PRODUCT SPECIFICATION

Date: January 17, 2008

Spec. No. SGCM 3000 EcoPower Rev E

SGCM 3000 EcoPower™

CENTER MOUNT TWO SPEED FUEL SAVING GENERATOR SET
With SG+ Controller

TECHNICAL SPECIFICATION

Approval:

Ingersoll Rand

TABLE OF CONTENTS

GENERAL DESCRIPTION

Manufacturer	**Thermo King Corporation**
Construction	1. The generator set is designed for mounting to the container chassis between the two main I-beams (centermount). 2. It is a completely welded steel structural assembly 3. Genset components (filters, hoses, wire harness, etc.) are installed and securely fastened to ensure dependable, long-term operation and ease of serviceability. 4. All wires/hoses/tubes etc. are fastened properly to protect integrity and prevent wire chafing. 5. Ring terminals are used on all high voltage connections
Structural Design	1. The Genset is designed to withstand & operate satisfactorily in over-the-road trucking, railway operations, & aboard ships. 2. The Genset is rated to withstand shock levels of a minimum 3 g's acceleration force in the horizontal direction & 6 g's acceleration force in the vertical direction. 3. The Genset is designed to have no harmful resonance frequencies between 20 and 100 Hz and is rated for vibration levels of 2 g's in all directions.
Structural Frame	1. Structural steel frame is chemically cleaned through an 8 stage pretreatment process with a multi-metal iron phosphate passivation, and coated with a Black polyester TGIC powder (2.5 - 4) mils. 2. All steel is commercial quality hot or cold rolled.
Panels and Doors	1. Panels and doors are chemically cleaned through a 6-stage pretreatment line with a multi-metal iron phosphate passivation and top coated with white polyester (2.5-4.0) mils TGIC (triglycidyl isocyanurate) powder. 2. Door material: Aluminum, .100" (2.54mm) thick 3. Panel material: Aluminum, .063" (1.60 mm) minimum thickness
Hardware	All hardware are stainless steel for maximum protection from salt water corrosion.
Nameplate Instructions	English and Spanish language operating instructions
CE Compliance	Compliant with the Machinery Directive 89/392/EEC amending Directive 91/368/EEC, Electro Magnetic Compatibility Directive 89/336/EEC, and Low Voltage Directives 73/23/EEC and 93/68/EEC.
Ambient Temperature Range	Structure: -40°C to 52°C (-40°F to 125°F) Operation and Starting: -26°C to 52°C (-15°F to 125°F) Running: -40°C to 52°C (-40°F to 125°F)
Output Power Rating	15kW. Designed to supply operating power for container refrigeration units complying with ISO 1496-2
Sound Pressure Level	74 dBA. 5 point average at 7m
Dimensions	Width: 1524 mm (60.0 in) Height: 800 mm (31.5 in) Depth: 1334 mm (52.5 in

Weight	671 kg (1480 lbs) – Total Weight, including Gen Set, oil, coolant, dry fuel tank and battery. Genset to be provided with decal indicating gross weight inclusive of fuel.
Chassis Mounting	The genset mounting arrangement will accommodate 254 mm (10 in) and 305 mm (12 in) I-beam type chassis. The angles are attached to the I-beam via four (4) cast ductile steel mounting clips, ¾-16 bolts, and locking nuts. The mounting clips and attachment positions on the steel angles will accommodate chassis I-beam spacings of 914 mm (36 in) or 965 mm (38 in) centers. The mounting clips are extremely versatile and will accommodate high tolerance I-beam spacings and flange widths.

ENGINE

Type	TK 486VG direct injection	**Protection**	Low oil level and high coolant temperature
Cylinder Arrangement	No. 1 at flywheel end	**Serviceability**	Starter motor/injector pump mounted on front side of engine
Bore	86 mm (3.39 in) nominal	**Paint**	Light Gray Water Lacquer
Displacement	2.09 liter (128 in^3)	**Timing System**	Gear drive for camshaft and injection pump
Horsepower	34.1	**Firing Order**	1-3-4-2
Oil Pressure (hot)	More than 127 kPa (18.5 psi) @ 1600 rpm	**Compression Pressure**	More than 2942 kPa (427 psi) @ 250 rpm
Oil Base (Pan) Capacity	12.3 liters (13 quarts)	**Nozzle Injection Pressure**	21600-22600 kPa (3100-3300 psi)
Engine Rotation	Clockwise (viewed from pulley end)	**Emission**	2008 manufactured engines are compliant with EPA and CARB regulations

ENGINE LUBRICATION SYSTEM

Oil Pump Type	Trochoid	**Delivery Volume**	15.7 liters (4.15 gallons) / min @ 1000 pump rpm
Oil Type	API CI grade -- Use straight or multi-weight oils appropriate for the ambient temperature (delivered with 10W30 oil)	**Oil Filters Full Flow: Dual lube Full flow/bypass filter**	Thermo King Part # 11-9182
Oil Change Interval	Consult applicable service manual		

ENGINE ELECTRICAL SYSTEM

PreHeat Type	Intake Air Heater	**Resistance**	0.2 Ohms
Rated Voltage	11 Volts	**Rated Current**	77 Amperes

SPEED SOLENOID

Voltage	12 V DC	**Resistance**	4.3 Ohms
Rated Voltage	12.5 Volts	**Rated Current**	2.9 Amperes
Non –energized position	Low speed		

FUEL SYSTEM

Fuel Tank	80 Gallon Aluminum Tank that meets U.S. Federal Highway Administration (FHWA) requirements for non-side mounted tanks with special markings.	**Fuel Tank Mounting**	Integral with genset frame on steel support members that are bolted to the genset frame.
		Fuel Tank Drainage	Supplied with a drain plug in the bottom of the tank for purging contaminants.
Automatic Air Bleed System	Thermo King furnishes a patented air removal system for purging air from the injector pump and fuel supply lines. The air bleed system works whether the generator set is operating or shutdown. In the case of long shutdown periods, the automatic air bleed system insures sufficient air free fuel available to the injectors to successfully start the engine without manually bleeding the lines and injector assembly.	**Fuel Filters**	Thermo King's self-evacuating filter (SEF) is both a fuel filter and a water separator in one spin-on canister. Thermo King Part # 11-9342 (see Attached)
		Anti-Siphon	Rated at 30GPM
		Transfer Pump Lobe Lift	5.0 mm (0.197 in)
		Injection Pump Rotation	Clockwise (viewed from gear end)
		Injection Timed at	See Maintenance Manual
Tightening Torque	41 N-m (27.5 ft-lb)	**Injection Lines, ID**	1.4 mm (0.055 in)
Nozzle Type	YDM-PD	**Injection Lines, OD**	6 mm (.236 in)

ENGINE STARTER MOTOR

Voltage	12 V DC	**Clutch Type**	Over running clutch
Rotation	Clockwise (viewed from pinion end)	**Motor Power**	2.3 kW
Pull-in Current of Solenoid	52 Amps	**Hold-in Current of Solenoid**	19 Amps
Method of Engagement	Magnetically-engaged sliding pinion		

GENERATOR

Type	Synchronous type generator consisting of a 4 pole alternator with integral revolving armature. 8 pole exciter with rotating rectifiers.	**Insulation**	Class F per NEMA Standard MG-1-1.65
Maximum Temperature Rise	105 °C in accordance with NEMA Standard MG 1-22.40	**Method of Cooling**	Drive disc radial fan
Varnish Treatment - Main Rotor & Exciter Armature	Vacuum pressure impregnated and baked with epoxy varnish.	**Varnish Treatment - Main Stator & Exciter Field**	Sprayed with epoxy primer, air dried, wound, vacuum pressure impregnated with epoxy varnish and baked.
Rear Bearing	6307 sealed and lubricated with synthetic hydrocarbon.	**Engine Flywheel Housing**	Cast steel housing. Cast surfaces are machined for the mounting bolts.
Generator Rating (Nominal)			
Output Power	15 KW	**Voltage**	460
Kilovolt-Amperes	18.75 kVA	**Phases**	3
Power Factor	0.8	**Frequency**	60 Hz
RPM	1800		

ELECTRICAL POWER RECEPTACLE

Type	ESL 1911-01	**Voltage**	460 V
Current Limit	32 Amps	**Protection**	Spring loaded water/dirt protection cover

AIR FILTER

Filter Type	Heavy-duty media filter with cyclonic action and pressure drop indicator. Media filter traps 99.5% of all debris particles. Cyclonic action removes large particles via centrifugal action.

HOSES

Intake Air Hose	Silicone with internal spring or high temperature structural EDPM
Coolant Hoses	Silicone

MUFFLER

Stainless Steel Material	Noise reducing baffle design

RADIATOR COIL

Protection	E-coat coating for corrosion resistance or equivalent	**Tube Material**	Copper, internally cross-hatched.
Fin Space	2.54 mm (0.100 in)	**Fin Material**	Aluminum
Pipe Material, Copper	According to DIN 1787 wall thickness 0.762 mm (0.030 in)	**Configuration**	Vertical
Surface Area	9.44 m^2 (101.6 ft^2)	**Coolant Fluid**	TEXACO Extended Life Coolant #16445 & rated to –40°C (-40°F)

RADIATOR FAN

Type	Propeller	**Diameter**	381 mm (15.0 in)
Number of Fans / Blades	1 / 6	**Speed**	1800 rpm
Blade Material	Aluminum	**Drive**	Direct off engine water pump
Hub Material	Steel	**Pitch**	31°
Air Flow	1400 cfm		

BATTERY

Type	Maintenance free 12 VDC	**Cold Cranking Amps**	925 Amps at -18°C (0°F)
Recharging	Solid-state battery charging, 26 Amps output integrated into SG+ controller.	**Terminal Posts**	Threaded post terminals and standard battery cable connections are provided.
		Dimensions	330 x 173 x 238 mm (13 x 6.8 x 9.4 in)

SG+ MICROPROCESSOR CONTROLLER DESCRIPTION

The SG+ Microprocessor Controller is a one-piece self contained microprocessor for diesel generator sets. This system automatically controls the generator set operation by providing:

- Ability to operate genset at variable speeds for enhanced fuel consumption
- Automatic unit preheat and engine start-up during initial start-up or unattended restart
- Variable air intake heater preheat time
- Automatic Pre-Trip capability
- Provides unit shutdown protection due to high engine coolant temperature, low engine oil pressure, low engine oil level, fuel relay feedback failure or 230/460V alternator overload
- Automatic unit restart attempt 20 minutes after:
  - High engine water temperature
  - Engine failure to start
  - Check fuel alarm
  - 230/460V alternator overload
  - Fuel relay feedback failure
- Exterior Deutsch downloading port with protective cap provided.
- Low engine oil pressure
- Delayed alternator excitation for 15 seconds, or until engine coolant temperature increases to 32°C (90°F) (selectable)
- Internal self-checking /diagnostic capability
- Hourmeter
- Multi language menu capability

SG+ CONTROLLER INTERFACE

The SG+ controller interface contains the following features and components:
A. LCD Digital Display
B. Alarm LED
C. Power LED
D. Six keypad keys:
1. “Escape” use escape a new setting or jump to the parent menu
2. “Up” use to scroll up through the menu display, or increase the value of a setting
3. “Down” use to scroll down through the menu display, or decrease the value of a setting
4. “Enter” use to enter or execute controller menu tasks or commands
5. “Alarm” use to go directly to the alarm list menu and view the alarm information in the display
6. “Language” use to change the display language. English and Spanish are currently available.
E. Unit On/Off switch

SG+ CONTROLLER INPUTS/OUTPUTS/MENUS

Microprocessor Inputs:	Microprocessor Outputs:
♦ Engine oil pressure ♦ Alternator Voltage ♦ Battery Voltage ♦ Engine Coolant temperature ♦ Air filter switch ♦ Coolant level sensor ♦ Engine oil pressure switch ♦ Engine oil level sensor ♦ Air heater (preheat) feedback ♦ Fuel pull relay feedback ♦ Fuel hold relay feedback ♦ Excitation feedback ♦ Flywheel sensor	♦ Start relay ♦ Preheat relay ♦ Fuel pull relay ♦ Fuel hold relay ♦ On light ♦ Alarm light

Display Menus:

1. Data Menu
   - ♦ Analog inputs
   - ♦ Digital inputs
   - ♦ Digital outputs
   - ♦ Internal states
2. Alarm list Menu
3. Message list Menu
4. Commands Menu
   - ♦ PTI
   - ♦ Manual function test
5. Misc. Functions Menu
   - ♦ Date/time
   - ♦ °C/°F mode
   - ♦ Program version
   - ♦ Timers/counters
6. Configuration Menu
7. Event log Menu

SG+ ALARMS/MESSAGES/OPERATING INSTRUCTIONS

Alarms/Messages/Operating instructions
See Thermo King SGCM Maintenance Manual.

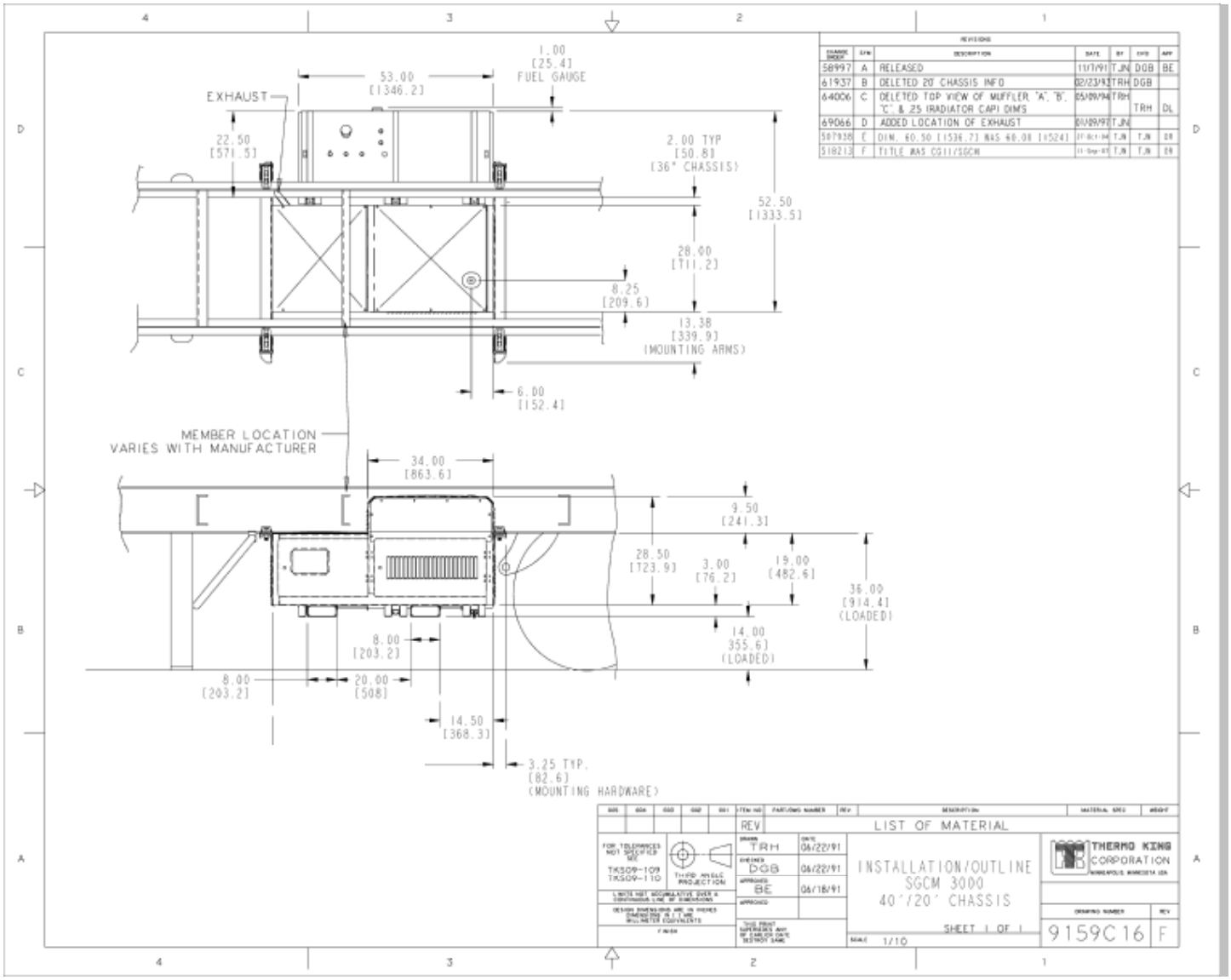
OPTIONS

CUSTOMER SPECIFIED COLOR
The frame assembly and panels can be painted per customer request but must be noted in advance.

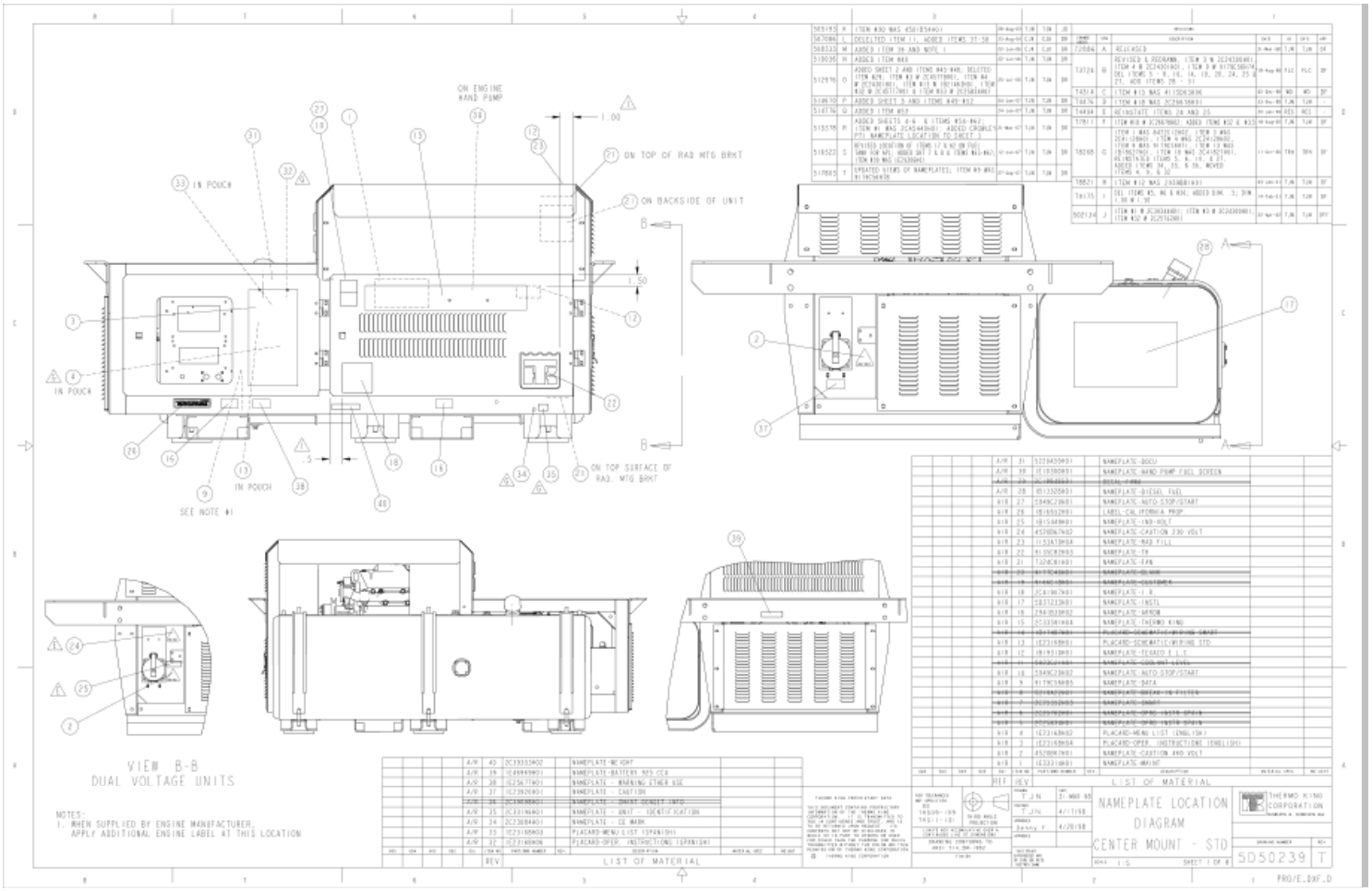
CUSTOMER UNIT SERIAL NUMBER DECALS
Customer decals can be included per customer request but must be noted in advance.

FUEL MONITORING
Capable of logging any event which causes changes in fuel levels outside of the range of normal genset operations.

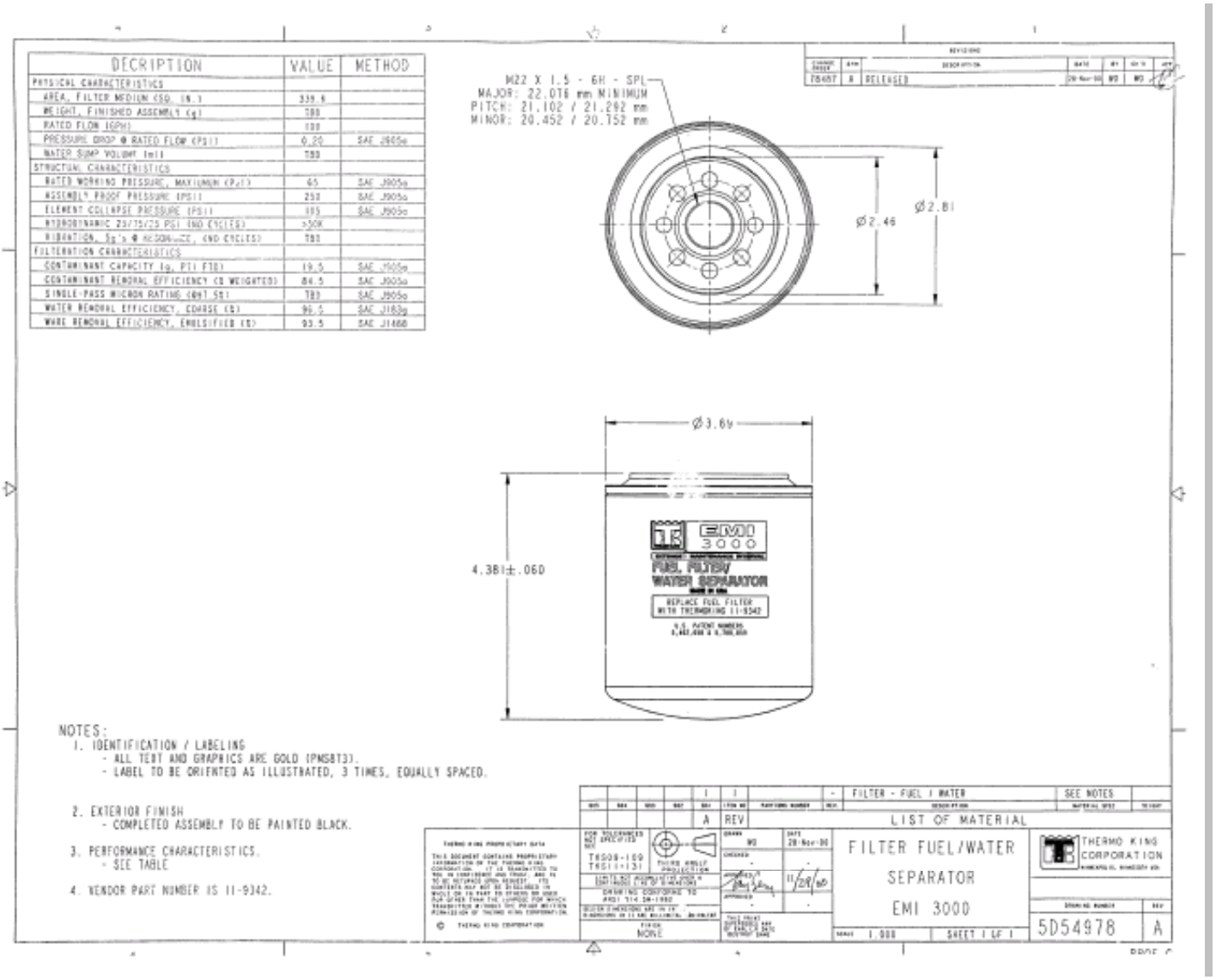
INSTALLATION DIAGRAM


EXHAUST
53.00 [1346.2]
1.00 [25.4] FUEL GAUGE
22.50 [571.5]
2.00 TYP [50.8] (36" CHASSIS)
52.50 [1333.5]
28.00 [711.2]
8.25 [209.6]
13.38 [339.9] (MOUNTING ARMS)
6.00 [152.4]
MEMBER LOCATION VARIES WITH MANUFACTURER
34.00 [863.6]
9.50 [241.3]
28.50 [723.9]
3.00 [76.2]
19.00 [482.6]
36.00 [914.4] (LOADED)
14.00 355.6] (LOADED)
8.00 [203.2]
8.00 [203.2]
20.00 [508]
14.50 [368.3]
3.25 TYP. [82.6] (MOUNTING HARDWARE)
REVISIONS
58997 A RELEASED 11/7/91 TJN DGB BE
61937 B DELETED 20' CHASSIS INFO 02/23/93 TRH DGB
64006 C DELETED TOP VIEW OF MUFFLER "A" "B" "C" & .25 (RADIATOR CAP) DIMS 05/09/94 TRH TRH DL
69066 D ADDED LOCATION OF EXHAUST 01/09/97 TJN
507936 E DIM. 60.50 [1536.7] WAS 60.00 [1524] 27-Oct-99 TJN TJN DB
518213 F TITLE WAS CG11/SGCM 11-Sep-01 TJN TJN DB
LIST OF MATERIAL
THERMO KING CORPORATION
TRH 06/22/91
DGB 06/22/91
BE 06/18/91
INSTALLATION/OUTLINE
SGCM 3000
40'/20' CHASSIS
SHEET 1 OF 1
SCALE 1/10
9159C16 F

NAMEPLATE LOCATION LAYOUT PRINT



FUEL FILTER DRAWING



EMI BULLETIN

EMI 3000 Package

The EMI package includes:

• New 5 Years or 12,000 Hours Extended Life Coolant (ELC)
• New EMI 3000 Water Pump, P/N 11-9442 (includes HNBR elastomer seals and EPDM O-rings)
• New EMI 3000 Dual Element Oil Filter, P/N 11-9182 (identified by black and gold colors)
• New EMI 3000 Dual Element Oil Filter Head, P/N 11-9354
• New EMI 3000 API Rating CG-4 Mineral Oil
• New EMI 3000 Fuel Filter, P/N 11-9342 (identified by black and gold colors)

The EMI 3000 package allows standard genset maintenance intervals to be extended to 3000 hours. However, please note that units equipped with the EMI 3000 package do require regular inspection in accordance with Thermo King pretrip inspection and maintenance recommendations.

CAUTION: With both EMI 3000 and standard (non-EMI 3000) units operating in the field, there are several important rules to remember:

• Extended Life Coolant (ELC) is RED in color while conventional coolant is GREEN or BLUE-GREEN.
• Do NOT add "RED" coolant to cooling systems using "GREEN" or "BLUE-GREEN" coolant.
• Do NOT add "GREEN" or "BLUE-GREEN" coolant to cooling systems using "RED" coolant.
• The EMI 3000 oil filter is NOT interchangeable with previous oil filters.

EMI 3000 Components:

Extended Life Coolant and EMI 3000 Water Pump

A decal tag on the coolant expansion tank will identify units with extended life coolant (ELC). ELC extends the coolant change interval up to 12,000 hours or 5 years. ELC requires a water pump with HNBR elastomer seal bellows and EPDM elastomer O-rings. Therefore ELC should not be used on older units with standard water pumps. All Yanmar (TK 486) engines with serial number L16553 and after include a new EMI 3000 water pump for use with extended life coolant.

ELC Compatible Water Pump 11-9442

ELC Nameplate 91-9269

Thermo King ships all water-cooled engines from the factory with a 50% antifreeze concentrate and 50% water mixture in the cooling system. ELC coolants are available in 100% full strength concentrate or (pre-mixed) 50/50 mixture. Thermo King recommends the use of 50/50 pre-mixed ELC coolant to assure that de-ionized water is used. ELC 100% concentrate must be mixed (50/50) with de-ionized or distilled water (NOT tap water) to ensure cooling system integrity.

The following Extended Life Coolants are approved by Thermo King for use in ELC units for five years or 12,000 hours:

• Texaco ELC #16445 (100% concentrate)
• Texaco ELC #16447 (premixed 50/50% mixture)
• Havoline Dex-Cool #7994 (100% concentrate)
• Havoline Dex-Cool #7995 (premixed 50/50% mixture)
• Shell Dexcool #94040
• Shell Rotella #94041
• Havoline XLC #30379 (100% concentrate, Europe)
• Havoline XLC #33013 (premixed 50/50% mixture, Europe)
• Saturn/General Motors Dex-Cool
• Caterpillar ELC
• Detroit Diesel POWERCOOL Plus.

NOTE: Use a glycol refractometer to accurately determine the freeze point and concentration of engine coolant (Anti-Freeze) solution. A refractometer works with both extended life and conventional coolants.

EMI 3000 Dual Element Oil Filter and Oil Filter Head

All Yanmar (TK 486) engines with serial number L32024 and after include an EMI 3000 oil filter head (P/N 11-9354) and gasket (P/N 33-2931), EMI 3000 dual element oil filter (P/N 11-9182) and API rated CG-4 mineral oil. These components are required to extend the maintenance interval to 3000 hours.

The EMI 3000 oil filter (identified by black and gold colors) is NOT interchangeable with the previous oil filters. The EMI 3000 oil filter head, gasket and oil filter can be retrofitted on previous Yanmar (TK 486) engines.

API service category CG-4 describes oils for use in high-speed four-stroke-cycle diesel engines used in both heavy-duty on-highway (0.05% wt sulfur fuel) and off-highway (less than 0.5% wt sulfur fuel) applications. CG-4 oils provide effective control over high-temperature piston deposits, wear, corrosion, foaming, oxidation stability, and soot accumulation. CG-4 (or better) mineral oil can be used in older units. However, an EMI 3000 oil filter (and oil filter head) is required to extend recommended maintenance intervals to 3,000 hours.

NOTE: The new oil filter head is equipped with a threaded port to accept an ESOC (Environmentally Safe Oil Change) fitting for quick oil changes.

EMI 3000 Fuel Filter

The new EMI 3000 fuel filter is required to extend the maintenance interval to 3000 hours. It can be interchanged with fuel filters used on previous Thermo King gensets.

REVISIONS

A	March 6, 2007	Original release
B	March 29, 2007	Update engine emission, official approval request being submitted.
C	June 19, 2007	Update engine emissions for 2008 engines, unit weight, structural frame section, added exterior downloading port to SG+ description.
D	August 24, 2007	Added option section, updated battery section.
E	January 17, 2008	General updates.