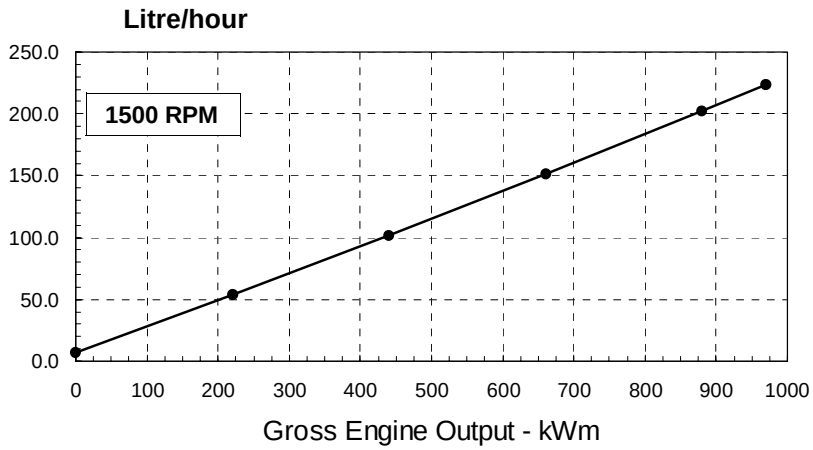
CUMMINS ENGINE COMPANY, INC Columbus, Indiana 47201 **ENGINE PERFORMANCE CURVE**	Basic Engine Model: **QST30-G4**	Date: **8May00**	*G-DRIVE* **QST** **1**
	Engine Critical Parts List: **CPL: 2499 (2 Pump / 2 Loop)** **CPL: 2548 (Air-to-Air)**	Curve Number: **FR-5160 (2P/ 2L)** **FR-5162 (Air-to-Air)**	

Displacement : **30.48** litre (**1860** in^3)	Bore : **140** mm (**5.51** in) Stroke : **165** mm (**6.50** in)
No. of Cylinders : **12**	Aspiration : **Turbocharged and Low Temperature Aftercooled**

Engine Speed	Standby Power		Prime Power		Continuous Power	
RPM	kWm	BHP	kWm	BHP	kWm	BHP
1500	970	1300	880	1180	683	915
1800	1112	1490	1007	1350	832	1115

Engine Performance Data @ 1500 RPM

OUTPUT POWER			FUEL CONSUMPTION			
%	kWm	BHP	kg/ kWm·h	lb/ BHP·h	litre/ hour	U.S. Gal/ hour
STANDBY POWER						
100	970	1300	0.196	0.323	224	59.1
PRIME POWER						
100	880	1180	0.195	0.320	202	53.2
75	660	885	0.194	0.319	151	39.8
50	440	590	0.197	0.324	102	26.9
25	220	295	0.207	0.341	54	14.2
CONTINUOUS POWER						
100	683	915	0.194	0.319	156	41.1



CONVERSIONS: (litres = U.S. Gal x 3.785) (Engine kWm = BHP x 0.746) (U.S. Gal = litres x 0.2642) (Engine BHP = Engine kWm x 1.34)

These guidelines have been formulated to ensure proper application of generator drive engines in A.C. generator set installations. Generator drive engines are not designed for and shall not be used in variable speed D.C. generator set applications.

STANDBY POWER RATING
Applicable for supplying emergency power for the duration of the utility power outage. No overload capability is available for this rating. Under no condition is an engine allowed to operate in parallel with the public utility at the Standby Power rating. This rating should be applied where reliable utility power is available. A Standby rated engine should be sized for a maximum of an 80% average load factor and 200 hours of operation per year. This includes less than 25 hours per year at the Standby Power rating. Standby ratings should never be applied except in true emergency power outages. Negotiated power outages contracted with a utility company are not considered an emergency.

PRIME POWER RATING
Applicable for supplying electric power in lieu of commercially purchased power. Prime Power applications must be in the form of one of the following two categories:

UNLIMITED TIME RUNNING PRIME POWER

Prime Power is available for an unlimited number of hours per year in a variable load application. Variable load should not exceed a 70% average of the Prime Power rating during any operating period of 250 hours. The total operating time at 100% Prime Power shall not exceed 500 hours per year. A 10% overload capability is available for a period of 1 hour within a 12-hour period of operation. Total operating time at the 10% overload power shall not exceed 25 hours per year.

LIMITED TIME RUNNING PRIME POWER

Limited Time Prime Power is available for a limited number of hours in a non-variable load application. It is intended for use in situations where power outages are contracted, such as in utility power curtailment. Engines may be operated in parallel to the public utility up to 750 hours per year at power levels never to exceed the Prime Power rating. The customer should be aware, however, that the life of any engine will be reduced by this constant high load operation. Any operation exceeding 750 hours per year at the Prime Power rating should use the Continuous Power rating.

CONTINUOUS POWER RATING
Applicable for supplying utility power at a constant 100% load for an unlimited number of hours per year. No overload capability is available for this rating.

Data shown above represent gross engine performance capabilities obtained and corrected in accordance with ISO-3046 conditions of 100 kPa (29.53 in Hg) barometric pressure [110 m (361 ft) altitude], 25 °C (77 °F) air inlet temperature, and relative humidity of 30% with No. 2 diesel or a fuel corresponding to ASTM D2.

See reverse side for application rating guidelines.

The fuel consumption data is based on No. 2 diesel fuel weight at 0.85 kg/litre (7.1 lbs/U.S. gal).

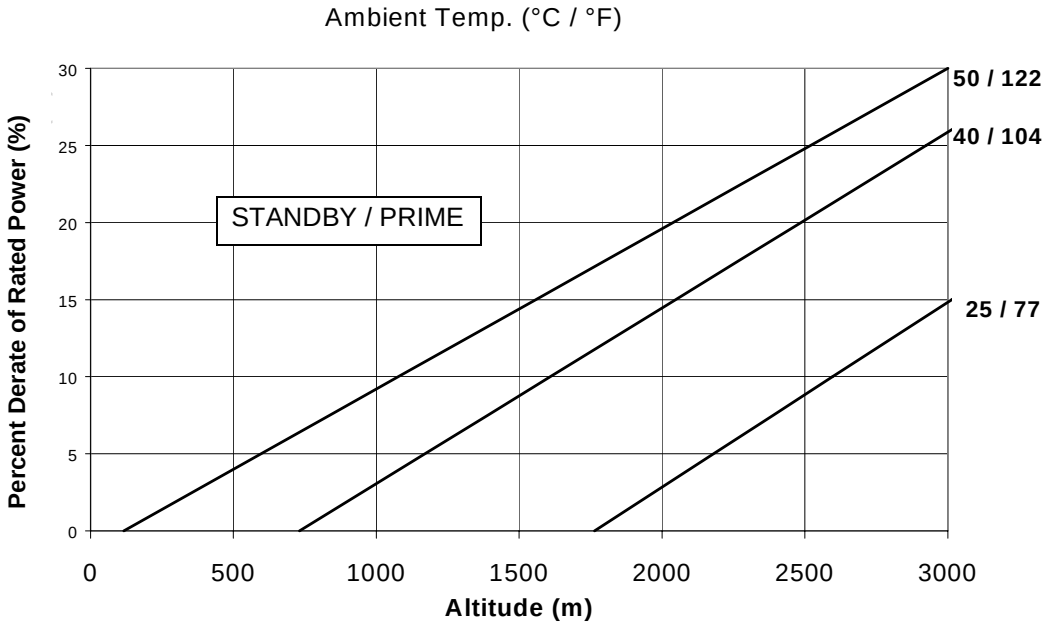
Power output curves are based on the engine operating with fuel system, water pump and lubricating oil pump; not included are battery charging alternator, fan, optional equipment and driven components.

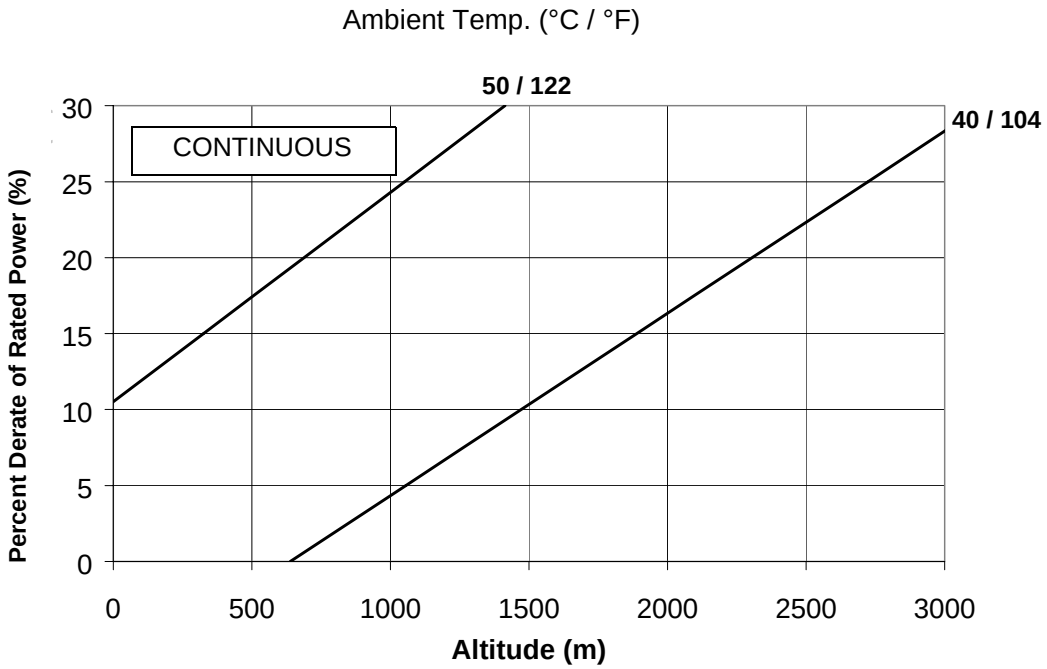
D K. Trueblood

TECHNICAL DATA DEPT. **CERTIFIED WITHIN 5%** **CHIEF ENGINEER**

QST30-G4 Derate Curves @ 1500 RPM

CURVE NO: FR-5160 (2 Pump 2 loop)
FR5162 (Air-to-Air)
DATE: 8May00





Reference Standards:

BS-5514 and DIN-6271 standards are based on ISO-3046.

Operation At Elevated Altitude and Temperature:

For sustained operation above these conditions, derate an additional 9% per 500 m (1640 ft) and 15% per 10°C (18°F)

Note: Derates shown are based on 15 in H_20 air intake restriction and 2 in Hg exhaust back pressure.

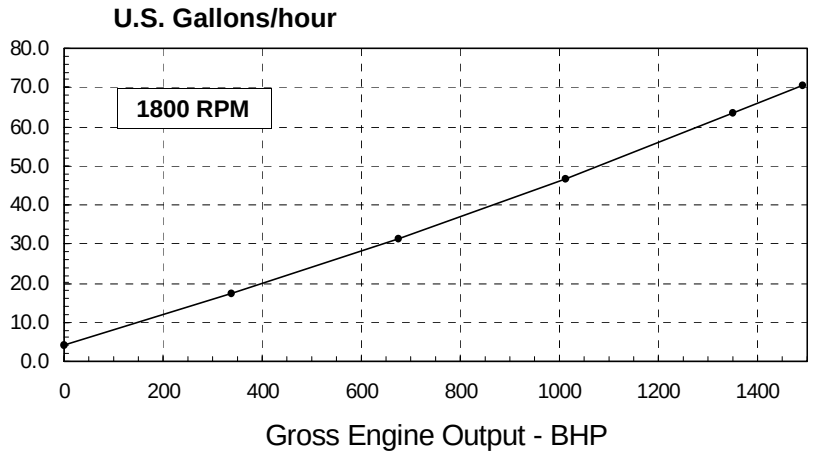
CUMMINS ENGINE COMPANY, INC Columbus, Indiana 47201 **ENGINE PERFORMANCE CURVE**	Basic Engine Model: **QST30-G4**	Date: **8May00**	*G-DRIVE* **QST** **3**
	Engine Critical Parts List: **CPL: 2499 (2 Pump / 2 Loop)** **CPL: 2548 (Air-to-AIr)**	Curve Number: **FR-5160 (2P / 2L)** **FR-5162 (Air-to-Air)**	

Displacement : **30.48** litre (**1860** in^3)	Bore : **140** mm (**5.51** in) Stroke : **165** mm (**6.50** in)
No. of Cylinders : **12**	Aspiration : **Turbocharged and Low Temperature Aftercooled**

Engine Speed	Standby Power		Prime Power		Continuous Power	
RPM	kWm	BHP	kWm	BHP	kWm	BHP
1500	970	1300	880	1180	683	915
1800	1112	1490	1007	1350	832	1115

Engine Performance Data @ 1800 RPM

OUTPUT POWER			FUEL CONSUMPTION			
%	kWm	BHP	kg/ kWm·h	lb/ BHP·h	litre/ hour	U.S. Gal/ hour
STANDBY POWER						
100	1112	1490	0.204	0.336	267	70.5
PRIME POWER						
100	1007	1350	0.203	0.333	240	63.3
75	756	1013	0.199	0.327	177	46.7
50	504	675	0.202	0.331	119	31.5
25	252	338	0.223	0.366	66	17.4
CONTINUOUS POWER						
100	832	1115	0.199	0.327	194	51.4



CONVERSIONS: (litres = U.S. Gal x 3.785) (kWm = BHP x 0.746) (U.S. Gal = litres x 0.2642) (BHP = kWm x 1.34)

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Applicable for supplying utility power at a constant 100% load for an unlimited number of hours per year. No overload capability is available for this rating.

Data shown above represent gross engine performance capabilities obtained and corrected in accordance with ISO-3046 conditions of 100 kPa (29.53 in Hg) barometric pressure [110 m (361 ft) altitude], 25 °C (77 °F) air inlet temperature, and relative humidity of 30% with No. 2 diesel or a fuel corresponding to ASTM D2.

See reverse side for application rating guidelines.

The fuel consumption data is based on No. 2 diesel fuel weight at 0.85 kg/litre (7.1 lbs/U.S. gal).

Power output curves are based on the engine operating with fuel system, water pump and lubricating oil pump; not included are battery charging alternator, fan, optional equipment and driven components.

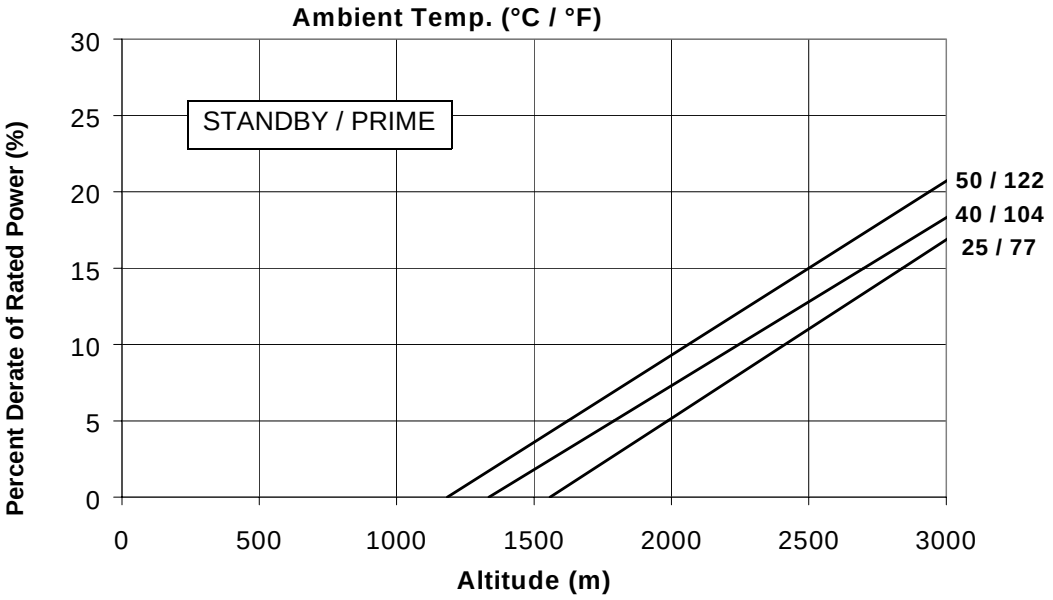
D K. Trueblood

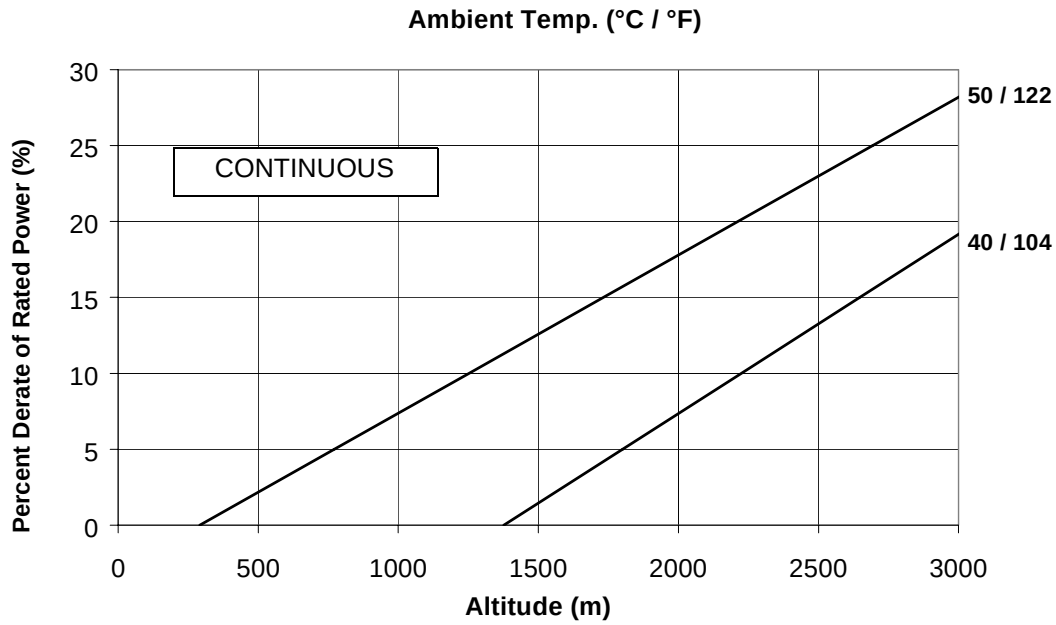
TECHNICAL DATA DEPT. **CERTIFIED WITHIN 5%** **CHIEF ENGINEER**

G-DRIVE
QST
4

QST30-G4 Derate Curves @ 1800 RPM

CURVE NO: FR-5160 (2 Pump 2 loop)
FR5162 (Air-to-AIr)
DATE: 8May00





Reference Standards:

BS-5514 and DIN-6271 standards are based on ISO-3046.

Operation At Elevated Altitude and Temperature:

For sustained operation above these conditions, derate an additional 9% per 1000 ft (300 m) and 15% per 10°C (18°F).

Note: Derates shown are based on 15 in H_20 air intake restrictions and 2 in Hg exhaust back pressure.

Cummins Engine Company, Inc.
Engine Data Sheet

G-DRIVE
QST 5

ENGINE MODEL : **QST30-G4** **CONFIGURATION NUMBER :** D573001GX03

DATA SHEET : DS-5160
DATE : 8May00
PERFORMANCE CURVE : FR-5160 (2P / 2L)
FR-5162 (A - A)

INSTALLATION DIAGRAM
- Fan to Flywheel (2 Pump / 2 Loop): 3170314
- Fan to Flywheel (Air-to-Air): 3170341

CPL NUMBER
- Engine Critical Parts List (2 Pump / 2 Loop) :2499
- Engine Critical Parts List (Air-to-Air) :2548

GENERAL ENGINE DATA

Type		4-Cycle; 50° Vee; 12-Cylinder Diesel	
Aspiration		Turbocharged and Low Temperature Aftercooled	
Bore x Stroke	— mm x mm (in x in)	140 x165 (5.51 x 6.50)	
Displacement	— (litre) in^3	30.48 (1860)	
Compression Ratio		14.0 : 1	
Dry Weight,Fan to Flywheel Engine	— kg (lb)	3012	(6640)
Wet Weight,Fan to Flywheel Engine	— kg (lb)	3112	(6860)
Moment of Inertia of Rotating Components			
• with FW 5050 Flywheel	— kg • m^2 (lb_m • ft^2)	8.7	(206)
Center of Gravity from Rear Face of Flywheel Housing (FH 5031)	— mm (in)	845	(33.3)
Center of Gravity Above Crankshaft Centerline	— mm (in)	195	(7.7)
Maximum Static Loading at Rear Main Bearing	— kg (lb)	950	(2100)

ENGINE MOUNTING

Maximum Bending Moment at Rear Face of Block	— N • m (lb • ft)	3100	(2286)

EXHAUST SYSTEM

Maximum Back Pressure	— mm Hg (in Hg)	51	(2)

AIR INDUCTION SYSTEM

Maximum Intake Air Restriction			
• with Dirty Filter Element	— mm H_2O (in H_2O)	635	(25)
• with Clean Filter Element	— mm H_2O (in H_2O)	381	(15)

COOLING SYSTEM (Low Temperature Aftercooling Required)

Coolant Capacity	— Engine Only	— litre (US gal)	79	(21)
	— Aftercoolers (2 Pump / 2 Loop)	— litre (US gal)	12	(3.2)
Minimum Pressure Cap		— kPa (psi)	69	(10)
Jacket Water Circuit Requirements				
Maximum Coolant Friction Head External to Engine	— 1500 / 1800 rpm	— kPa (psi)	48 / 69	(7 / 10)
Maximum Static Head of Coolant Above Engine Crank Centerline		— m (ft)	14	(46)
Standard Thermostat (Modulating) Range		— °C (°F)	82 - 95	(180 - 203)
Maximum Top Tank Temperature for Standby / Prime Power		— °C (°F)	104 / 100	(220 / 212)
Aftercooler Circuit Requirements (2 Pump / 2 Loop Aftercooling)				
Maximum Inlet Water Temperature to Aftercooler @ 77 °F		— °C (°F)	49	(120)
Maximum Inlet Water Temperature to Aftercooler		— °C (°F)	65	(150)
Maximum Coolant Friction Head External to Engine	— 1500 / 1800 rpm	— kPa (psi)	35 / 48	(5 / 7)
Air-to-Air Core Requirements				
Maximum Temp. Rise Between Engine Air Inlet and Intake Manifold	— 1500 / 1800 rpm	— °C (°F)	33 / 39	(60 / 70)
Maximum Air Press. Drop from Turbo AIr Outlet to Intake Manifold	— 1500 / 1800 rpm	— mm (in Hg)	102 / 127	(4 / 5)

LUBRICATION SYSTEM

Oil Pressure @ Idle Speed	— kPa (psi)	166	(24)
@ Governed Speed	— kPa (psi)	310 - 386	(45 - 56)
Maximum Oil Temperature	— °C (°F)	121	(250)
Oil Capacity with OP 5133 Oil Pan : High - Low	— litre (US gal)	133 - 114	(35 - 30)
Total System Capacity (Including Bypass Filter)	— litre (US gal)	154	(40.7)

FUEL SYSTEM

Type Injection System		Bosch P8500 LLA Direct Injection		
Maximum Restriction at Lift Pump	— with Clean Fuel Pre-Filter	— mm Hg (in Hg)	102	(4.0)
	— with Dirty Fuel Pre-Filter	— mm Hg (in Hg)	203	(8.0)
Maximum Allowable Head on Injector Return Line (Consisting of Friction and Static Head)		— mm Hg (in Hg)	508	(20)
Maximum Fuel Flow to Injection Pumps (Left and Right Banks Combined)	1500 / 1800 rpm	— litre / hr (US gph)	550 / 570	(145 / 150)
Maximum Fuel Inlet Temperature		— °C (°F)	71	(150)
Maximum Return Flow	1500 / 1800 rpm	— litre / hr (US gph)	530 / 550	(140 / 145)

ELECTRICAL SYSTEM

Cranking Motor (Heavy Duty, Positive Engagement) — volt		24
Battery Charging System, Negative Ground — ampere		35
Maximum Allowable Resistance of Cranking Circuit — ohm		0.002
Minimum Recommended Battery Capacity		
• Cold Soak @ 10 °C (50 °F) and Above — 0°F CCA		1200
• Cold Soak @ 0 °C to 10 °C (32 °F to 50 °F) — 0°F CCA		1280
• Cold Soak @ -18 °C to 0 °C (0 °F to 32 °F) — 0°F CCA		1800

COLD START CAPABILITY

Minimum Ambient Temperature for Cold Start with 8000 watt Coolant Heater to Rated Speed — °C (°F)	-7	(20)
Minimum Ambient Temperature for Unaided Cold Start to Idle Speed — °C (°F)	7	(45)
Minimum Ambient Temperature for NFPA110 Cold Start (90°F Minimum Coolant Temperature) — °C (°F)	0	(32)

PERFORMANCE DATA

All data is based on:

- Engine operating with fuel system, water pump, lubricating oil pump, air cleaner and exhaust silencer; not included are battery charging alternator, fan, and optional driven components.
- Engine operating with fuel corresponding to grade No. 2-D per ASTM D975.
- ISO 3046, Part 1, Standard Reference Conditions of:

Barometric Pressure	100 kPa (29.53 in Hg)	Air Temperature	25 °C (77 °F)
Altitude	110 m (361 ft)	Relative Humidity	30%
Air Intake Restriction	254 mm H_2O (10 in H_2O)	Exhaust Restriction	51 mm Hg (2 in Hg)

Steady State Stability Band at any Constant Load — %	+/- 0.25
Estimated Free Field Sound Pressure Level of a Typical Generator Set; Excludes Exhaust Noise; at Rated Load and 7.5 m (24.6 ft); @1500 / 1800 rpm — dBA	91 / 93
Exhaust Noise at 1 m Horizontally from Centerline of Exhaust Pipe Outlet Upwards at 45° @1500 / 1800 rpm — dBA	128 / 131

	STANDBY POWER 60 hz		STANDBY POWER 50 hz		PRIME POWER 60 hz		PRIME POWER 50 hz	
Governed Engine Speed — rpm	1800		1500		1800		1500	
Engine Idle Speed — rpm	700 - 900		700 - 900		700 - 900		700 - 900	
Gross Engine Power Output — kW_m (BHP)	1112	(1490)	970	(1300)	1007	(1350)	880	(1180)
Brake Mean Effective Pressure — kPa (psi)	2427	(352)	2544	(369)	2199	(319)	2310	(335)
Piston Speed — m / s (ft / min)	9.9	(1949)	8.3	(1634)	9.9	(1949)	8.3	(1634)
Friction Horsepower — kW_m (BHP)	82	(110)	58	(78)	82	(110)	58	(78)
Engine Jacket Water Flow at Stated Friction Head External to Engine:								
• 5 psi Friction Head — litre / s (US gpm)	17.0	(270)	14.2	(225)	17.0	(270)	14.2	(225)
• Maximum Friction Head — litre / s (US gpm)	16.5	(262)	13.7	(217)	16.5	(262)	13.7	(217)
Engine Data with Dry Type Exhaust Manifold								
Intake Air Flow — litre / s (cfm)	1340	(2840)	1005	(2130)	1250	(2650)	945	(2005)
Exhaust Gas Temperature — °C (°F)	525	(975)	575	(1070)	495	(920)	565	(1050)
Exhaust Gas Flow — litre / s (cfm)	3670	(7775)	2980	(6310)	3285	(6960)	2750	(5820)
Air to Fuel Ratio — air : fuel	25 : 1		22 : 1		26.5 : 1		22.6 : 1	
Radiated Heat to Ambient — kW_m (BTU / min)	130	(7460)	115	(6410)	115	(6650)	105	(5860)
Heat Rejection to Jacket Water Coolant — kW_m (BTU / min)	365	(20880)	335	(18940)	340	(19350)	320	(18150)
Heat Rejection to Exhaust — kW_m (BTU / min)	740	(42130)	670	(38050)	660	(37640)	600	(33990)
Engine Aftercooler Data								
Heat Rejection to Aftercooler — kW_m (BTU / min)	270	(15420)	170	(9560)	215	(12120)	145	(8240)
Aftercooler Water Flow at Stated Friction Head External to Engine:								
• 2 psi Friction Head — litre / s (US gpm)	5.4	(85)	4.5	(71)	5.4	(85)	4.5	(71)
• Maximum Friction Head — litre / s (US gpm)	5.0	(80)	4.4	(68)	5.0	(80)	4.4	(68)
Charge Air Flow — kg/ min (lb / min)	93	(205)	70	(154)	87	(192)	66	(145)
Turbocharger Compressor Outlet Pressure — mm Hg (in / Hg)	1859	(73)	1534	(60)	1666	(66)	1374	(54)
Turbocharger Compressor Outlet Temperature — °C (°F)	202	(395)	177	(350)	183	(360)	165	(330)

N.A. - Data is Not Available
N/A - Not Applicable to this Engine
TBD - To Be Determined