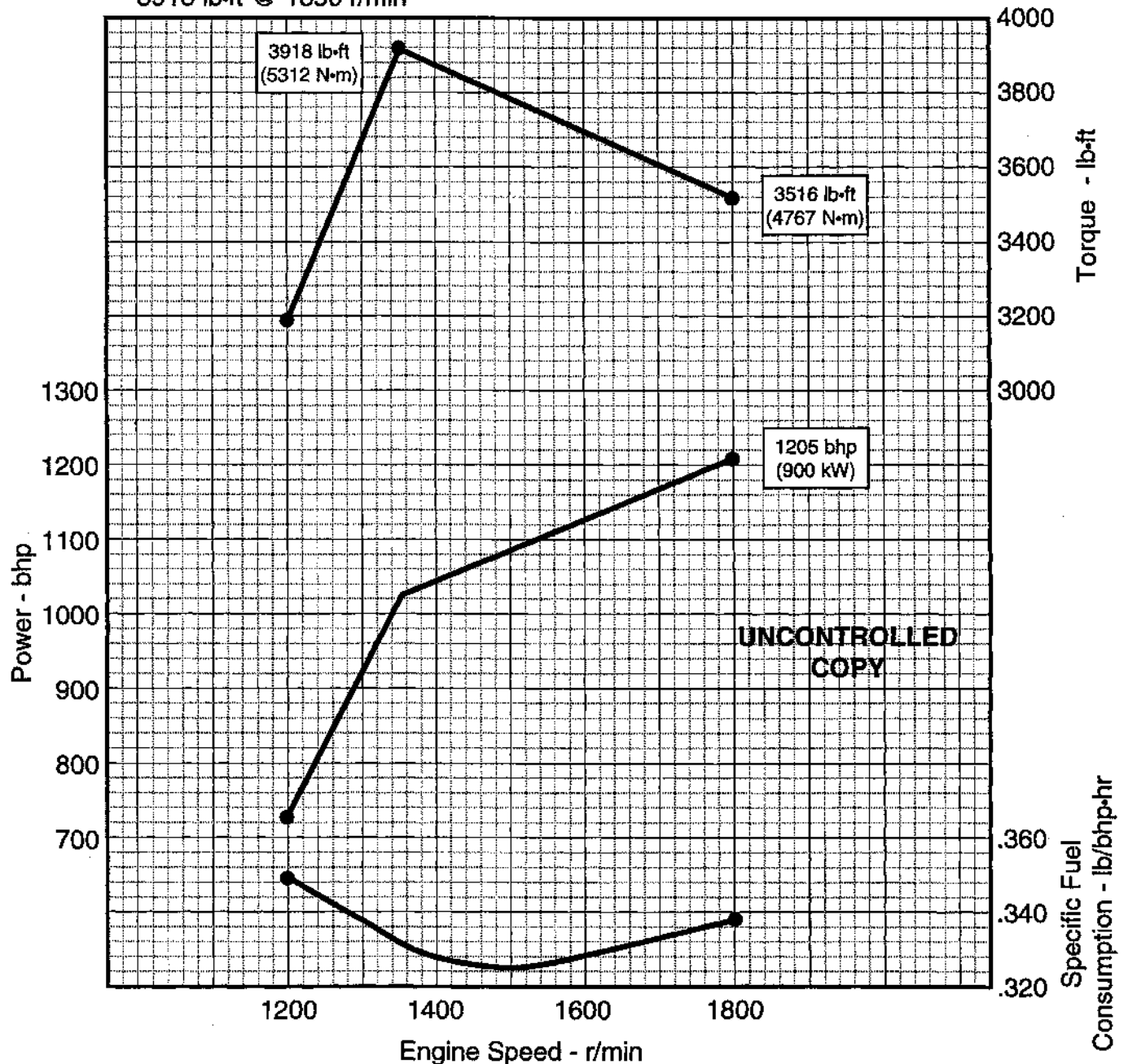
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Industrial Power

Model: 16V-2000TA DDEC®

Rating: 1205 bhp @ 1800 r/min

3918 lb·ft @ 1350 r/min



Power output guaranteed at SAE J1995 conditions:
 77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
 100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
 Air intake restriction: 10 in. H₂O (2.5 kPa)
 Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: kg/kW · hr = lb/bhp · hr x 0.608

Torque: N · m = lb · ft x 1.356

Turbo: K37-4671

Fuel Pump: EUP

Certified by:

Curve No. E4-2163-31-8

Rev. / Date: 1 / 5-11-98

Sheet No. 1 of 2

Performance Curve

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model	R163-7K07
Number of Cylinders	16
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1944 (31.86)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged
Configuration	
Injection Device	EUP
Turbocharger	K37-4761
Charge Air Cooling	SCCC
Low Idle Speed - r/min	600
High Idle Speed - r/min	1950
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	86.9 (2207)
Width - in. (mm)	47.4 (1204)
Height - in. (mm)	51.4 (1306)
Weight, dry - lb (kg)	5600 (2540)
Weight, wet - lb (kg)	5984 (2714)
Center of Gravity Distances:	
From R.F.O.B. (x axis) - in. (mm)	28.8 (732)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5360100301 & SK-4257

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	407.3 (184.8)
Fuel Consumption - gal/hr (L/hr)	58.3 (220.6)
Fuel Spill - lb/hr (kg/hr)	2260 (1025)
Fuel Spill - gal/hr (L/hr)	323.3 (1224)
Total Fuel Flow - lb/hr (kg/hr)	2667 (1210)
Total Fuel Flow - gal/hr (L/hr)	381.6 (1445)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	647.7 (11.4)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	25
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	77-115 (531-793)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	101.5 (96.1)
Low Limit - qt (L)	83.5 (79.0)
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	18557 (326.3)
Charge Air Cooler Heat Rejection - Btu/min (kW)	10920 (192.0)
Engine Radiated Heat - Btu/min (kW)	6860 (120.6)
Coolant Flow - gal/min (L/min)	315 (1192)
Max. External Pressure Differential - lb/in. ² (kPa)	8.0 (55.2)
Coolant Flow Separate Circuit - gal/min (L/min)	113 (428)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	8.0 (55.2)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	80.3 (76.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Pump Discharge Pressure - lb/in. ² (kPa)	26.3 (181)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient Air to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.8 (0.045)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2555 (72.9)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	53.5 (180)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	6530 (184.9)
Exhaust Temperature - °F (°C)	880 (471)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)

Performance Data

BMEP - lb/in. ² (kPa)	272.7 (1881)
Friction Power:	
Rated Speed - hp (kW)	133 (99)
Peak Torque Speed - hp (kW)	77 (57)
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
1800	1205 (900)	3516 (4767)	0.338 (206)
1650	1148 (856)	3654 (4954)	0.330 (201)
1500	1085 (809)	3799 (5151)	0.325 (198)
1350	1007 (751)	3918 (5312)	0.332 (202)
1200	728 (543)	3186 (4320)	0.349 (212)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.2
Smoke, Peak Torque Speed - Bosch Number	0.5
Noise - dB(A) @ 1m	105.8
Additional Noise Data	N1-2163-31-4
(CWC) Certification Word Code	8427
NO _x - g/hr	5733
CO - g/hr	327
HC - g/hr	150
SO _x - g/hr	1850

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

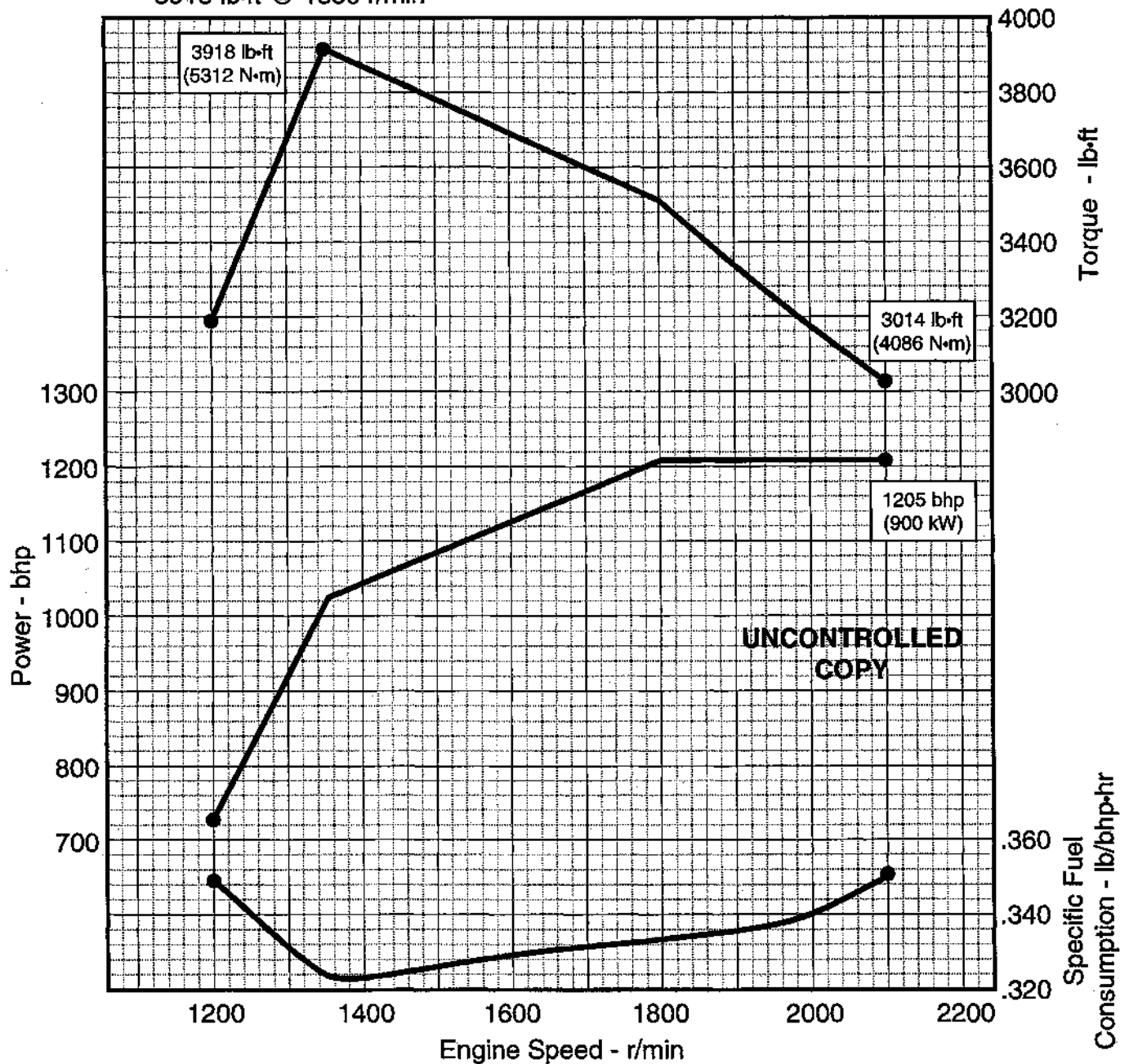
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Industrial Power

Model: 16V-2000TA DDEC®

Rating: 1205 bhp @ 2100 r/min
3918 lb·ft @ 1350 r/min



Power output guaranteed at SAE J1995 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (98kPa) dry barometer;
100°F (38°C) fuel inlet temperature; .853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746
Fuel: kg/kW · hr = lb/bhp · hr x 0.608
Torque: N · m = lb · ft x 1.356

Turbo: K37-4671

Fuel Pump: EUP

Certified by: *[Signature]*

Curve No. E4-2163-31-5

Rev. / Date: 5 / 5-11-98

Sheet No. 1 of 2

Performance Curve

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model	R163-7K07
Number of Cylinders	16
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1944 (31.86)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	2067 (630)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	K37-4761
Charge Air Cooling	SCCC
Low Idle Speed - r/min	600
High Idle Speed - r/min	2250
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	86.9 (2207)
Width - in. (mm)	47.4 (1204)
Height - in. (mm)	51.4 (1306)
Weight, Dry - lb (kg)	5600 (2540)
Weight, Wet - lb (kg)	5984 (2714)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	28.8 (732)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5360100301 & SK-11257

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	422.7 (191.7)
Fuel Consumption - gal/hr (L/hr)	60.5 (228.9)
Fuel Spill - lb/hr (kg/hr)	2446 (1110)
Fuel Spill - gal/hr (L/hr)	349.9 (1325)
Total Fuel Flow - lb/hr (kg/hr)	2869 (1301)
Total Fuel Flow - gal/hr (L/hr)	410.4 (1554)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	824 (14.5)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	25
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	80-120 (552-827)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	101.5 (96.1)
Low Limit - qt (L)	83.5 (79.0)
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	19280 (339.0)
Charge Air Cooler Heat Rejection - Btu/min (kW)	11830 (208.0)
Engine Radiated Heat - Btu/min (kW)	7120 (125.2)
Coolant Flow - gal/min (L/min)	364 (1378)
Max. External Pressure Differential - lb/in. ² (kPa)	11.0 (75.8)
Coolant Flow Separate Circuit - gal/min (L/min)	133 (503)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	10 (69.0)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure:	Positive
Engine Coolant Capacity - qt (L)	80.3 (76.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Pump Discharge Pressure - lb/in. ² (kPa)	36.3 (250)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	180 (71)
Maximum Ambient Air to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.6 (0.045)
Minimum Drawdown Requirement	8% of Cooling System
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2840 (80.4)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	53.3 (180)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	7080 (200.5)
Exhaust Temperature - °F (°C)	850 (454)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)

Performance Data

BMEP - lb/in. ² (kPa)	233.8 (1612)
Friction Power:	
Rated Speed - hp (kW)	182 (136)
Peak Torque Speed - hp (kW)	77 (57)
Altitude Capability - ft (m)	10200 (3110)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
2100	1205 (900)	3014 (4086)	0.351 (213)
1950	1205 (900)	3246 (4400)	0.342 (208)
1800	1205 (900)	3516 (4767)	0.338 (206)
1650	1148 (856)	3654 (4954)	0.330 (201)
1500	1085 (809)	3799 (5151)	0.325 (198)
1350	1007 (751)	3918 (5312)	0.332 (202)
1200	728 (543)	3186 (4320)	0.348 (212)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.2
Smoke, Peak Torque Speed - Bosch Number	0.5
Noise - dB(A) @ 1m	106.5
Additional Noise Data	N1-2163-31-3
(CWC) Certification Word Code	8426
NO _x - g/hr	6173
CO - g/hr	314
HC - g/hr	164
SO _x - g/hr	1917

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2163-31-5
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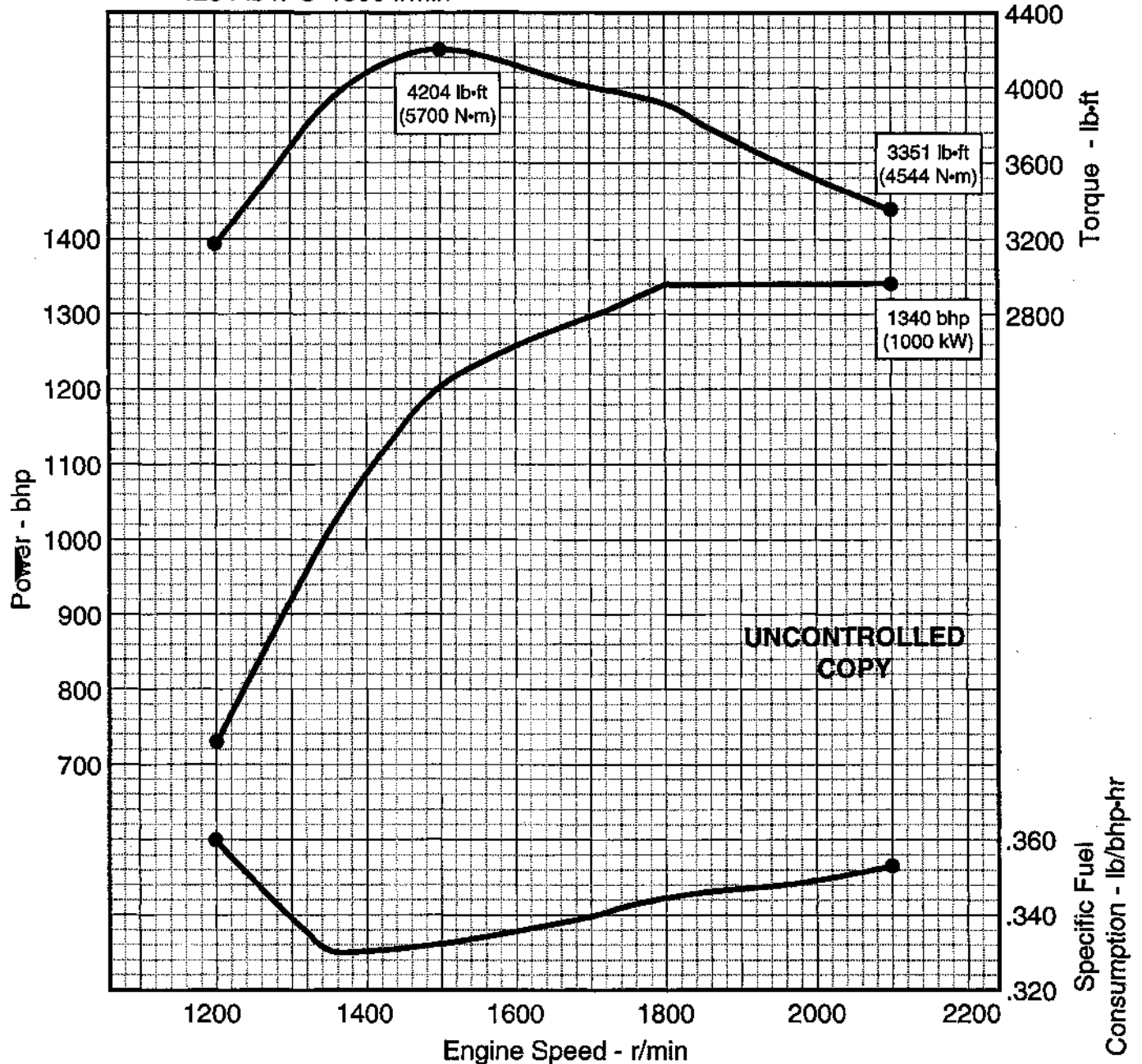
Series 2000TM

Industrial Power

Model: 16V-2000TA DDEC®

Rating: 1340 bhp @ 2100 r/min

4204 lb·ft @ 1500 r/min



Power output guaranteed at SAE J1996 conditions:
77°F (25°C) air inlet temperature; 29.31 in. Hg (99kPa) dry barometer;
100°F (38°C) fuel inlet temperature; 853 specific gravity at 60°F.
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust Back Pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

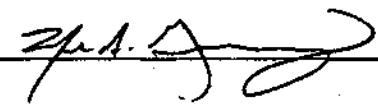
Power: kW = bhp x 0.746

Fuel: kg/kW·hr = lb/bhp·hr x 0.608

Torque: N·m = lb·ft x 1.356

Turbo: K37-4671

Fuel Pump: EUP

Certified by: 

Curve No. E4-2163-31-6

Rev. / Date: 5 / 5-11-98

Sheet No. 1 of 2

Performance Curve

CONSTRUCTION AND INDUSTRIAL SPECIFICATION SHEET

General Data

Model	R163-7K07
Number of Cylinders	16
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1944 (31.86)
Compression Ratio	14.5:1
Piston Speed - ft/min (m/min)	2067 (630)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K37-4761
Charge Air Cooling	SCCC
Low Idle Speed - r/min	600
High Idle Speed - r/min	2250
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	96.9 (2207)
Width - in. (mm)	47.4 (1204)
Height - in. (mm)	51.4 (1306)
Weight, Dry - lb (kg)	5800 (2540)
Weight, Wet - lb (kg)	5984 (2714)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	28.8 (732)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5360100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	473.0 (214.6)
Fuel Consumption - gal/hr (L/hr)	67.6 (255.9)
Fuel Spill - lb/hr (kg/hr)	2397 (1087)
Fuel Spill - gal/hr (L/hr)	342.9 (1298)
Total Fuel Flow - lb/hr (kg/hr)	2870 (1302)
Total Fuel Flow - gal/hr (L/hr)	410.6 (1554)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	824 (14.5)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	80-120 (552-827)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	101.5 (96.1)
Low Limit - qt (L)	83.5 (79.0)
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	23315 (410.0)
Charge Air Cooler Heat Rejection - Btu/min (kW)	14388 (253.0)
Engine Radiated Heat - Btu/min (kW)	8070 (141.9)
Coolant Flow - gal/min (L/min)	364 (1378)
Max. External Pressure Differential - lb/in. ² (kPa)	11.0 (75.8)
Coolant Flow Separate Circuit - gal/min (L/min)	133 (503)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	10 (69.0)
Thermostat:	
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure:	POSITIVE
Engine Coolant Capacity - qt (L)	80.3 (76.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Pump Discharge Pressure - lb/in. ² (kPa)	36.3 (250)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	180 (71)
Maximum Ambient Air to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.6 (0.045)
Minimum Drawdown Requirement - qt (L)	8% (0.1)
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	3105 (88.0)
Engine Air Box/Manifold Pressure - in. Hg (kPa)	61.3 (207)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	7820 (221.5)
Exhaust Temperature - °F (°C)	860 (460)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)

Performance Data

BMEP - lb/in. ² (kPa)	260.0 (1793)
Friction Power:	
Rated Speed - fhp (kW)	182 (136)
Peak Torque Speed - fhp (kW)	77 (57)
Altitude Capability - ft (m)	7400 (2256)
Torque Available at 800 r/min - lb-ft (N-m)	Not Available

Engine Speed r/min	Rated Power bhp (kW)	Rated Torque lb-ft (N-m)	Rated BSFC lb/bhp-hr (g/kW-hr)
2100	1340 (1000)	3351 (4544)	0.353 (215)
1950	1340 (1000)	3609 (4893)	0.348 (212)
1800	1340 (1000)	3910 (5301)	0.344 (209)
1650	1275 (951)	4058 (5502)	0.337 (205)
1500	1201 (898)	4204 (5700)	0.332 (202)
1350	1007 (751)	3696 (5312)	0.330 (201)
1200	725 (541)	2714 (4302)	0.360 (219)

Emissions Data

Smoke, Rated Speed - Bosch Number	0.2
Smoke, Peak Torque Speed - Bosch Number	0.2
Noise - dB(A) @ 1	107.3
Additional Noise Data	N1-2163-31-5
NO _x - g/hr	7915
CO - g/hr	333
HC - g/hr	250
SO _x - g/hr	2145

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2163-31-6
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Generator Set Power

Model: 8V-2000 G70

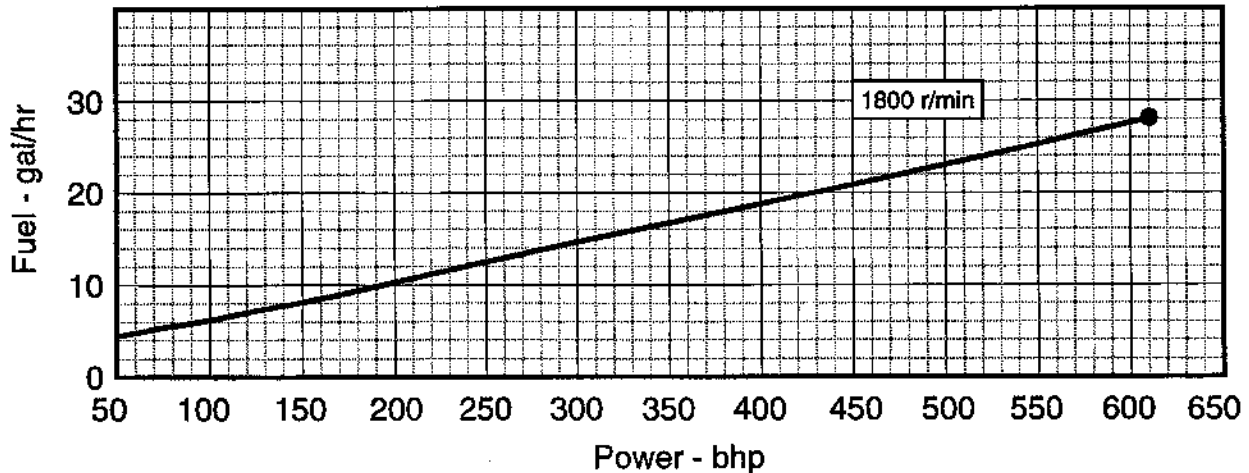
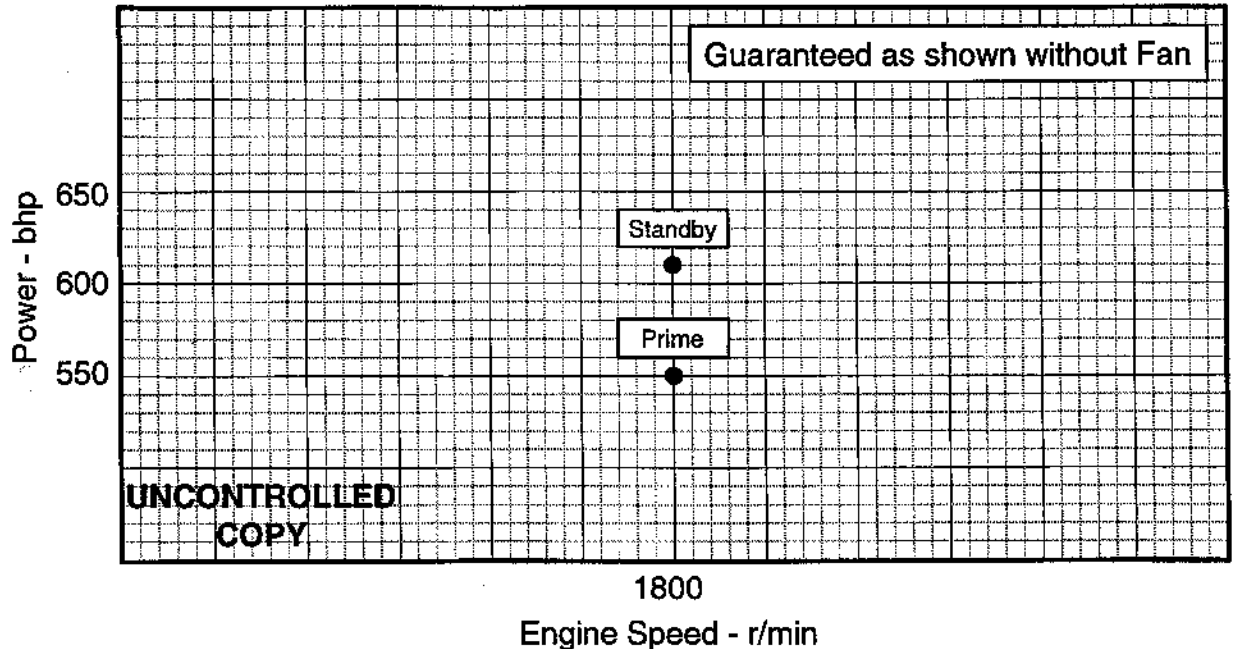
Certification: Nonroad

Standby Rating:

Prime Rating:

610 bhp (455 kW) @ 1800 r/min

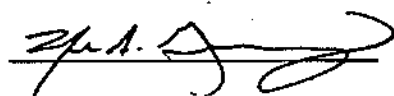
550 bhp (410 kW) @ 1800 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity.
 Curves also represent capabilities at the following ambient conditions:
 DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 60% relative humidity
 JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.
 Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (85kg/iter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).
 Air intake restriction: 10 in. H₂O (2.5 kPa)
 Exhaust back pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:
 Power: kW = bhp x 0.746
 Fuel: L/hr = gal/hr x 3.785

Turbo: K31
Injector: EUP

Certified by: 

Curve No. E4-2085-31-1
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Performance Curve

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1800 r/min

General Data

Model	R083-7K35
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.94)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K31-3767/22.20
Charge Air Cooling	JWCC
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg)	3530 (1603)
Weight, Wet - lb (kg)	3735 (1696)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (423)
Above Crankshaft (y axis) - in. (mm)	6.2 (158)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	600 (2669)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	205.0 (93.0)
Fuel Spill - lb/hr (kg/hr)	1117.9 (507.1)
Fuel Spill - gal/hr (L/hr)	157.2 (595.2)
Total Fuel Flow - lb/hr (kg/hr)	1323.1 (600.2)
Total Fuel Flow - gal/hr (L/hr)	186.1 (704.4)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	400.6 (7.04)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	20
Fuel Filter Size, Secondary - Microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	47 - 57 (324-393)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	14520 (255.3)
Engine Radiated Heat - Btu/min (kW)	3400 (59.8)
Generator Radiated Heat - Btu/min (kW)	1448 (25.5)
Coolant Flow - gal/min (L/min)	249 (943)
Max. External Pressure Differential - lb/in. ² (kPa)	6 (41.4)
Thermostat	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure	POSITIVE
Engine Coolant Capacity - qt (L)	48.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1130 (32.0)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	51.7 (174.6)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	3090 (87.5)
Exhaust Temperature - °F (°C)	965 (518)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	610 (455)
Rated Speed - r/min	1800
BMEP - lb/in. ² (kPa)	276.1 (1904)
Friction Power - fhp (kW)	70.0 (52.2)
Altitude Capability - ft (m)	10200 (3109)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	1.57 (5.95)
25% Power	8.4 (31.8)
50% Power	15.3 (58.0)
75% Power	21.8 (82.6)
100% Power	28.8 (109.2)

Emissions Data

Smoke - Bosch Number	0.3
Noise - dB(A) @ 1m	101.2
Additional Noise Data	N1-2085-31-8

Load	0%	25%	50%	75%	100%
NO _x - g/hr	418	850	1715	3015	4585
CO - g/hr	126	94.0	89.5	96.9	130
HC - g/hr	60.4	43.8	45.5	47.9	40.4
SO ₂ - g/hr	51	271	494	704	930
Particulates - g/hr	11.4	11.5	16.9	13.5	12.7

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2085-31-1
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GENERATOR SPECIFICATION SHEET

PRIME POWER - 1800 r/min

General Data

.....	R083-7K35
.....	8
Bore and Stroke - in. x in. (mm x mm).....	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L).....	972 (15.94)
Compression Ratio.....	16.0:1
Piston Speed - ft/min (m/min).....	1772 (540)
Intake Valves Per Cylinder.....	2
Exhaust Valves Per Cylinder.....	2
Combustion System.....	DIRECT INJECTION
Engine Type.....	90° VEE 4 CYCLE
Aspiration.....	TURBOCHARGED

Configuration

Injection Device.....	EUP
Turbocharger.....	K31-3767/22.20
Charge Air Cooling.....	JWCC
Engine Crankcase Vent System.....	OPEN

Physical Data

Size:	
Length - in. (mm).....	57.5 (1460)
Width - in. (mm).....	43.7 (1109)
Height - in. (mm).....	48.8 (1238)
Weight, Dry - lb (kg).....	3530 (1603)
Weight, Wet - lb (kg).....	3735 (1696)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm).....	16.7 (423)
Above Crankshaft (y axis) - in. (mm).....	6.2 (158)
Right of Crankshaft (z axis) - in. (mm).....	1.18 (30.0)
Installation Drawing.....	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N).....	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N).....	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m).....	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N).....	600 (2669)
Additional Mechanical Data.....	Not Available

Fuel System

Pump.....	5235920
Consumption - lb/hr (kg/hr).....	185.4 (84.1)
Spill - lb/hr (kg/hr).....	1138.2 (516.3)
Fuel Spill - gal/hr (L/hr).....	180.1 (606.0)
Total Fuel Flow - lb/hr (kg/hr).....	1323.1 (600.2)
Total Fuel Flow - gal/hr (L/hr).....	186.1 (704.4)
Maximum Fuel Inlet Temperature - °F (°C).....	140 (60)
Heat Rejection to Fuel - Btu/min (kW).....	396.7 (6.98)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa).....	6 (20.3)
Dirty System - in. Hg (kPa).....	12 (41)
Fuel Filter Size, Primary - Microns.....	20
Fuel Filter Size, Secondary - Microns.....	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa).....	47 - 57 (324-393)
Oil Pressure at Low Idle - lb/in. ² (kPa).....	20 (38)
In Pan Oil Temperature - °F (°C).....	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L).....	49 (46.4)
Low Limit - qt (L).....	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L).....	57 (53.9)
Engine Angularity Limits, Front Up - Degrees.....	30
Engine Angularity Limits, Front Down - Degrees.....	30
Engine Angularity Limits, Side Tilt - Degrees.....	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F.....	950
24 Volt System, Below 32°F.....	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms.....	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW).....	13100 (230.4)
Engine Radiated Heat - Btu/min (kW).....	3070 (554.0)
Generator Radiated Heat - Btu/min (kW).....	1308 (23.0)
Coolant Flow - gal/min (L/min).....	249 (942.6)
Max. External Pressure Differential - lb/in. ² (kPa).....	6 (41.4)
Thermostat.....	Full Blocking
Start to Open - °F (°C).....	165 (74)
Fully Open - °F (°C).....	188.8 (87)
Minimum Water Pump Inlet Pressure.....	POSITIVE
Engine Coolant Capacity - qt (L).....	48.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa).....	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m).....	50 (15.2)
Maximum Top Tank Temperature - °F (°C).....	210 (99)
Minimum Top Tank Temperature - °F (°C).....	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min).....	3 (11.4)
Cooling Index @ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C).....	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min).....	0.8 (0.023)
Minimum Drawdown Requirement - qt (L).....	8% of cooling system
Deaeration Time - Minutes.....	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C).....	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa).....	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa).....	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min).....	1045 (29.6)
Fan Air Flow - ft ³ /min (m ³ /min).....	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa).....	43.2 (145.9)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm).....	Not Applicable
Dual - in. (mm).....	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa).....	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min).....	2850 (80.7)
Exhaust Temperature - °F (°C).....	960 (516)
Maximum Back Pressure - in. Hg (kPa).....	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm).....	6.0 (152)
Dual - in. (mm).....	5.0 (127)

Performance Data

Rated Power - bhp (kW).....	550
Rated Speed - r/min.....	1800
BMEP - lb/in. ² (kPa).....	249.0 (1717)
Friction Power - fhp (kW).....	70 (52.2)
Altitude Capability - ft (m).....	10200 (3109)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power.....	1.57 (5.95)
25% Power.....	7.9 (29.7)
50% Power.....	14.0 (53.0)
75% Power.....	20.0 (75.8)
100% Power.....	26.1 (98.7)

Emissions Data

Smoke - Bosch Number.....	0.5
Noise - dB(A) @ 1m.....	100.8
Additional Noise Data.....	N1-2085-31-7

Load	0%	25%	50%	75%	100%
NO _x - g/hr.....	418	810	1620	2590	4065
CO - g/hr.....	126	105	123	163	450
HC - g/hr.....	60.4	61	57	58	54
SO ₂ - g/hr.....	51	253	451	646	841
Particulates - g/hr.....	11.4	25.4	37.2	21	22

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Generator Set Power

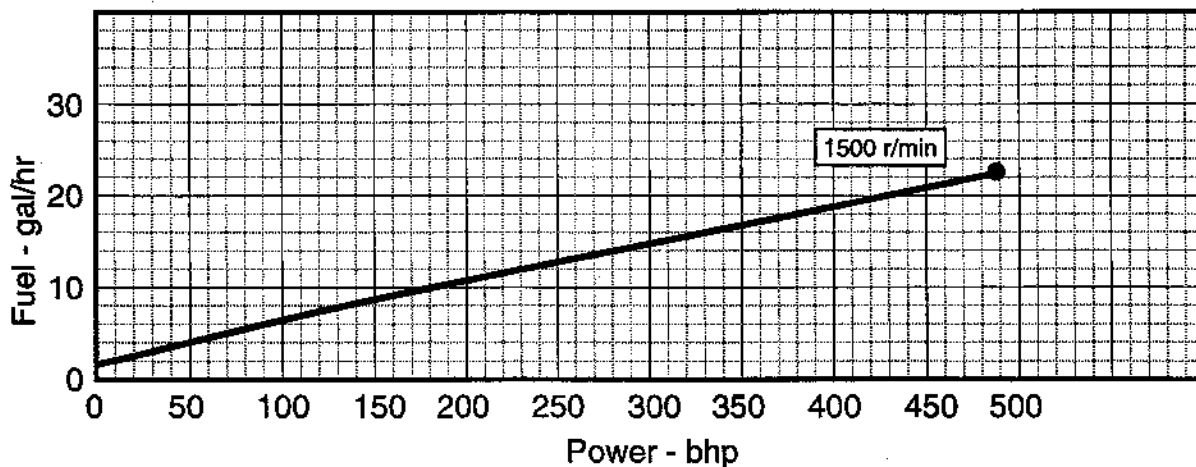
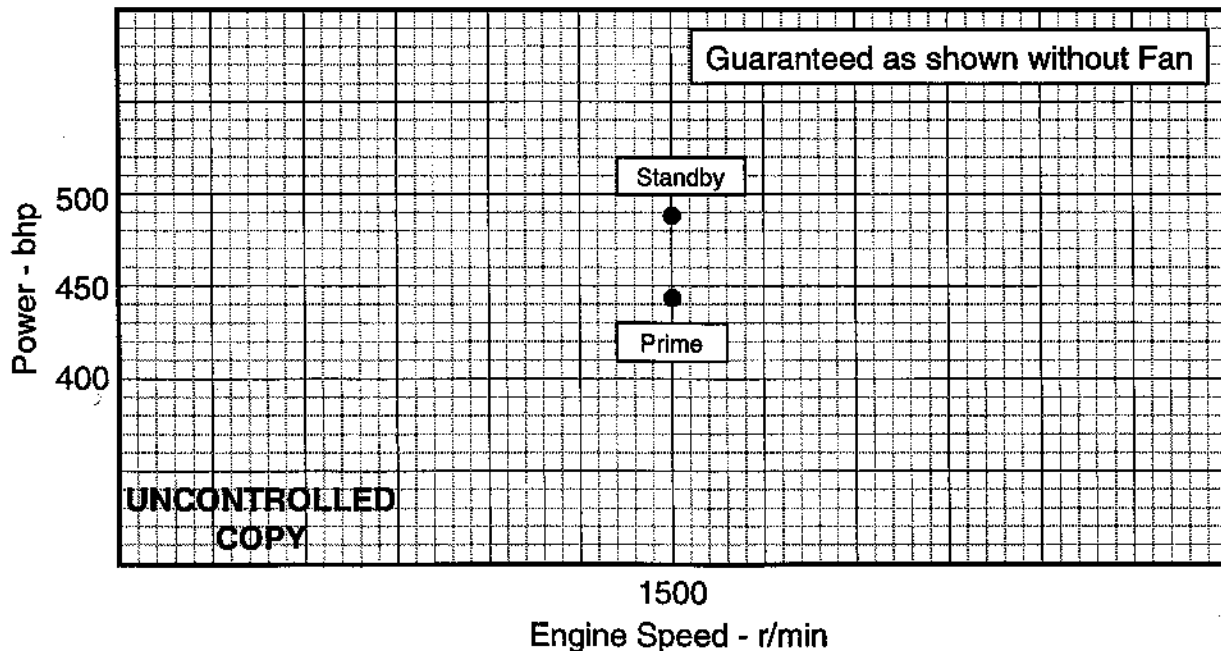
Model: 8V-2000 G50

Standby Rating:

489 bhp (365 kW) @ 1500 r/min

Prime Rating:

443 bhp (330 kW) @ 1500 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity.

Curves also represent capabilities at the following ambient conditions:

DIN 6270: 738 torr barometric pressure, 20 °C air inlet, 60% relative humidity

JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.

Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).

Air intake restriction: 10 in. H₂O (2.5 kPa)

Exhaust back pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: K27

Injector: EUP

Certified by:

Curve No. E4-2085-31-2

Rev. / Date: 7 / 6-9-98

Sheet No. 1 of 3

Performance Curve

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1500 r/min

General Data

Model	R083-7K05
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.81 (130 x 150)
Displacement - in. ³ (L)	972 (15.94)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED
Configuration	
Injection Device	EUP
Turbocharger	K27-3465/18.20
Charge Air Cooling	JWCC
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg)	3530 (1603)
Weight, Wet - lb (kg)	3735 (1696)
Center of Gravity Distances:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (423)
Above Crankshaft (y axis) - in. (mm)	6.2 (159)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	600 (2669)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	159.9 (72.5)
Fuel Spill - lb/hr (kg/hr)	942.1 (427.3)
Fuel Spill - gal/hr (L/hr)	132.5 (501.6)
Total Fuel Flow - lb/hr (kg/hr)	1102.2 (500.0)
Total Fuel Flow - gal/hr (L/hr)	155.0 (586.7)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel- Btu/min (kW)	296.4 (5.21)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	20
Fuel Filter Size, Secondary - Microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	37 - 47 (255-324)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	11740 (206.4)
Engine Radiated Heat - Btu/min (kW)	2640 (46.4)
Generator Radiated Heat - Btu/min (kW)	1203 (21.1)
Coolant Flow - gal/min (L/min)	206 (780)
Max. External Pressure Differential - lb/in. ² (kPa)	4 (27.6)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	890 (25.2)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	47.0 (158.7)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	2320 (65.7)
Exhaust Temperature - °F (°C)	900 (482)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	489 (365)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	265.6 (1904)
Friction Power - fhp (kW)	49.3 (36.8)
Altitude Capability - ft (m)	10200 (3109)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	0.71 (2.69)
25% Power	7.2 (27.3)
50% Power	12.6 (47.6)
75% Power	17.3 (65.6)
100% Power	22.5 (85.1)

Emissions Data

Smoke - Bosch Number	0.2
Noise - dB(A) @ 1m	97.5
Additional Noise Data	N1-2085-31-2

Load	0%	25%	50%	75%	100%
NO _x - g/hr	400	1010	2323	2925	3520
CO - g/hr	85	75	66	120	323
HC - g/hr	61	53	45.5	43.3	45
SO ₂ - g/hr	23	233	405	559	725
Particulates - g/hr	N/a				
TA Luft	0%	25%	50%	75%	100%
NO _x - mg/(m ³ n)	3599	3553	4594	3928	3636
CO - mg/(m ³ n)	513	260	126	156	322
HC - mg/(m ³ n)	597	181	87.3	56.4	44.7
Particulates - mg/(m ³ n)	N/a				

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2085-31-2

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Sheet No. 2 of 3

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GENERATOR SPECIFICATION SHEET

PRIME POWER - 1500 r/min

General Data

Model	R083-7K05
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.94)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K27-3465/18.20
Charge Air Cooling	JWCC
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg)	3530 (1603)
Weight, Wet - lb (kg)	3735 (1696)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (423)
Above Crankshaft (y axis) - in. (mm)	6.2 (158)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	600 (2669)
Additional Mechanical Data	Not Available

Fuel System

Pump	5235920
Consumption - lb/hr (kg/hr)	147.9 (67.1)
Fuel Spill - lb/hr (kg/hr)	954.5 (433.0)
Fuel Spill - gal/hr (L/hr)	134.3 (508.4)
Total Fuel Flow - lb/hr (kg/hr)	1102.2 (500.0)
Total Fuel Flow - gal/hr (L/hr)	155.0 (586.7)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	293.6 (5.16)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	20
Fuel Filter Size, Secondary - Microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	37 - 47 (255-324)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	11110 (195.4)
Engine Radiated Heat - Btu/min (kW)	2450 (43.1)
Generator Radiated Heat - Btu/min (kW)	1093 (19.2)
Coolant Flow - gal/min (L/min)	206 (780)
Max. External Pressure Differential - lb/in. ² (kPa)	4 (27.6)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open	188.6 (87)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	180 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	810 (22.9)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	40.3 (136.1)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	2100 (59.5)
Exhaust Temperature - °F (°C)	890 (477)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	443 (330)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	241.5 (1665)
Friction Power - fhp (kW)	49.3 (36.8)
Altitude Capability - ft (m)	10200 (3109)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	0.71 (2.69)
25% Power	6.7 (25.4)
50% Power	11.7 (44.1)
75% Power	16.0 (60.5)
100% Power	20.8 (78.7)

Emissions Data

Smoke - Bosch Number	0.2
Noise - dB(A) @ 1m	98.3
Additional Noise Data	N1-2085-31-1

Load	0%	25%	50%	75%	100%
NO _x - g/hr	400	950	2200	2750	3370
CO - g/hr	85	77	66	100	251
HC - g/hr	61	54	47	43.7	45
SO ₂ - g/hr	23	216	376	516	46
Particulates - g/hr	N/a				
TA Luft	0%	25%	50%	75%	100%
NO _x - mg/(m ³ n)	3599	3558	4393	4120	3756
CO - mg/(m ³ n)	513	290	100	147	270
HC - mg/(m ³ n)	597	230	105	65.4	49.3
Particulates - mg/(m ³ n)	N/a				

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Generator Set Power

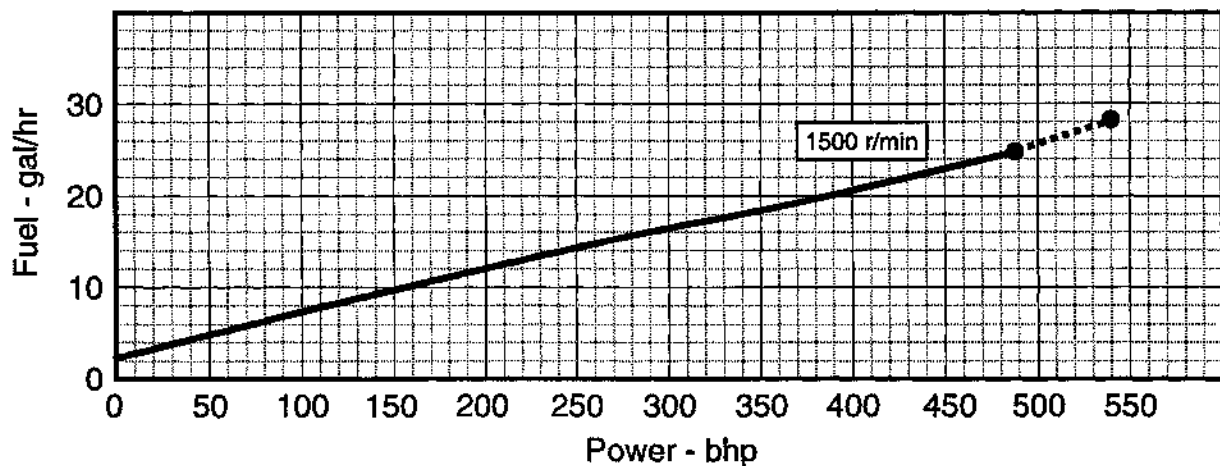
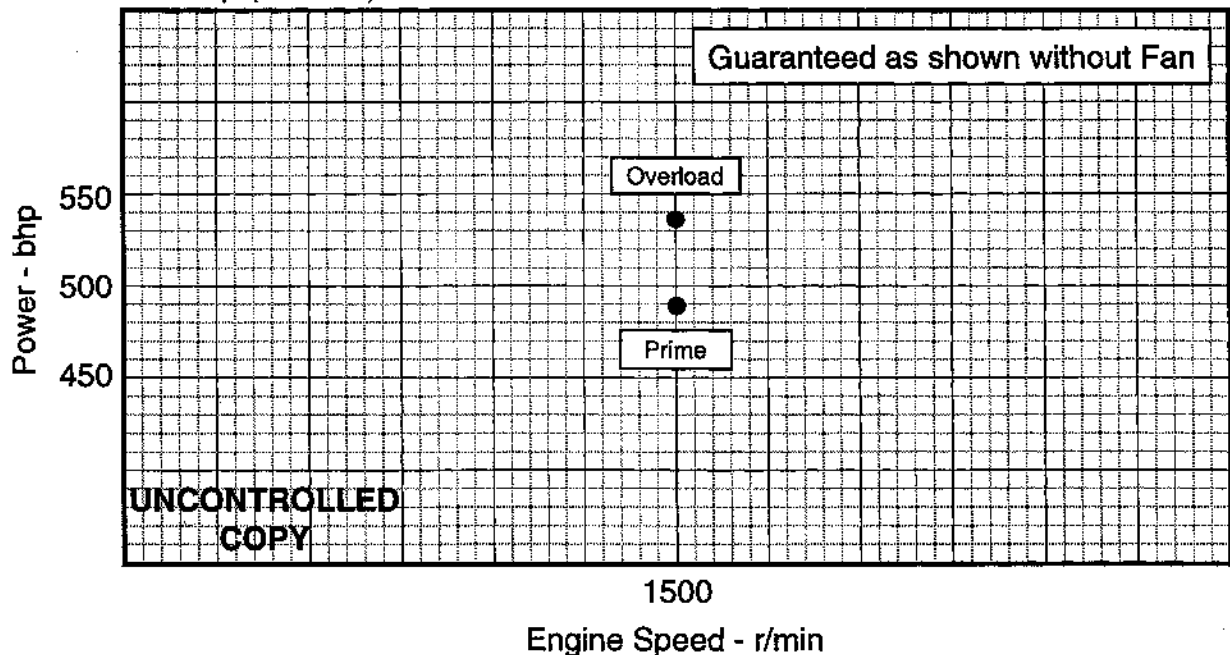
Model: 8V-2000 G60

Prime Rating:

489 bhp (365 kW) @ 1500 r/min

Certification:

TA Luft Emissions



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions:
 DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 60% relative humidity
 JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.
 Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).
 Air intake restriction: 10 in. H₂O (2.5 kPa)
 Exhaust back pressure: 15 in. H₂O (3.7 kPa)

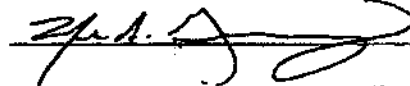
Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: K27

Injector: EUP

Certified by: 

Curve No. E4-2085-31-3

Rev. / Date: 6 / 6-9-98

Sheet No. 1 of 2

Performance Curve

GENERATOR SPECIFICATION SHEET

PRIME POWER - 1500 r/min

General Data

Model	R083-7K38
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.94)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K27-3465/18.20
Charge Air Cooling	SCCC
Engine Crankcase Vent System	Closed

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg)	3530 (1603)
Weight, Wet - lb (kg)	3735 (1696)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (423)
Above Crankshaft (y axis) - in. (mm)	6.2 (158)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	600 (2669)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	175.6 (79.7)
Fuel Spill - lb/hr (kg/hr)	926.4 (420.2)
Fuel Spill - gal/hr (L/hr)	130.3 (493.2)
Total Fuel Flow - lb/hr (kg/hr)	1102.2 (500.0)
Total Fuel Flow - gal/hr (L/hr)	155.0 (586.7)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	304.5 (5.35)*
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	20
Fuel Filter Size, Secondary - Microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	37 - 47 (255-324)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	10255 (180.3)*
Engine Heat Rejection SCCC - Btu/min (kW)	2960 (52.0)*
Engine Radiated Heat - Btu/min (kW)	2900 (51.0)*
Generator Radiated Heat - Btu/min (kW)	1203 (21.1)*
Coolant Flow - gal/min (L/min)	156 (591)
Max. External Pressure Differential - lb/in. ² (kPa)	4 (27.6)
Coolant Flow Separate Circuit - gal/min (L/min)	85 (246)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	5 (34.5)
Thermostat	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Maximum Water Pump Inlet Pressure:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	180 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Temperature - °F (°C)	167 (75)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1190 (33.7)*
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	68.6 (224.9)*
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	3650 (103.4)*
Exhaust Temperature - °F (°C)	1150 (621)*
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	489 (365)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	265.6 (1904)
Friction Power - fhp (kW)	49.3 (36.8)
Altitude Capability - ft (m)	10200 (3109)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	0.71 (2.69)
25% Power	6.5 (24.6)
50% Power	11.4 (43.2)
75% Power	16.7 (63.2)
100% Power	24.7 (93.5)
110% Power	28.5 (108.0)

Emissions Data

Smoke - Bosch Number	0.4
Noise - dB(A) @ 1m	98.1
Additional Noise Data	N1-2085-31-3,4

Load	0%	25%	50%	75%	100%
NO _x - g/hr	488	830	2090	3910	1975
CO - g/hr	164	96.6	65.1	55.2	162.6
HC - g/hr	89	51.7	45	42.5	60
SO ₂ - g/hr	23	210	368	538	797
Particulates - g/hr					32.5

TA Luft	0%	25%	50%	75%	100%
NO _x - mg/(m ³ n)	3385	3330	4700	5950	1960
CO - mg/(m ³ n)	962	330	128	74.2	146.5
HC - mg/(m ³ n)	406	176.5	88.1	57.2	54.1
Particulates - mg/(m ³ n)					42.4

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2085-31-3

Rev. / Date: 6 / 6-9-98

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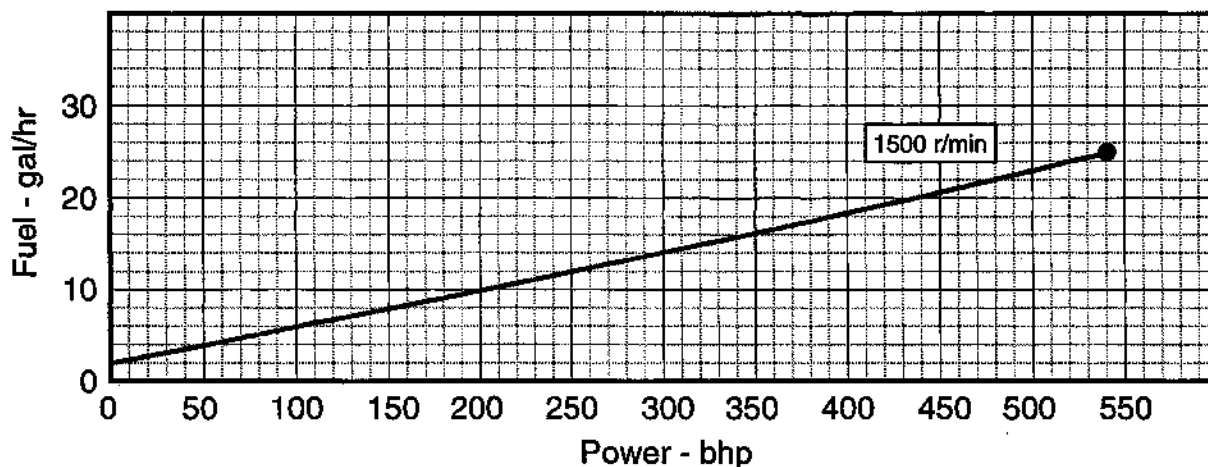
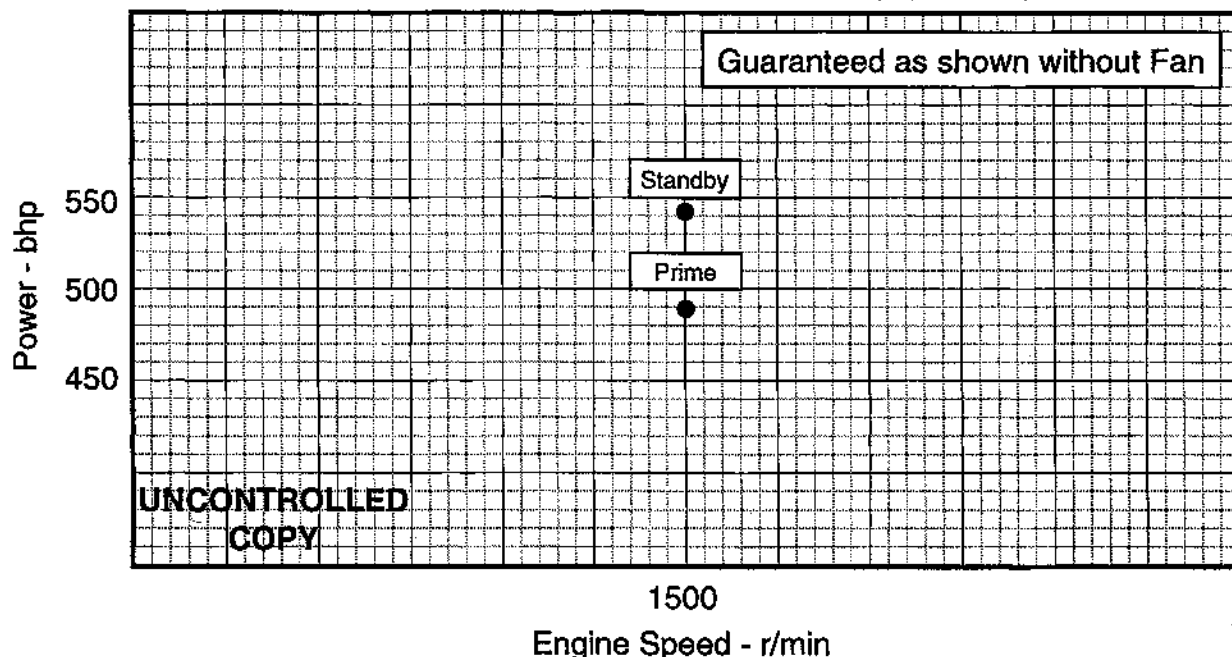
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Generator Set Power**Model:** 8V-2000 G60**Standby Rating:**

543 bhp (405 kW) @ 1500 r/min

Prime Rating:

489 bhp (365 kW) @ 1500 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions:
DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 60% relative humidity
JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.
Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust back pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: K27**Injector:** EUP**Certified by:** **Curve No.** E4-2085-31-4**Rev. / Date:** 6 / 6-9-98**Sheet No.** 1 of 3**Performance Curve**

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1500 r/min

General Data

Model	R083-7K08
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.94)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED
Configuration	EUP
Injection Device	K27-3465/18.20
Turbocharger	SCCC
Charge Air Cooling	OPEN
Engine Crankcase Vent System	

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg)	3530 (1603)
Weight, Wet - lb (kg)	3735 (1696)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (423)
Above Crankshaft (y axis) - in. (mm)	6.2 (158)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	600 (2669)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	177.9 (80.7)
Fuel Spill - lb/hr (kg/hr)	924.1 (419.2)
Fuel Spill - gal/hr (L/hr)	130.0 (492.1)
Total Fuel Flow - lb/hr (kg/hr)	1102.2 (500.0)
Total Fuel Flow - gal/hr (L/hr)	155.0 (586.7)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	298.6 (5.25)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	20
Fuel Filter Size, Secondary - Microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	37 - 47 (255-324)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (48.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	9505 (167.1)
Engine Heat Rejection SCCC - Btu/min (kW)	1660 (29.2)
Engine Radiated Heat - Btu/min (kW)	2940 (51.7)
Generator Radiated Heat - Btu/min (kW)	1335 (23.5)
Coolant Flow - gal/min (L/min)	156 (591)
Max. External Pressure Differential - lb/in. ² (kPa)	4 (27.6)
Coolant Flow Separate Circuit - gal/min (L/min)	65 (246)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	5 (34.5)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (8.9)
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (98.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Deaeration, Air Injection Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1055 (29.9)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	54.7 (184.7)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	2660 (75.3)
Exhaust Temperature - °F (°C)	855 (457)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	543 (405)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	295.0 (2034)
Friction Power - fhp (kW)	49.3 (36.8)
Altitude Capability - ft (m)	10200 (3109)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	0.71 (2.69)
25% Power	7.02 (26.6)
50% Power	12.56 (47.6)
75% Power	18.52 (70.1)
100% Power	25.02 (94.7)

Emissions Data

Smoke - Bosch Number	0.2
Noise - dB(A) @ 1m	98.1
Additional Noise Data	N1-2085-31-6

Load	0%	25%	50%	75%	100%
NO _x - g/hr	488	920	2380	2953	3315
CO - g/hr	184	94	60	71	112
HC - g/hr	69	53	43	48.4	52
SO ₂ - g/hr	23	226	405	597	807
Particulates - g/hr					35

TA Luft	0%	25%	50%	75%	100%
NO _x - mg/(m ³ n)	3390	3404	4818	4004	3260
CO - mg/(m ³ n)	963	300	106	85	99
HC - mg/(m ³ n)	406	169	76.3	58.3	46
Particulates - mg/(m ³ n)					42.4

Curve No. E4-2085-31-4

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Sheet No. 2 of 3

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GENERATOR SPECIFICATION SHEET

PRIME POWER - 1500 r/min

General Data

Model	R083-7K08
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.94)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED
Configuration	
Injection Device	EUP
Turbocharger	K27-3465/18.20
Charge Air Cooling	SCCC
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg)	3530 (1603)
Weight, Wet - lb (kg)	3735 (1696)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (423)
Above Crankshaft (y axis) - in. (mm)	6.2 (158)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	600 (2669)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Consumption - lb/hr (kg/hr)	159.0 (72.1)
Spill - lb/hr (kg/hr)	943.3 (427.8)
Fuel Spill - gal/hr (L/hr)	132.7 (502.3)
Total Fuel Flow - lb/hr (kg/hr)	1102.2 (500.0)
Total Fuel Flow - gal/hr (L/hr)	155.0 (586.7)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	291.5 (5.25)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	20
Fuel Filter Size, Secondary - Microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	37 - 47 (255-324)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	8735 (153.6)
Engine Heat Rejection SCCC - Btu/min (kW)	1330 (23.4)
Engine Radiated Heat - Btu/min (kW)	2630 (46.2)
Generator Radiated Heat - Btu/min (kW)	1202 (21.1)
Coolant Flow - gal/min (L/min)	156 (591)
Max. External Pressure Differential - lb/in. ² (kPa)	4 (27.6)
Coolant flow Separate Circuit - gal/min (L/min)	65 (246)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	5 (34.5)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Deaeration, Air Injection Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	970 (27.5)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	48.0 (162.1)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	2390 (67.7)
Exhaust Temperature - °F (°C)	830 (443)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	489 (365)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	265.6 (1832)
Friction Power - fhp (kW)	49.3 (36.8)
Altitude Capability - ft (m)	10200 (3109)
Part Load Fuel Consumption	
Fuel - gal/hr (L/hr) - 0% Power	0.71 (2.69)
25% Power	6.41 (24.3)
50% Power	11.46 (43.4)
75% Power	18.70 (63.2)
100% Power	22.36 (84.6)

Emissions Data

Smoke - Bosch Number	0.2
Noise - dB(A) @ 1m	97.7
Additional Noise Data	N1-2085-31-3

Load	0%	25%	50%	75%	100%
NO _x - g/hr	488	850	2100	2800	3200
CO - g/hr	164	100	65	65	90
HC - g/hr	69	55	45	48	51
SO _x - g/hr	23	207	370	538	721
Particulates - g/hr					35

TA Luft	0%	25%	50%	75%	100%
NO _x - mg/(m ³ n)	3390	3400	4600	4300	3600
CO - mg/(m ³ n)	963	350	140	90	90
HC - mg/(m ³ n)	406	190	90	65	50
Particulates - mg/(m ³ n)					42.4

* At 10% Overload Horsepower

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Generator Set Power

Model: 8V-2000 G80

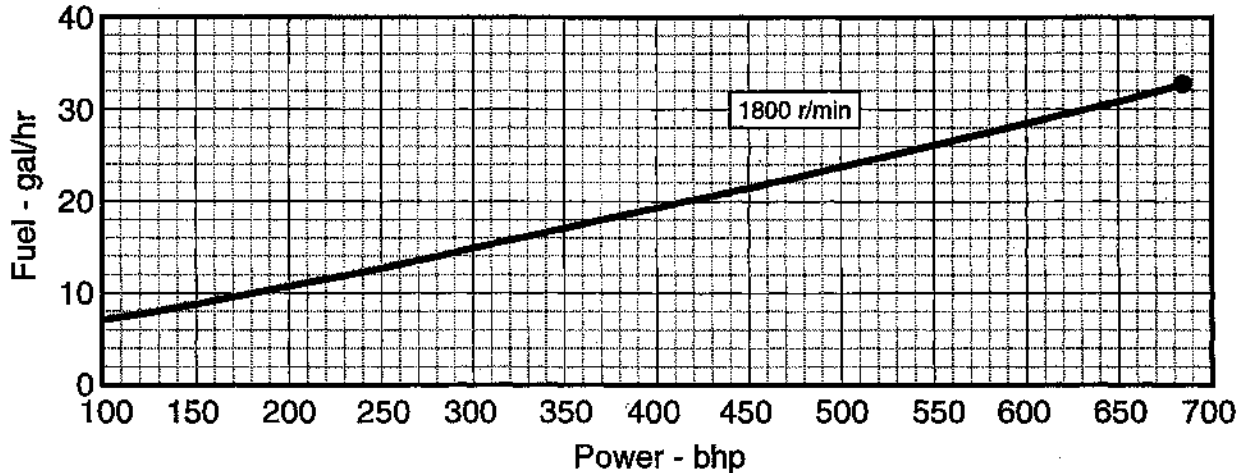
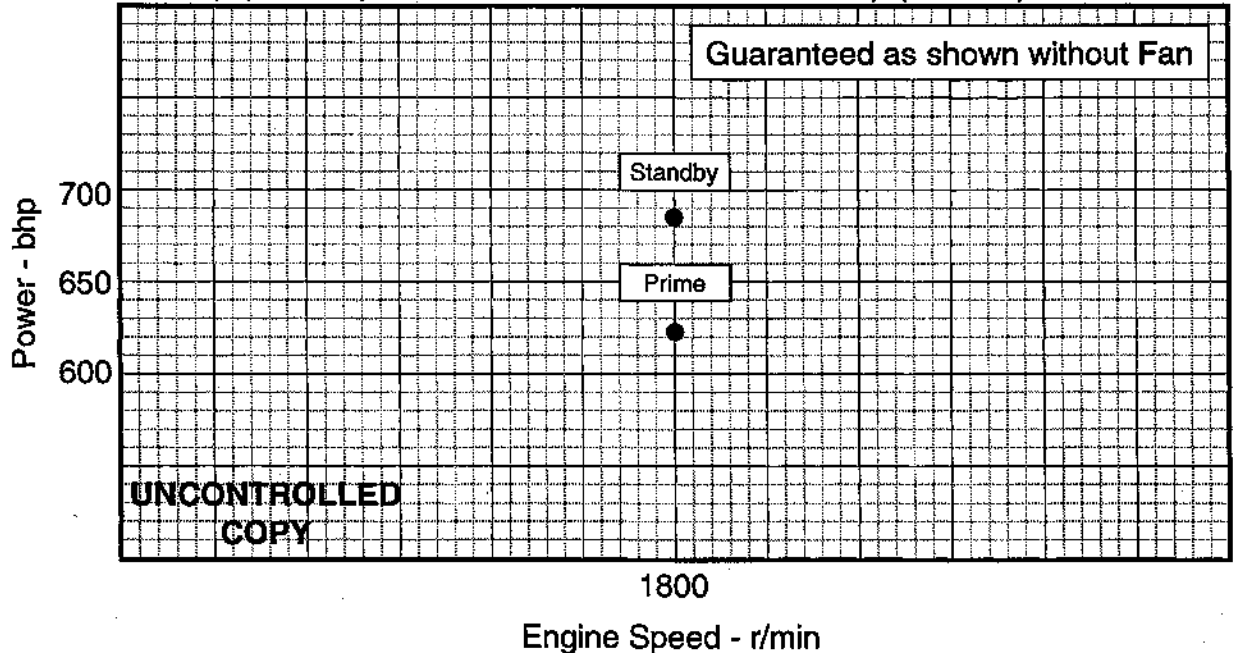
Certification: Nonroad

Standby Rating:

Prime Rating:

685 bhp (511 kW) @ 1800 r/min

623 bhp (465 kW) @ 1800 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions:
 DIN 8270: 736 torr barometric pressure, 20 °C air inlet, 60% relative humidity
 JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.
 Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).
 Air intake restriction: 10 in. H₂O (2.5 kPa)
 Exhaust back pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: K31

Injector: EUP

Certified by:

Curve No. E4-2085-31-5

Rev. / Date: 5 / 8-7-98

Sheet No. 1 of 3

Performance Curve

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1800 r/min

General Data

Model	R083-7K36
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.94)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K31-3767/22.20
Charge Air Cooling	SCCC
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg)	3530 (1603)
Weight, Wet - lb (kg)	3735 (1696)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (423)
Above Crankshaft (y axis) - in. (mm)	6.2 (158)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	600 (2669)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	232.6 (105.5)
Fuel Spill - lb/hr (kg/hr)	1090.9 (494.8)
Fuel Spill - gal/hr (L/hr)	153.4 (580.8)
Total Fuel Flow - lb/hr (kg/hr)	1323.1 (600.1)
Total Fuel Flow - gal/hr (L/hr)	186.1 (704.4)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	358.6 (6.31)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	20
Fuel Filter Size, Secondary - Microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	47 - 57 (324-393)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	11955 (210.2)
Engine Heat Rejection SCCC - Btu/min (kW)	6045 (108.3)
Engine Radiated Heat - Btu/min (kW)	3850 (67.7)
Generator Radiated Heat - Btu/min (kW)	1626 (28.6)
Coolant Flow - gal/min (L/min)	187 (708)
Max. External Pressure Differential - lb/in. ² (kPa)	6 (41.4)
Coolant Flow Separate Circuit - gal/min (L/min)	79 (299)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	8 (55.2)
Thermostat	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Maximum Ambient to Intercooler Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Cooling Index @ 110 °F Ambient w/H ₂ O @ Sea Level:	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement - qt (L)	8% of Cooling System
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1365 (38.7)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplier
Intake Manifold Pressure - in. Hg (kPa)	61.6 (208.0)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	3690 (104.5)
Exhaust Temperature - °F (°C)	935 (502)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	685 (511)
Rated Speed - r/min	1800
BMEP - lb/in. ² (kPa)	310.1 (2138)
Friction Power - fhp (kW)	70.0 (52)
Altitude Capability - ft (m)	7500 (2280)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	1.57 (5.95)
25% Power	9.1 (34.5)
50% Power	16.4 (82.2)
75% Power	24.1 (91.1)
100% Power	32.7 (123.9)

Emissions Data

Smoke - Bosch Number	0.5
Noise - dB(A) @ 1m	101.5
Additional Noise Data	N1-2085-31-10

Load	0%	25%	50%	75%	100%
NO _x - g/hr	476	892	1851	3012	3886
CO - g/hr	218	121	110	117	162
HC - g/hr	72.0	47.9	52.2	55.6	48.4
SO ₂ - g/hr	51	294	530	777	1055
Particulates - g/hr	6.8	10.6	16.7	14.2	12.5

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Curve No. E4-2085-31-5
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GENERATOR SPECIFICATION SHEET

PRIME POWER - 1800 r/min

General Data

Model	R083-7K36
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.94)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K31-3767/22.20
Charge Air Cooling	SCCC
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg)	3530 (1603)
Weight, Wet - lb (kg)	3735 (1696)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (423)
Above Crankshaft (y axis) - in. (mm)	6.2 (158)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	600 (2669)
Additional Mechanical Data	Not Available

Fuel System

Pump	5235920
Consumption - lb/hr (kg/hr)	207.5 (94.1)
Spill - lb/hr (kg/hr)	1115.7 (506.1)
Fuel Spill - gal/hr (L/hr)	156.9 (594.0)
Total Fuel Flow - lb/hr (kg/hr)	1323.1 (600.1)
Total Fuel Flow - gal/hr (L/hr)	186.1 (704.4)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	355.8 (6.26)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	20
Fuel Filter Size, Secondary - Microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	47 - 57 (324-393)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	10905 (191.8)
Engine Heat Rejection SCCC - Btu/min (kW)	5170 (80.9)
Engine Radiated Heat - Btu/min (kW)	3430 (60.3)
Generator Radiated Heat - Btu/min (kW)	1479 (26.0)
Coolant Flow - gal/min (L/min)	187 (708)
Max. External Pressure Differential - lb/in. ² (kPa)	6 (41.4)
Coolant Flow Separate Circuit - gal/min (L/min)	79 (299)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	8 (55.2)
Thermostat	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - lb/in. ² (kPa)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Maximum Ambient to Intercooler Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Cooling Index (@110 °F Ambient w/H ₂ O @ Sea Level):	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement - qt (L)	8% of Cooling System
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1245 (35.3)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	5.3 (180.0)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	3300 (93.5)
Exhaust Temperature - °F (°C)	910 (488)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	623 (465)
Rated Speed - r/min	1800
BMEP - lb/in. ² (kPa)	282.0 (1945)
Friction Power - fhp (kW)	70.0 (52)
Altitude Capability - ft (m)	7500 (2280)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	1.57 (5.95)
25% Power	8.6 (32.7)
50% Power	14.7 (55.7)
75% Power	22.1 (83.7)
100% Power	29.2 (110.5)

Emissions Data

Smoke - Bosch Number	0.5
Noise - dB(A) @ 1m	101.2
Additional Noise Data	N1-2085-31-9

Load	0%	25%	50%	75%	100%
NO _x - g/hr	500	900	1725	2500	3295
CO - g/hr	175	115.5	114	145	287
HC - g/hr	72.0	52.6	57.8	60.4	61
SO ₂ - g/hr	51	268	474	650	941
Particulates - g/hr	34.5	25	35.1	20.6	35

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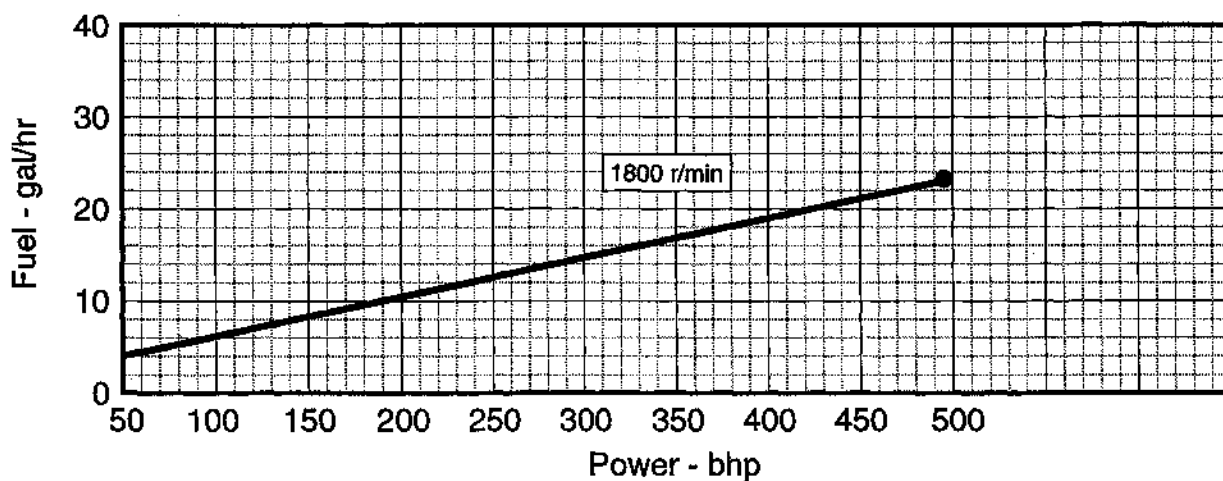
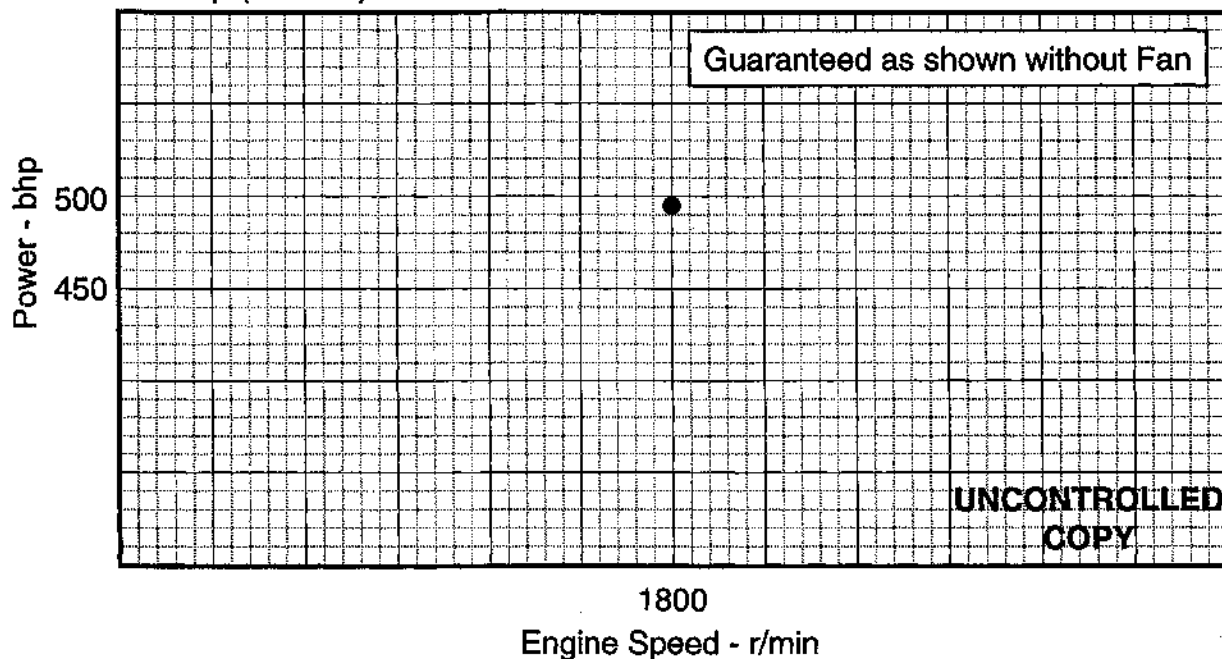
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Generator Set Power

Model: 8V-2000 G70

Continuous Rating:

496 bhp (370 kW) @ 1800 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3048, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity.
 Curves also represent capabilities at the following ambient conditions:
 DIN 8270: 736 torr barometric pressure, 20 °C air inlet, 60% relative humidity
 JIS D1005-1978: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.
 Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).
 Air intake restriction: 10 in. H₂O (2.5 kPa)
 Exhaust back pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: KW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: K31

Injector: EUP

Verified by:

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Performance Curve

GENERATOR SPECIFICATION SHEET

CONTINUOUS POWER - 1800 r/min

General Data

Model	R083-7K35
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.94)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K31-3767/22.20
Charge Air Cooling	JWCC
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg)	3530 (1603)
Weight, Wet - lb (kg)	3735 (1696)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (423)
Above Crankshaft (y axis) - in. (mm)	6.2 (158)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	600 (2669)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	167.6 (76.0)
Fuel Spill - lb/hr (kg/hr)	1155.1 (523.9)
Fuel Spill - gal/hr (L/hr)	162.5 (615.0)
Total Fuel Flow - lb/hr (kg/hr)	1323.1 (600.1)
Total Fuel Flow - gal/hr (L/hr)	186.1 (704.4)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	364.5 (6.41)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	20
Fuel Filter Size, Secondary - Microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	47 - 57 (324-393)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (38)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	11805 (207.6)
Engine Radiated Heat - Btu/min (kW)	2780 (48.9)
Generator Radiated Heat - Btu/min (kW)	1178 (20.7)
Coolant Flow - gal/min (L/min)	249 (94.3)
Max. External Pressure Differential - lb/in. ² (kPa)	6 (41.4)
Thermostat	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure	Positive
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	980 (27.8)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	40.4 (136.8)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	2620 (74.2)
Exhaust Temperature - °F (°C)	935 (502)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	496 (370)
Rated Speed - r/min	1800
BMEP - lb/in. ² (kPa)	224.5 (1548)
Friction Power - fhp (kW)	70 (52.2)
Altitude Capability - ft (m)	10200 (3109)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	1.57 (5.95)
25% Power	7.4 (28.0)
50% Power	12.8 (48.4)
75% Power	18.3 (69.3)
100% Power	23.6 (89.2)

Emissions Data

Smoke - Bosch Number	0.5
Noise - dB(A) @ 1m	100.0
Additional Noise Data	Not Available

Load	0%	25%	50%	75%	100%
NO _x - g/hr	418	850	1450	2300	3550
CO - g/hr	126	115	110	130	370
HC - g/hr	60.4	65	57.5	57.5	54.5
SO ₂ - g/hr	51	239	413	590	760
Particulates - g/hr	11.4	14.9	25.0	20.8	21.5

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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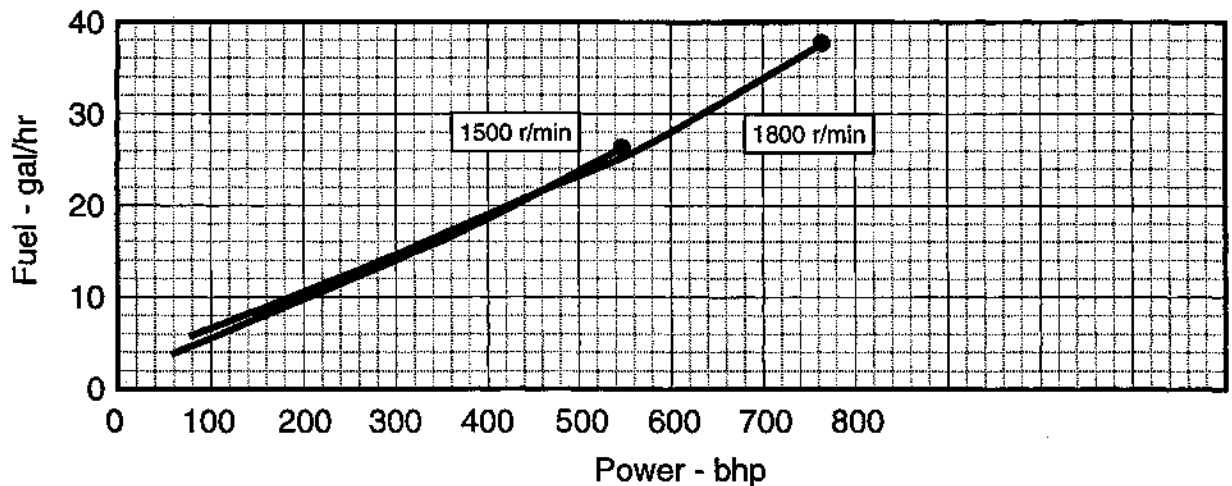
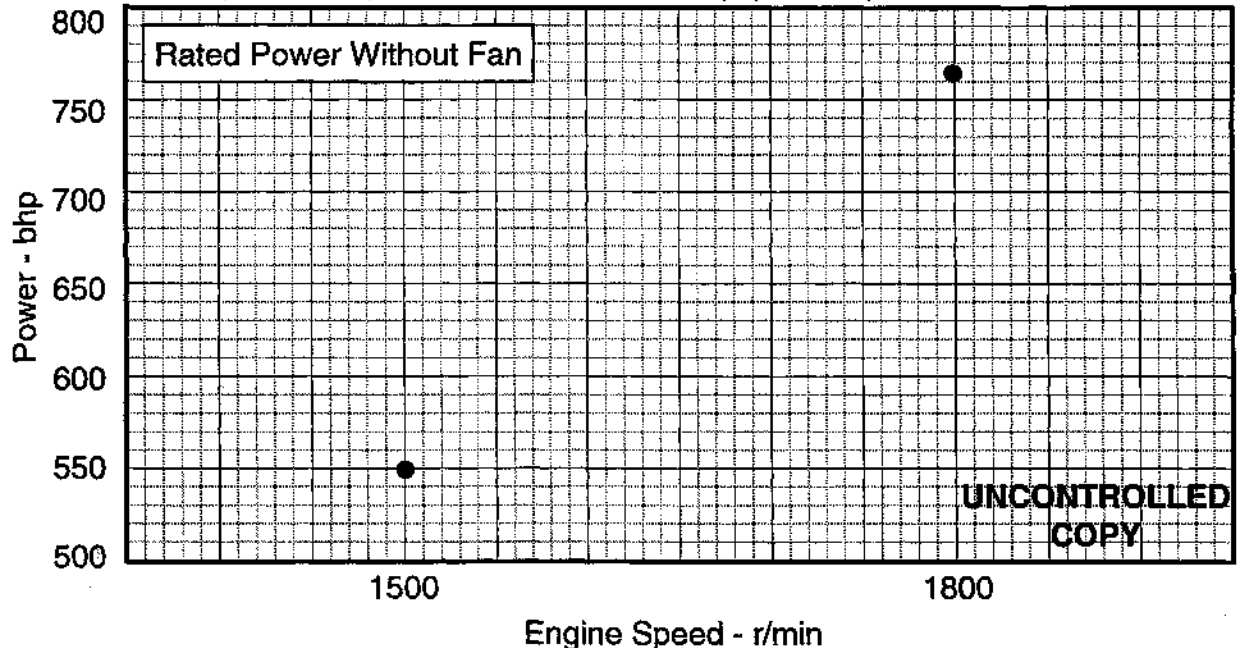
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Generator Set Power

Model: 8V-2000 G81

Standby Rating:

765 bhp (571 kW) @ 1800 r/min & 549 bhp (410 kW) @ 1500 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions: DIN 6270: 735 torr barometric pressure, 20 °C air inlet, 60% relative humidity JIS D1005-1978: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure. Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g). Air intake restriction: 10 in. H₂O (2.5 kPa) Exhaust back pressure: 15 in. H₂O (3.7 kPa)

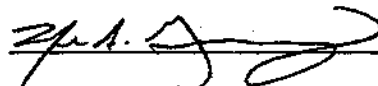
Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: K31-3771

Injector: EUP

Certified by: 

Curve No. E4-2085-31-7

Rev. / Date: 1 / 6-9-98

Sheet No. 1 of 3

Performance Curve

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1800 r/min

General Data

Model	R083-7K06
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.94)
Compression Ratio	14.5:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K31-3771/24.22
Charge Air Cooling	SCCC
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg)	3530 (1603)
Weight, Wet - lb (kg)	3735 (1696)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (423)
Above Crankshaft (y axis) - in. (mm)	6.2 (158)
Flight of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	600 (2669)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	267.8 (121.5)
Fuel Spill - lb/hr (kg/hr)	1054.8 (478.5)
Fuel Spill - gal/hr (L/hr)	148.4 (561.6)
Total Fuel Flow - lb/hr (kg/hr)	1323.1 (600.2)
Total Fuel Flow - gal/hr (L/hr)	186.1 (704.4)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	337.5 (5.93)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	20
Fuel Filter Size, Secondary - Microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	47 - 57 (324-393)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	11535 (202.8)
Engine Heat Rejection SCCC - Btu/min (kW)	7385 (129.9)
Engine Radiated Heat - Btu/min (kW)	3400 (59.8)
Generator Radiated Heat - Btu/min (kW)	1448 (25.5)
Coolant Flow - gal/min (L/min)	187 (708)
Max. External Pressure Differential - lb/in. ² (kPa)	6 (41.4)
Coolant Flow SCCC - gal/min (L/min)	79 (299)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	8 (55.2)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.8 (87)
Minimum Water Pump Inlet Pressure:	POSITIVE
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (98.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1460 (41.3)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	70.0 (236.4)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	4080 (115.5)
Exhaust Temperature - °F (°C)	980 (527)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	765 (571)
Rated Speed - r/min	1800
BMEP - lb/in. ² (kPa)	346.3 (2388)
Friction Power - fhp (kW)	70.0 (52.2)
Altitude Capability - ft (m)	7500 (2286)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	1.57 (5.95)
25% Power	10.1 (38.1)
50% Power	18.1 (68.4)
75% Power	26.8 (101.6)
100% Power	37.7 (142.6)

Emissions Data

Smoke - Bosch Number	1.0
Noise - dB(A) @ 1m	102.2
Additional Noise Data	N1-2085-31-14

Load	10%	25%	50%	75%	100%
NO _x - g/hr	645	1300	2865	3845	3365
CO - g/hr	294	175	116	240	640
HC - g/hr	102	63	68	78	63
SO ₂ - g/hr	172	324	583	865	1215
Particulates - g/hr	18.4	16.5	19.8	34.3	182

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GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1500 r/min

General Data

Model	R083-7K06
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.94)
Compression Ratio	14.5:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K31-3771/24.22
Charge Air Cooling	SCCC
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, Dry - lb (kg)	3530 (1603)
Weight, Wet - lb (kg)	3735 (1696)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (423)
Above Crankshaft (y axis) - in. (mm)	6.2 (158)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	600 (2669)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Consumption - lb/hr (kg/hr)	185.9 (84.8)
Spill - lb/hr (kg/hr)	915.1 (415.1)
Spill - gal/hr (L/hr)	128.7 (487.2)
Total Fuel Flow - lb/hr (kg/hr)	1102.2 (500.09)
Total Fuel Flow - gal/hr (L/hr)	155.0 (586.7)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	272.4 (4.79)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	20
Fuel Filter Size, Secondary - Microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	37 - 47 (255-324)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°F	950
24 Volt System, Below 32°F	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	9635 (169.4)
Engine Heat Rejection SCCC - Btu/min (kW)	3065 (53.9)
Engine Radiated Heat - Btu/min (kW)	2861 (50.3)
Generator Radiated Heat - Btu/min (kW)	1203 (21.1)
Coolant Flow - gal/min (L/min)	156 (591)
Max. External Pressure Differential - lb/in. ² (kPa)	4 (27.6)
Coolant Flow SCCC - gal/min (L/min)	65 (246)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	5 (34.5)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	885 (24.5)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	41.2 (139.1)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	2610 (73.9)
Exhaust Temperature - °F (°C)	1085 (585)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	549 (410)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	298.2 (2056)
Friction Power - thp (kW)	49.3 (36.8)
Altitude Capability - ft (m)	10200 (3109)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	0.71 (2.69)
25% Power	7.1 (26.8)
50% Power	13.0 (49.4)
75% Power	19.4 (73.5)
100% Power	26.3 (99.5)

Emissions Data

Smoke - Bosch Number	1.4
Noise - dB(A) @ 1m	101.4
Additional Noise Data	N1-2085-31-12

Load	10%	25%	50%	75%	100%
NO _x - g/hr	580	1310	2000	2620	2990
CO - g/hr	234	117	157	705	1750
HC - g/hr	84.2	50.1	47.4	38.9	51
SO ₂ - g/hr	118	229	421	626	848
Particulates - g/hr	26.4	14.2	14.3	34.1	101.2

TA Luft	0%	25%	50%	75%	100%
NO _x - mg/(m ³ n)	3990	4510	3760	3230	2737
CO - mg/(m ³ n)	1446	368	269	804	1487
HC - mg/(m ³ n)	521	156	81.5	44.2	43.3
Particulates - mg/(m ³ n)					98.5

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Generator Set Power

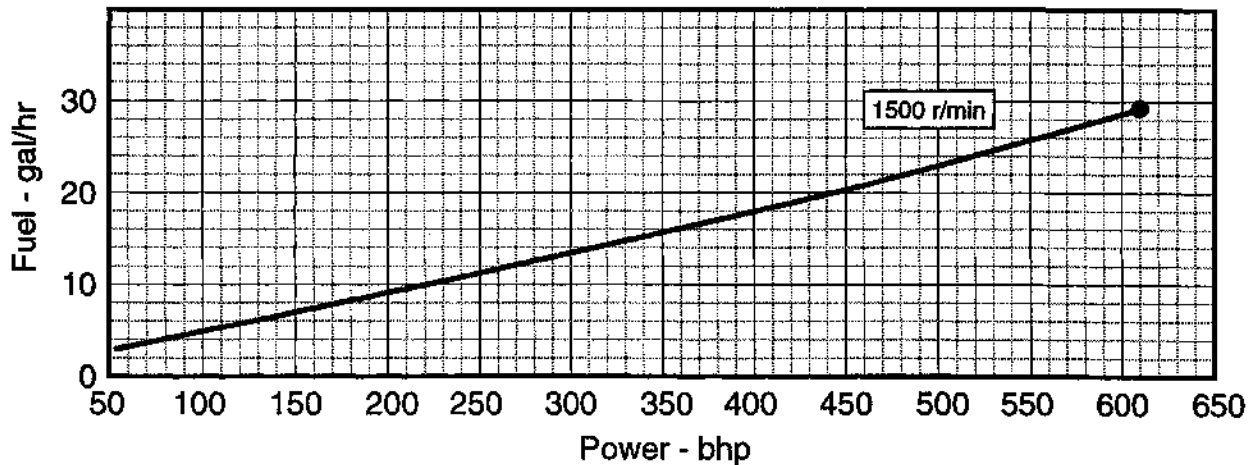
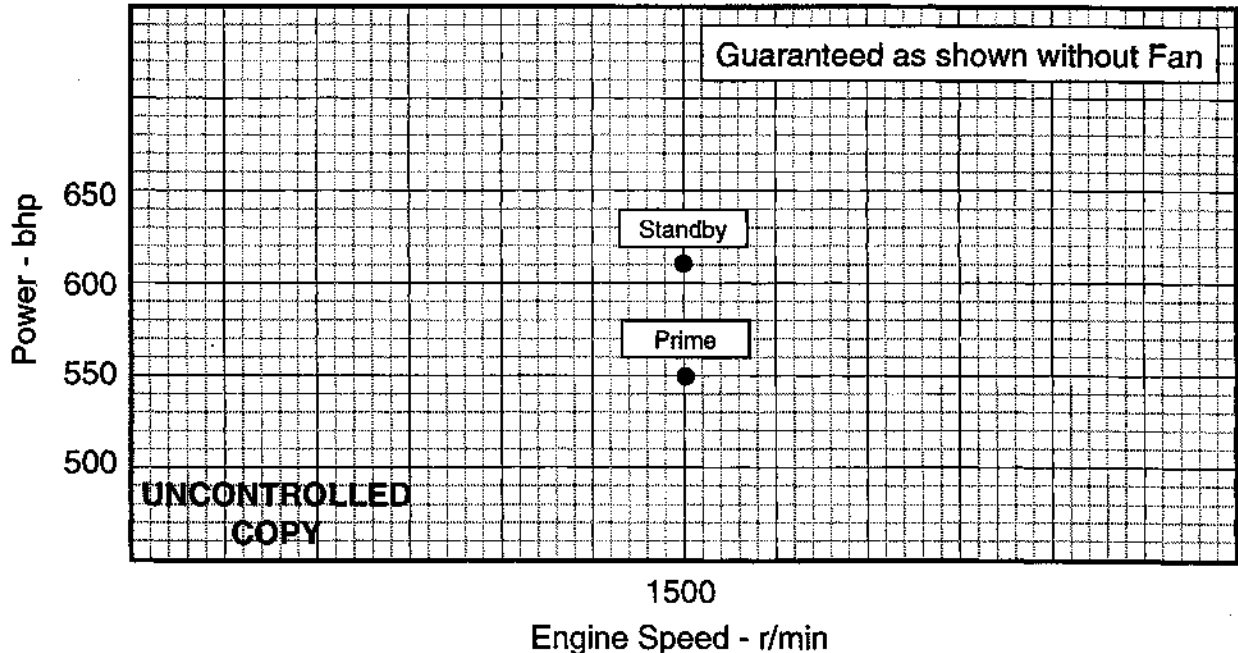
Model: 8V-2000 G61

Standby Rating:

610 bhp (455 kW) @ 1500 r/min

Prime Rating:

549 bhp (410 kW) @ 1500 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity.
Curves also represent capabilities at the following ambient conditions:
DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 60% relative humidity
JIS D1005-1978: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.
Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust back pressure: 15 in. H₂O (3.7 kPa)

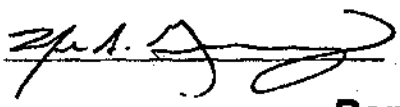
Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: K27

Injector: EUP

Certified by: 

Curve No. E4-2085-31-8

Rev. / Date: 1 / 10-7-98

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Performance Curve

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1500 r/min

General Data

Model	R083-7K08
Number of Cylinders	8
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.94)
Compression Ratio	14.5:1
Piston Speed - ft/min (m/min)	1478 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K27-3465/18.20
Charge Air Cooling	SCCC
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, dry - lb (kg)	3530 (1603)
Weight, wet - lb (kg)	3735 (1696)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (423)
Above Crankshaft (y axis) - in. (mm)	6.2 (158)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	600 (2669)
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	207.5 (94.1)
Fuel Spill - lb/hr (kg/hr)	894.8 (405.9)
Fuel Spill - gal/hr (L/hr)	125.9 (476.4)
Total Fuel Flow - lb/hr (kg/hr)	1102.2 (500.0)
Total Fuel Flow - gal/hr (L/hr)	155.0 (588.7)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	261.6 (4.60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	20
Fuel Filter Size, Secondary - microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	37 - 47 (255-324)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - degrees	30
Engine Angularity Limits, Front Down - degrees	30
Engine Angularity Limits, Side Tilt - degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection to Coolant - Btu/min (kW)	9580 (168.5)
Engine Heat Rejection SCCC - Btu/min (kW)	6180 (108.7)
Engine Radiated Heat - Btu/min (kW)	2985 (51.7)
Generator Radiated Heat - Btu/min (kW)	1335 (23.5)
Coolant Flow - gal/min (L/min)	156 (591)
Max. External Pressure Differential - lb/in. ² (kPa)	4 (27.6)
Coolant Flow Separate Circuit - gal/min (L/min)	65 (246)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	5 (34.5)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Deaeration, Air Injection Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1230 (34.8)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	69.7 (235.4)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	3180 (90.1)
Exhaust Temperature - °F (°C)	875 (468)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	610 (455)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	331.4 (2286)
Friction Power - ihp (kW)	49.3 (36.8)
Altitude Capability - ft (m)	7500 (2286)
Part Load Fuel Consumption	
Fuel - gal/hr (L/hr) - 0% Power	0.71 (2.69)
25% Power	7.7 (29.3)
50% Power	14.0 (53.2)
75% Power	21.0 (79.3)
100% Power	29.2 (110.5)

Emissions Data

Smoke - Bosch Number	0.9
Noise - dB(A) @ 1m	98.7
Additional Noise Data	N1-2085-31-11

Load	10%	25%	50%	75%	100%
NO _x - g/hr	444	1260	2375	3050	2970
CO - g/hr	197	109	100	141	338
HC - g/hr	81.7	50.3	59.6	67.7	78.4
SO ₂ - g/hr	107	250	453	676	940
Particulates - g/hr	17.1	10.6	15.8	27.9	90.6

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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GENERATOR SPECIFICATION SHEET

PRIME POWER - 1500 r/min

General Data

Number of Cylinders	R083-7K06
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	972 (15.94)
Compression Ratio	14.5:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K27-3465/18.20
Charge Air Cooling	SCCC
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	57.5 (1460)
Width - in. (mm)	43.7 (1109)
Height - in. (mm)	48.8 (1238)
Weight, dry - lb (kg)	3530 (1603)
Weight, wet - lb (kg)	3735 (1696)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	16.7 (423)
Above Crankshaft (y axis) - in. (mm)	6.2 (158)
Right of Crankshaft (z axis) - in. (mm)	1.18 (30.0)
Installation Drawing	5310100201

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	800 (2669)
Additional Mechanical Data	Not Available

Fuel System

Pump	5235920
Consumption - lb/hr (kg/hr)	182.2 (82.7)
Fuel Spill - lb/hr (kg/hr)	920.0 (417.3)
Fuel Spill - gal/hr (L/hr)	129.4 (489.8)
Total Fuel Flow - lb/hr (kg/hr)	1102.2 (500.0)
Total Fuel Flow - gal/hr (L/hr)	155.0 (586.7)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	267.8 (4.71)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	20
Fuel Filter Size, Secondary - microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	37 - 47 (255-324)
Oil Pressure at Low Idle - lb/in. ² (kPa)	20 (138)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	49 (46.4)
Low Limit - qt (L)	40 (37.9)
Total Engine Oil Capacity with Filters - qt (L)	57 (53.9)
Engine Angularity Limits, Front Up - degrees	30
Engine Angularity Limits, Front Down - degrees	30
Engine Angularity Limits, Side Tilt - degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection to Coolant - Btu/min (kW)	8870 (156.0)
Engine Heat Rejection SCCC - Btu/min (kW)	4930 (86.7)
Engine Radiated Heat - Btu/min (kW)	2620 (46.0)
Generator Radiated Heat - Btu/min (kW)	1335 (23.5)
Coolant Flow - gal/min (L/min)	156 (591)
Max. External Pressure Differential - lb/in. ² (kPa)	4 (27.6)
Coolant Flow Separate Circuit - gal/min (L/min)	65 (246)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	5 (34.5)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (8.8)
Engine Coolant Capacity - qt (L)	46.5 (44.0)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Deaeration, Air Injection Capacity - ft ³ /min (m ³ /min)	0.8 (0.023)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1115 (31.6)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	60.0 (202.6)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)
Exhaust System	
Exhaust Flow - ft ³ /min (m ³ /min)	2790 (79.0)
Exhaust Temperature - °F (°C)	835 (446)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	6.0 (152)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	549 (410)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	298.2 (2056)
Friction Power - fhp (kW)	49.3 (36.8)
Altitude Capability - ft (m)	7500 (2286)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	0.71 (2.7)
25% Power	7.2 (27.3)
50% Power	12.8 (48.3)
75% Power	18.8 (71.0)
100% Power	25.6 (97.0)

Emissions Data

Smoke - Bosch Number	0.5
Noise - dB(A) @ 1m	98.9
Additional Noise Data	N1-2085-31-12

Load	10%	25%	50%	75%	100%
NO _x - g/hr	444	1170	2150	2900	2980
CO - g/hr	197	120	102	120	220
HC - g/hr	81.7	51	58	65	72
SO ₂ - g/hr	107	233	412	605	827
Particulates - g/hr	17.1	11	15	21	47

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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Generator Set Power

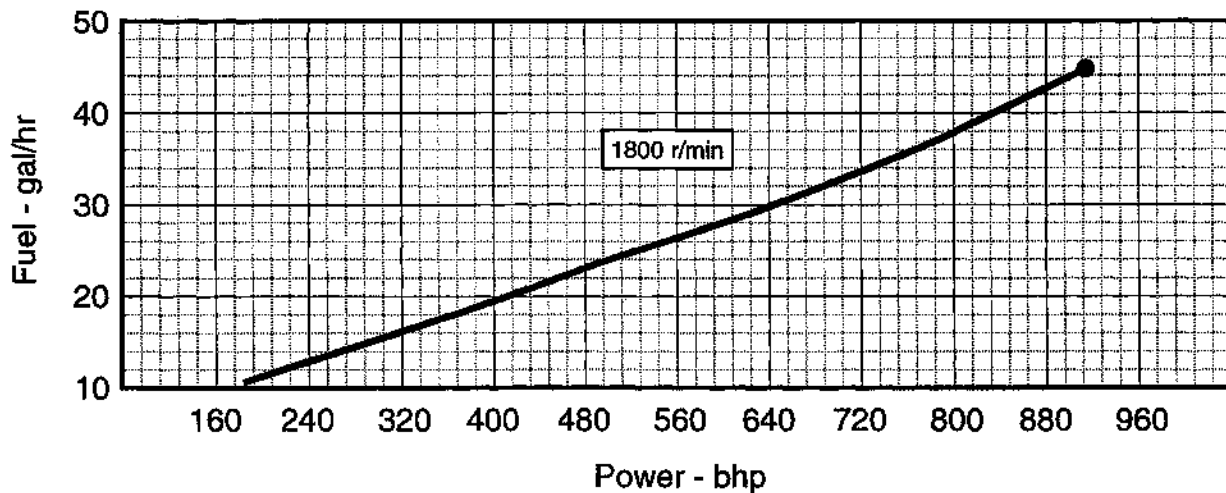
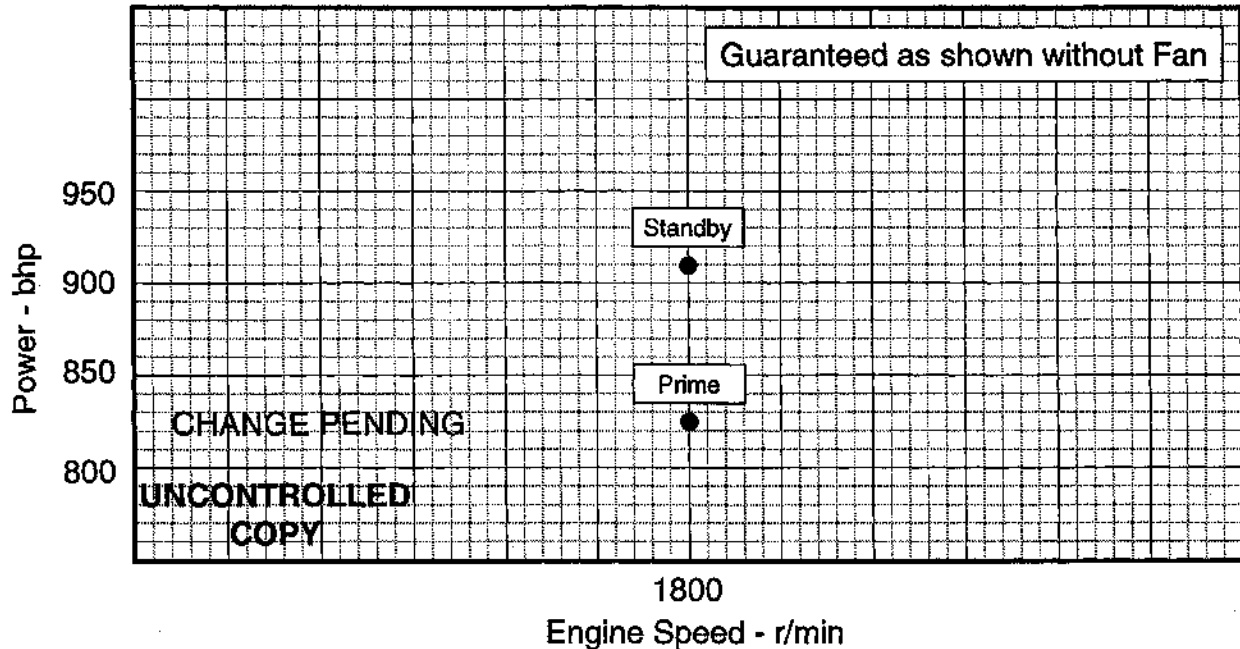
Model: 12V-2000 G70

Standby Rating:

910 bhp (679 kW) @ 1800 r/min

Prime Rating:

823 bhp (614 kW) @ 1800 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions:
DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 60% relative humidity
JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.
Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust back pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: TMF-5505 (1.15 A/R)

Injector: EUP

Certified by:

Curve No. E4-2125-31-1

Rev. / Date: 2 / 12-6-97

Sheet No. 1 of 3

Performance Curve

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1800 r/min

General Data

Model	R123-7K05
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.91)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	TMF-5505 (1.15 A/R)
Charge Air Cooling	JWCC (TC)
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	73.3 (1862)
Width - in. (mm)	44.3 (1125)
Height - in. (mm)	50.0 (1270)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	318.4 (144.4)
Fuel Spill - lb/hr (kg/hr)	1673.6 (759.1)
Fuel Spill - gal/hr (L/hr)	235.4 (891.0)
Total Fuel Flow - lb/hr (kg/hr)	1992.0 (903.6)
Total Fuel Flow - gal/hr (L/hr)	280.2 (1060.6)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	100 - 130 (690-896)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

* With outboard support bearing

Cooling System

Engine Heat Rejection - Btu/min (kW)	24395 (438.5)
Engine Radiated Heat - Btu/min (kW)	5270 (92.7)
Generator Radiated Heat - Btu/min (kW)	2161 (38.0)
Coolant Flow - gal/min (L/min)	290 (1098)
Minimum Coolant Flow - gal/min	261 (988)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure:	POSITIVE
Engine Coolant Capacity - qt (L)	70 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Cooling Index (@ 110°F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement - qt (L)	6% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2140 (60.6)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	74 (249.9)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.6 (0.65)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	5120 (145.0)
Exhaust Temperature - °F (°C)	795 (424)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.2)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	910 (679)
Rated Speed - r/min	1800
BMEP - lb/in. ² (kPa)	274.6 (1894)
Friction Power - fhp (kW)	119 (89)
Altitude Capability - ft (m)	10200 (3109)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	4.4 (16.6)
25% Power	12.6 (47.5)
50% Power	22.2 (83.9)
75% Power	32.3 (122.4)
100% Power	44.8 (169.5)

Emissions Data

Noise - dB(A) @ 1m	105.4
Additional Noise Data	N1-2125-31-1
Smoke - Bosch Number	0.2

Load	0%	25%	50%	75%	100%
NO _x - g/hr	3000	4000	5500	6100	5460
CO - g/hr	180	145	147	158	176.5
HC - g/hr	130	152	158.7	166	167.2
SO ₂ - g/hr	141	405	715	1043	1444
Particulates - g/hr	N/A	38.5	22.6	28.5	41.5

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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GENERATOR SPECIFICATION SHEET

PRIME POWER - 1800 r/min

General Data	
Model	R123-7K05
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.91)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED
Configuration	
Injection Device	EUP
Turbocharger	TMF-5505 (1.15 A/R)
Charge Air Cooling	JWCC (TC)
Engine Crankcase Vent System	OPEN
Physical Data	
Size:	
Length - in. (mm)	73.3 (1852)
Width - in. (mm)	44.3 (1125)
Height - in. (mm)	50.0 (1270)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301
Mechanical Data	
Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available
Fuel System	
Injection Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	284.0 (128.8)
Fuel Spill - lb/hr (kg/hr)	1708 (774.7)
Fuel Spill - gal/hr (L/hr)	240.2 (909.3)
Total Fuel Flow - lb/hr (kg/hr)	1992.0 (903.6)
Total Fuel Flow - gal/hr (L/hr)	280.2 (1060.6)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8
Lubrication System	
Oil Pressure at Rated Speed - lb/in. ² (kPa)	100 - 130 (690-896)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30
Electrical System	
Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

* With outboard support bearing

Cooling System	
Engine Heat Rejection - Btu/min (kW)	21200 (372.8)
Engine Radiated Heat - Btu/min (kW)	4700 (82.6)
Generator Radiated Heat - Btu/min (kW)	1954 (34.4)
Coolant Flow - gal/min (L/min)	290 (1098)
Minimum Coolant Flow - gal/min	261 (988)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure:	POSITIVE
Engine Coolant Capacity - qt (L)	70 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30
Air System	
Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2015 (57.1)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	64.5 (217.8)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.6 (0.65)
Exhaust System	
Exhaust Flow - ft ³ /min (m ³ /min)	4700 (145.0)
Exhaust Temperature - °F (°C)	765 (407)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.2)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)
Performance Data	
Rated Power - bhp (kW)	823 (614)
Rated Speed - r/min	1800
BMEP - lb/in. ² (kPa)	248.4 (1713)
Friction Power - fhp (kW)	119 (89)
Altitude Capability - ft (m)	10200 (3109)
Part Load Fuel Consumption	
Fuel - gal/hr (L/hr) - 0% Power	4.4 (16.6)
25% Power	11.7 (44.2)
50% Power	20.2 (76.5)
75% Power	29.3 (110.9)
100% Power	39.9 (151.2)
Emissions Data	
Noise - dB(A) @ 1m	103.3
Additional Noise Data	N1-2125-31-2
Smoke - Bosch Number	0.1

Load	0%	25%	50%	75%	100%
NO _x - g/hr	3000	3840	5420	5940	5960
CO - g/hr	180	154	144	154.8	164.2
HC - g/hr	130	150.8	159.3	162.4	168.5
SO ₂ - g/hr	141	377	652	945	1288
Particulates - g/hr	N/A	40.2	24.2	27.0	32.1

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Generator Set Power

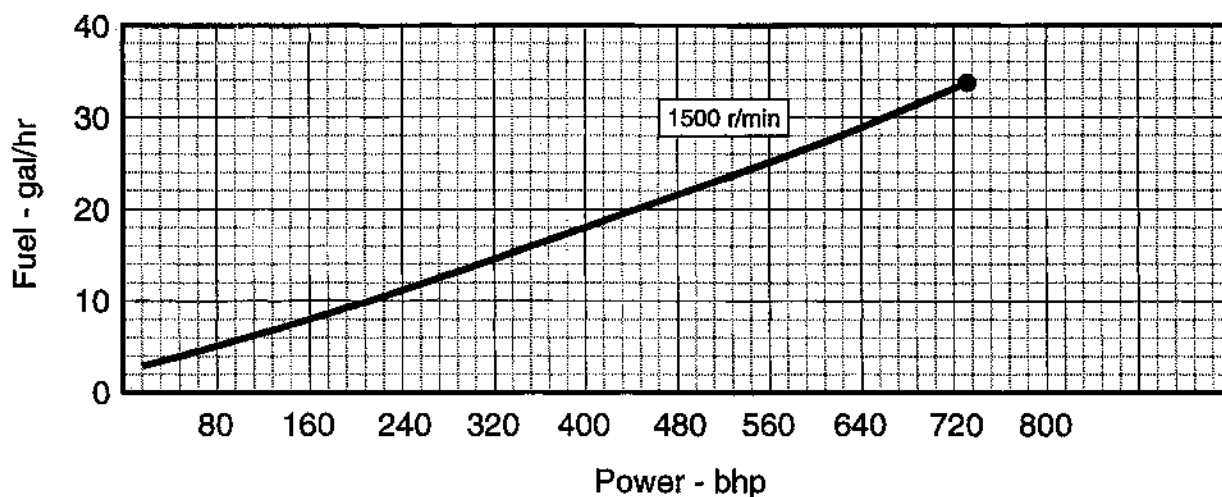
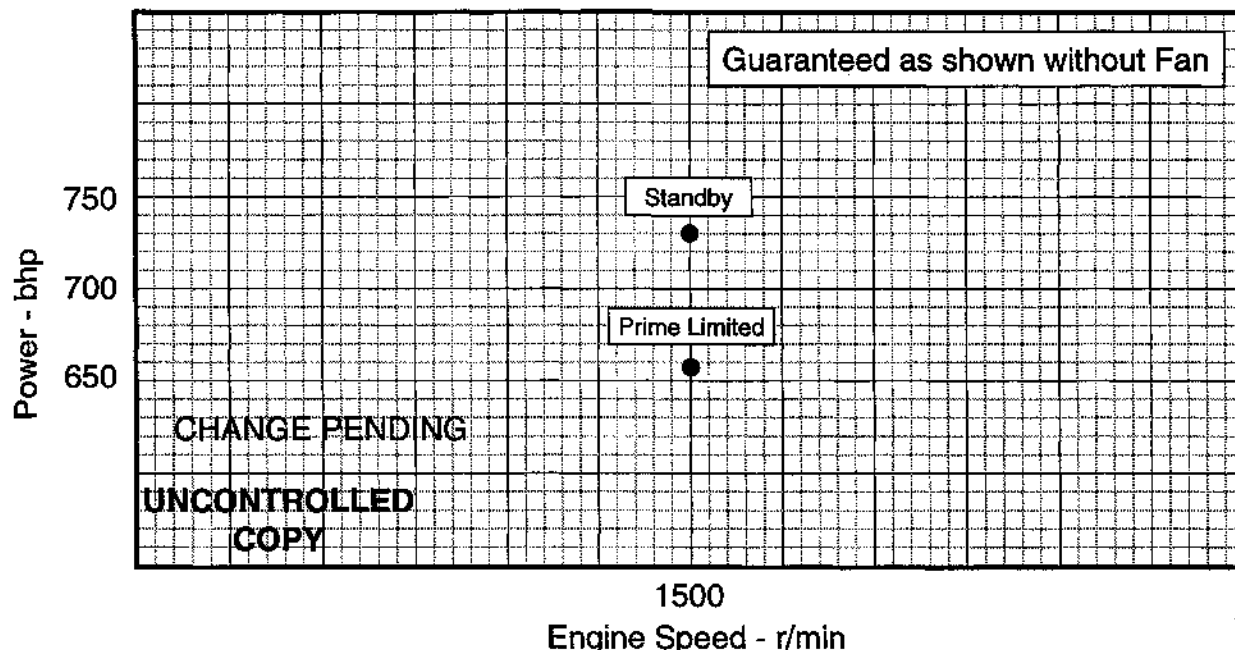
Model: 12V-2000 G50

Standby Rating:

730 bhp (545 kW) @ 1500 r/min

Prime Rating:

656 bhp (489 kW) @ 1500 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS6614: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions: DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 80% relative humidity JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure. Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g). Air intake restriction: 10 in. H₂O (2.5 kPa) Exhaust back pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: TMF-5505 (1.15 A/R)

Injector: EUP

Certified by:

Curve No. E4-2125-31-2

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Performance Curve

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1500 r/min

General Data

Model	R123-7K05
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.91)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	TMF-5505 (1.15 A/R)
Charge Air Cooling	JWCC (TC)
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	73.3 (1862)
Width - in. (mm)	44.3 (1125)
Height - in. (mm)	50.0 (1270)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	240.6 (109.1)
Fuel Spill - lb/hr (kg/hr)	1449.4 (657.4)
Fuel Spill - gal/hr (L/hr)	203.9 (771.7)
Total Fuel Flow - lb/hr (kg/hr)	1690.0 (766.6)
Total Fuel Flow - gal/hr (L/hr)	237.7 (899.8)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	95 - 125 (655-862)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

* With outboard support bearing

Cooling System

Engine Heat Rejection - Btu/min (kW)	16580 (291.2)
Engine Radiated Heat - Btu/min (kW)	3990 (70.2)
Generator Radiated Heat - Btu/min (kW)	1733 (30.5)
Coolant Flow - gal/min (L/min)	240 (908)
Minimum Coolant Flow - gal/min	216 (818)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure:	POSITIVE
Engine Coolant Capacity - qt (L)	70 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	180 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Cooling Index (@ 110°F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1210 (34.3)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	45.5 (153.7)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	3240 (91.8)
Exhaust Temperature - °F (°C)	930 (499)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.2)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	730 (545)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	264.4 (1823)
Friction Power - fhp (kW)	84 (63)
Altitude Capability - ft (m)	10200 (3109)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	2.8 (16.6)
25% Power	9.2 (34.9)
50% Power	17.5 (66.4)
75% Power	25.8 (96.9)
100% Power	33.8 (128.1)

Emissions Data

Noise - dB(A) @ 1m	101.8
Additional Noise Data	N1-2125-31-7
Smoke - Bosch Number	0.2

Load	0%	25%	50%	75%	100%
NO _x - g/hr	800	2500	3700	5100	5626
CO - g/hr	20	110	105	168	213
HC - g/hr	100	115	106	142	128.5
SO ₂ - g/hr	91	298	513	825	1091
Particulates - g/hr	N/A	32.8	30.6	33.4	35.8

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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GENERATOR SPECIFICATION SHEET

PRIME POWER - 1500 r/min

General Data

Model	R123-7K05
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.91)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	TMF-5505 (1.15 A/R)
Charge Air Cooling	JWCC (TC)
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	73.3 (1862)
Width - in. (mm)	44.3 (1125)
Height - in. (mm)	50.0 (1270)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

System

Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	217.1 (98.5)
Fuel Spill - lb/hr (kg/hr)	1472.4 (668.1)
Fuel Spill - gal/hr (L/hr)	207.2 (784.2)
Total Fuel Flow - lb/hr (kg/hr)	1690.0 (768.6)
Total Fuel Flow - gal/hr (L/hr)	237.7 (899.8)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	95 - 125 (655-862)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (278)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

* With outboard support bearing

Cooling System

Engine Heat Rejection - Btu/min (kW)	14630 (257.3)
Engine Radiated Heat - Btu/min (kW)	3600 (63.3)
Generator Radiated Heat - Btu/min (kW)	1558 (27.4)
Coolant Flow - gal/min (L/min)	240 (908)
Minimum Coolant Flow - gal/min	216 (818)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure:	POSITIVE
Engine Coolant Capacity - qt (L)	70 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Cooling Index (@ 110°F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1130 (32.0)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	38.4 (129.7)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	2990 (84.7)
Exhaust Temperature - °F (°C)	915 (491)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.2)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	656 (489)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	237.6 (1638)
Friction Power - thp (kW)	84 (63)
Altitude Capability - ft (m)	10200 (3109)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	2.8 (10.6)
25% Power	8.6 (32.5)
50% Power	14.8 (55.9)
75% Power	25.1 (94.9)
100% Power	30.5 (115.6)

Emissions Data

Noise - dB(A) @ 1m	101.3
Additional Noise Data	N1-2125-31-4
Smoke - Bosch Number	0.2

Load	0%	25%	50%	75%	100%
NO _x - g/hr	800	2340	3500	4800	5322
CO - g/hr	20	118	98	140	179.6
HC - g/hr	100	118	102	140	130.3
SO ₂ - g/hr	91	277	476	808	985
Particulates - g/hr		33.2	30.8	32.5	35.1

TA LUFT

NO _x - mg/(m ³ n)	4345
CO - mg/(m ³ n)	132.3
HC - mg/(m ³ n)	96
Particulates - mg/(m ³ n)	50.638

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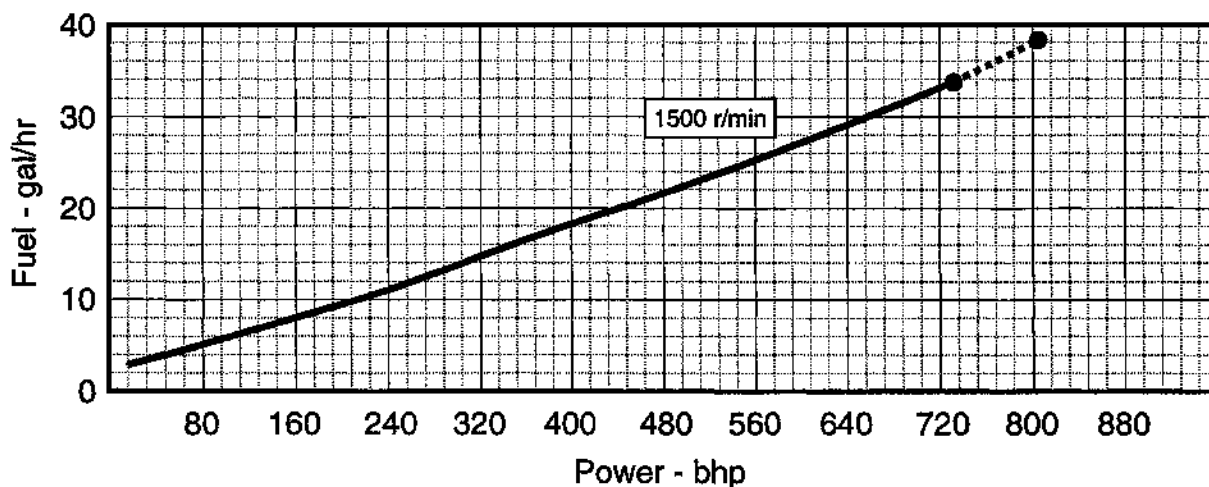
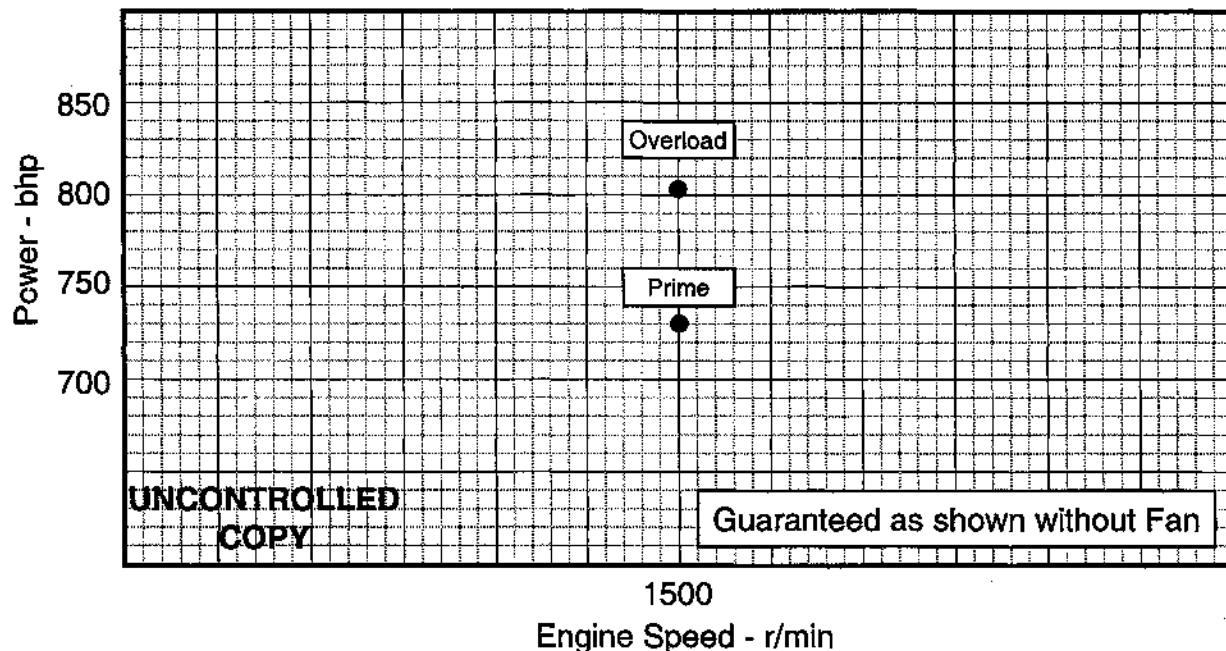
Generator Set Power

Model: 12V-2000 G60

Prime Rating : 730 bhp (545 kW) @ 1500 r/min

Certification:

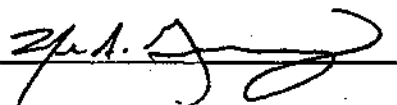
TA Luft Emissions



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions:
DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 80% relative humidity
JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.
Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust back pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:
Power: kW = bhp x 0.746
Fuel: L/hr = gal/hr x 3.785

Turbo: TMF-5505 (1.15 A/R)
Injector: EUP

Certified by: 

Curve No. E4-2125-31-3
Rev. / Date: 5 / 12-1-98
Sheet No. 1 of 2

Performance Curve

GENERATOR SPECIFICATION SHEET

PRIME POWER - 1500 r/min

General Data

Model	R123-7K38
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.91)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	TMF-5505 (1.15 A/R)
Charge Air Cooling	SCCC(TB)
Engine Crankcase Vent System	Closed

Physical Data

Size:	
Length - in. (mm)	73.3 (1862)
Width - in. (mm)	44.3 (1125)
Height - in. (mm)	50.0 (1270)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	250.8 (118.3)
Fuel Spill - lb/hr (kg/hr)	1449.4 (657.4)
Fuel Spill - gal/hr (L/hr)	203.9 (771.7)
Total Fuel Flow - lb/hr (kg/hr)	1710.2 (775.7)
Total Fuel Flow - gal/hr (L/hr)	240.5 (910.5)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	340 (5.98)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	25
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	95 - 125 (655-862)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

* With outboard support bearing

† At 10% overload horsepower

Cooling System

Engine Heat Rejection - Btu/min (kW)	14480 (254.6) †
Engine Heat Rejection SCCC - Btu/min (kW)	4615 (81.2) †
Engine Radiated Heat - Btu/min (kW)	4320 (78.0) †
Generator Radiated Heat - Btu/min (kW)	1733 (30.5) †
Coolant Flow - gal/min (L/min)	136 (515)
Minimum Coolant Flow - gal/min	122 (463)
Coolant Flow SCCC - gal/min (L/min)	73 (278)
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Minimum Water Pump Inlet Pressure	
Rapid Warmup Radiator:	Positive
Conventional Radiator - in. Hg (kPa)	2.0 (8.8)
Engine Coolant Capacity - qt (L)	70 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement - qt (L)	5% of Cooling System
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1705 (48.3) †
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	61.0 (206) †
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	4430 (125.5) †
Exhaust Temperature - °F (°C)	900 (482) †
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.2)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	730 (545)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	264.4 (1823)
Friction Power - bhp (kW)	84 (63)
Altitude Capability - ft (m)	10200 (3109)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	2.8 (16.6)
25% Power	9.2 (34.9)
50% Power	17.5 (66.2)
75% Power	25.6 (96.9)
100% Power	36.7 (138.8)
110% Power	39.3 (148.7)

Emissions Data

Noise - dB(A) @ 1m	101.9
Additional Noise Data	N1-2125-31-3
Smoke - Bosch Number	0.2

Load	0%	25%	50%	75%	100%
NO _x - g/hr	1000	2014	3310	3767	3065
CO - g/hr	140	123	117	233	268
HC - g/hr	90	80.4	75.6	72.6	82
SO ₂ - g/hr	91	317	564	724	1183
Particulates - g/hr		39.7	44.8	50.9	53.7

TA LUFT	0%	25%	50%	75%	100%
NO _x - mg/(m ³ n)		4990	4537	3553	1998
CO - mg/(m ³ n)		279	149	205	163
HC - mg/(m ³ n)		183	96.1	63.9	50.1
Particulates - mg/(m ³ n)		48.0	53.3	59.7	66.5

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2125-31-3

Rev. / Date: 5 / 12-1-98

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Generator Set Power

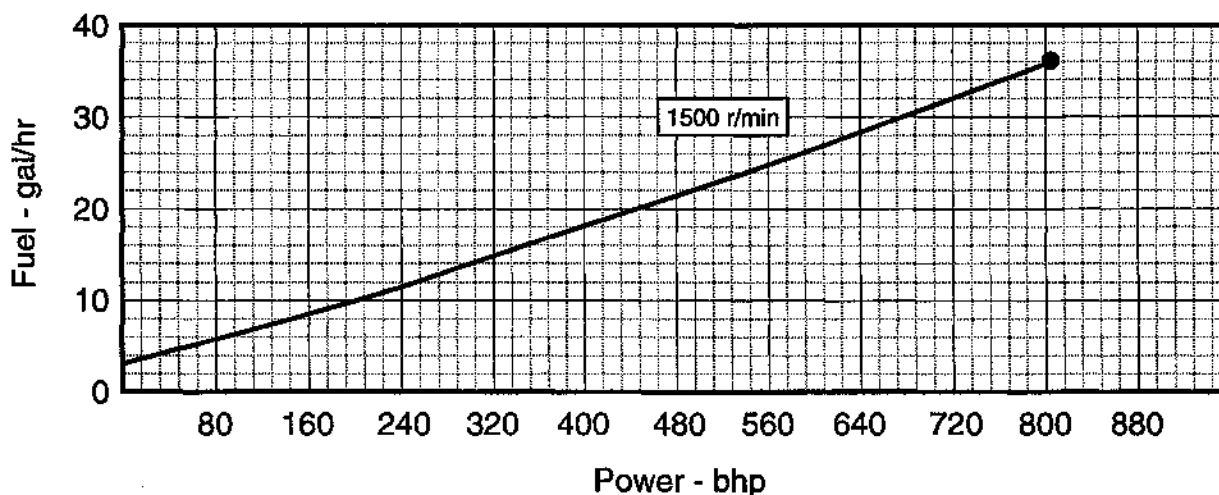
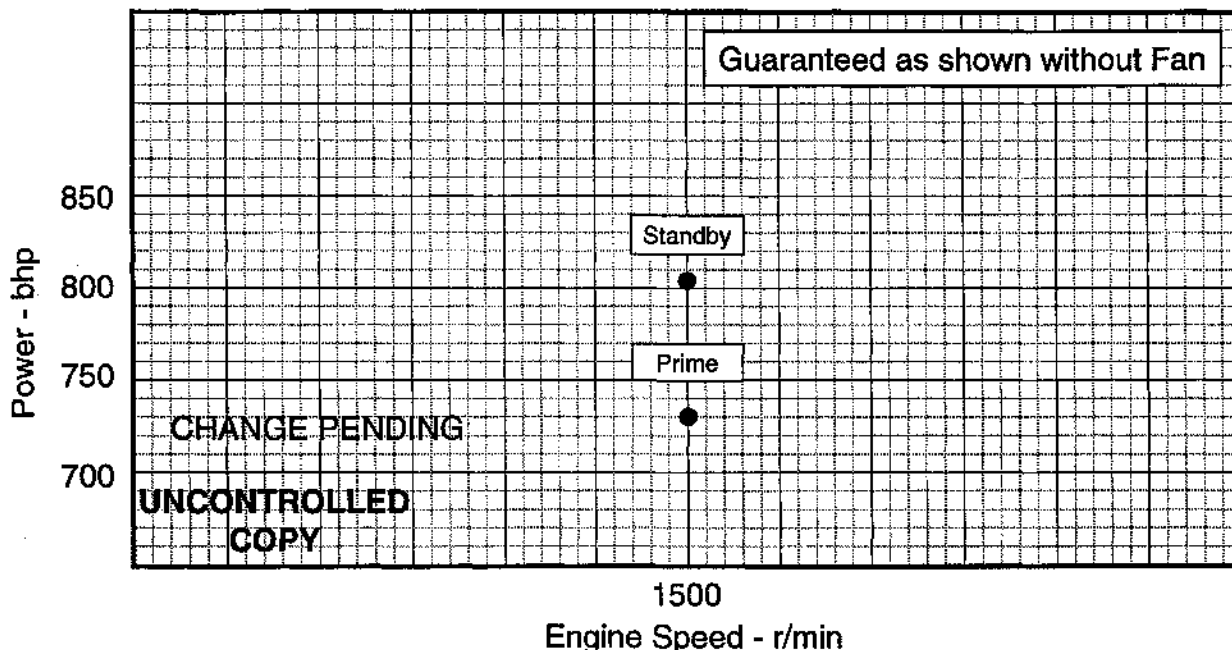
Model: 12V-2000 G60

Standby Rating:

804 bhp (600 kW) @ 1500 r/min

Prime Rating:

730 bhp (545 kW) @ 1500 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions: DIN 6270: 738 torr barometric pressure, 20 °C air inlet, 60% relative humidity JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure. Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g). Air intake restriction: 10 in. H₂O (2.5 kPa) Exhaust back pressure: 15 in. H₂O (3.7 kPa)

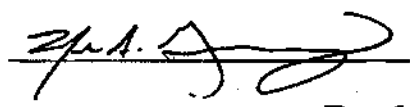
Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: TMF-5505 (1.15 A/R)

Injector: EUP

Certified by: 

Curve No. E4-2125-31-4

Rev. / Date: 4 / 6-5-98

Sheet No. 1 of 3

Performance Curve

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1500 r/min

General Data

Model.....	R123-7K08
Number of Cylinders.....	12
Bore and Stroke - in. x in. (mm x mm).....	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L).....	1458 (23.91)
Compression Ratio.....	16.0:1
Piston Speed - ft/min (m/min).....	1476 (450)
Intake Valves Per Cylinder.....	2
Exhaust Valves Per Cylinder.....	2
Combustion System.....	DIRECT INJECTION
Engine Type.....	90° VEE 4 CYCLE
Aspiration.....	TURBOCHARGED

Configuration

Injection Device.....	EUP
Turbocharger.....	TMF-5505 (1.15 A/R)
Charge Air Cooling.....	SCCC(TB)
Engine Crankcase Vent System.....	OPEN

Physical Data

Size:	
Length - in. (mm).....	73.3 (1862)
Width - in. (mm).....	44.3 (1125)
Height - in. (mm).....	50.0 (1270)
Weight, dry - lb (kg).....	4859 (2204)
Weight, wet - lb (kg).....	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm).....	23.4 (594)
Above Crankshaft (y axis) - in. (mm).....	6.3 (160)
Right of Crankshaft (z axis) - in. (mm).....	0.8 (20.3)
Installation Drawing.....	5350100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N).....	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N).....	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m).....	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N).....	2000 (8896)*
Additional Mechanical Data.....	Not Available

Fuel System

Fuel Pump.....	5235920
Fuel Consumption - lb/hr (kg/hr).....	262.0 (118.8)
Fuel Spill - lb/hr (kg/hr).....	1449.4 (657.4)
Fuel Spill - gal/hr (L/hr).....	203.9 (771.7)
Total Fuel Flow - lb/hr (kg/hr).....	1711.4 (778.3)
Total Fuel Flow - gal/hr (L/hr).....	240.7 (911.1)
Maximum Fuel Inlet Temperature - °F (°C).....	140 (60)
Heat Rejection to Fuel- Btu/min (kW).....	()
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa).....	6 (20.3)
Dirty System - in. Hg (kPa).....	12 (41)
Fuel Filter Size, Primary - Microns.....	25
Fuel Filter Size, Secondary - Microns.....	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa).....	95 - 125 (655-862)
Oil Pressure at Low Idle - lb/in. ² (kPa).....	40 (276)
In Pan Oil Temperature - °F (°C).....	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min).....	34 (129)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L).....	72.9 (69.0)
Low Limit - qt (L).....	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L).....	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees.....	30
Engine Angularity Limits, Front Down - Degrees.....	30
Engine Angularity Limits, Side Tilt - Degrees.....	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°.....	950
24 Volt System, Below 32°.....	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms.....	0.002

* With outboard support bearing

Cooling System

Engine Heat Rejection - Btu/min (kW).....	14000 (246.2)
Engine Heat Rejection SCCC - Btu/min (kW).....	5600 (98.5)
Engine Radiated Heat - Btu/min (kW).....	4340 (76.3)
Generator Radiated Heat - Btu/min (kW).....	1909 (33.6)
Coolant Flow - gal/min (L/min).....	240 (908)
Max. External Pressure Differential - lb/in. ² (kPa).....	5 (34.5)
Coolant Flow SCCC - gal/min (L/min).....	73 (276)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa).....	5 (34.5)
Thermostat:	
Start to Open - °F (°C).....	160 (71)
Fully Open - °F (°C).....	185 (85)
Minimum Water Pump Inlet Pressure	
Rapid Warmup Radiator.....	POSITIVE
Conventional Radiator - in. Hg (kPa).....	2.0 (6.8)
Engine Coolant Capacity - qt (L).....	70 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa).....	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m).....	50 (15.2)
Maximum Top Tank Temperature - °F (°C).....	210 (99)
Minimum Top Tank Temperature - °F (°C).....	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C).....	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C).....	167 (75)
Cooling Index (@ 110°F Ambient w/H ₂ O @ Sea Level):	
Maximum Air to Water Differential - °F (°C).....	100 (56)
Minimum Coolant Fill Rate - gal/min (L/min).....	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min).....	1.2 (0.034)
Minimum Drawdown Requirement - qt (L).....	8% of cooling system
Deaeration Time - Minutes.....	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C).....	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa).....	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa).....	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min).....	1480 (41.9)
Fan Air Flow - ft ³ /min (m ³ /min).....	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa).....	61.0 (208.0)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm).....	Not Applicable
Dual - in. (mm).....	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa).....	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min).....	3830 (108.5)
Exhaust Temperature - °F (°C).....	890 (477)
Maximum Back Pressure - in. Hg (kPa).....	3.0 (10.2)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm).....	8.0 (203)
Dual - in. (mm).....	5.0 (127)

Performance Data

Rated Power - bhp (kW).....	804 (600)
Rated Speed - r/min.....	1500
BMEP - lb/in. ² (kPa).....	291.2 (1823)
Friction Power - fhp (kW).....	84 (63)
Altitude Capability - ft (m).....	10200 (3109)
Part Load Fuel Consumption	
Fuel - gal/hr (L/hr) - 0% Power.....	2.8 (10.6)
25% Power.....	10.7 (40.6)
50% Power.....	18.9 (71.7)
75% Power.....	27.6 (104.6)
100% Power.....	36.8 (139.5)

Emissions Data

Noise - dB(A) @ 1m.....	101.5
Additional Noise Data.....	N1-2125-31-6
Smoke - Bosch Number.....	0.2

Load	0%	25%	50%	75%	100%
NO _x - g/hr	1000	2155	3625	4975	4770
CO - g/hr	140	117.5	117	272	532
HC - g/hr	90	778	70	63	72
SO ₂ - g/hr	91	346	611	891	1188
Particulates - g/hr					

TA LUFT	0%	25%	50%	75%	100%
NO _x - mg/(m ³ n)		5300	4600	4310	3045
CO - mg/(m ³ n)		251	138	220	318
HC - mg/(m ³ n)		166	82.5	51	43
Particulates - mg/(m ³ n)					

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2125-31-4

Rev. / Date: 4 / 6-5-98

Sheet No. 2 of 3

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GENERATOR SPECIFICATION SHEET

PRIME POWER - 1500 r/min

General Data	
Model	R123-7K08
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.91)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED
Configuration	
Injection Device	EUP
Turbocharger	TMF-5505 (1.15 A/R)
Charge Air Cooling	SCCC(TB)
Engine Crankcase Vent System	OOPEN
Physical Data	
Size:	
Length - in. (mm)	73.3 (1862)
Width - in. (mm)	44.3 (1125)
Height - in. (mm)	50.0 (1270)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301
Mechanical Data	
Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available
Fuel System	
Fuel Pump	5235920
Consumption - lb/hr (kg/hr)	237.4 (107.7)
Spill - lb/hr (kg/hr)	1449.4 (657.4)
Fuel Spill - gal/hr (L/hr)	203.9 (771.7)
Total Fuel Flow - lb/hr (kg/hr)	1686.8 (765.1)
Total Fuel Flow - gal/hr (L/hr)	237.2 (898.1)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8
Lubrication System	
Oil Pressure at Rated Speed - lb/in. ² (kPa)	95 - 125 (655-862)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (278)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	34 (129)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30
Electrical System	
Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

* With outboard support bearing

Cooling System	
Engine Heat Rejection - Btu/min (kW)	13200 (232.1)
Engine Heat Rejection SCCC - Btu/min (kW)	4600 (80.9)
Engine Radiated Heat - Btu/min (kW)	3930 (69.1)
Generator Radiated Heat - Btu/min (kW)	1733 (30.5)
Coolant Flow - gal/min (L/min)	240 (908)
Minimum Coolant Flow - gal/min	216 (818)
Coolant Flow SCCC - gal/min (L/min)	73 (276)
Thermostat	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Minimum Water Pump Inlet Pressure	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (8.8)
Engine Coolant Capacity - qt (L)	70 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (98.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	187 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Cooling Index @ 110 °F Ambient w/H ₂ O @ Sea Level	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30
Air System	
Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1350 (38.2)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	56.0 (189.1)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)
Exhaust System	
Exhaust Flow - ft ³ /min (m ³ /min)	3470 (98.3) Φ
Exhaust Temperature - °F (°C)	880 (471) Φ
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.2)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)
Performance Data	
Rated Power - bhp (kW)	730 (545)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	264.4 (1823)
Friction Power - fhp (kW)	84 (63)
Altitude Capability - ft (m)	10200 (3109)
Part Load Fuel Consumption	
Fuel - gal/hr (L/hr) - 0% Power	2.8 (16.6)
25% Power	9.9 (37.4)
50% Power	17.3 (65.6)
75% Power	25.3 (95.6)
100% Power	33.4 (126.4)
Emissions Data	
Noise - dB(A) @ 1m	101.9
Additional Noise Data	N1-2125-31-3
Smoke - Bosch Number	0.2

Load	0%	25%	50%	75%	100%
NO _x - g/hr	1000	1950	3300	4400	4900
CO - g/hr	140	125	117	200	480
HC - g/hr	90	80	71	65	68
SO ₂ - g/hr	91	319	559	815	1077
Particulates - g/hr					
TA LUFT	0%	25%	50%	75%	100%
NO _x - mg/(m ³ n)		5100	4700	4400	3950
CO - mg/(m ³ n)		260	170	180	250
HC - mg/(m ³ n)		180	90	55	45
Particulates - mg/(m ³ n)					

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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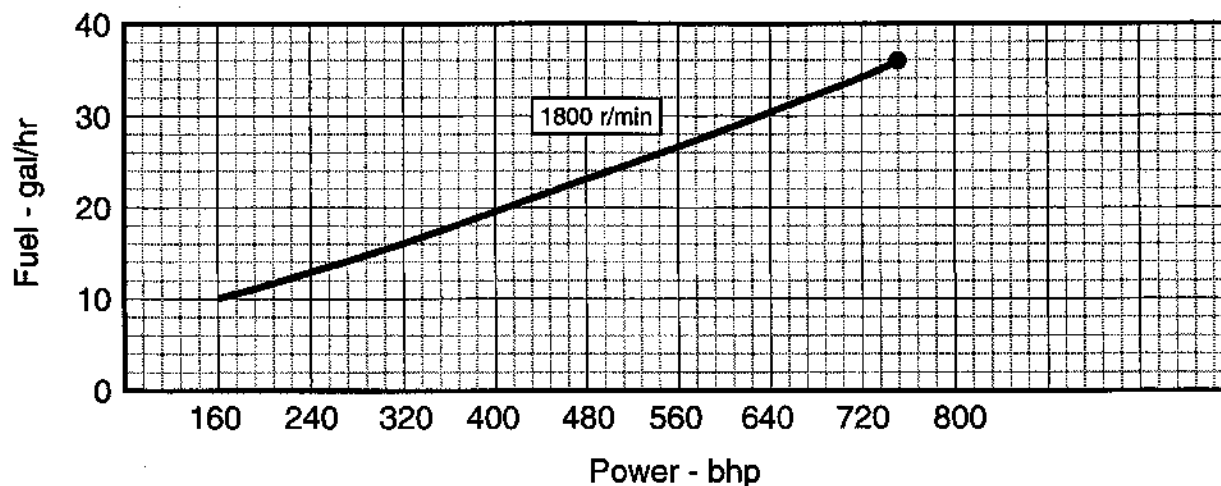
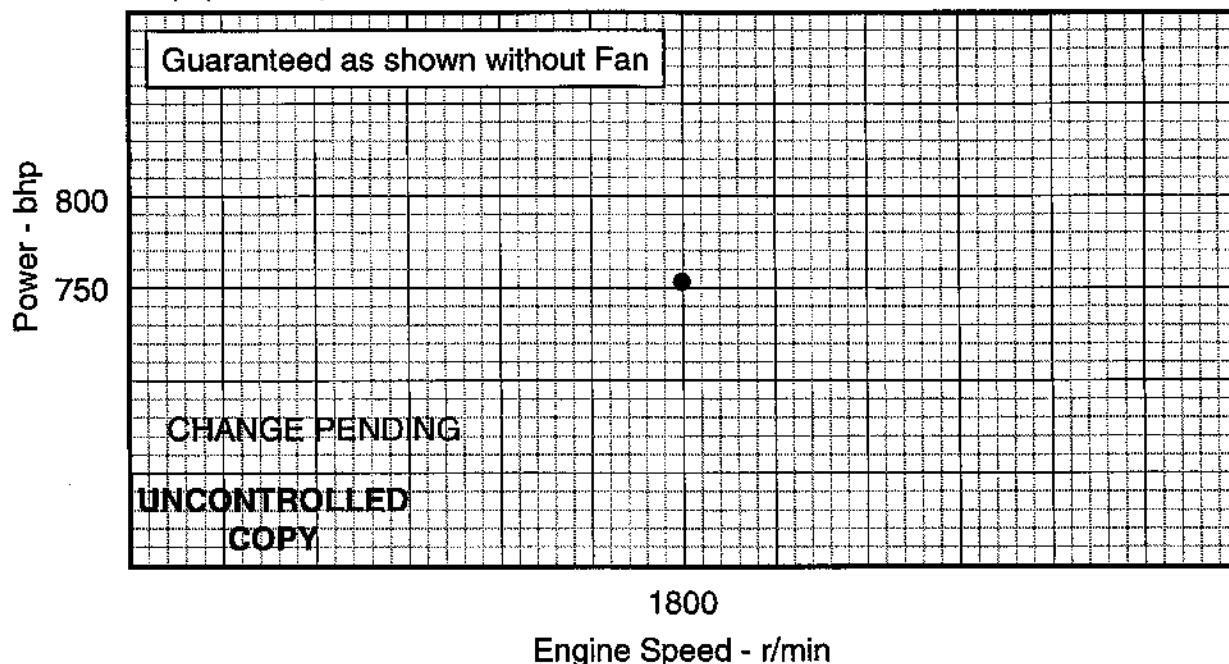
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Generator Set Power

Model: 12V-2000 G70

Continuous Rating:

752 bhp (561 kW) @ 1800 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3048, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions: DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 80% relative humidity JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure. Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g). Air intake restriction: 10 in. H₂O (2.5 kPa) Exhaust back pressure: 15 in. H₂O (3.7 kPa)	Conversion Factors: Power: kW = bhp x 0.746 Fuel: L/hr = gal/hr x 3.785	Turbo: TMF-5505 (1.15 A/R) Injector: EUP
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Certified by:

Curve No. E4-2125-31-5

Rev. / Date: New / 10-11-97

Sheet No. 1 of 2

Performance Curve

GENERATOR SPECIFICATION SHEET

CONTINUOUS - 1800 r/min

General Data

Model	R123-7K05
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.91)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	TMF-5505 (1.15 A/R)
Charge Air Cooling	JWCC (TC)
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	73.3 (1862)
Width - in. (mm)	44.3 (1125)
Height - in. (mm)	50.0 (1270)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	254.5 (115.4)
Fuel Spill - lb/hr (kg/hr)	1737.5 (788.1)
Fuel Spill - gal/hr (L/hr)	244.4 (925.0)
Total Fuel Flow - lb/hr (kg/hr)	1992.0 (903.6)
Total Fuel Flow - gal/hr (L/hr)	280.2 (1060.6)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	20
Fuel Filter Size, Secondary - Microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	105 - 135 (724-931)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93-121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

* With outboard support bearing

Cooling System

Engine Heat Rejection - Btu/min (kW)	17335 (304.8)
Engine Radiated Heat - Btu/min (kW)	4220 (74.2)
Generator Radiated Heat - Btu/min (kW)	1786 (31.4)
Coolant Flow - gal/min (L/min)	290 (1098)
Minimum Coolant Flow - gal/min	261 (988)
Thermostat:	Full Blocking
Start to Open - °F (°C)	165 (74)
Fully Open - °F (°C)	188.6 (87)
Minimum Water Pump Inlet Pressure:	POSITIVE
Engine Coolant Capacity - qt (L)	70 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1820 (51.5)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	53.0 (179.5)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.6 (0.65)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	4240 (120.1)
Exhaust Temperature - °F (°C)	750 (399)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	752 (561)
Rated Speed - r/min	1800
BMEP - lb/in. ² (kPa)	227.0 (1565)
Friction Power - fhp (kW)	Not Available
Altitude Capability - ft (m)	10200 (3109)
Part Load Fuel Consumption	
Fuel - gal/hr (L/hr) - 0% Power	4.4 (16.6)
25% Power	11.0 (41.8)
50% Power	18.7 (70.6)
75% Power	26.8 (101.6)
100% Power	35.8 (135.5)

Emissions Data

Noise - dB(A) @ 1m	103
Additional Noise Data	Not Available
Smoke - Bosch Number	0.1

Load	0%	25%	50%	75%	100%
NO _x - g/hr	3000	3720	5300	5830	6208
CO - g/hr	180	160	143	152	162.2
HC - g/hr	130	150	159.9	158.3	168.5
SO ₂ - g/hr	141	356	602	866	1154
Particulates - g/hr	N/A				

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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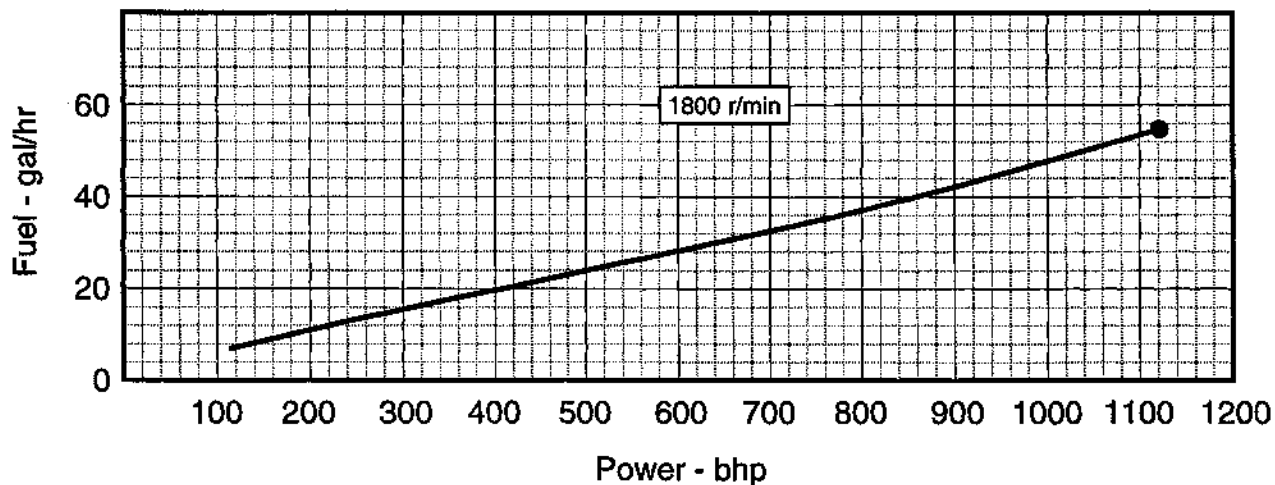
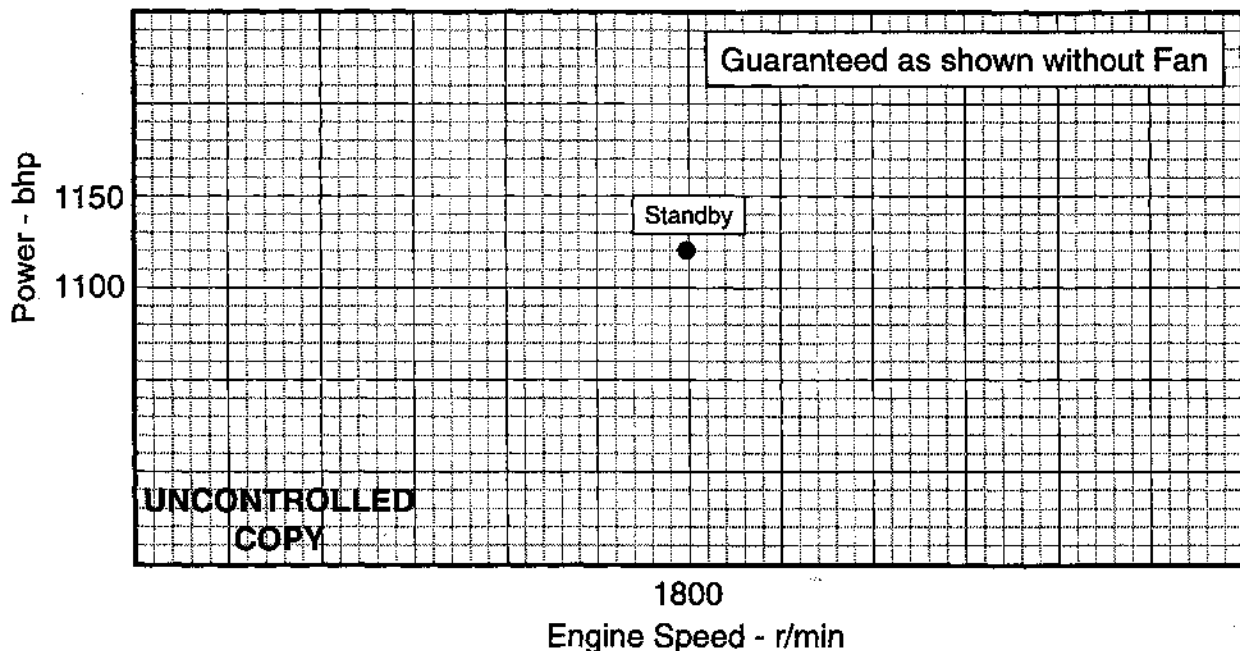
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Generator Set Power

Model: 12V-2000 G81

Standby Rating:

1120 bhp (836 kW) @ 1800 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity.
Curves also represent capabilities at the following ambient conditions:
DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 60% relative humidity
JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.
Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust back pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: GT5002X (1.34 A/R)

Injector: EUP

Certified by:

Curve No. E4-2125-31-6

Rev. / Date: New / 7-8-98

Sheet No. 1 of 2

Performance Curve

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1800 r/min

General Data

Model	R123-7K08
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.91)
Compression Ratio	14.5:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	GT5002x (1.34 A/R)
Charge Air Cooling	SCCC(TB)
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	73.3 (1862)
Width - in. (mm)	44.3 (1125)
Height - in. (mm)	50.0 (1270)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	389.1 (176.5)
Fuel Spill - lb/hr (kg/hr)	1602.9 (727.1)
Fuel Spill - gal/hr (L/hr)	225.4 (853.4)
Total Fuel Flow - lb/hr (kg/hr)	1992 (903.6)
Total Fuel Flow - gal/hr (L/hr)	280.2 (1061)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	405 (7.12)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	100 - 130 (690-896)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	19625 (345.1)
Engine Heat Rejection SCCC - Btu/min (kW)	12650 (222.4)
Engine Radiated Heat - Btu/min (kW)	5600 (98.5)
Generator Radiated Heat - Btu/min (kW)	2161 (38.0)
Coolant Flow - gal/min (L/min)	290 (1098)
Max. External Pressure Differential - lb/in. ² (kPa)	7 (48.3)
Coolant Flow SCCC - gal/min (L/min)	89 (337)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	8 (55.2)
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Minimum Water Pump Inlet Pressure	
Rapid Warmup Radiator:	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	70 (86.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Cooling Index (@ 110°F Ambient w/H ₂ O @ Sea Level):	
Maximum Air to Water Differential - °F (°C)	100 (56)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2395 (67.8)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	73.0 (247.2)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	6370 (180.4)
Exhaust Temperature - °F (°C)	915 (491)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.2)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	1120 (836)
Rated Speed - r/min	1800
BMEP - lb/in. ² (kPa)	338 (2331)
Friction Power - ihp (kW)	119 (89)
Altitude Capability - ft (m)	7500 (2286)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	4.4 (16.6)
25% Power	15.2 (57.6)
50% Power	26.9 (101.7)
75% Power	39.4 (149.1)
100% Power	54.7 (207.1)

Emissions Data

Noise - dB(A) @ 1m	102.4
Additional Noise Data	N1-2125-31-9
Smoke - Bosch Number	1.0

Load	10%	25%	50%	75%	100%
NO _x - g/hr	1442	2453	4585	5305	4886
CO - g/hr	422	264	226	434	748
HC - g/hr	138	120	135	148	125
SO ₂ - g/hr	239	491	867	1271	1765
Particulates - g/hr	38.5	43.4	34.7	59	117

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2125-31-6
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Generator Set Power

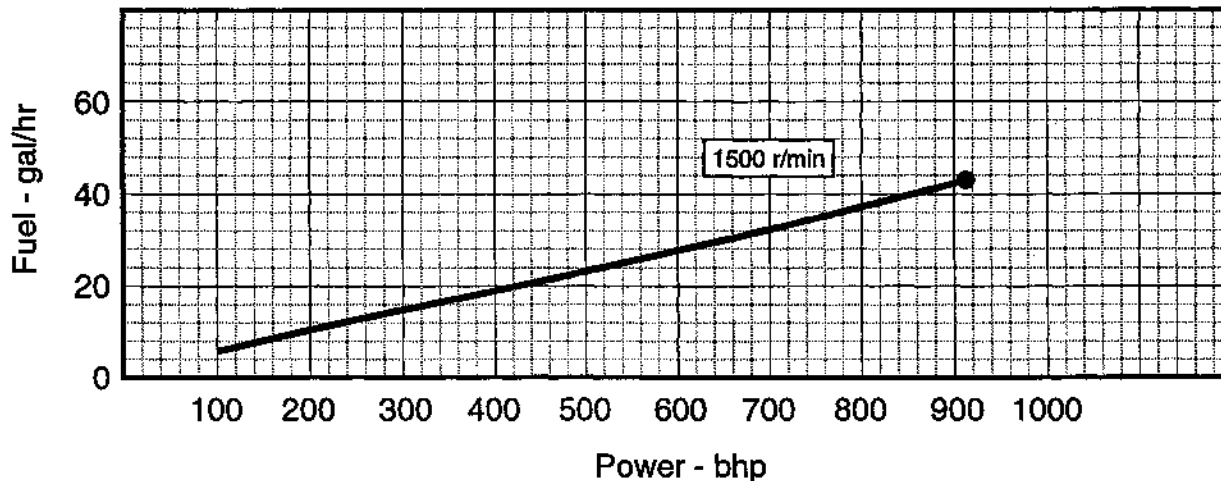
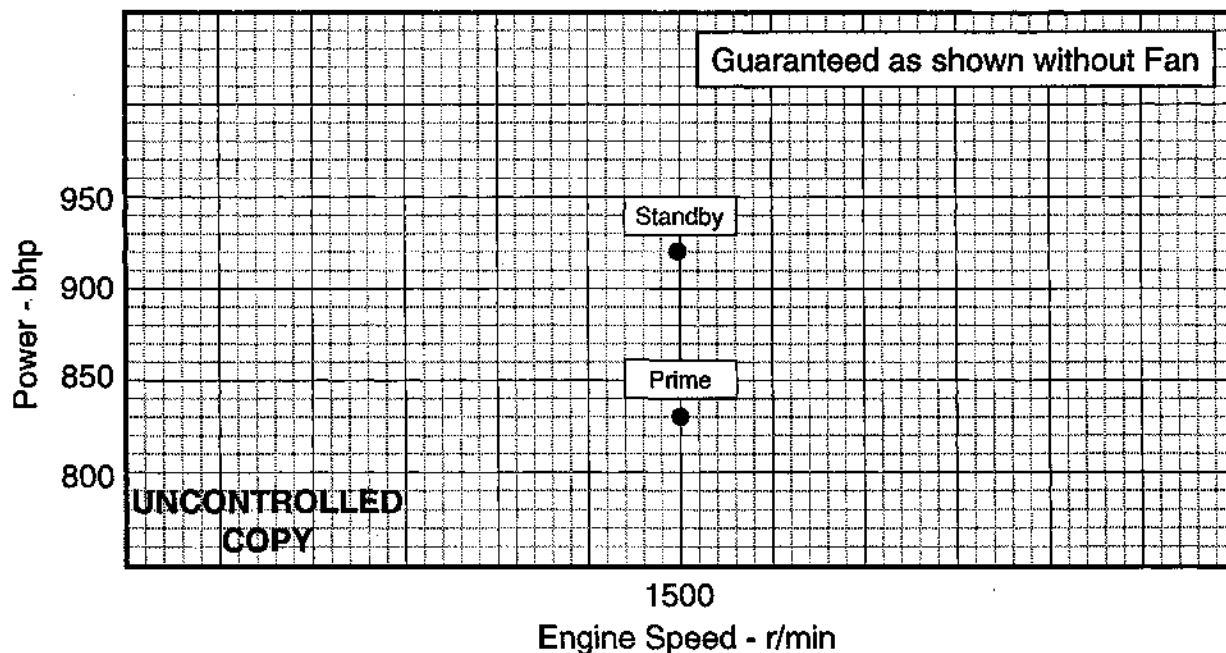
Model: 12V-2000 G61

Standby Rating:

912 bhp (680 kW) @ 1500 r/min

Prime Rating:

830 bhp (619 kW) @ 1500 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS614: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions:
 DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 60% relative humidity
 JIS D1005-1978: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.
 Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).
 Air intake restriction: 10 in. H₂O (2.5 kPa)
 Exhaust back pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: GT5002X (1.15 A/R)

Injector: EUP

Certified by:

Curve No. E4-2125-31-7

Rev. / Date: 1 / 10-20-98

Sheet No. 1 of 3

Performance Curve

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1500 r/min

General Data

Model	R123-7K06
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.91)
Compression Ratio	14.5:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	GT5002X (1.15 A/R)
Charge Air Cooling	SCCC(TB)
Engine Crankcase Vent System	Open

Physical Data

Size:	
Length - in. (mm)	73.3 (1862)
Width - in. (mm)	44.3 (1125)
Height - in. (mm)	50.0 (1270)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1358)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	305.3 (138.5)
Fuel Spill - lb/hr (kg/hr)	1406.1 (637.8)
Fuel Spill - gal/hr (L/hr)	197.8 (748.6)
Total Fuel Flow - lb/hr (kg/hr)	1711.4 (776.3)
Total Fuel Flow - gal/hr (L/hr)	240.7 (911.1)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	300 (5.3)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	95 - 125 (655-862)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	16995 (298.8)
Engine Heat Rejection SCCC - Btu/min (kW)	7645 (134.4)
Engine Radiated Heat - Btu/min (kW)	4393 (77.3)
Generator Radiated Heat - Btu/min (kW)	1909 (33.6)
Coolant Flow - gal/min (L/min)	240 (908)
Max. External Pressure Differential - lb/in. ² (kPa)	5 (34.5)
Coolant Flow SCCC - gal/min (L/min)	73 (276)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	5 (34.5)
Thermostat	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Minimum Water Pump Inlet Pressure	
Rapid Warmup Radiator:	Positive
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	70 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Cooling Index (@ 110°F Ambient w/H ₂ O @ Sea Level):	
Maximum Air to Water Differential - °F (°C)	100 (56)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1700 (48.1)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	61.0 (206.0)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	4550 (128.9)
Exhaust Temperature - °F (°C)	920 (493)
Maximum Back Pressure - in. Hg (kPa)	2.5 (8.5)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	912 (680)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	330.2 (2277)
Friction Power - fhp (kW)	84 (63)
Altitude Capability - ft (m)	7500 (2286)
Part Load Fuel Consumption	
Fuel - gal/hr (L/hr) - 0% Power	2.8 (10.6)
25% Power	12.0 (45.5)
50% Power	21.7 (82.2)
75% Power	31.6 (119.5)
100% Power	42.9 (162.5)

Emissions Data

Noise - dB(A) @ 1m	100.9
Additional Noise Data	N1-2125-31-10
Smoke - Bosch Number	1.3

Load	10%	25%	50%	75%	100%
NO _x - g/hr	1200	1812	3356	4394	4525
CO - g/hr	385	222	234	590	1160
HC - g/hr	135	111	113	112	107
SO ₂ - g/hr	181	367	700	1018	1385
Particulates - g/hr	58	51	36	60	124

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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GENERATOR SPECIFICATION SHEET

PRIME POWER - 1500 r/min

General Data

Model	R123-7K06
Number of Cylinders	12
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1458 (23.91)
Compression Ratio	14.5:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	Direct Injection
Engine Type	90° VEE 4 Cycle
Aspiration	Turbocharged

Configuration

Injection Device	EUP
Turbocharger	GT5002X (1.15 A/R)
Charge Air Cooling	SCCC(TB)
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	73.3 (1862)
Width - in. (mm)	44.3 (1125)
Height - in. (mm)	50.0 (1270)
Weight, Dry - lb (kg)	4859 (2204)
Weight, Wet - lb (kg)	5194 (2356)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	23.4 (594)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5350100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Consumption - lb/hr (kg/hr)	273.7 (124.2)
Spill - lb/hr (kg/hr)	1437.7 (652.1)
Spill - gal/hr (L/hr)	202.2 (765.4)
Total Fuel Flow - lb/hr (kg/hr)	1711.4 (776.3)
Total Fuel Flow - gal/hr (L/hr)	240.7 (911.1)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	300 (5.3)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - microns	25
Fuel Filter Size, Secondary - microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	95 - 125 (655-862)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
Oil Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	72.9 (69.0)
Low Limit - qt (L)	60.2 (57.0)
Total Engine Oil Capacity with Filters - qt (L)	99.4 (94.1)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

* With outboard support bearing

Cooling System

Engine Heat Rejection - Btu/min (kW)	16290 (286.4)
Engine Heat Rejection SCCC - Btu/min (kW)	6215 (109.3)
Engine Radiated Heat - Btu/min (kW)	4393 (77.3)
Generator Radiated Heat - Btu/min (kW)	1909 (33.6)
Coolant Flow - gal/min (L/min)	240 (908)
Max. External Pressure Differential - lb/in. ² (kPa)	5 (34.5)
Coolant Flow SCCC - gal/min (L/min)	73 (276)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	5 (34.5)
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Minimum Water Pump Inlet Pressure	
Rapid Warmup Radiator:	Positive
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	70 (66.2)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max. Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Cooling Index (@ 110°F Ambient w/H ₂ O @ Sea Level):	
Maximum Air to Water Differential - °F (°C)	100 (56)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.2 (0.034)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1535 (43.5)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	52.0 (176.1)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	6.0 (152)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	2.0 (0.50)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	4060 (115.0)
Exhaust Temperature - °F (°C)	905 (485)
Maximum Back Pressure - in. Hg (kPa)	2.5 (8.5)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	8.0 (203)
Dual - in. (mm)	5.0 (127)

Performance Data

Rated Power - bhp (kW)	830 (619)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	300.6 (2072)
Friction Power - fhp (kW)	84 (63)
Altitude Capability - ft (m)	7500 (2286)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	2.8 (10.6)
25% Power	11.1 (42.2)
50% Power	19.8 (75.1)
75% Power	28.8 (108.9)
100% Power	38.5 (145.7)

Emissions Data

Noise - dB(A) @ 1m	100.5
Additional Noise Data	N1-2125-31-11
Smoke - Bosch Number	

Load	10%	25%	50%	75%	100%
NO _x - g/hr	1200	1700	2900	4150	4615
CO - g/hr	385	250	232	420	874
HC - g/hr	135	114	112	112	111
SO ₂ - g/hr	181	359	840	928	1240
Particulates - g/hr	58	53	38	52	89

values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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Generator Set Power

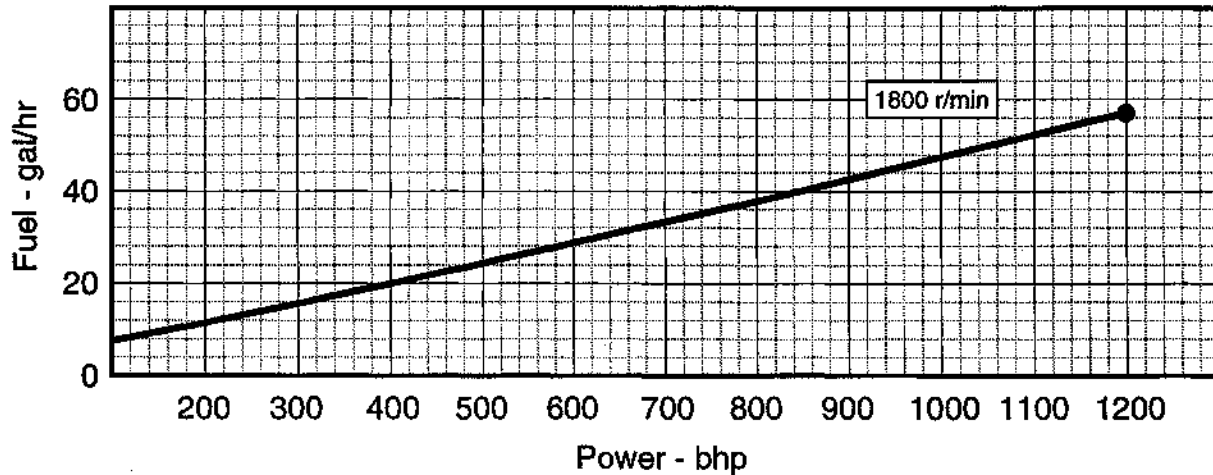
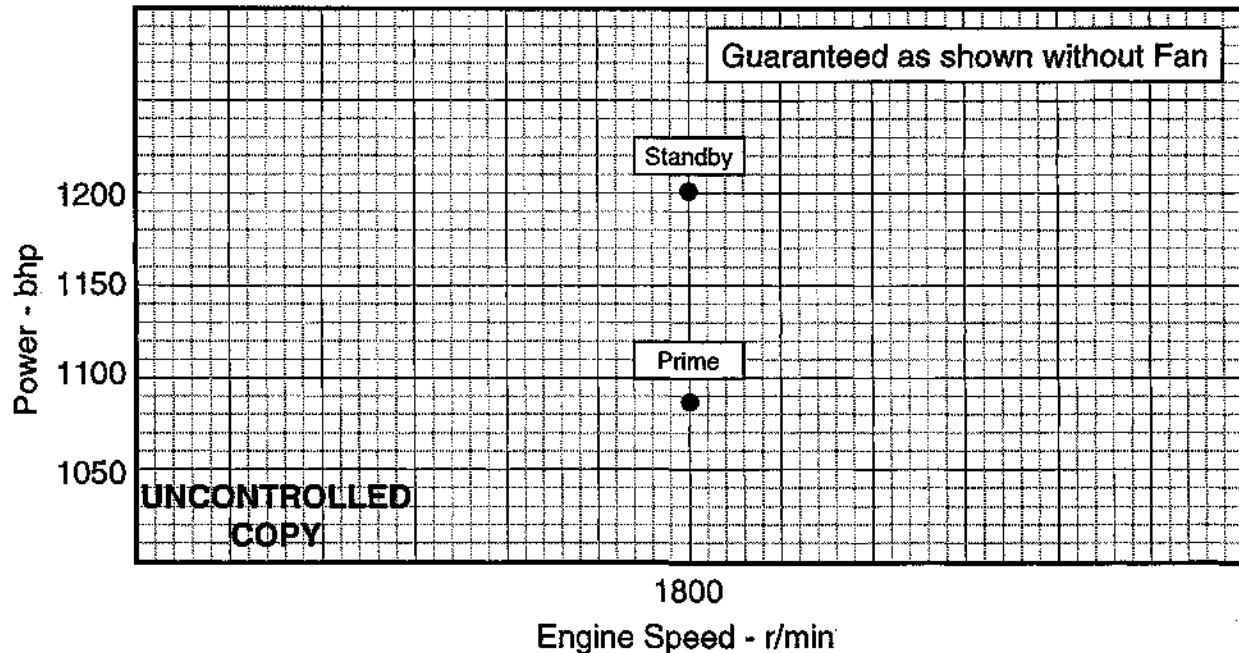
Model: 16V-2000 G70

Standby Rating:

1200 bhp (895 kW) @ 1800 r/min

Prime Rating:

1086 bhp (810 kW) @ 1800 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions:
DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 60% relative humidity
JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.
Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust back pressure: 15 in. H₂O (3.7 kPa)

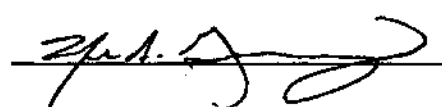
Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: K37-4671

Injector: EUP

Certified by: 

Curve No. E4-2165-31-1

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Performance Curve

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1800 r/min

General Data

Model	R163-7K05
Number of Cylinders	16
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1944 (31.88)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K37-4671
Charge Air Cooling	JWCC (TC)
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	86.9 (2207)
Width - in. (mm)	47.4 (1204)
Height - in. (mm)	51.4 (1306)
Weight, Dry - lb (kg)	5600 (2540)
Weight, Wet - lb (kg)	5983 (2714)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	28.8 (731)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5360100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	408.6 (185.4)
Fuel Spill - lb/hr (kg/hr)	2260 (1025)
Fuel Spill - gal/hr (L/hr)	317.9 (1203)
Total Fuel Flow - lb/hr (kg/hr)	2669 (1211)
Total Fuel Flow - gal/hr (L/hr)	375.4 (1421)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	728 (12.8)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	80 - 120 (552-827)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	102 (96.5)
Low Limit - qt (L)	84 (79.5)
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	29510 (518.9)
Engine Radiated Heat - Btu/min (kW)	6750 (118.7)
Generator Radiated Heat - Btu/min (kW)	2849 (50.1)
Coolant Flow - gal/min (L/min)	300 (1136)
Max. External Pressure Differential - lb/in. ² (kPa)	7.0 (48.3)
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	3.0 (10.1)
Engine Coolant Capacity - qt (L)	80 (75.7)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (98.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.6 (0.045)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2515 (71.2)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	60.0 (203)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	6510 (184.4)
Exhaust Temperature - °F (°C)	880 (471)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)

Performance Data

Rated Power - bhp (kW)	1200 (895)
Rated Speed - r/min	1800
BMEP - lb/in. ² (kPa)	271.6 (1873)
Friction Power - fhp (kW)	133 (99)
Altitude Capability - ft (m)	10000 (3048)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	5.8 (22.1)
25% Power	16.6 (62.9)
50% Power	28.6 (108.4)
75% Power	42.7 (161.8)
100% Power	57.5 (217.6)

Emissions Data

Noise - dB(A) @ 1m	106.1
Additional Noise Data	N1-2165-31-1
Smoke - Bosch Number	0.2

Load	0%	25%	50%	75%	100%
NO _x - g/hr	1870	3040	5120	6735	6980
CO - g/hr	235	185	172	201	264
HC - g/hr	104	95	101	122	156
SO ₂ - g/hr	188	536	923	1379	1854
Particulates - g/hr	50	29.5	28.0	29.2	91.1

* With outboard support bearing

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All values are at rated speed and power at SAE J1995
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GENERATOR SPECIFICATION SHEET

PRIME POWER - 1800 r/min

Data

Model	R163-7K05
Number of Cylinders	18
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1944 (31.88)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K37-4671
Charge Air Cooling	JWCC (TC)
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	86.9 (2207)
Width - in. (mm)	47.4 (1204)
Height - in. (mm)	51.4 (1306)
Weight, Dry - lb (kg)	5600 (2540)
Weight, Wet - lb (kg)	5983 (2714)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	28.8 (731)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5360100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

System

Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	365.0 (165.6)
Fuel Spill - lb/hr (kg/hr)	2304 (1045.0)
Fuel Spill - gal/hr (L/hr)	324.0 (1227)
Total Fuel Flow - lb/hr (kg/hr)	2669.0 (1211)
Total Fuel Flow - gal/hr (L/hr)	375.4 (1421)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	809 (14.2)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	5

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	80 - 120 (552-827)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	102 (96.5)
Low Limit - qt (L)	84 (79.5)
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

* With outboard support bearing

Cooling System

Engine Heat Rejection - Btu/min (kW)	26390 (464.0)
Engine Radiated Heat - Btu/min (kW)	6050 (106.4)
Generator Radiated Heat - Btu/min (kW)	2579 (45.3)
Coolant Flow - gal/min (L/min)	300 (1136)
Max. External Pressure Differential - lb/in. ² (kPa)	7.0 (48.3)
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	3.0 (10.1)
Engine Coolant Capacity - qt (L)	80 (75.7)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.6 (0.045)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (18.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2420 (68.5)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	52.6 (178.1)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	6280 (177.8)
Exhaust Temperature - °F (°C)	885 (474)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)

Performance Data

Rated Power - bhp (kW)	1086 (810)
Rated Speed - r/min	1800
BMEP - lb/in. ² (kPa)	245.8 (1695)
Friction Power - fhp (kW)	133 (99)
Altitude Capability - ft (m)	10000 (3048)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	5.8 (22.1)
25% Power	15.3 (57.8)
50% Power	26.3 (99.4)
75% Power	36.7 (146.6)
100% Power	51.3 (194.4)

Emissions Data

Noise - dB(A) @ 1m	105.4
Additional Noise Data	N1-2165-31-2
Smoke - Bosch Number	0.1

Load	0%	25%	50%	75%	100%
NO _x - g/hr	1670	2795	4665	6560	6840
CO - g/hr	235	189	168	192	237
HC - g/hr	104	96	96	112	147
SO ₂ - g/hr	188	484	859	1253	1655
Particulates - g/hr	50	29.3	23.3	29.6	36.4

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Generator Set Power

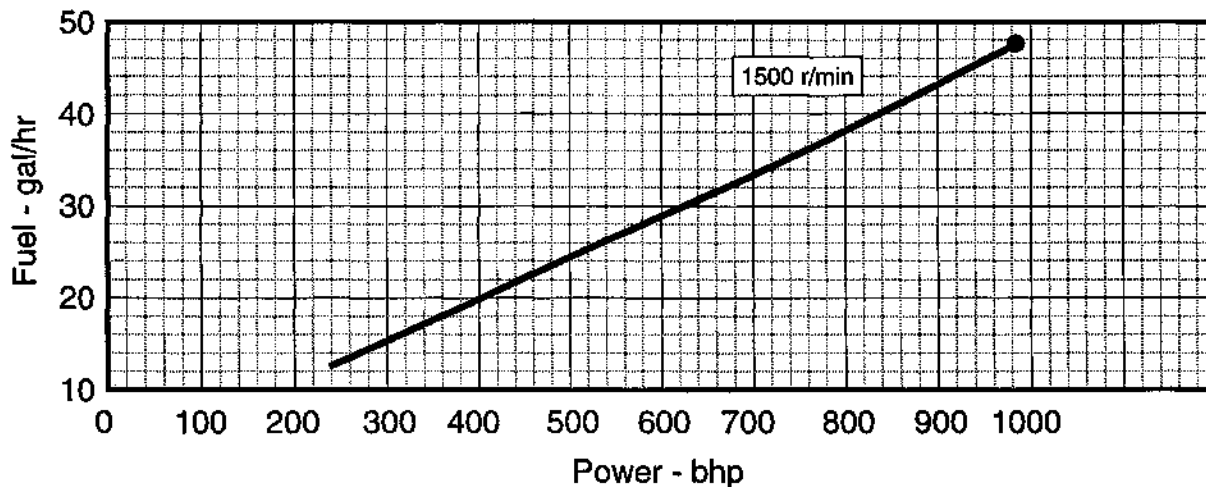
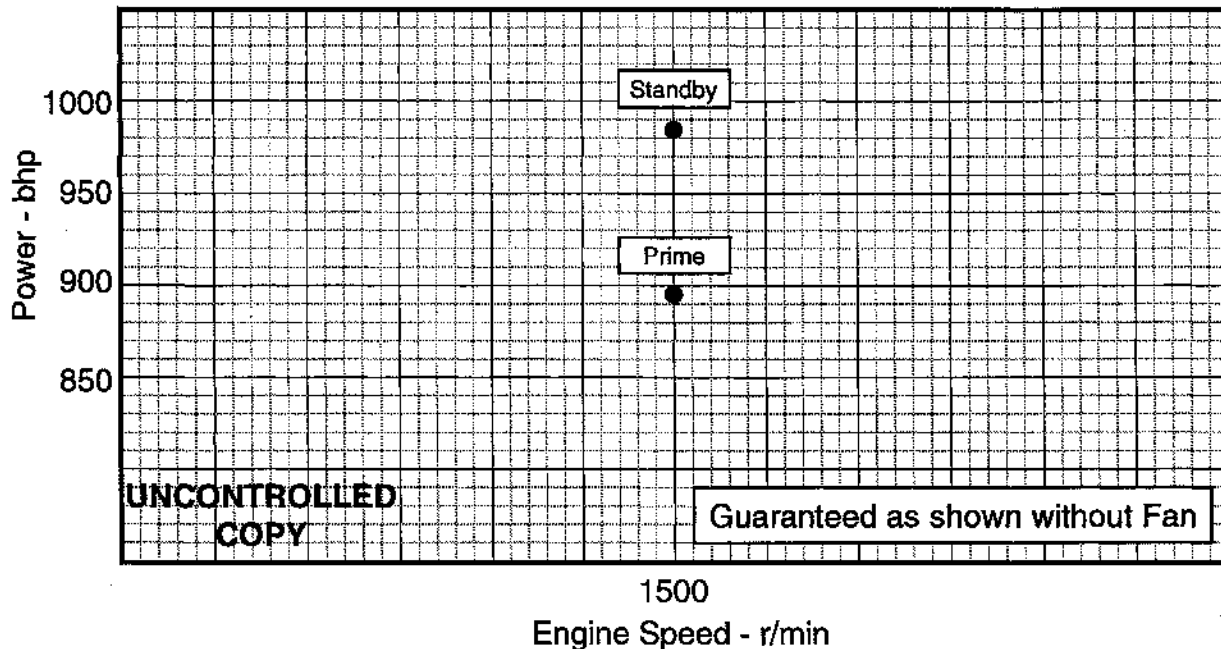
Model: 16V-2000 G50

Standby Rating:

985 bhp (735 kW) @ 1500 r/min

Prime Rating:

895 bhp (668 kW) @ 1500 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions:
DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 60% relative humidity
JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.
Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust back pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: K37-4671

Injector: EUP

Certified by:

Curve No. E4-2165-31-2

Rev. / Date: 4 / 5-7-98

Sheet No. 1 of 3

Performance Curve

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1500 r/min

General Data

Model	R163-7K05
Number of Cylinders	16
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1944 (31.88)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K37-4671
Charge Air Cooling	JWCC (TC)
Engine Crankcase Vent System	OPEN

Physical Data

Size:	
Length - in. (mm)	86.9 (2207)
Width - in. (mm)	47.4 (1204)
Height - in. (mm)	51.4 (1306)
Weight, Dry - lb (kg)	5600 (2540)
Weight, Wet - lb (kg)	5983 (2714)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	28.8 (731)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5360100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	337.9 (153.3)
Fuel Spill - lb/hr (kg/hr)	1935 (877.7)
Fuel Spill - gal/hr (L/hr)	272.1 (1030)
Total Fuel Flow - lb/hr (kg/hr)	2273 (1031)
Total Fuel Flow - gal/hr (L/hr)	319.7 (1210)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	540.8 (9.51)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	75 - 112 (517-772)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	102 (96.5)
Low Limit - qt (L)	84 (79.5)
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection - Btu/min (kW)	24230 (426.1)
Engine Radiated Heat - Btu/min (kW)	5380 (94.6)
Generator Radiated Heat - Btu/min (kW)	2291 (40.3)
Coolant Flow - gal/min (L/min)	250 (946)
Max. External Pressure Differential - lb/in. ² (kPa)	5.0 (34.5)
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	3.0 (10.1)
Engine Coolant Capacity - qt (L)	80 (75.7)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.6 (0.045)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1600 (45.3)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	39 (132.1)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	4750 (134.5)
Exhaust Temperature - °F (°C)	1060 (571)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)

Performance Data

Rated Power - bhp (kW)	985 (735)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	267.5 (1845)
Friction Power - fhp (kW)	94 (70)
Altitude Capability - ft (m)	10000 (3048)
Part Load Fuel Consumption	
Fuel - gal/hr (L/hr) - 0% Power	3.7 (14.16)
25% Power	13.1 (49.6)
50% Power	23.6 (89.4)
75% Power	35.7 (135.0)
100% Power	47.5 (179.9)

Emissions Data

Noise - dB(A) @ 1m	101.5
Additional Noise Data	N1-2165-31-3
Smoke - Bosch Number	0.1

Load	0%	25%	50%	75%	100%
NO _x - g/hr	1285	2375	3550	4805	5835
CO - g/hr	203	152	175	437	1115
HC - g/hr	119	97	96	84	62
SO ₂ - g/hr	121	422	762	1150	1533
Particulates - g/hr	92.4	62.6	36.8	272	59.1

* With outboard support bearing

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2165-31-2
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GENERATOR SPECIFICATION SHEET

PRIME POWER - 1500 r/min

Data					
Number of Cylinders	R163-7K05				
Bore and Stroke - in. x in. (mm x mm)	16				
Displacement - in. ³ (L)	5.12 x 5.91 (130 x 150)				
Compression Ratio	1944 (31.88)				
Piston Speed - ft/min (m/min)	16.0:1				
Intake Valves Per Cylinder	1476 (450)				
Exhaust Valves Per Cylinder	2				
Combustion System	2				
Engine Type	DIRECT INJECTION				
Aspiration	90° VEE 4 CYCLE				
Configuration	TURBOCHARGED				
Injection Device	EUP				
Turbocharger	K37-4671				
Charge Air Cooling	JWCC (TC)				
Engine Crankcase Vent System	OPEN				
Physical Data					
Size:					
Length - in. (mm)	86.9 (2207)				
Width - in. (mm)	47.4 (1204)				
Height - in. (mm)	51.4 (1306)				
Weight, Dry - lb (kg)	5600 (2540)				
Weight, Wet - lb (kg)	5983 (2714)				
Center of Gravity Distance:					
From R.F.O.B. (x axis) - in. (mm)	28.8 (731)				
Above Crankshaft (y axis) - in. (mm)	6.3 (160)				
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)				
Installation Drawing	5360100301				
Mechanical Data					
Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)				
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)				
Maximum Static Bending Moment at Rear					
Face of Block - lb-ft (N-m)	1000 (1356)				
Maximum Vertical Load at					
Rear Face of Flywheel - lb (N)	2000 (8896)*				
Additional Mechanical Data	Not Available				
Fuel System					
Pump	5235920				
Consumption - lb/hr (kg/hr)	306.6 (139.1)				
Fuel Spill - lb/hr (kg/hr)	1967 (892.2)				
Fuel Spill - gal/hr (L/hr)	276.6 (1047)				
Total Fuel Flow - lb/hr (kg/hr)	2274 (1031)				
Total Fuel Flow - gal/hr (L/hr)	319.8 (1211)				
Heat Rejection to Fuel - Btu/min (kW)	541 (9.51)				
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)				
Maximum Fuel Pump Suction:					
Clean System - in. Hg (kPa)	6 (20.3)				
Dirty System - in. Hg (kPa)	12 (41)				
Fuel Filter Size, Primary - Microns	25				
Fuel Filter Size, Secondary - Microns	5				
Lubrication System					
Oil Pressure at Rated Speed - lb/in. ² (kPa)	75 - 122 (517-772)				
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)				
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)				
Oil Flow - gal/min (L/min)	Not Available				
Oil Pan Capacity: > 24 Hour Operation					
High Limit - qt (L)	102 (98.5)				
Low Limit - qt (L)	84 (79.5)				
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)				
Engine Angularity Limits, Front Up - Degrees	30				
Engine Angularity Limits, Front Down - Degrees	30				
Engine Angularity Limits, Side Tilt - Degrees	30				
Electrical System					
Recommended Battery Capacity (CCA @ 0°F):					
24 Volt System, Above 32°	950				
24 Volt System, Below 32°	1250				
Maximum Resistance of Starting Circuit:					
24 Volt System - ohms	0.002				
Cooling System					
Engine Heat Rejection - Btu/min (kW)	21000 (369.3)				
Engine Radiated Heat - Btu/min (kW)	4850 (85.3)				
Generator Radiated Heat - Btu/min (kW)	2088 (36.4)				
Coolant Flow - gal/min (L/min)	250 (946)				
Max. External Pressure Differential - lb/in. ² (kPa)	5.0 (34.5)				
Thermostat	Full Blocking				
Start to Open - °F (°C)	160 (71)				
Fully Open - °F (°C)	185 (85)				
Maximum Water Pump Inlet Restriction:					
Rapid Warmup Radiator	POSITIVE				
Conventional Radiator - in. Hg (kPa)	3.0 (10.1)				
Engine Coolant Capacity - qt (L)	80 (75.7)				
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)				
Maximum Coolant Pressure					
Static Head - ft (m)	50 (15.2)				
Maximum Top Tank Temperature - °F (°C)	210 (99)				
Minimum Top Tank Temperature - °F (°C)	160 (71)				
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)				
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)					
Maximum Air to Water Differential - °F (°C)	100 (56)				
Air Handling Capacity - ft ³ /min (m ³ /min)	1.6 (0.045)				
Minimum Drawdown Requirement - qt (L)	8% of cooling system				
Deaeration Time - Minutes	30				
Air System					
Maximum Temperature Rise					
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)				
Maximum Air Intake Restriction:					
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)				
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)				
Engine Air Flow - ft ³ /min (m ³ /min)	1465 (41.5)				
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied				
Intake Manifold Pressure - in. Hg (kPa)	32.4 (109.7)				
Recommended Intake Pipe Outer Diameter:					
Single - in. (mm)	Not Applicable				
Dual - in. (mm)	8.0 (203)				
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)				
Exhaust System					
Exhaust Flow - ft ³ /min (m ³ /min)	4320 (122.3)				
Exhaust Temperature - °F (°C)	1050 (566)				
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)				
Recommended Exhaust Pipe Diameter:					
Single - in. (mm)	Not Applicable				
Dual - in. (mm)	8.0 (203)				
Performance Data					
Rated Power - bhp (kW)	895 (668)				
Rated Speed - r/min	1500				
BMEP - lb/in. ² (kPa)	243.1 (1676)				
Friction Power - fhp (kW)	94 (70)				
Altitude Capability - ft (m)	10000 (3048)				
Part Load Fuel Consumption					
Fuel - gal/hr (L/hr) - 0% Power	3.7 (14.16)				
25% Power	12.1 (45.7)				
50% Power	21.7 (82.1)				
75% Power	32.4 (122.5)				
100% Power	43.1 (163.2)				
Emissions Data					
Noise - dB(A) @ 1m	101.2				
Additional Noise Data	E4-2165-31-4				
Smoke - Bosch Number	0.1				

* With outboard support bearing

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All values are at rated speed and power at SAE J1995
with standard engine hardware, unless otherwise noted.

Generator Set Power

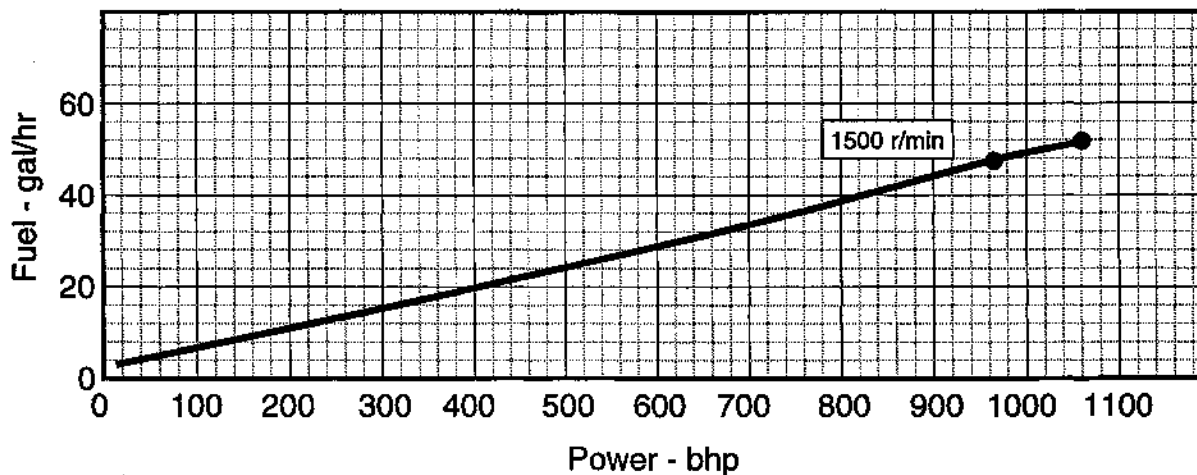
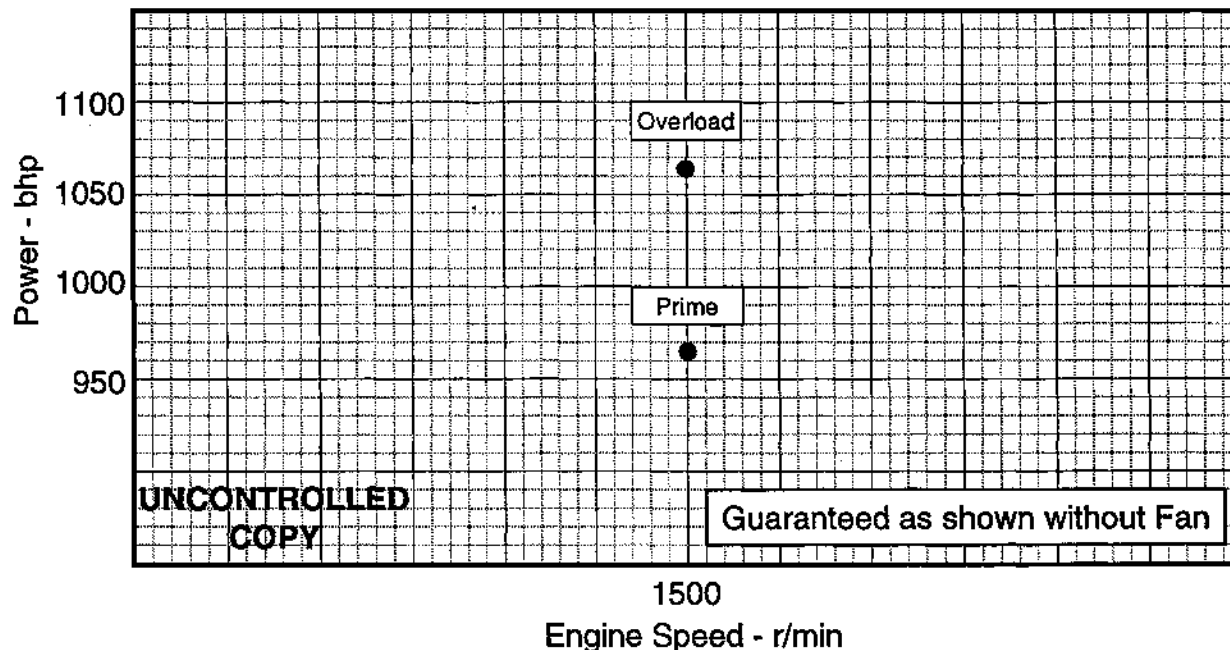
Model: 16V-2000 G60

Prime Rating:

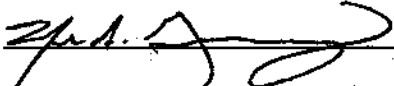
965 bhp (720 kW) @ 1500 r/min

Certification:

TA Luft Emissions



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514; 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions: DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 60% relative humidity JIS D1005-1978: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure. Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g). Air intake restriction: 10 in. H₂O (2.5 kPa) Exhaust back pressure: 15 in. H₂O (3.7 kPa)	Conversion Factors: Power: kW = bhp x 0.746 Fuel: L/hr = gal/hr x 3.785	Turbo: K37-4671 Injector: EUP
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Certified by: 

Curve No. E4-2165-31-3

Rev. / Date: 4 / 5-12-98

Sheet No. 1 of 2

Performance Curve

GENERATOR SPECIFICATION SHEET

PRIME POWER - 1500 r/min

General Data

Model	R163-7K38
Number of Cylinders	16
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1944 (31.88)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K37-4671
Charge Air Cooling	SCCC
Engine Crankcase Vent System	CLOSED

Physical Data

Size:	
Length - in. (mm)	86.9 (2207)
Width - in. (mm)	47.4 (1204)
Height - in. (mm)	51.4 (1306)
Weight, Dry - lb (kg)	5600 (2540)
Weight, Wet - lb (kg)	5983 (2714)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	28.8 (731)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5360100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896) *
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	337.2 (153.0)
Fuel Spill - lb/hr (kg/hr)	1932.0 (876.4)
Fuel Spill - gal/hr (L/hr)	276.4 (1056.3)
Total Fuel Flow - lb/hr (kg/hr)	2270 (1030)
Total Fuel Flow - gal/hr (L/hr)	324.7 (1229)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	454.1 (7.96)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	75 - 112 (517-772)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	102 (96.5)
Low Limit - qt (L)	84 (79.5)
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	960
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection to Coolant - Btu/min (kW)	17270 (303.6) †
Engine Heat Rejection SCCC - Btu/min (kW)	8360 (147.0) †
Engine Radiated Heat - Btu/min (kW)	5590 (98.3) †
Generator Radiated Heat - Btu/min (kW)	2291 (40.3)
Coolant Flow - gal/min (L/min)	261 (988)
Max. External Pressure Differential - lb/in. ² (kPa)	5 (34.5)
Coolant Flow SCCC - gal/min (L/min)	93.6 (354)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	5 (34.5)
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (8.8)
Engine Coolant Capacity - qt (L)	80 (75.7)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3 (11.4)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.6 (0.045)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2025 (57.3) †
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	52.0 (176.17) †
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	5580 (158.0)**
Exhaust Temperature - °F (°C)	960 (516)**
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)

Performance Data

Rated Power - bhp (kW)	965 (720)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	282.1 (1807)
Friction Power - fhp (kW)	94 (70)
Altitude Capability - ft (m)	10200 (3190)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	3.7 (14.16)
25% Power	11.8 (44.6)
50% Power	23.1 (87.6)
75% Power	33.8 (127.3)
100% Power	47.4 (179.5)
110% Power	51.6 (195.5)

Emissions Data

Noise - dB(A) @ 1m	102.0
Additional Noise Data	N1-2165-31-6
Smoke - Bosch Number	0.5

Load 10% 25% 50% 75% 100%

NO _x - g/hr	1450	2260	3695	3930	3755
CO - g/hr	287	206	200	351	470
HC - g/hr	138	119	110	115	105
SO ₂ - g/hr	223	480	845	1128	1533
Particulates - g/hr	82.5	106	53.5	39	77

TA Luft	10%	25%	50%	75%	100%
NO _x - mg/(m ³)	4375	4490	3810	2720	1855
CO - mg/(m ³)	766	366	186	224	214
HC - mg/(m ³)	369	212	102	73	48
Particulates - mg/(m ³)	270	240	77	50	93

Curve No. E4-2165-31-3

Rev. / Date: 4 / 5-12-98

Sheet No. 2 of 2

All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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Generator Set Power

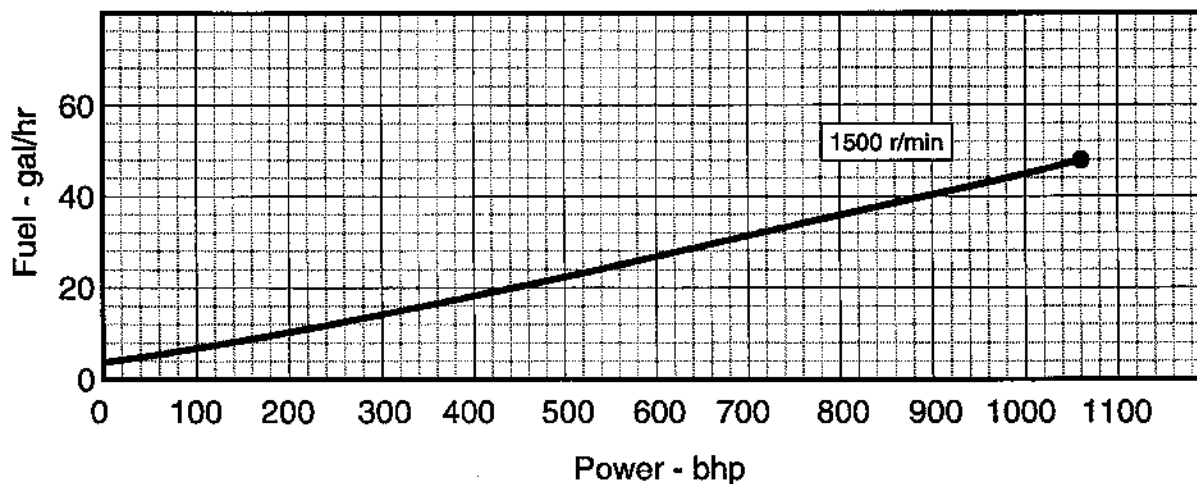
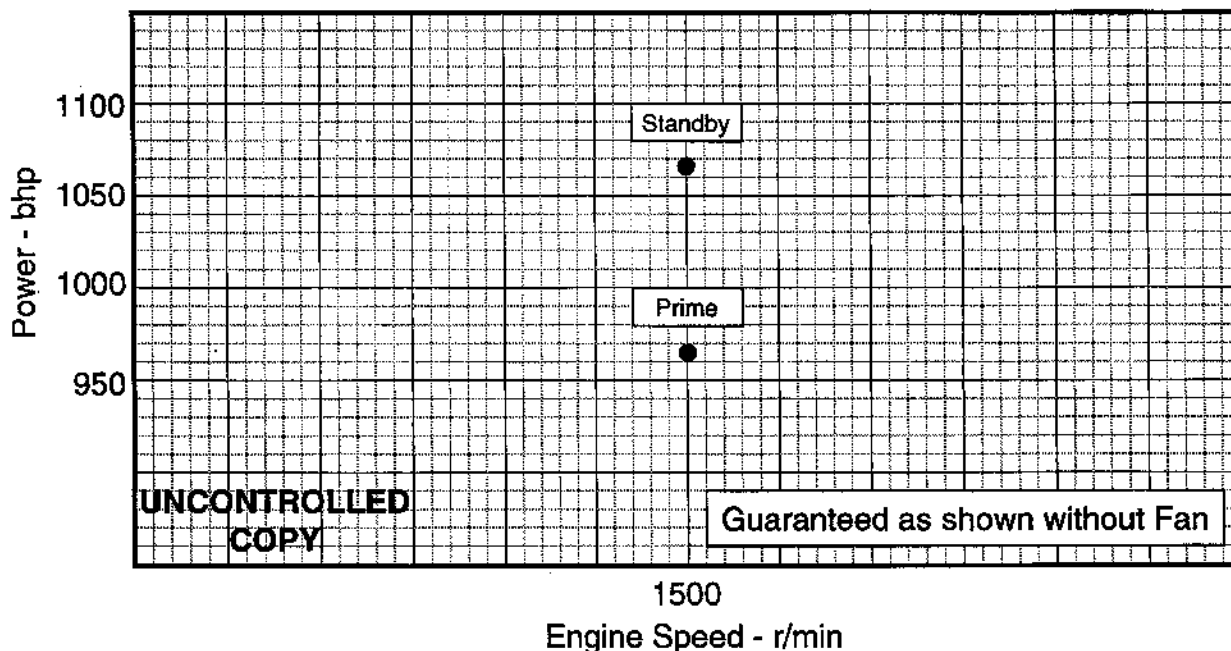
Model: 16V-2000 G60

Standby Rating:

1066 bhp (795 kW) @ 1500 r/min

Prime Rating :

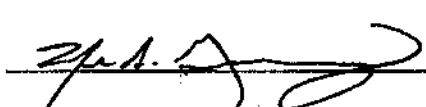
965 bhp (720 kW) @ 1500 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions:
DIN 6270: 738 torr barometric pressure, 20 °C air inlet, 60% relative humidity
JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.
Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust back pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:
Power: kW = bhp x 0.746
Fuel: L/hr = gal/hr x 3.785

Turbo: K37-4671
Injector: EUP

Certified by: 

Curve No. E4-2165-31-4
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Sheet No. 1 of 3

Performance Curve

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1500 r/min

General Data

Model	R163-7K08
Number of Cylinders	16
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1944 (31.88)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K37-4671
Charge Air Cooling	SCCC
Engine Crankcase Vent System	CLOSED

Physical Data

Size:	
Length - in. (mm)	86.9 (2207)
Width - in. (mm)	47.4 (1204)
Height - in. (mm)	51.4 (1306)
Weight, Dry - lb (kg)	5600 (2540)
Weight, Wet - lb (kg)	5983 (2714)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	28.8 (731)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5360100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	347.2 (157.5)
Fuel Spill - lb/hr (kg/hr)	1925 (899.8)
Fuel Spill - gal/hr (L/hr)	270.7 (1025)
Total Fuel Flow - lb/hr (kg/hr)	2272 (1031)
Total Fuel Flow - gal/hr (L/hr)	319.5 (1210)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	538 (9.46)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	75 - 112 (517-772)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	102 (96.5)
Low Limit - qt (L)	84 (79.5)
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection to Coolant - Btu/min (kW)	17056 (300.0)
Engine Heat Rejection SCCC - Btu/min (kW)	7507 (132.0)
Engine Radiated Heat - Btu/min (kW)	5680 (99.9)
Generator Radiated Heat - Btu/min (kW)	2531 (44.5)
Coolant Flow - gal/min (L/min)	262 (992)
Max. External Pressure Differential - lb/in. ² (kPa)	5 (34.5)
Coolant Flow SCCC - gal/min (L/min)	93.5 (354)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	5 (34.5)
Thermostat	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	80 (75.7)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	180 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3.0 (11.4)
Cooling Index @ 110°F Ambient w/H ₂ O @ Sea Level	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.6 (0.045)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1950 (55.2)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	49.0 (165.9)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	5350 (151.5)
Exhaust Temperature - °F (°C)	955 (513)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)

Performance Data

Rated Power - bhp (kW)	1068 (795)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	289.5 (1996)
Friction Power - fhp (kW)	94 (70)
Altitude Capability - ft (m)	10000 (3048)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	3.7 (14.16)
25% Power	12.7 (48.2)
50% Power	24.3 (92.1)
75% Power	36.3 (137.2)
100% Power	48.8 (184.8)

Emissions Data

Noise - dB(A) @ 1m	101.8
Additional Noise Data	N1-2165-31-5
Smoke - Bosch Number	0.1

Load

	10%	25%	50%	75%	100%
NO _x - g/hr	1445	2515	3925	5135	5360
CO - g/hr	287	201	218	398	816
HC - g/hr	138	114	110	106.5	82
SO ₂ - g/hr	223	410	784	1170	1575
Particulates - g/hr	82.4	80	56.4	47	40.6

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2165-31-4
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Sheet No. 2 of 3

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GENERATOR SPECIFICATION SHEET

PRIME POWER - 1500 r/min

General Data

Model	R163-7K08
Number of Cylinders	16
Bore and Stroke - In. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - In. ³ (L)	1944 (31.88)
Compression Ratio	16.0:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K37-4871
Charge Air Cooling	SCCC
Engine Crankcase Vent System	CLOSED

Physical Data

Size:	
Length - in. (mm)	86.9 (2207)
Width - in. (mm)	47.4 (1204)
Height - in. (mm)	51.4 (1306)
Weight, Dry - lb (kg)	5600 (2540)
Weight, Wet - lb (kg)	5983 (2714)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	28.8 (731)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5360100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	311.5 (141.3)
Fuel Spill - lb/hr (kg/hr)	1962 (890)
Fuel Spill - gal/hr (L/hr)	276 (1045)
Total Fuel Flow - lb/hr (kg/hr)	2273.5 (1031)
Total Fuel Flow - gal/hr (L/hr)	319.8 (1210)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel- Btu/min (kW)	576 (10.1)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	75 - 112 (517-772)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	102 (96.5)
Low Limit - qt (L)	84 (79.5)
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit	
24 Volt System - ohms	0.002

* With outboard support bearing

Cooling System

Engine Heat Rejection to Coolant- Btu/min (kW)	15922 (280)
Engine Heat Rejection SCCC - Btu/min (kW)	5970 (105)
Engine Radiated Heat - Btu/min (kW)	5140 (90.4)
Generator Radiated Heat - Btu/min (kW)	2291 (40.3)
Coolant Flow - gal/min (L/min)	262 (992)
Max. External Pressure Differential - lb/in. ² (kPa)	5 (34.5)
Coolant Flow SCCC - gal/min (L/min)	93.5 (354)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	5 (34.5)
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	80 (75.7)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3.0 (11.4)
Cooling Index (@ 110 °F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.6 (0.045)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	1770 (50.1)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	41.2 (139.5)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	4800 (135.9)
Exhaust Temperature - °F (°C)	940 (504)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)

Performance Data

Rated Power - bhp (kW)	965 (720)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	262.1 (1807)
Friction Power - fhp (kW)	94 (70)
Altitude Capability - ft (m)	10000 (3048)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	3.7 (14.16)
25% Power	12.0 (45.3)
50% Power	22.1 (83.7)
75% Power	32.7 (123.9)
100% Power	43.8 (165.9)

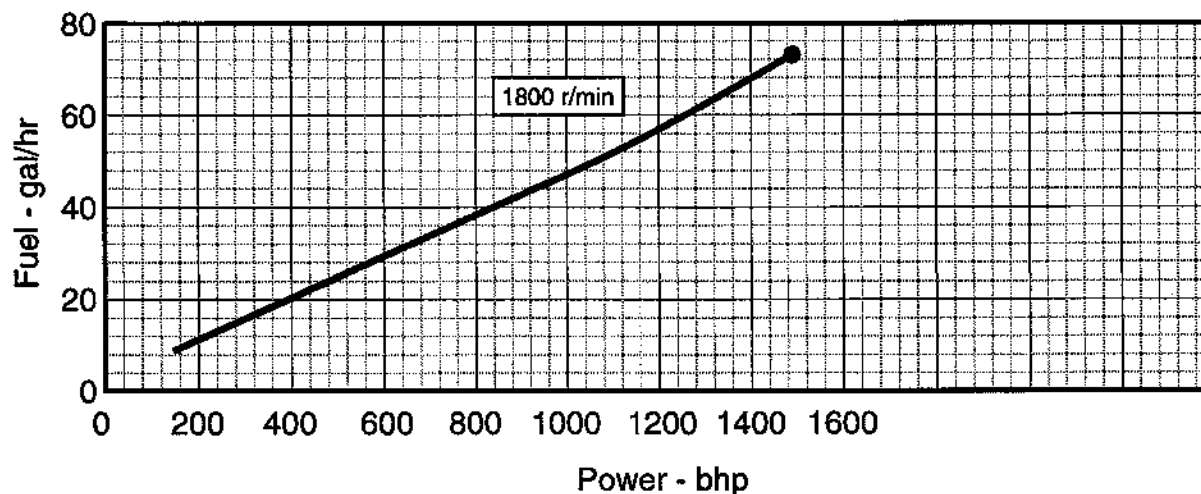
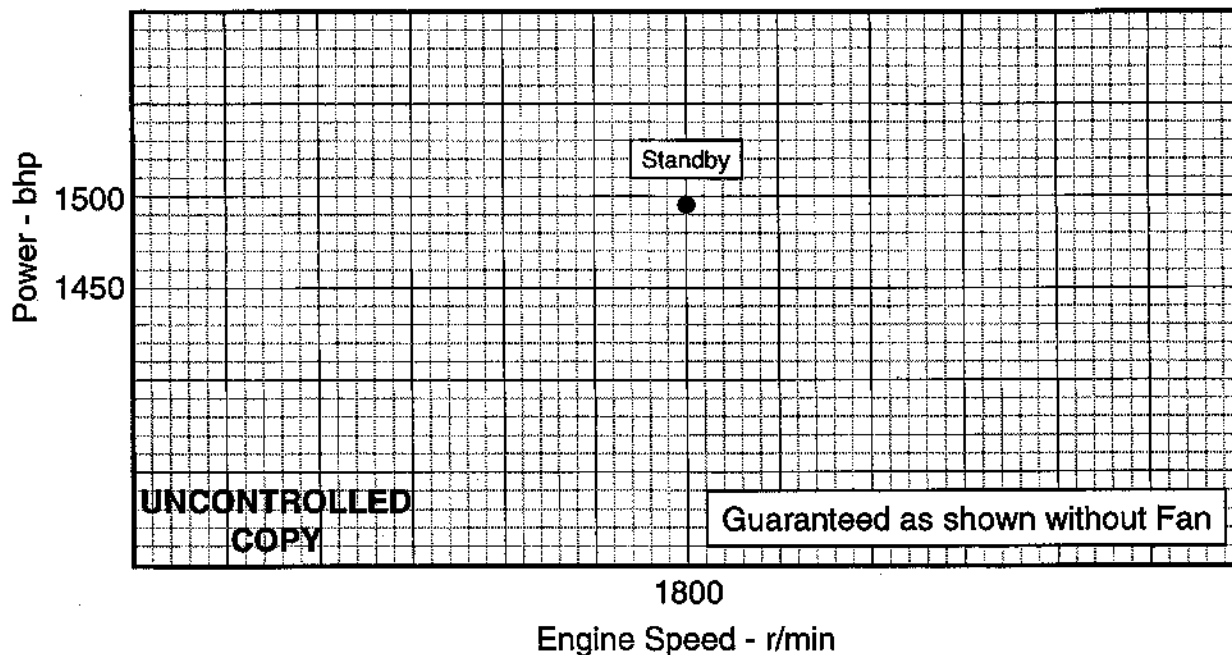
Emissions Data

Noise - dB(A) @ 1m	101.4
Additional Noise Data	N1-2165-31-6
Smoke - Bosch Number	0.1

Load	10%	25%	50%	75%	100%
NO _x - g/hr	1445	2255	3690	4995	5335
CO - g/hr	287	206	199	313	680
HC - g/hr	138	119	109.4	107.6	97
SO ₂ - g/hr	223	386	713	1056	1413
Particulates - g/hr	82.4	106	53.5	45.7	69.5

Values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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Generator Set Power**Model:** 16V-2000 G81**Standby Rating:** 1495 bhp (1115 kW) @ 1800 r/min

Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity.
Curves also represent capabilities at the following ambient conditions:
DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 60% relative humidity
JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.
Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).
Air Intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust back pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: TD13M-43QV22RC**Injector:** EUP**Certified by:****Curve No.** E4-2165-31-5**Rev. / Date:** 2 / 10-26-98**Sheet No.** 1 of 2**Performance Curve**

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1800 r/min

General Data

Model	R163-7K06
Number of Cylinders	16
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1944 (31.88)
Compression Ratio	14.5:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	TD-13M-43QV22RC
Charge Air Cooling	SCCC
Engine Crankcase Vent System	CLOSED

Physical Data

Size:	
Length - in. (mm)	86.9 (2207)
Width - in. (mm)	47.4 (1204)
Height - in. (mm)	51.4 (1306)
Weight, Dry - lb (kg)	5600 (2540)
Weight, Wet - lb (kg)	5983 (2714)
Center of Gravity Distances:	
From R.F.O.B. (x axis) - in. (mm)	28.8 (731)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5360100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	520.4 (236.0)
Fuel Spill - lb/hr (kg/hr)	2150 (975.2)
Fuel Spill - gal/hr (L/hr)	302.4 (1145)
Total Fuel Flow - lb/hr (kg/hr)	2670 (1031)
Total Fuel Flow - gal/hr (L/hr)	375.5 (1422)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	502 (8.83)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	75 - 112 (517-772)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	102 (96.5)
Low Limit - qt (L)	84 (79.5)
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection to Coolant - Btu/min (kW)	22865 (402.1)
Engine Heat Rejection SCCC - Btu/min (kW)	15440 (271.5)
Engine Radiated Heat - Btu/min (kW)	7490 (131.7)
Generator Radiated Heat - Btu/min (kW)	2531 (44.5)
Coolant Flow - gal/min (L/min)	315 (1192)
Max. External Pressure Differential - lb/in. ² (kPa)	8 (55.2)
Coolant Flow SCCC - gal/min (L/min)	113.5 (430)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	8 (55.2)
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	80 (75.7)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3.0 (11.4)
Cooling Index (@ 110°F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.6 (0.045)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	3075 (87.1)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	65.5 (221.8)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	8780 (248.6)
Exhaust Temperature - °F (°C)	1015 (546)
Maximum Back Pressure - in. Hg (kPa)	2.5 (8.5)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)

Performance Data

Rated Power - bhp (kW)	1495 (1115)
Rated Speed - r/min	1800
BMEP - lb/in. ² (kPa)	338.4 (2333)
Friction Power - fhp (kW)	133 (99)
Altitude Capability - ft (m)	7500 (2286)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	5.8 (22.1)
25% Power	20.5 (77.5)
50% Power	36.7 (138.9)
75% Power	53.4 (202.32)
100% Power	73.2 (277.0)

Emissions Data

Noise - dB(A) @ 1m	103.6
Additional Noise Data	N1-2165-31-11
Smoke - Bosch Number	0.7

Load 10% 25% 50% 75% 100%

NO _x - g/hr	1685	1890	3395	5750	6010
CO - g/hr	705	449	560	868	1660
HC - g/hr	199	155	160	175	158
SO ₂ - g/hr	320	660	1184	1723	2360
Particulates - g/hr	86	58.7	73.7	175	426

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2165-31-5
Rev. / Date: 2 / 10-26-98
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Generator Set Power

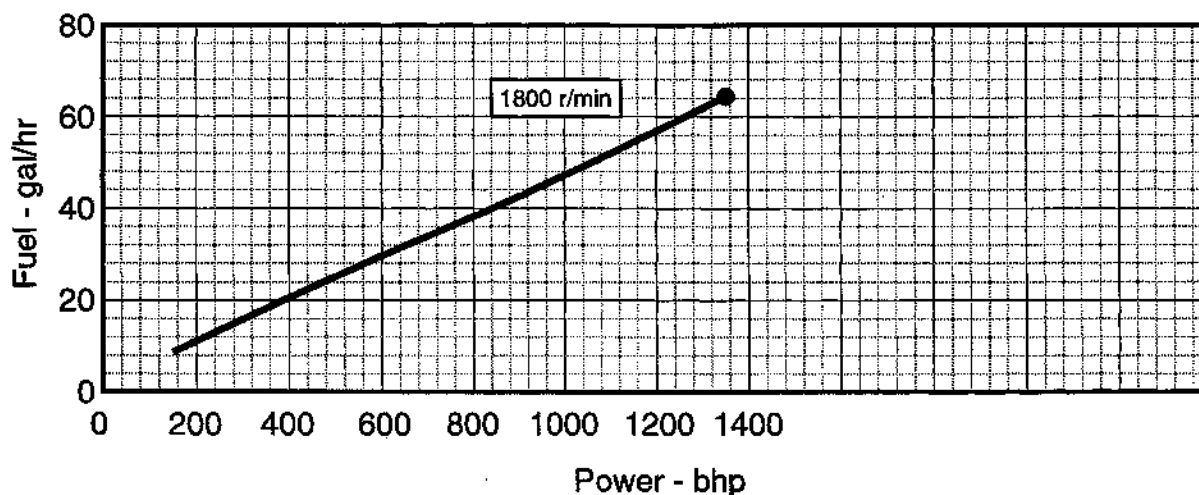
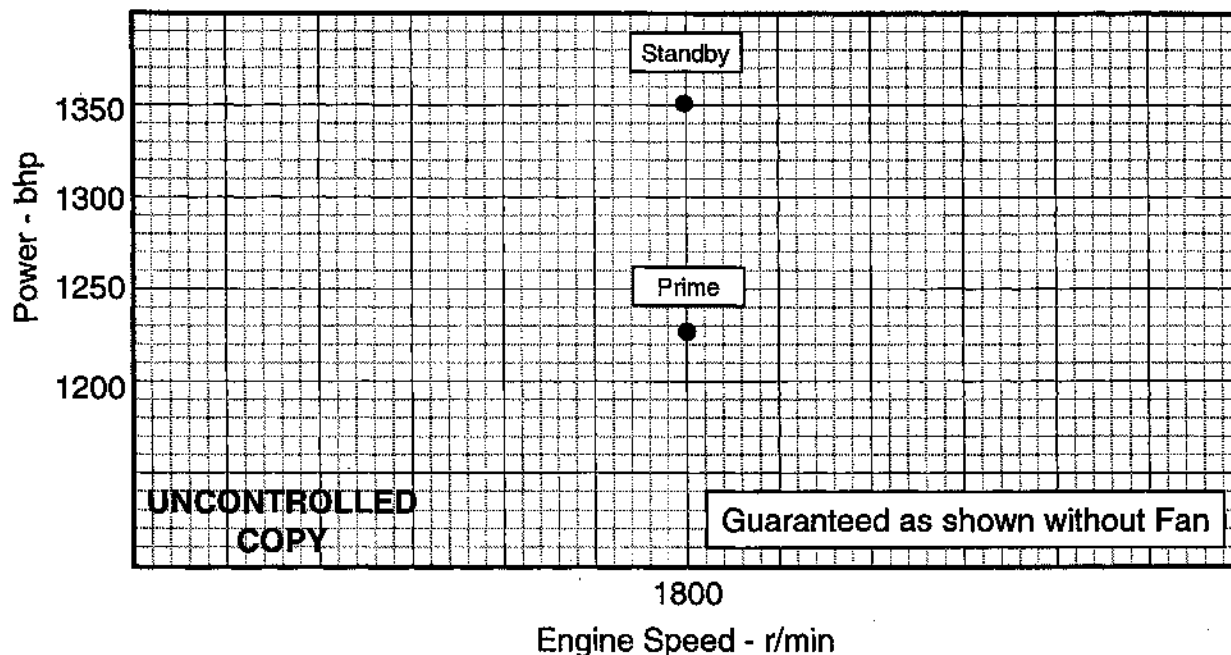
Model: 16V-2000 G80

Standby Rating:

1350 bhp (1007 kW) @ 1800 r/min

Prime Rating:

1227 bhp (915 kW) @ 1800 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions:
DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 80% relative humidity
JIS D1005-1976: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure.
Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (.85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g).
Air intake restriction: 10 in. H₂O (2.5 kPa)
Exhaust back pressure: 15 in. H₂O (3.7 kPa)

Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: TD13M-43QV22RC

Injector: EUP

Certified by: 

Curve No. E4-2165-31-6

Rev. / Date: 1 / 10-22-98

Sheet No. 1 of 3

Performance Curve

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1800 r/min

General Data

Model	R163-7K06
Number of Cylinders	16
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1944 (31.88)
Compression Ratio	14.5:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	TD-13M-43QV22HC
Charge Air Cooling	SCCC
Engine Crankcase Vent System	CLOSED

Physical Data

Size:	
Length - in. (mm)	86.9 (2207)
Width - in. (mm)	47.4 (1204)
Height - in. (mm)	51.4 (1308)
Weight, Dry - lb (kg)	5600 (2540)
Weight, Wet - lb (kg)	5983 (2714)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	28.8 (731)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5360100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	459.7 (208.5)
Fuel Spill - lb/hr (kg/hr)	2210 (1002.6)
Fuel Spill - gal/hr (L/hr)	310.8 (1177)
Total Fuel Flow - lb/hr (kg/hr)	2670 (1031)
Total Fuel Flow - gal/hr (L/hr)	375.5 (1422)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	513 (9.02)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	75 - 112 (517-772)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	102 (96.5)
Low Limit - qt (L)	84 (79.5)
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

Cooling System

Engine Heat Rejection to Coolant - Btu/min (kW)	21500 (378.1)
Engine Heat Rejection SCCC - Btu/min (kW)	12300 (216.3)
Engine Radiated Heat - Btu/min (kW)	6620 (116.4)
Generator Radiated Heat - Btu/min (kW)	2531 (44.5)
Coolant Flow - gal/min (L/min)	315 (1192)
Max. External Pressure Differential - lb/in. ² (kPa)	8 (55.2)
Coolant Flow SCCC - gal/min (L/min)	113.5 (430)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	8 (55.2)
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	80 (75.7)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3.0 (11.4)
Cooling Index @ 110°F Ambient w/H ₂ O @ Sea Level	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.6 (0.045)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2800 (79.3)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	54.0 (182.8)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	7960 (225.4)
Exhaust Temperature - °F (°C)	1010 (543)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)

Performance Data

Rated Power - bhp (kW)	1350 (1007)
Rated Speed - r/min	1800
BMEP - lb/in. ² (kPa)	305.8 (2107)
Friction Power - fhp (kW)	133 (99)
Altitude Capability - ft (m)	10000 (3048)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	5.8 (22.1)
25% Power	18.5 (68.0)
50% Power	33.5 (106.5)
75% Power	48.5 (155.5)
100% Power	64.7 (244.7)

Emissions Data

Noise - dB(A) @ 1m	103.4
Additional Noise Data	N1-2165-31-10
Smoke - Bosch Number	0.7

Load

	10%	25%	50%	75%	100%
NO _x - g/hr	1665	1830	2950	5100	6120
CO - g/hr	705	470	480	740	1190
HC - g/hr	199	165	158	173	166
SO ₂ - g/hr	320	612	1080	1564	2085
Particulates - g/hr	86	70	68	150	385

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2165-31-6
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GENERATOR SPECIFICATION SHEET

PRIME POWER - 1800 r/min

General Data

Model	R163-7K06
Number of Cylinders	16
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1944 (31.88)
Compression Ratio	14.5:1
Piston Speed - ft/min (m/min)	1772 (540)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	TD-13M-43QV22RC
Charge Air Cooling	SCCC
Engine Crankcase Vent System	CLOSED

Physical Data

Size:	
Length - in. (mm)	86.9 (2207)
Width - in. (mm)	47.4 (1204)
Height - in. (mm)	51.4 (1306)
Weight, Dry - lb (kg)	5600 (2540)
Weight, Wet - lb (kg)	5983 (2714)
Center of Gravity Distances:	
From R.F.O.B. (x axis) - in. (mm)	28.8 (731)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5360100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	415.0 (188.2)
Spill - lb/hr (kg/hr)	2255 (1023)
Spill - gal/hr (L/hr)	317.2 (1201)
Total Fuel Flow - lb/hr (kg/hr)	2670 (1031)
Total Fuel Flow - gal/hr (L/hr)	375.5 (1422)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	470 (8.26)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	75 - 112 (517-772)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	102 (96.5)
Low Limit - qt (L)	84 (79.5)
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

* With outboard support bearing

Cooling System

Engine Heat Rejection to Coolant - Btu/min (kW)	20000 (351.7)
Engine Heat Rejection SCCC - Btu/min (kW)	9500 (167.1)
Engine Radiated Heat - Btu/min (kW)	6620 (116.4)
Generator Radiated Heat - Btu/min (kW)	2531 (44.5)
Coolant Flow - gal/min (L/min)	315 (1192)
Max. External Pressure Differential - lb/in. ² (kPa)	8 (55.2)
Coolant Flow SCCC - gal/min (L/min)	113.5 (430)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	8 (55.2)
Thermostat	Full Blocking
Start to Open - °F (°C)	180 (71)
Fully Open - °F (°C)	185 (85)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	80 (75.7)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3.0 (11.4)
Cooling Index @ 110°F Ambient w/H ₂ O @ Sea Level	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.6 (0.045)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2450 (69.4)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	45.3 (153.4)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	6880 (194.8)
Exhaust Temperature - °F (°C)	990 (532)
Maximum Back Pressure - in. Hg (kPa)	3.0 (10.1)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)

Performance Data

Rated Power - bhp (kW)	1227 (915)
Rated Speed - r/min	1800
BMEP - lb/in. ² (kPa)	277.8 (1915)
Friction Power - fhp (kW)	133 (99)
Altitude Capability - ft (m)	10000 (3048)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	5.8 (22.1)
25% Power	17.6 (66.7)
50% Power	30.8 (116.4)
75% Power	44.5 (168.3)
100% Power	58.4 (221.0)

Emissions Data

Noise - dB(A) @ 1m	102.8
Additional Noise Data	N1-2165-31-13
Smoke - Bosch Number	0.7

Load	10%	25%	50%	75%	100%
NO _x - g/hr	1685	1740	2780	4050	5930
CO - g/hr	705	510	465	640	980
HC - g/hr	199	171	157	169	172
SO ₂ - g/hr	320	568	992	1434	1882
Particulates - g/hr	86	81	59	116	260

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

Curve No. E4-2165-31-6
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Generator Set Power

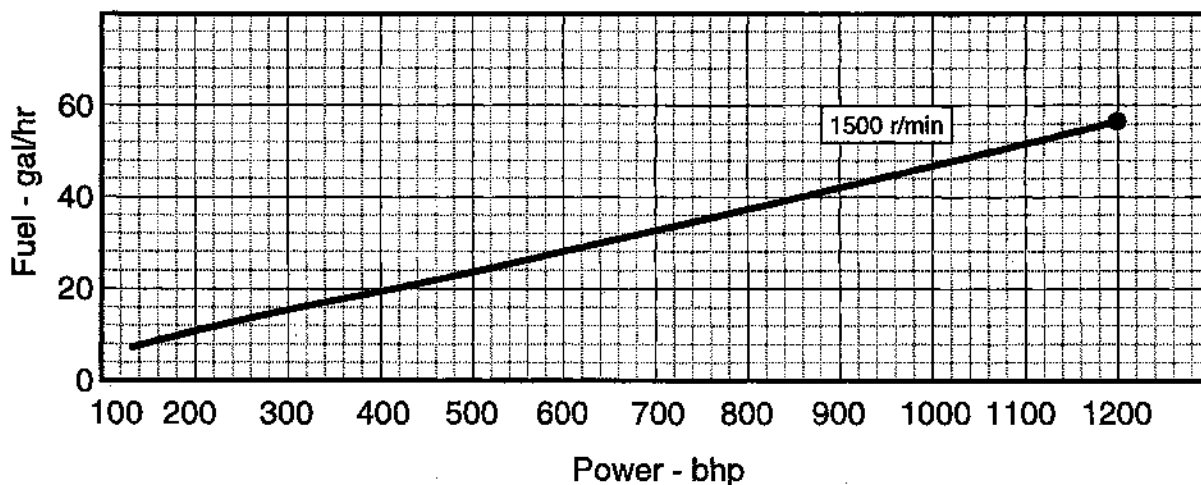
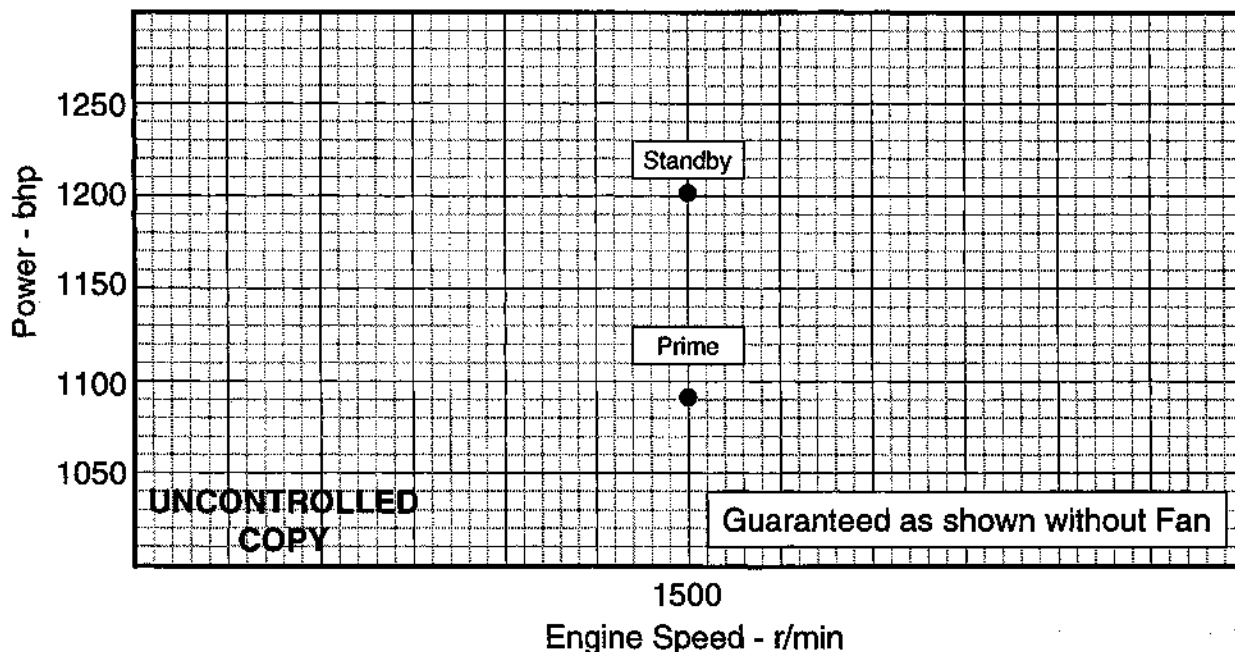
Model: 16V-2000 G61

Standby Rating:

1200 bhp (895 kW) @ 1500 r/min

Prime Rating:

1091 bhp (814 kW) @ 1500 r/min



Rated power output shown represents engine performance capabilities at ambient conditions equivalent to ISO 3046, BS5514: 100 kPa total barometric pressure, 25°C air inlet temperature, 30% relative humidity. Curves also represent capabilities at the following ambient conditions: DIN 6270: 736 torr barometric pressure, 20 °C air inlet, 60% relative humidity JIS D1005-1978: 760 MM Hg barometric pressure, 20 °C air inlet, 11.4 mm Hg vapor pressure. Fuel consumption data is based on diesel fuel No.2 with a fuel weight of 7.11 lb/U.S. gal (85kg/liter). Fuel heating value is 18370 Btu/lb (1.02 kcal/g). Air intake restriction: 10 in. H₂O (2.5 kPa) Exhaust back pressure: 15 in. H₂O (3.7 kPa)

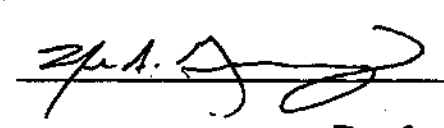
Conversion Factors:

Power: kW = bhp x 0.746

Fuel: L/hr = gal/hr x 3.785

Turbo: K37-4671

Injector: EUP

Certified by: 

Curve No. E4-2165-31-7

Rev. / Date: 2 / 12-8-98

Sheet No. 1 of 3

Performance Curve

GENERATOR SPECIFICATION SHEET

STANDBY POWER - 1500 r/min

General Data

Model	R163-7K06
Number of Cylinders	16
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1944 (31.88)
Compression Ratio	14.5:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K37-4671
Charge Air Cooling	SCCC
Engine Crankcase Vent System	CLOSED

Physical Data

Size:	
Length - in. (mm)	86.9 (2207)
Width - in. (mm)	47.4 (1204)
Height - in. (mm)	51.4 (1306)
Weight, Dry - lb (kg)	5600 (2540)
Weight, Wet - lb (kg)	5983 (2714)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	28.8 (731)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5360100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	403.0 (182.8)
Fuel Spill - lb/hr (kg/hr)	1869 (847.8)
Fuel Spill - gal/hr (L/hr)	262.9 (995.1)
Total Fuel Flow - lb/hr (kg/hr)	2272 (1031)
Total Fuel Flow - gal/hr (L/hr)	319.5 (1210)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	409 (7.19)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	75 - 112 (517-772)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	102 (96.5)
Low Limit - qt (L)	84 (79.5)
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

* With outboard support bearing

Cooling System

Engine Heat Rejection to Coolant - Btu/min (kW)	19745 (347.2)
Engine Heat Rejection SCCC - Btu/min (kW)	10375 (182.4)
Engine Radiated Heat - Btu/min (kW)	5800 (102.0)
Generator Radiated Heat - Btu/min (kW)	2531 (44.5)
Coolant Flow - gal/min (L/min)	262 (992)
Max. External Pressure Differential - lb/in. ² (kPa)	5 (34.5)
Coolant Flow SCCC - gal/min (L/min)	93.5 (354)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	5 (34.5)
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	80 (75.7)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max Intercooler Coolant Out Temperature - °F (°C)	167 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3.0 (11.4)
Cooling Index (@ 110°F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.6 (0.045)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2320 (65.7)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	57.0 (193.0)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	6380 (180.7)
Exhaust Temperature - °F (°C)	960 (516)
Maximum Back Pressure - in. Hg (kPa)	2.5 (8.5)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)

Performance Data

Rated Power - bhp (kW)	1200 (895)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	326.0 (2247)
Friction Power - fhp (kW)	94 (70)
Altitude Capability - ft (m)	10000 (3048)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	3.7 (14.16)
25% Power	15.4 (58.4)
50% Power	28.3 (107.3)
75% Power	41.9 (152.4)
100% Power	56.7 (214.6)

Emissions Data

Noise - dB(A) @ 1m	102.1
Additional Noise Data	N1-2165-31-9
Smoke - Bosch Number	0.1

Load	10%	25%	50%	75%	100%
NO _x - g/hr	1355	2030	3350	4115	5040
CO - g/hr	381	267	682	1885	2400
HC - g/hr	156	120	127	66	133
SO ₂ - g/hr	223	498	914	1353	1828
Particulates - g/hr	85	49	85	223	441

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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GENERATOR SPECIFICATION SHEET

PRIME POWER - 1500 r/min

General Data

Model	R163-7K08
Number of Cylinders	16
Bore and Stroke - in. x in. (mm x mm)	5.12 x 5.91 (130 x 150)
Displacement - in. ³ (L)	1944 (31.88)
Compression Ratio	14.5:1
Piston Speed - ft/min (m/min)	1476 (450)
Intake Valves Per Cylinder	2
Exhaust Valves Per Cylinder	2
Combustion System	DIRECT INJECTION
Engine Type	90° VEE 4 CYCLE
Aspiration	TURBOCHARGED

Configuration

Injection Device	EUP
Turbocharger	K37-4671
Charge Air Cooling	SCCC
Engine Crankcase Vent System	CLOSED

Physical Data

Size:	
Length - in. (mm)	86.9 (2207)
Width - in. (mm)	47.4 (1204)
Height - in. (mm)	51.4 (1306)
Weight, Dry - lb (kg)	5600 (2540)
Weight, Wet - lb (kg)	5983 (2714)
Center of Gravity Distance:	
From R.F.O.B. (x axis) - in. (mm)	28.8 (731)
Above Crankshaft (y axis) - in. (mm)	6.3 (160)
Right of Crankshaft (z axis) - in. (mm)	0.8 (20.3)
Installation Drawing	5360100301

Mechanical Data

Thrust Bearing Load Limit, Continuous - lb (N)	1800 (8007)
Thrust Bearing Load Limit, Intermittent - lb (N)	1800 (8007)
Maximum Static Bending Moment at Rear	
Face of Block - lb-ft (N-m)	1000 (1356)
Maximum Vertical Load at	
Rear Face of Flywheel - lb (N)	2000 (8896)*
Additional Mechanical Data	Not Available

Fuel System

Fuel Pump	5235920
Fuel Consumption - lb/hr (kg/hr)	362.5 (164.4)
Spill - lb/hr (kg/hr)	1909.5 (866.1)
Spill - gal/hr (L/hr)	268.6 (1017)
Total Fuel Flow - lb/hr (kg/hr)	2272 (1031)
Total Fuel Flow - gal/hr (L/hr)	319.5 (1210)
Maximum Fuel Inlet Temperature - °F (°C)	140 (60)
Heat Rejection to Fuel - Btu/min (kW)	409 (7.19)
Maximum Fuel Pump Suction:	
Clean System - in. Hg (kPa)	6 (20.3)
Dirty System - in. Hg (kPa)	12 (41)
Fuel Filter Size, Primary - Microns	25
Fuel Filter Size, Secondary - Microns	8

Lubrication System

Oil Pressure at Rated Speed - lb/in. ² (kPa)	75 - 112 (517-772)
Oil Pressure at Low Idle - lb/in. ² (kPa)	40 (276)
In Pan Oil Temperature - °F (°C)	200 - 250 (93 - 121)
Oil Flow - gal/min (L/min)	Not Available
Oil Pan Capacity: > 24 Hour Operation	
High Limit - qt (L)	102 (96.5)
Low Limit - qt (L)	84 (79.5)
Total Engine Oil Capacity with Filters - qt (L)	114 (107.9)
Engine Angularity Limits, Front Up - Degrees	30
Engine Angularity Limits, Front Down - Degrees	30
Engine Angularity Limits, Side Tilt - Degrees	30

Electrical System

Recommended Battery Capacity (CCA @ 0°F):	
24 Volt System, Above 32°	950
24 Volt System, Below 32°	1250
Maximum Resistance of Starting Circuit:	
24 Volt System - ohms	0.002

* With outboard support bearing

Cooling System

Engine Heat Rejection to Coolant - Btu/min (kW)	18190 (319.9)
Engine Heat Rejection SCCC - Btu/min (kW)	8265 (145.3)
Engine Radiated Heat - Btu/min (kW)	5800 (102.0)
Generator Radiated Heat - Btu/min (kW)	2531 (44.5)
Coolant Flow - gal/min (L/min)	282 (992)
Max. External Pressure Differential - lb/in. ² (kPa)	5 (34.5)
Coolant Flow SCCC - gal/min (L/min)	93.5 (354)
Maximum Separate Circuit External Pressure	
Differential - lb/in. ² (kPa)	5 (34.5)
Thermostat:	Full Blocking
Start to Open - °F (°C)	160 (71)
Fully Open - °F (°C)	185 (85)
Maximum Water Pump Inlet Restriction:	
Rapid Warmup Radiator	POSITIVE
Conventional Radiator - in. Hg (kPa)	2.0 (6.8)
Engine Coolant Capacity - qt (L)	80 (75.7)
Minimum Pressure Cap - lb/in. ² (kPa)	14 (96.5)
Maximum Coolant Pressure	
Static Head - ft (m)	50 (15.2)
Maximum Top Tank Temperature - °F (°C)	210 (99)
Minimum Top Tank Temperature - °F (°C)	160 (71)
Maximum Ambient to Intercooler Coolant Out	
Temperature Rise - °F (°C)	45 (25)
Max Intercooler Coolant Out Temperature - °F (°C)	187 (75)
Minimum Coolant Fill Rate - gal/min (L/min)	3.0 (11.4)
Cooling Index (@ 110°F Ambient w/H ₂ O @ Sea Level)	
Maximum Air to Water Differential - °F (°C)	100 (56)
Air Handling Capacity - ft ³ /min (m ³ /min)	1.6 (0.045)
Minimum Drawdown Requirement - qt (L)	8% of cooling system
Deaeration Time - Minutes	30

Air System

Maximum Temperature Rise	
(Ambient Air to Engine Inlet) - °F (°C)	30 (16.7)
Maximum Air Intake Restriction:	
Clean Air Cleaner - in. H ₂ O (kPa)	12 (3.0)
Dirty Air Cleaner - in. H ₂ O (kPa)	20 (5.0)
Engine Air Flow - ft ³ /min (m ³ /min)	2055 (58.2)
Fan Air Flow - ft ³ /min (m ³ /min)	Customer Supplied
Intake Manifold Pressure - in. Hg (kPa)	48.5 (164.2)
Recommended Intake Pipe Outer Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)
Maximum Crankcase Pressure - in. H ₂ O (kPa)	4.0 (1.0)

Exhaust System

Exhaust Flow - ft ³ /min (m ³ /min)	5600 (158.6)
Exhaust Temperature - °F (°C)	945 (507)
Maximum Back Pressure - in. Hg (kPa)	2.5 (8.5)
Recommended Exhaust Pipe Diameter:	
Single - in. (mm)	Not Applicable
Dual - in. (mm)	8.0 (203)

Performance Data

Rated Power - bhp (kW)	1091 (814)
Rated Speed - r/min	1500
BMEP - lb/in. ² (kPa)	296.4 (2044)
Friction Power - fhp (kW)	94 (70)
Altitude Capability - ft (m)	10000 (3048)

Part Load Fuel Consumption

Fuel - gal/hr (L/hr) - 0% Power	3.7 (14.18)
25% Power	14.4 (54.5)
50% Power	26.0 (98.4)
75% Power	38.2 (144.5)
100% Power	51.0 (193.0)

Emissions Data

Noise - dB(A) @ 1m	101.9
Additional Noise Data	N1-2165-31-12
Smoke - Bosch Number	0.1

Load	10%	25%	50%	75%	100%
NO _x - g/hr	1355	1950	3100	3830	4984
CO - g/hr	381	275	610	1740	2223
HC - g/hr	156	123	125	76	124
SO ₂ - g/hr	223	465	839	1231	1644
Particulates - g/hr	85	49	78	180	392

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All values are at rated speed and power at SAE J1995 with standard engine hardware, unless otherwise noted.

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ENGINE SERVICE FLUID AND FILTER REQUIREMENTS

DETROIT DIESEL

Lubricating Oil, Fuel, and Filters



Engine Requirements

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Introduction

This publication specifies the type of fuels, lubricants, filters, and related maintenance intervals required for most diesel-fueled engines manufactured and marketed by Detroit Diesel Corporation. For information on fuels, lubricants, and filters required for DDC® engines using alternate fuels (other than diesel fuel), and other engine products not covered in this publication, refer to the specific publications for those engines.

Selection of the proper quality of fuel, lubricating oil and filters in conjunction with required oil and filter maintenance is required to achieve the long and trouble-free service which Detroit Diesel® engines are designed to provide. Conversely, operation with improper fuels, lubricants, and filters can degrade engine performance and may void the manufacturer's warranty.

It is Detroit Diesel Corporation policy to build engines that will operate satisfactorily with fuels and lubricants generally available in the commercial market. However, not all fuels and lubricants are adequate. Product selection should be based on these requirements and consultation with a reliable supplier who understands the equipment and its application.

Lubricating Oil Requirements

Hundreds of commercial oils are marketed today, but labeling terminology differs among suppliers and can be confusing. Some marketers may claim their lubricant is suitable for all makes of diesel engines and may list the make and type, including Detroit Diesel, on their containers. Such claims by themselves are insufficient as a method of lubricant selection for Detroit Diesel engines.

The proper lubricating oil for all Detroit Diesel engines is selected based on SAE (Society of Automotive Engineers) Viscosity Grade and API (American Petroleum Institute) Service Designation. Both of these properties are displayed in the API symbol which is illustrated within the specific requirements. For most Detroit Diesel engines, the proper lubricant must possess additional requirements. Refer to the specific requirements that follow.

Four-Stroke Cycle Engines

Detroit Diesel Series 40, 40E, 50, 55, 60, 638, D700, 2000 and 4000

Lubricant Requirements

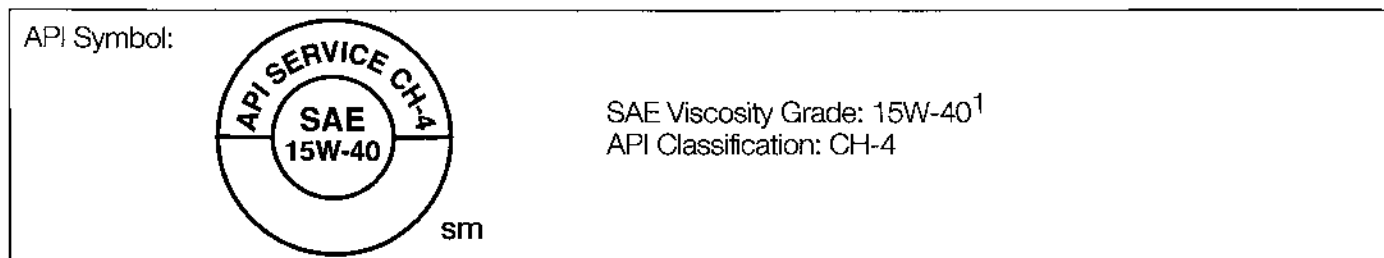


Figure 1. API Symbol: 4-Stroke Cycle Engine Oils

1. At ambient temperatures below -20°C (-4°F) when sufficient starter speed cannot be achieved with SAE 15W-40 oils, 5W-XX and 10W-XX oils, where XX is 30 or 40, may be used to improve startability, provided they are API CH-4 and have demonstrated field performance in DDC engines. These oils must possess a HT/HS Viscosity of 3.7 minimum. See the section titled "High Temperature / High Shear Viscosity" later in this publication.
2. TBN, ASTM D2896, minimum 8.0 recommended for all engines, required for Series 2000 and Series 4000 engines.
3. Engine oils meeting EMA LRG-1 and Global DHD-1 qualify for oil drain extension. See Oil Drain Interval Table 5 and sections pertaining to these specifications under Lubricating Oil Selection for more information.
4. Only API licensed oils may be used in Detroit Diesel Engines.

Lubricants meeting these criteria have provided maximum engine life when used in conjunction with specified oil drain and filter maintenance schedules.

API Service Category CH-4 is intended for use with engines meeting 1998 and later exhaust emission regulations. Compared to the older API CG-4 category, the new API CH-4 engine oils have improved performance in wear protection at higher used oil soot

levels and extended oil drain capability. Lubricants meeting API Service category CH-4 are required for use in 1998 and newer engines, and recommended for use in all Detroit Diesel Series 40™, 40E™, 50®, 55®, 60®, 638™, D700™, 2000™, and 4000™ engines.

API CG-4 oils may be used when CH-4 oils are not available, however their use may require a reduction in oil drain interval of up to 50%, depending upon the application and the fuel sulfur level. If oils of lower performance than API CH-4 are required, contact DDC for guidance.

Monograde oils, irrespective of API category, should not be used in on-road applications in any DDC 4-cycle engines, or in on- or off-road applications in Series 40E, 50, or 60 engines. Monograde oils may be used in Series 2000 and Series 4000 marine, and off-road and generator applications with closed breather systems. These oils must meet API CF or be listed in DDC Technical Service Bulletin 01-TS-07, "Oils for Closed Breather Applications."

When the use of high sulfur fuel (greater than 0.5% mass sulfur) is unavoidable, higher alkalinity (TBN) lubricants are recommended. High sulfur fuels require modification to oil drain intervals. For further information, refer to the section titled, "The Use of High Sulfur Fuels."

Two-Stroke Cycle Engines

Detroit Diesel Series 53, 71, 92, 149

Lubricant Requirements

The selection of the correct engine oil for DDC two-stroke cycle engines is dependent upon the application and fuel sulfur levels. Listed in Table 1 and listed in Table 2 are the proper engine oils. These tables should be used to select the proper engine oil.

Engine Series	Fuel Sulfur	Recommended Oil Type	
		Primary	Secondary
53, 71, 92 All Applications	Less than 0.5%	1	2, 3 or 4
	0.5 to 1.0%	1#	4
149 Marine Only	Less than 0.5%	2 or 3	4
	0.5 to 1.0%	1#	3# or 4
149 All Applications, Except Marine	Less than 0.4%	3	4
	0.4 to 1.0%	4	None

The use of oils under these conditions requires a reduction in oil drain interval. Refer to the sections of this publication titled, "Oil Drain Intervals" and "The Use of High Sulfur Fuel."

Table 1. DDC Two-Stroke Cycle Engine Requirements

After determining the required oil type for the application and anticipated fuel sulfur content, use Table 2 to identify the type of lubricant required. These are listed in Table 2. The numbers refer to notes of explanation provided beneath the table.

Oil Type	1	2	3	4
API Classification¹	CF-2	CF-2	CF-2	CF-2 or LMOA ²
Viscosity Grade³	40 ⁴	40 ⁴	50 ⁵	50 ⁵
Sulfated Ash⁶	1.0% max.	0.8% max.	0.8% max.	NS
Alkalinity (ASTM D2896)	7.0 min. ⁷	7.0 min. ⁷	7.0 min. ⁷	13.0 min.
Calcium, ppm	NS	NS	500 max.	NS
Zinc, ppm	NS ⁸	NS ⁸	NS ⁸	100 max.
Phosphorous, ppm	NS ⁸	NS ⁸	NS ⁸	100 max.

Table 2. Oil Type Specifications

1. Only oils licensed by the American Petroleum Institute are recommended in Detroit Diesel two-stroke cycle engines. Licensed oils display the API Symbol. See Figure 2.



Figure 2. API Symbol: 2-Stroke Cycle Engine Oils

2. LMOA = Locomotive Maintenance Officers' Association
3. For continuous high temperature operation (over 200°F or 94°C Coolant Out), the use of an SAE grade 50 lubricant in DDC two-stroke cycle Series 53, 71, and 92 engines is required. SAE grade 50 lubricants are also required for all Series 149 engines where ambient temperatures are above 95°F (35°C).
4. At ambient temperatures below freezing (32°F or 0°C) sufficient starter cranking speed may not be achieved to start the engine with SAE 40 grade oils. Where starting aids are not available or at very cold temperatures (0 to -25°F or -18 to -32°C) even if starting aids are available, the use of multigrade SAE 15W-40 or monograde SAE 30 lubricants will improve startability. These lubricants must possess a High Temperature - High Shear Rate Viscosity (measured by ASTM D 4741 or equivalent) of 3.70 cP minimum. **These oils must be replaced with monograde SAE 40 lubricants as soon as ambient conditions permit. Do not use multigrade or SAE 30 grade lubricants in two-stroke cycle marine engines under any circumstances.**
5. At lower ambient temperatures where sufficient starter cranking speed may not be achieved to start the engine with SAE 50 grade oils, SAE 40 grade oils may be used. SAE 50 grade oils are not recommended below 45°F ambient. **Do not use multigrade or SAE 30 grade lubricants in Series 149 engines under any circumstances.**

6. Sulfated Ash to be determined by ASTM D874. NS = Not Specified

7. Engine oils with Alkalinity between 6.5 and 7.0 may be used with demonstration of satisfactory performance and review by Detroit Diesel.

8. Not Specified, 700 ppm minimum recommended

Lubricants meeting these criteria have provided maximum engine life when used in conjunction with recommended oil drain and filter maintenance schedules.

Military specified oils (Mil-L-2104 suffixes A through G) should not be used in commercial DDC two-stroke cycle engines *unless they are API CF-2 licensed*. Engine oils meeting military specification Mil-L-2104 are intended for use in military engines. Due to the specific operating and life cycle requirements of military engines, the oils for these engines tend to be specialized toward that application. Refer to a later section titled Military Engine Oil Requirements.

A more detailed description of each of these selection criteria may be found in further sections of this publication.

Lubricating Oil Selection Criteria

Closed Breather Applications

In some applications, such as marine and power generation, engine crankcase vapors are routed into the air intake system. Some multigrade engine oil formulations have a tendency to generate vapors that condense on turbocharger and intercooler components adversely affecting the operation of the engine. The volume and composition of these vapors are dependent on the oil formulation. Monograde oils tend not to make these deposits.

A laboratory test, MTV 5040, has been found effective in predicting vaporization tendencies. The test was developed by MTU and has a passing limit of 110 mg. Since this performance test is not included as part of an API Service Category, oils meeting this requirement are listed separately in Technical Service Bulletin 01-TS-07 titled, "Oils for Closed Breather Applications."

—MA LRG-1

The Engine Manufacturers' Association has developed a *Lubricant Recommended Guideline* (LRG-1), which supports API CH-4. This guideline was developed to assist in identifying engine oils with more restrictive testing protocol than supported in API CH-4. Engine oils that meet both EMA LRG-1 and API CH-4 are preferred and should be the primary selection criteria.

Global DHD-1 Specification

Engine and equipment manufacturers from the United States, Europe, and Japan have jointly developed a global heavy duty diesel engine oil specification designated "Global DHD-1." Oils meeting this specification provide premium performance beyond API CH-4, and are recommended by Detroit Diesel for use in all 4-cycle engine products throughout the world. Engine oils meeting Global DHD-1 and EMA LRG-1 will permit extension of oil drain intervals 50% beyond those listed in Table 3.

SAE Viscosity Grade

Viscosity is a measure of an oil's ability to flow at various temperatures. The SAE Viscosity Grade system is defined in SAE Standard J300 that designates a viscosity range with a grade number. Lubricants with two grade numbers separated by a "W," such as 15W-40, are classified as multigrade, while those with a single number are monograde. The higher the number, the higher the viscosity.

The kinematic viscosity ranges with the associated SAE viscosity grade are listed in Table 3. This information is taken from SAE Standard J300 (Dec99) and is important in selecting the best viscosity grade for the anticipated temperature range. It should be used only as a guideline, since actual operating conditions of the engine may determine the lowest practical temperature at which an engine will start and operate. Note that grades designated with a "W" are required to meet both low temperature and high temperature viscosity requirements.

SAE Viscosity Grade	Viscosity (cP) at Temp. (°C), Max.		Viscosity (cSt) ASTM D445 t 100°C		High Temperature High Shear Rate Visc. @ 150°C & 10 ⁵ sec.
	Cranking ASTM D 5293	Pumping ASTM D 4684	Min.	Max.	
0W	6200 at -35	60,000 at -40	3.8	—	—
5W	6600 at -30	60,000 at -35	3.8	—	—
10W	7000 at -25	60,000 at -30	4.1	—	—
15W	7000 at -20	60,000 at -25	5.6	—	—
20W	9500 at -15	60,000 at -20	5.6	—	—
25W	13,000 at -10	60,000 at -15	9.3	—	—
20			5.6	9.3	> 2.6
30			9.3	12.5	> 2.9
40			12.5	16.3	> 3.7
50			16.3	21.9	> 3.7
60			21.9	26.1	>3.7

Table 3. SAE Viscosity Grades for Engine Oils

High Temperature / High Shear Viscosity

Unlike Kinematic Viscosity, High Temperature / High Shear (HT/HS) Viscosity is measured under conditions similar to those of an operating engine. The test is conducted at 150°C under shear stress conditions similar to very thin film lubrication areas such as found at the piston ring-to-cylinder wall interface. The value obtained from this test provides an indication of temporary shear stability of the viscosity index improver used in multigrade oils. In 15W-40 grade oils a High Temperature/High Shear viscosity below 3.7 centipoise (cP) indicates that the oil will not perform as a 40 grade oil at engine operating conditions.

API Service Classification

The American Petroleum Institute (API) has established a means of classifying lubricant performance suitable for different types of engines and types of service. Each performance classification is substantiated through engine testing. To differentiate the performance requirements of two and four stroke diesel engines, a suffix of "-2" or "-4" is used in newer diesel engine categories. Categories without a suffix may be used in either engine type under certain operating conditions, for example, with high sulfur fuel.

Engine oils intended for gasoline engines begin with "S," while those intended for diesel engines begin with "C". When both "S" and "C" categories are used, the category listed *first* identifies the primary intended usage of the oil.

The higher performance or quality for diesel engines includes API CF, CF-2, CG-4 and CH-4. Detroit Diesel does not recommend the use of older and lower performance classifications such as API CF-4, CE, CD, CC, CB, and CA due to the discontinuance of the qualifying tests.

When multiple API Service Classifications are used, make sure that the classification specified by Detroit Diesel Corporation is among those listed. Oils designated SG or SH are intended for passenger car applications. Oils without these designations are preferred in Detroit Diesel engines.

API Symbol

Lubricant marketers have adopted a uniform method of displaying the SAE viscosity and API service classification on product containers and in product literature. The three- segment "donut" contains the SAE grade number in the center and the API service in the top segment. The lower segment is used to

designate energy-conserving status for gasoline engines and has no significance for diesel engine use.

A marketer is required to license his oil with API in order to display the symbol. Be aware that some marketers may indicate their products "meet" API requirements. This is not adequate. Although the licensing process does not guarantee good oil performance, the marketer must be able to produce support data and follow established testing guidelines to substantiate that the service classification is met. *Only oils licensed by API should be used in Detroit Diesel engines. A directory of API licensees is available at the API website. See section titled "Supplemental Information" for details.*

Purchasing Engine Oil

To assure continuing quality of engine oil purchased in bulk quantities, procurement specifications should include a requirement that the supplier follow *API Recommended Practice 1525* for handling bulk engine oils. This voluntary practice contains guidelines for quality control tracking within the supplier's process. In addition, customers are advised to obtain a control sample prior to any actual receipts to which future shipments may be compared.

Sulfated Ash and Total Base Number

Sulfated ash is a lubricant property measured by a laboratory test (ASTM D 874) to determine the potential for formation of metallic ash. The ash residue is related to the oil's additive composition and is significant in predicting lubricants which may cause valve distress, cylinder kit scuffing, or exhaust catalyst plugging under certain operating conditions. Sulfated ash is related to Total Base Number (TBN), which measures an oil's alkalinity and ability to neutralize acid using a laboratory test (ASTM D 2896 or D 4739). As TBN increases, sulfated ash also increases to where lubricants with TBN's above 10 will likely have sulfated ash contents above 1.0% mass.

Total Base Number is important to deposit control in four-stroke cycle diesel engines and to neutralize the effects of high sulfur fuel in all diesel engines. When the use of a high ash oil is required, such as with high sulfur fuel, the oil selected should have the highest TBN (ASTM D 2896) to Ash (D 874) ratio possible. For example, an oil with a TBN of 10 and an Ash of 1.2% mass is less desirable than an oil with the same TBN and 1.0% Ash. Also refer to section titled "Oil Change Intervals."

Universal Oils

Universal Oils are designed for use with both gasoline and diesel engines and provide an operational convenience in mixed engine fleets. These products are identified with combination API category designations such as SJ/CF or CG-4/SH. Although such products can be used in Detroit Diesel engines (provided they satisfy all Detroit Diesel requirements), their use is not as desirable as lubricants formulated specifically for diesel engines and having API CF-2 or CG-4 / CH-4 designations. When selecting a universal oil, select one with the "C" category *first* as this should be primarily intended for diesel service.

Synthetic Oils

Synthetic oils may be used in Detroit Diesel engines, provided they are API licensed and meet the performance and chemical requirements outlined in this publication. Synthetic oils are formulated with special base oils that offer improved low temperature flow properties and high temperature oxidation resistance. Due to their increased cost, marketers of synthetic oils often promote extended oil drain intervals. Such claims must be accompanied with proof of performance at the drain interval being considered. Refer to the section titled "Extending Oil Drain Intervals." Although synthetic oils are generally capable of extended oil drains, there are no industry specifications, i.e. API categories, which provide verification of such performance.

Today's "synthetic" oils may include a variety of base oils, as well as combinations of base oils. Some oils are also referred to as "semi-synthetic" oils. They may be marketed in viscosity grades different than those recommended in this publication. It is important to review data supporting their performance to assure that the oil meets their intended use. Only synthetic oils which do not contain viscosity improver additives may be used in Detroit Diesel two-stroke cycle engines.

Low Zinc, High TBN Industrial Diesel Lubricants (Oil Type 4 for Two-Stroke Cycle Engines)

The petroleum industry markets specialty lubricants for diesel engines which are characterized by their high TBN and the absence of magnesium and zinc in their composition. These lubricants take into consideration the unique environments and operational characteristics of marine propulsion and railroad

locomotive applications. Consequently, they are formulated quite differently from the types of lubricants specified by Detroit Diesel.

Marine and railroad lubricants are recommended for use in Series 149 and other DDC two-stroke cycle engines where fuel sulfur content exceeds 0.5%. These oils may also be selected for use when one of the following situations exists:

- They are required in other equipment and only a single engine lubricant can be inventoried.
- Where there is a risk of resulting exhaust valve distress with conventional high ash oil.

Selection should be based on demonstrated satisfactory field performance in Detroit Diesel engines as provided by the oil supplier. ***These oils are not recommended for use in DDC 4-cycle engines, unless API licensed as CH-4.***

The Use of Supplemental Additives

Lubricants meeting the Detroit Diesel specifications outlined in this publication contain a carefully balanced additive treatment. The use of supplemental additives, such as break-in oils, top oils, graphitizers and friction-reducing compounds, in these fully formulated lubricants are not necessary and can upset the oil's formulation, causing a deterioration in performance. These supplemental additives may be marketed as either oil treatments or engine treatments and should not be used in Detroit Diesel engines. Their use will not void your Detroit Diesel Corporation product warranty; however, engine damage resulting from the use of such materials is not covered. The use of such additives is at the customer's risk. Detroit Diesel will not provide statements relative to their use beyond this publication.

Lubricant Selection Outside North America

Engine Oils meeting EMA LRG-1 and Global DHD-1 are preferred for all DDC 4-cycle engines worldwide and permit extended oil drain intervals as listed in Table 5. If these lubricants are not available, lubricants meeting European ACEA E2-96, E3-96, or E5-99 and API CG-4 or CH-4 may be used at the oil drain intervals shown in Table 5. Oils of lower performance may only be used at a 50% oil drain interval reduction.

Oils meeting API CF may be used in DDC 2-cycle products, provided they also meet military specification Mil-L-2104 F.

Contact Detroit Diesel Corporation for further guidance.

Military Engine Oil Requirements

For military engine applications worldwide an engine oil meeting the latest military specification SAE J 2357 (MIL-PRF-2104G), is required. While other branches of the military may have similar engine oil specifications, only oils meeting this specification should be used in DDC engines.

Waste Oil Disposal and Re-refined Oils



CAUTION:

To avoid injury from contact with the contaminants in used engine oil, wear protective gloves and apron.

With over one billion gallons of waste oil generated annually in the U.S. alone, disposal of waste oil has become a serious environmental concern. Rerefining waste oils provides an environmentally viable way of handling this material. Several states have established collection and recycling programs. A few states have also designated used oil as a hazardous waste requiring special handling and disposal. Detroit Diesel favors the recycling of waste oil and permits the use of rerefined oils in all engine product lines, provided the rerefined oil meets the SAE Viscosity and API specifications previously mentioned.

Several processes are used to rerefine oil. The only true rerefining process is one which treats the used oil as a crude oil, subjecting it to the same refinery processes normally used for geological crude, such as dehydration, vacuum distillation, and hydrogenation. Waste oil provides a more consistent feedstock, compared to the geological crudes that a refinery typically processes. As a result, the finished oil should also be consistent in properties and quality. Unfortunately, this is not the norm. It is the inconsistencies of the processing and product quality which make most users reluctant to utilize rerefined products.

Consideration for the disposal of waste oil should begin when negotiating the purchase of new oil. Supplier selection criteria should include a proposal for handling waste oil. It is important to know exactly how

the oil will be disposed of, since it is the generator, not the hauler, that is ultimately responsible for its proper disposal.

Brand Name Approved Lubricants

Detroit Diesel does not maintain a list of brand name approved products. All lubricants which meet the qualifications listed in this publication will provide satisfactory performance when used in conjunction with the oil drain and filter requirements. To ensure the selected lubricant meets these qualifications, the customer should verify the candidate oil's current API license number. Although the lubricant supplier should

be able to supply this information, it may also be obtained from other sources. Refer to section titled "Supplemental Information."

Typical Properties

Listed in Table 4 are the typical chemical and physical properties of a lubricant meeting Detroit Diesel requirements in normal applications. Exceptions to these requirements were noted in previous sections. This table is for information purposes only. It should neither be construed as being a specification, nor used alone in selection of an engine lubricant.

Engine Type	2-Cycle			4-Stroke Cycle	
Viscosity Grade API Service	30 CF-2	40 CF-2	50 CF-2	15W-40 CF-4/CG-4/CH-4	10W-30 CH-4
Viscosity, Kinematic, cSt:					
40°C	100 - 120	130 - 150	200 - 230	95 - 115	75 - 85
100°C	9.3 - 12.5	12.5 - 16.3	16.3 - 21.9	12.5 - 16.3	9.3 - 12.5
HT/HS, cP 150°C	—	—	—	3.7 min.	3.7 min HD 3.5 min. LD
Viscosity Index	95	95	95	130	130
Pour Point °C, Max.	-18	-15	-10	-23	-30
Flash Point °C, Min.	220	225	230	215	205
Sulfated Ash, % mass	—	1.0 Max.	—	2.0 Max.	2.0 Max.
Total Base Number ASTM D 2896	—	7.0 - 10.0	—	Above 8	Above 8
Zinc, ppm	—	Above 700	—	Above 1000	Above 1000

Table 4. Typical Properties of a DDC-Recommended Engine Oil

Additional Information

The Engine Manufacturers' Association publishes the *EMA Lubricating Oils DataBook*, which contains information on several hundred engine oils. The data in the DataBook is provided by oil companies in response to a questionnaire. Information includes viscosity grade, API category, ash content, and other useful engine oil properties. It may be obtained directly from EMA. Refer to section titled "Supplemental Information."

Oil Change Intervals

During use, engine lubricating oil undergoes deterioration from combustion by-products and contamination by the engine. Certain components in a lubricant additive package are designed to deplete with

use. For this reason, regardless of the oil formulation, regular oil drain intervals are required. These intervals may vary in length, depending on engine operation, fuel quality, and lubricant quality. Generally, shorter oil drain intervals extend engine life through prompt replenishment of the protection qualities in the lubricant. Conversely, extending oil drain intervals beyond the useful life of the lubricant can significantly reduce engine life.

The oil drain intervals listed in Table 5 (normal operation with low sulfur fuel) and the oil change intervals listed in Table 8 (normal operation with high sulfur fuel) should be considered **maximum** and should not be exceeded. If the fuel used does not meet all the properties listed in Table 11 titled, "Diesel Fuel Specification Table," the oil drain intervals listed in Table 6 apply. Always install new engine oil filters when the oil is changed.

Service Application	Engine Series	Oil Drain Interval
Highway Truck & Motor Coach	40	12,000 Miles (19,200 km)
	50, 55, 60, 71, 92	15,000 Miles (24,000 km)
Highway Truck	638	9,000 Miles (24,000 km)
City Transit Coaches#	40	12,000 Miles (19,200 km)
	50, 53, 60, 71 & 92	6,000 Miles (9,600 km) 300 hours or 3 months*
Fire Fighting / Crash Rescue Vehicles	50, 60	6000 Miles (9,600 km), 300 hours, or 1 year*
Pick-up & Delivery	40, 40E, 50, 53, 71	12,000 Miles (19,000 km)
	638	6,000 Miles (9,600 km)
Stop & Go, Short Trip	50	6,000 Miles (9,600 km)
Construction / Industrial, Agricultural and Continuous Marine	40, 40E	450 Hours or 1 Year*
	50 / 60	250 Hours or 1 Year*
	SUN / D700	250 Hours or 1 Year*+
	2000 / 4000	500 Hours or 1 Year*+
	149	300 Hours or 1 Year*
	53, 71 & 92	150 Hours or 1 Year*
Marine, Pleasurecraft and Commercial	60 / MD700	250 Hours of 1 Year*
	2000 / 4000	250 Hours or 1 Year*+
	149	300 Hours or 1 Year*
	53, 71 & 92	150 Hours or 1 Year*
Stationary Electrical Generator Units, Standby	40	450 Hours or 1 Year*
	2000	500 Hours or 1 Year*
	4000	500 Hours or 1 Year*+
	60	250 Hours or 3 Months*
	53, 50, 60, 71, 92 & 149	150 Hours or 1 Year*
Stationary Electrical Generator Units, Prime or Continuous	40	450 Hours or 6 Months*
	2000	500 Hours or 1 Year*+
	4000	500 Hours or 1 Year*+
	50, 53, 60, 71, 92 & 149	300 Hours or 3 Months*

* Whichever comes first.

+ Change oil filters every 250 hours maximum, and service the centrifugal filter based on filter cake thickness. See the Operator's Guide for further details.

Note: Oil drain intervals may be increased 50% with the use of oil meeting EMA LRG-1 and Global DHD-1. Increased filter capacity may be required. See "Extending Oil Drain Intervals" for additional information.

Table 5. Maximum Allowable Oil Drain Intervals (Normal Operation with Low Sulfur Fuel)

Oil Drain Intervals for 1998 and Newer Series 50 and Series 60 On-Highway Engines

Beginning in 1998, more stringent exhaust emission requirements were implemented for on-highway engines. To meet these requirements, engine fuel injection timing has been changed, resulting in higher rates of soot accumulation in the engine oils. The new API CH-4 engine oils have been formulated to handle these higher soot concentrations by providing improved dispersency and wear protection. While it is anticipated that these new oils provide the capability of maintaining the oil drain intervals listed in Table 5 and listed in Table 8, certain applications may involve engine operation which require an adjustment to oil drain intervals.

Adjusted oil drain intervals will depend on the engine's rate of soot production and the engine oil's capability to protect the engine. In some cases, it will be necessary to shorten oil drain intervals from the baseline oil drains, while in others, it may be possible to operate at the maximum oil drain intervals listed in Table 5. Soot accumulations in the engine oil exceeding the capability of the oil formulation can result in increased wear and reduced engine durability. DDC recommends used oil analysis to determine the proper oil drain interval for these engines and oils. The oil analysis properties and limits listed in Table 6 should be considered when establishing oil drain intervals for these engines.

Used Oil Property	Test Method	Limit
Soot	TGA (E1131) ¹	3% max.
Kinematic Viscosity	ASTM D445	25 cSt max. @ 100°C
Iron	ASTM 5185	150 ppm

Table 6. 1998 and Newer On-Road Series 50/60 Engine Used Oil Drain Limits

Extending Oil Drain Intervals

Changing engine oil and filters at regular recommended intervals removes contaminants in the oil and filter and replenishes expendable oil performance additives. The extension of oil change intervals necessitates that an engine can tolerate increased levels of contaminants such as soot, dirt, wear metals, fuel residues, and water. Extending oil filter change intervals requires that filters have sufficient increased capacity to continue collecting these contaminants at a sufficient rate to protect the engine. The engine oils must be formulated with additives capable of extended performance for wear and oxidation, dispersency and detergency, and filterability.

While the extension of oil drain intervals can provide owners and operators of diesel-powered equipment a cost savings in materials (oil and filters), maintenance-related downtime, and waste disposal, there can be a significant reduction of engine life to overhaul. Most currently marketed engine oils and filters are not designed to operate at extended service intervals. These products meet performance requirements of standardized industry tests that are intended to predict actual engine operation under the conditions of standard service intervals.

While some oil companies promote engine lubricants with a claimed longer useful life, Detroit Diesel Corporation does not recommend the extension of oil drain intervals beyond the Maximum Allowable Periods listed in Table 5 unless the oil meets Global DHD-1 and EMA LRG-1. These engine oils are formulated to higher performance requirements and may be used at oil drain intervals 50% higher than the intervals listed in Table 5. Additional oil filter capacity is required for Series 4000 engines.

If oil and filter change interval extension beyond 50% is pursued, the following criteria will help to minimize the detriment to performance and engine life. DDC recommends that oil and filter change intervals not be extended at anytime beyond the used oil analysis limits listed in Table 8, "Single Sample Used Oil Analysis Warning Limits."

1. A rigorous maintenance program which includes used oil sampling, close adherence to maintenance schedules, and consistent make-up oil additions. DDC POWER Trac[®] used oil analysis kits with TBN, P/N 23520989, or equivalent is recommended in determining the proper oil drain interval.
2. Duty cycle severity no greater than defined as 60% maximum load factor, based on fuel consumption, and a 40% maximum operating time at idling conditions.

3. The oil and filters should have field test demonstrated performance. Depending on the engine and application, the field test should be conducted at drain intervals at least 30% higher than the intended target for a duration of 500,000 miles or 5,000 hours.
4. The oil and filter suppliers should have a written policy regarding extended service intervals beyond manufacturer recommendations. This policy should clearly state the requirements to be met by the customer and warranty support for early engine wearout resulting from the use of their product in extended service.

The decision to extend oil and filter change intervals beyond those recommended rests with the customers, the oil, and oil filter suppliers. Extending oil drain interval will not void the DDC product warranty. In the

event of engine failure or premature wearout when running extended oil and filter change intervals, a determination will be made as to the extent, if any, that DDC workmanship and materials were responsible. If DDC determines that the failure or early wearout is related to workmanship or materials, warranty coverage of the repairs will apply. If the engine fails or wears out within the DDC engine warranty period and this is determined to be a result of extending oil drain intervals, any claim for reimbursement of expenses under the terms of the engine warranty will be denied.

The Use of High Sulfur Fuels

Although diesel fuels containing more than 0.5% sulfur are considered high sulfur fuels, piston ring wear studies have shown that the combustion of fuels containing more than 0.3% sulfur significantly increases ring face wear rates. See Figure 3.

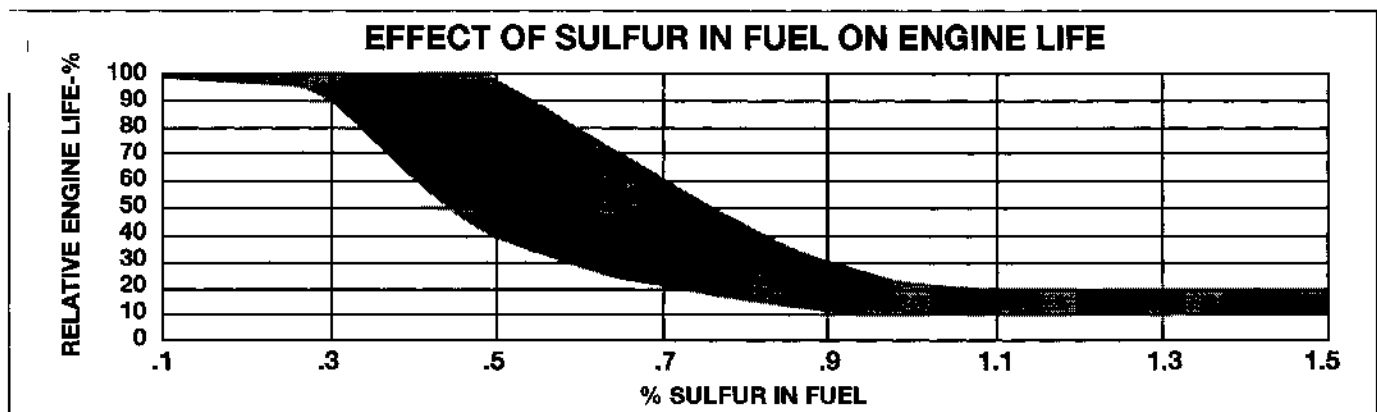


Figure 3. Effect of Sulfur in Fuel on Engine Life

High fuel sulfur forms acids during combustion, particularly during idling and low temperature operation. The best defense against the effects of acid formation is to shorten oil drain intervals. The proper drain interval may be determined by oil analysis or by using the drain intervals listed in Table 7. A reduction in TBN (ASTM D 4739) to one-third of the initial value provides a general drain interval guideline. Marine fuels identified as meeting ASTM D2609, *Specification for Marine Fuels*, should not be used in Detroit Diesel engines due to the high sulfur contents and boiling ranges permitted.

Should it be determined that the oil drain interval is unacceptably short, the selection of a lubricant with a Total Base Number (TBN per ASTM D 2896) above 10 may be appropriate. Experience has shown, however, that a higher TBN oil with a longer oil change interval is not as effective in protecting the engine from wear. Use the intervals listed in Table 7 until the best practical oil drain interval can be established by oil analysis. Used oil TBN may be determined with DDC POWER Trac, P/N 23520989.

Service Application	Engine Series	Oil Drain Interval New Oil TBN above 10
Highway Truck & Motor Coach	40, 40E, 50, 55, 60, 71 & 92	10,000 Miles (16,000 km)
Highway Truck	638	6,000 Miles (9,600 km)
City Transit Coaches	40, 40E, 50, 55, 60, 71 & 92	4,000 Miles (6,400 km) or 3 Months Maximum*
Fire Fighting / Crash Rescue Vehicles	50, 60	200 Hours, 4,000 Miles, (6,400 km), or 6 Months*
Pick-up & Delivery,	40, 40E, 50, 53, 60, 71 & 92	6,000 Miles (12,500 km)
	638	4,000 Miles (6,400 km)
Construction / Industrial, Agricultural and Continuous Marine	40	200 Hours or 6 Months*
	50, 60, SUN, D700	100 Hours or 6 Months*
	2000, 4000	250 Hours or 1 Year*
	149	300 Hours or 1 Year*
	53, 71 & 92	150 Hours or 1 Year*
Marine, Pleasurecraft and Commercial	60, MD700, 2000, 4000	150 Hours or 1 Year*
	149	300 Hours or 1 Year*
	53, 71 & 92	150 Hours or 1 Year*
Stationary Electrical Generator Units, Standby	2000, 4000	150 Hours or 1 Year*
	40, 50, 53, 60, 71, 92 & 149	150 Hours or 6 Months
Stationary Electrical Generator Units, Prime or Continuous	40	250 Hours or 4 Months*
	50, 60, 71, 92 & 149	150 Hours or 3 Months*
	2000, 4000	200 Hours or 1 Year*

* Whichever comes first

These drain intervals are to be used for all engines and applications where the fuel used does not meet the recommended properties shown in Table 5.

Table 7. Maximum Allowable Oil Drain Intervals when Using a Fuel not Meeting DDC Recommendation Listed in Table 9, or Sulfur Above 0.5% (Use oil analysis to determine optimum drain interval)

Used Lubricating Oil Analysis

Detroit Diesel's **POWER Trac**® used oil analysis program is recommended for monitoring crankcase oil in all engines. Oil analysis consists of a series of laboratory tests conducted on the engine lubricant. Most tests reveal conditions of the engine, while some indicate the condition of the lubricant. The "Warning Limits" listed in Table 8 show what each test evaluates. Since an oil analysis cannot completely assess the lubricating oil for continued service, it should not be used to extend oil drain intervals. An oil analysis program with regular sampling is recommended, and the oil should be changed immediately if contamination is present in concentrations exceeding the warning limits listed in Table 8.

These limits are provided for guidance for a single sample analysis. It should never be concluded that the engine is worn out based on a single measurement that exceeds the warning level. Imminent engine wearout can only be determined through a continuous analysis program wherein the change in data or deviation from baseline data can be used to interpret the condition of engine parts. Confirmation for necessity of engine overhaul should be based upon operational data (for example, increasing oil consumption and crankcase pressure) and physical inspection of parts.

Diesel Fuel

Quality and Selection

The quality of fuel used is a very important factor in obtaining satisfactory engine performance, long engine life, and acceptable exhaust emission levels. Detroit Diesel engines are designed to operate on most diesel fuels marketed today. In general, fuels meeting the properties listed in Table 9 are recommended for satisfactory performance. Many fuels marketed today are claimed to meet ASTM Designation D 975. This specification is inadequate in defining the fuel quality necessary for modern low emission diesel engines. For optimum engine operation and maximum service life, diesel fuels meeting the property requirements listed in Table 9, or the properties of EMA FQP-1a or b are recommended for use.

Characteristic	ASTM or DIN Test Method	Condition Measured	Two Cycle		Four Cycle		
		Engine Series	53, 71, 92	149	40, 50, 60	55	2000, 4000
Viscosity	D445 DIN 51562	Engine & Oil					
Kv100C, cSt. min.			12.5 SAE 40	16.0 SAE 50	12.5 SAE 15W-40	12.5 SAE 15W-40	10.0 SAE 15W-40
Kv100C, cSt., max.			16.3 SAE 40	22.0 SAE 50	16.3 (25.0) ¹ SAE 15W-40	16.3 (25.0) ¹ SAE 15W-40	20.0 SAE 15W-40
Soot, %, max.	E1131 or LEM ²	Engine Combustion	0.8	0.8	1.5 (3.0) ³	1.5	1.0
Pentane Insolubles, max.	D83 DIN 51365	Engine Combustion	1.0	1.0	1.0 (N/A) ⁴	2.0	2.5
Total Base Number,		Oil					
min.	D4739		1.0 or 1/3 New Oil ⁵				
min.	D2896 ISO 3771		2.0 or 1/3 New Oil ⁵				50% of new oil value
Glycol max.	D2892 DIN 51375	Engine	Negative				
Water max.	D1744	Engine	0.3%				
Fuel Dilution max.	D3524	Engine	2.5%				5% for Series 2000 2.5% for Series 4000
Flash Point COC °C min.	D92 ISO 2592	Engine & Oil	Not Specified				180
Metals, ppm⁴							
Iron, max.	D5185	Engine Wear	150 (250) ⁵	35	150	200	30
Copper, max.	D5185	Engine Wear	25	25	30	20	30
Lead, max.	D5185	Engine Wear / Oil Corrosion	10	10	30	40	20

1. With API CH-4 oil

2. LEMSM is a patented soot measurement process by Analysts, Inc. Infrared spectroscopy may also be used, provided it is calibrated to be equivalent to TGA.

3. Whichever is higher

4. These are general limits. Wear metals limits must be determined for specific application and oil used.

5. Marine engines only

NOTE: These limits are intended as guidance when a single oil sample is tested and are based on the normal oil drain intervals listed in Table 5. Actual limits are dependent on engine, application, drain interval and oil type. Refer to DDC Publication 7SE 398 for determining warning limits specific to your application.

Table 8. Single Sample Used Oil Analysis Warning Limits

Property	Test Method		On-road		Off-road
	ASTM	ISO	No. 1	No. 2	
API Gravity, @ 60°F Minimum Maximum	D 287		40 44	34 38	33 43
Specific Gravity, g/ml @ 60°F Minimum Maximum	D 1298	3675	0.806 0.825	0.835 0.855	0.810 0.860
Flash Point, °C, Minimum	D 93	2719	38	52	Note 1
Viscosity, Kinematic cSt @ 40°C Minimum Maximum	D 445	3104	1.3 2.4	1.9 4.1	1.3 4.5
Sulfur, wt% Maximum	D 2622	EN 24260	0.05	0.05	0.4
Cloud Point	D 2500			Note 2	
Filter Plugging Point	D4359	309		Note 3	
Cetane No., Minimum	D 613	5165	45	45	45
Cetane Index, Minimum	D 4737	4264	40	40	40
Distillation % Vol. Recovery, °F (°C) IBP, Typical 10%, Typical 50%, Typical 90%, Maximum 95% Maximum Recovered Volume, % Minimum	D 86	3405	350 (177) 385 (196) 425 (218) 500 (260) 550 (288) 98	375 (191) 430 (221) 510 (256) 625 (329) 671 (355) 98	320 (160) - 392 (200) 437 (225) - 527 (275) 626 (330) 680 (360) 98
Water, % Maximum (Note 4)	D 2709		0.02	0.02	0.02
Sediment > 1 µm, mg/L Maximum	D2276 or D5452		10	10	10
Total Contamination, mg/kg Maximum		DIN 51419	24	24	24
Ash, % mass Maximum	D 482	6245	0.01	0.01	0.01
Carbon Residue, on 10%, % mass	D 524	10370	0.15	0.35	0.3
Copper Corrosion, Maximum	D 130	2160	No. 3a	No. 3a	No. 3a
Accelerated Storage Stability mg/L, Maximum	D 2274		15	15	15
Dupont Pad Test, Reflectance, at 150°C, Minimum	D6468		70	70	70
Heat Content, Net, BTU/gal	D4868		125,000 - 127,300	128,500 130,900	126,600 - 131,500
Lubricity Load, gms, Minimum Wear Scar, µm, Maximum	D6078 D6069		3100 460	3100 460	3100 460

Table 9. Diesel Fuel Specification Table

Note 1: The flash point temperature is a safety related property which must be established according to applicable local requirements.

Note 2: The cloud point should be 10°F (6°C) below the lowest expected fuel temperature to prevent clogging of fuel filters by wax crystals.

Note 3: The Filter Plugging Point temperature should equal to or below the lowest expected fuel temperature.

Note 4: No free water visible

Note 5: Transit Coach engines are emission certified on either No. 1 or No. 2 fuel. To maintain emission compliance, only the correct certified fuel should be used.

Note 6: When prolonged idling periods or cold weather conditions below 32°F (0°C) are encountered, the use of 1-D fuel is recommended.

Fuel Lubricity

Some fuels, such as those containing kerosene and jet fuel, and some low sulfur fuels have characteristics which may cause operational concerns in some fuel injection systems. To assure trouble-free operation it is recommended that all fuels used in DDC engines meet the minimum lubricity requirements listed in Table 9. Fuels not meeting the lubricity requirements may be additized to meet them.

Biodiesel Fuels

Biodiesel fuel is broadly defined in ASTM specification PS 121. However, this specification does not restrict feedstock types, nor does it include all the properties necessary to assure trouble-free operation. Detroit Diesel permits the use of biodiesel derived from virgin soy methyl ester and rapeseed methyl ester when blended up to 20% maximum in diesel fuel. Use of recycled feedstocks is not recommended. The resulting mixture must meet the fuel properties listed in Table 9.

Although such blends purport to reduce exhaust emission particulates, they increase engine exhaust

nitrogen oxides content. They also tend to have poorer thermal stability and may deteriorate engine oil TBN more rapidly than wholly petroleum-based diesel fuels. Little long-term use data exists, but concerns from combustion deposits, fuel injection system durability, and accelerated engine oil degradation warrant a cautious approach when considering the use of biodiesel. Use of these fuels may require a reduction in oil drain interval. Failures attributed to the use of biodiesel fuel or blends of biodiesel will not be covered by the Detroit Diesel product warranty.

Other Fuels

In addition to the diesel fuels listed in Table 9, customers have used other fuels successfully, including fuels marketed as premium diesel fuels, kerosene-based jet fuels, and other fuels listed in Table 10. These fuels have provided economic and availability advantages for some applications, particularly where No. 1 type fuels are required. Since these fuels do not meet all the fuel property requirements in Table 9, successful operating experience must exist. Fuel type specifications and applications are listed in Table 11.

Property	Jet A/A-1 D 1655	JP-5	JP-8#	CONUS DF-1	CONUS DF-2	OCONUS DF-2
API Gravity, @ 60°F	44.3	41.1	45.6	42.3	34.2	38.5
Flash Point, °C	38	62	45	50	74	70
Viscosity, Kin., cSt @ 40°C	—	1.5	1.2	1.6	2.8	3.0
Cloud Point °C	-40	-46	-47	-41	-12	-19
Sulfur, % mass	0.3 Max.	0.4 Max.	0.4 Max.	0.05 Max.	0.05 Max.	0.3 Max.
Cetane Number	—	42	45	44	47	49
Distillation % Vol. Rec., °C						
IBP	—	180	157	174	190	176
10% Typical	205	191	175	196	222	219
50% Typical	Report	215	200	219	265	365
90% Max.	Report	242	236	246	313	311
Final Boiling Point, Max. Temp.	300					
Heat Content, Btu/gal., Net	123,608	125,270	123,069	125,960	131,207	127,820

JP8 + 100 is not recommended in equipment with water-coalescing filters.

Table 10. Selected Typical Fuel Properties

Type	NATO Spec.	Mil Spec.	Application
JP-4	F-40	Mil-T-5624	Jet Fuel, Contains 50% Gasoline, Not Recommended
JP-5	F-44	Mil-T-5624	Jet Fuel, Kerosene based
JP-8	F-34	Mil-T-83133	Jet A-1 with De-icer and Corrosion Inhibitor
Jet A	None	None	Industry Standard Jet Fuel
Jet A-1	F-35	None	Jet Fuel, ASTM D 1655
DL-1/DL-2	F-54	VV-F-800 CONUS	Specified Military Use Inside Continental U.S.
DF-2	F-54	VV-F-800 OCONUS	Specified Military Use Outside Continental U.S.

Table 11. Fuel Type Specifications and Applications

Lower density fuels, such as those listed in Table 10 and listed in Table 11 and "winter blended" diesel fuels, have a lower volumetric heat content than the standard No. 2 fuel listed in Table 9, "Diesel Fuel Specification Table." Operating with these fuels will result in reduced engine output and reduced fuel mileage, compared to standard No. 2 fuel. Reductions of 5% are not unusual and may be as high as 10%. A good rule of thumb is this: *The engine power is proportional to the heating value of the fuel.*

Lower density fuels also tend to have lower viscosity and poor lubrication characteristics. Fuel filtration should be changed to that recommended for "Severe Duty Service" to prevent potential injector seizure from dirt contamination of fuel.

Heavy Fuels Not Recommended

Heavy fuels intended for use in slow speed diesel engines and as burner fuel are not recommended for use in any Detroit Diesel engine. Marine fuels specified by ASTM D2609 are examples of such fuels. These fuels are known to cause combustion deposits and will likely reduce engine durability.

Premium Diesel Fuel

Several oil companies market fuels they designate as "premium" diesel fuel. This fuel will typically have a higher cetane number and lower density than ASTM D975 2D fuel. These fuels will also have a performance additive package. Although premium diesel fuels are not covered by any existing industry specification, they may be used in DDC engines. It is recommended that the customer obtain additional information from the fuel marketer and compare properties to those listed in Table 9, "Diesel Fuel Specification Table," before using.

Diesel Fuel Selection Criteria

Distillation

The boiling range indicates the temperature range over which the fuel turns to a vapor and is a very important property in consideration of diesel fuel quality. Lower boiling range fuels, such as No. 1, have a higher volatility, while fuels such as No. 2 are of lower volatility and higher temperature boiling range. Higher volatility fuels are preferred in conditions of prolonged idling, such as city coach applications, or in cold temperatures. The determination of boiling range is made using ASTM Test Method D86 or D2887 (Gas Chromatography Test Method).

Although many specifications contain only a partial listing of the distillation results (Distillation Temperature at 90% Recovered, for example), this is not enough to determine the quality and suitability of the fuel for use in diesel engines. Diesel fuels are blended products which may contain high boiling constituents that can affect combustion. Only fuels with a minimum 98% recovery by distillation should be used. The full boiling range as shown in previous tables should be used for proper selection.

95% Boiling Point

Fuel can be burned in an engine only after it has been completely vaporized. The temperature at which the fuel is completely vaporized is described as the "End Point Temperature" in ASTM D 86 Distillation Test Method. Since this temperature is difficult to measure with good repeatability, the fuel's 90% or 95% distillation point is often used. DDC specifies the 95% temperature because it is closer to the end point than the 90% used by ASTM in D975.

Cetane Number

Cetane Number is a relative measure of the time delay between the beginning of fuel injection and the start of combustion. In cold engine starting a low cetane number will cause difficult starting and white exhaust smoke until the engine warms up. In engines with charge air cooling a low cetane number fuel may also cause white exhaust smoke during light load operation.

A minimum cetane number of 45 is specified for best engine performance. However, the cetane number alone should not be considered when selecting a

quality fuel. Other properties, such as 95% distillation temperature and carbon residue, should also be considered.

Calculated Cetane Index is sometimes reported instead of Cetane Number. Cetane Index is an empirical property determined mathematically from boiling range temperatures and specific gravity of the fuel, whereas Cetane Number is determined through an engine test. Additives may be used by the fuel marketer to improve the cetane number; however, they have no effect on cetane index. Both properties should be evaluated when selecting diesel fuel.

Fuel Stability

Diesel fuel oxidizes in the presence of air, heat, and water, particularly if the fuel contains cracked products that are relatively unstable. The oxidation of fuel can result in the formation of undesirable gums and black sediment. Such undesirable products can cause filter plugging, combustion chamber deposit formation, and gumming or lacquering of injection system components, with resultant reduced engine performance and fuel economy. Two tests are specified for fuel stability, ASTM Test Method D 2274 which measures diesel fuel storage oxidative stability and the DuPont Pad Test which measures in-use stability. The DuPont Pad test should be conducted at 302°F(150°C). The results of the DuPont Pad Test are based on a visual rating of the filter pad by the amount of light reflected from the filter pad. A 100% rating is a clean pad, while a 50% rating is very dirty. ASTM D2274 is a weighed measure of the sediment filtered from the fuel after storage. Although the results of D 2274 may vary with actual field storage, it does measure characteristics that will affect fuel storage stability for periods of up to 12 months.

Fuel Sulfur Content

Diesel fuel sulfur content above 0.3% mass causes premature ring and cylinder wear and deposit formation. It has also been identified as a major contributor to exhaust particulates, which became a federal regulated exhaust constituent in 1988. Fuel sulfur was limited to 0.05% for U.S. on-highway engines beginning in October 1993 to reduce particulate emissions.

Diesel fuels with low sulfur content should be selected. If the use of fuels with sulfur contents above 0.4% are unavoidable, lube oil drain intervals and lubricant selection needs to be reduced. Detroit Diesel recommends that the Total Base Number (TBN D 4739) of the lubricant be monitored and that the oil drain interval be reduced. Refer to section titled "Oil Changes."

Fuel Operating Temperature and Viscosity

Since diesel fuel provides cooling of the injection system, the temperature of the fuel may vary considerably due to engine operating temperature. As fuel temperature increases, fuel viscosity decreases, along with the lubrication capabilities of the fuel. Maintaining proper fuel temperatures and selecting fuels with the viscosity ranges listed in Table 9, "Diesel Fuel Specification Table," will assure proper injection system functioning.

When operating with reduced fuel viscosity or elevated fuel temperatures the injectors will operate at reduced internal clearances. As a result, dirt and smaller particulate material may cause injector durability concerns. Filters on Detroit Diesel two stroke-cycle engines should be changed to those specified for "Severe Duty Service." Installing a fuel cooler or operating with fuel tanks above half full may also help eliminate the concern.

Fuel Additives

Detroit Diesel engines are designed to operate satisfactorily on a wide range of diesel fuels. The regular use of supplemental fuel additives is not required or recommended. Some additives may be beneficial in addressing temporary fuel quality problems but should not replace proper fuel selection and handling.

Water Contamination

Some fuel additives provide temporary benefit when fuel is contaminated with water. They are not intended to replace good fuel handling practices. Where water contamination is a concern, the fuel system should be equipped with a fuel/water separator that should be serviced regularly. In marine and other environments where microbe growth is a problem, a fungicide such as Biobor® JF (or equivalent) may be used. Microbial activity may be confirmed with commercially available test kits. Follow the manufacturer's instructions for

treatment. Avoid the use of fungicides containing chlorine, bromine, or fluorine compounds, since these may cause fuel system corrosion.

When small amounts of water are present, supplemental additives containing methyl carbitol or butyl cellosolve are effective. Follow the manufacturer's instructions for their use. The use of isopropyl alcohol is no longer recommended due to its negative effect on fuel lubricity.

The following fuel additives are NOT allowed:

Used Lubricating Oil - Detroit Diesel specifically prohibits the use of drained lubricating oil in diesel fuel. Used lubricating oil contains combustion acids and particulate materials, which erode injector components, resulting in loss of power and increased exhaust emissions. In addition, the use of drained lubricating oil will increase maintenance requirements due to filter plugging and combustion deposits. Refer to the section titled, "Waste Oil Disposal and Rerefined Oils" for recommendations on proper used oil disposal.

Gasoline - The addition of gasoline to diesel fuel will create a serious fire hazard. The presence of gasoline in diesel fuel will reduce the fuel cetane number and increase combustion temperatures. Tanks that contain such mixtures should be drained and cleaned as soon as possible.

Detroit Diesel Corporation will not be responsible for any detrimental effects which it determines resulted from the use of used lubricating oil or gasoline in the diesel fuel.

Evaluation of Supplemental Fuel Additives

Many supplements available today are intended to be added to the fuel by the customer. These include a variety of independently marketed products which claim to be:

- Cetane Improvers
- Emission Control Additives
- Detergents
- Combustion Improvers
- Smoke Suppressants
- Cold Weather Flow Improvers

Should a customer decide that a supplemental additive is required, the following is intended to provide guidance to the customer in evaluating potential safety hazards and deleterious engine effects.

1. A Material Safety Data Sheet (MSDS) should be carefully reviewed for special handling instructions and hazardous material content. Additives containing hazardous materials should not be used due to personal safety risk.
2. A detailed compositional analysis should be provided by the supplier. Ash forming metallic elements and corrosive elements must not be present. Additives containing calcium, barium, zinc, phosphorous, sodium, magnesium, iron, copper, and manganese are known to cause combustion ash deposits that can foul fuel injectors and create deposits which may adversely affect cylinder life. Halogenated compounds containing chloride, fluoride, and bromide are corrosive, as are some sulfur containing compounds. The use of additives with these components should be avoided.
3. Many commercial diesel fuels today contain performance additives, particularly those marketed as premium diesel fuel. Any supplemental additive being considered must be compatible with the fuel it is to be used in. A mixture containing twice the recommended concentration of additive should be evaluated for compatibility to represent an overdosage condition, using the tests listed in Table 9, "Diesel Fuel Specification Table."
4. Performance evaluation of a fuel supplemental additive should be conducted in customer equipment for a minimum of six months. Testing should be a side-by-side comparison with and without the additive to verify performance claims. Testimonials are not substantial claims of performance.

Supplemental fuel additives are not recommended due to potential injector system or engine damage. Our experience has been that such additives increase operating costs without providing benefit. The use of supplemental fuel additives does not necessarily void the engine warranty. However, repair expenses which result from fuel system or engine component malfunctions or damage attributed to their use will not be covered. These products should be accompanied with performance data supporting their merit. Detroit Diesel Corporation will not test or verify the performance of any supplemental additives and will not accept responsibility for use, selection, or hazards relating to the use of such products.

Diesel Fuel Storage

Fuel oil should be clean and free of contamination. Storage tanks and stored fuel should be inspected regularly for dirt, water, and sludge. Tanks should be drained and cleaned, if contaminated. Diesel fuel tanks can be made of monel, stainless steel, black irc welded steel or reinforced (non-reactive) plastic.

NOTICE:
Do not use galvanized steel or sheet metal tanks and galvanized pipes or fittings in any diesel fuel storage, delivery, or fuel system. The fuel oil will react chemically with the zinc coating, forming a compound which can clog filters and cause engine damage.

Filtration

Filters make up an integral part of fuel and lubricating oil systems. Proper filter selection and maintenance are important to satisfactory engine operation and service life. Filters however, should be used to maintain a clean system, not to clean up a contaminated system.

Filter performance and test specifications vary between manufacturers. These specifications are general in nature and do not reflect the actual performance of genuine DDC POWER GUARD® filters. The user is also cautioned when comparing micron ratings between filter makes. Some filter makers may publish results from tests in which the SAE J1858 test procedure was not used. It is also important to note that capacity and efficiency (micron) ratings should not be the only criteria on which to judge filter performance. Many other important factors, including media strength, resistance to impulse failures and burst strength, often differ greatly between filter makes and should enter into the filter selection process.

Regular and optional service spin-on fuel filters for most DDC engines are listed in Table 12. Fuel Pro® filters are listed in Table 13, and Sea Pro® marine engine fuel filters are listed in Table 14. Cartridge-type fuel filters are listed in Table 15. Spin-on lubricating oil filters are listed in Table 16.

Finer filtration will generally provide increased engine service life, but may require shorter filter change intervals. Detroit Diesel specifies filter performance based on the optimum combination of filter micron rating, filter capacity, and mechanical requirements (assembly integrity).

Aftermarket Filtration

Aftermarket supplemental filtration systems may be used, provided they do not replace the factory-installed system or reduce oil volumes, pressures, or flow rates delivered to the engine. The use of such systems does not address oil degradation from normal use and, therefore, does not permit extension of oil drain intervals. Fuel filters must be properly sized to provide the proper fuel flow to the engine. A fuel/water separator, if used, must be installed between the fuel tank and the inlet side of the engine fuel pump.

Detroit Diesel Maintenance Products

Fuel and Lubricating Oil Filter Applications for Detroit Diesel Engines

Primary Fuel Filter			Secondary Fuel Filter		
Engine	Qty.	Power Guard	Qty.	Power Guard	Power Guard Plus
3-53	1	23518527	1	23518526	23518669
4-53	1	23518527	1	23518526	23518669
6V-53	1	23518481	1	23518482	23518530
3-71	1	23518527	1	23518526	23518669
4-71	1	23518527	1	23518526	23518669
6-71	1	23518481	1	23518482	23518530
6V-71	1	23518481	1	23518482	23518530
8V-71	1	23518481	1	23518482	23518530
12V-71	2	23518528	1	23518532	23518529
16V-71	2	23518528	1	23518532	23518529
6V-92	1	23518481	1	23518482	23518530
8V-92	1	23518481	1	23518482	23518530
12V-92	1	23518528	1	23518532	23518529
16V-92	1	23518528	1	23518532	23518529
8V-149	2	23518528	1	23518532	23518529
12V-149	2	23518528	2	—	23518529
16V-149	2	23518528	2	—	23518529
DDC 500	1	—		23518526	23518669
Series 40	—	—		1 820 479 C1 (6 in.)	—
Series 40	—	—		1 809 789 C1 (8 in.)	—
Series 40	—	—		23523907	—
Series 50	1	23518481		23518482	—
Series 55	—	—		23518482	—
Series 60	1	23518481		23518482	—
Series 2000 C&I	1	23518528	1	23518529	—
Series 2000 Marine	1	23518168	1	5314770301	
Series 4000 C&I	1	23512631	2	23518529	
Series 4000 Marine	1	23519405	1	5314770301	
Series 2000 Series 4000 Optional Service	1	23519404	1	23518182	

NOTE: A fuel water separator assembly may be used in place of the primary filter assembly, but not together with it.

*For Series 50 and Series 60 the fuel/water separator filter number is 23512317.

Table 12. Spin-On Fuel Filter Elements

Detroit Diesel Maintenance Products

Fuel and Lubricating Oil Filter Applications for Detroit Diesel Engines (Cont.)

Fuel Pro® 230	23521527
Fuel Pro 232	23528565
Fuel Pro 321	23518481
Fuel Pro 380/382	23521528 / 23529168#
Fuel Pro 40 Mega Filter™	23512631

#Elemax™ extended service element (optional)

Table 13. Fuel Pro® Fuel Filter Elements

Sea Pro® 50/100 (30 Micron Filter)	23519851
Sea Pro 50/100 (5 Micron Filter)	23519852
Sea Pro 150/300 (20 Micron Filter)	23518169
Sea Pro 150/300 (30 Micron Filter)	23518168
Sea Pro 152/511 (15 Micron Filter)	23521528
Sea Pro 600 (20 Micron Filter)	23519404
Sea Pro 600 (30 Micron Filter)	23519405
Water In-Fuel Sensor Kit	23518182

NOTE: The numbers after the Sea Pro name indicate the gallon per hour (GPH) flow capacity of the filter. (Does not apply to Fuel Pro.)

Table 14. Sea Pro® Fuel Filter Elements

Engine Series	Primary	Secondary
	DDC Part No.	DDC Part No.
3-53	23519148	23519162
4-53	23519148	23519162
6V-53	23519151	23519152
3-71	23519148	23519162
4-71	23519148	23519162
6-71	23519151	23519152
6V-71	23519151	23519152
8V-71	23519151	23519152
12V-71	23519153	23519154
16V-71	23519153	23519154
6V-92	23519151	23519152
8V-92	23519151	23519152
12V-92	23519153	23519154
16V-92	23519153	23519154
8V-149	N/A	N/A
12V-149	23519156	23519154
16V-149	23519156	23519154

Table 15. Cartridge Type Fuel Filter Elements

Engine	Qty.	Power Guard	Power Guard Plus
3-53	1	23518525	—
4-53	1	23518671	23518524
6V-53	1	23518671	23518524
3-71	1	23518671	23518524
4-71	1	23518671	23518524
6-71	1	23518671	23518524
6V-71	1	23518671	23518524
8V-71	1	23518671	23518524
12V-71	2	23518671	23518524
16V-71	2	23518671	23518524
6V-92	1	23518671	23518624
8V-92	1	23518671	23518524
12V-92	2 or 4	23518671	23518524
16V-92	2 or 4	23518671	23518524
8V-149	3	—	23518524
12V-149	4 or 6	—	23518524
16V-149	4 or 6	—	23518524
20V-149	6	—	23518524
DDC 500	2	23518668	—
Series 40	1	23523906	—
Series 50	2	23527033	—
Series 55	1	23540000	—
Series 60	2	23527033	23523701#
Series 60	2	23524251 (High capacity)	
Series 2000	*	23526919	
Series 4000	*	23540000	
Series 4000 Marine	*	23540039	
Series 60 (Pre-1993)			
Full Flow	2	—	—
Bypass	1	—	—

#For use with synthetic lube oil only.

*Refer to the Owner's Guide for the actual number.

Table 16. Spin-On Lubricating Oil Filters

Part No.	Description
23515823	Standard Kit
23517267	Includes Extraction Kit
23520989	Includes Prepaid Test for TBN

Table 17. Power Trac Oil Analysis Kits

Fuel Pro®, Sea Pro®, and Mega Filter™ are registered trademarks of Davco Manufacturing, L.L.C. Elemax™ is a trademark of Davco Manufacturing, L.L.C.

Statement of Detroit Diesel Corporation Warranty

Detroit Diesel Corporation is not responsible for the cost of maintenance or repairs due to the lack of performance of required maintenance services or the failure to use fuel, oil, lubricants and coolants meeting DDC-recommended specifications. Performance of required maintenance and use of proper fuel, oil, lubricants and coolants are the responsibility of the owner. For full details see the Engine Operator's Guide for your engine.

A requirement of Detroit Diesel Corporation's service contract (Power Protection Plan) is that the customer use the lubricants, fuels, and filters described in this publication in conjunction with a used oil analysis program such as the Detroit Diesel *POWER Trac* oil analysis Program.

Supplemental Information

Specifications referred to in this publication and other related information may be obtained by contacting the following sources:

1. SAE Standards

Society of Automotive Engineers
Technical Publications
400 Commonwealth Drive
Warrendale, PA 15096-0001
www.sae.org

2. ASTM Annual Book of Standards, Section 5

ASTM
100 Barr Harbor Dr.
West Conshohocken, PA 19428-2959
www.astm.org

3. EMA Lubricating Oils Databook

Engine Manufacturers' Association
Suite 2200
Two North LaSalle Street
Chicago, IL 60602
www.engine-manufacturers.com

4. API Annual List of Licensees and Other Publications

American Petroleum Institute
1220 L Street Northwest
Washington, D.C. 20005
Directory of Licensees: www.api.org/cgi-bin/eolcs.cgi

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