	Cummins India Limited **Power Generation Business Unit** **Engine Data Sheet**	Basic Engine Model: **X2.5G4** Engine Critical Parts List:	Curve Number: Date: **29 June 09**	*G-DRIVE* **X2.5** **1**

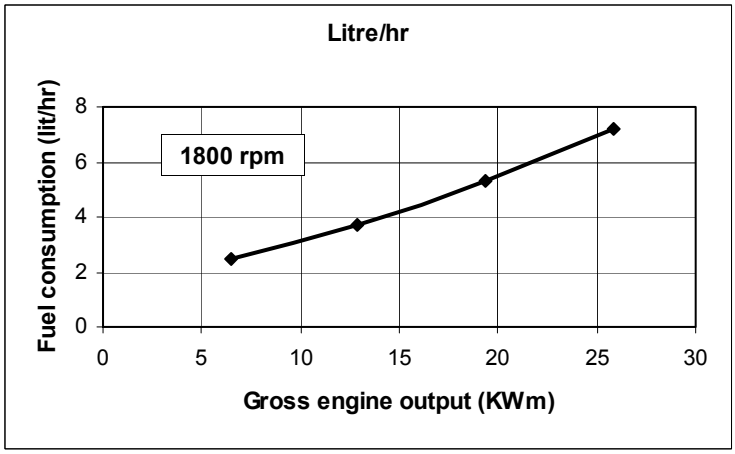
Displacement : **2.5** litre (**153** in^3)	Bore : **91.4**mm (**3.59** in.) Stroke : **127** mm (**5** in.)
No. of Cylinders : **3**	Aspiration : **Naturally Aspirated**

Engine Speed	Standby Power		Prime Power		Continuous Power	
rpm	kWm	hp	kWm	hp	kWm	hp
1800	28.7	38.5	25.85	34.65	20.10	26.95

Engine Performance Data @ 1800 rpm

OUTPUT POWER			FUEL CONSUMPTION			
%	kWm	hp	kg/ kWm·h	lb/ hp·h	litre/ hour	US gal/ hour
STANDBY POWER						
100	28.7	38.5	0.234	0.382	8.0	2.1
PRIME POWER						
100	25.85	34.65	0.237	0.389	7.2	1.9
75	19.39	26.00	0.232	0.382	5.3	1.4
50	12.92	17.33	0.243	0.400	3.7	0.7
25	6.46	8.66	0.329	0.541	2.5	0.5
CONTINUOUS POWER						
100	20.10	26.95	0.231	0.380	5.5	1.4

litre/hour



CONVERSIONS:(litres = US Gal x 3.785) (US Gal = litres x 0.2642)

Data Subject to Change Without Notice

These guidelines have been formulated to ensure proper application of generator drive engines in A.C. generator set installations. **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.

Reference AEB 10.47 for determining Electrical Output.

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

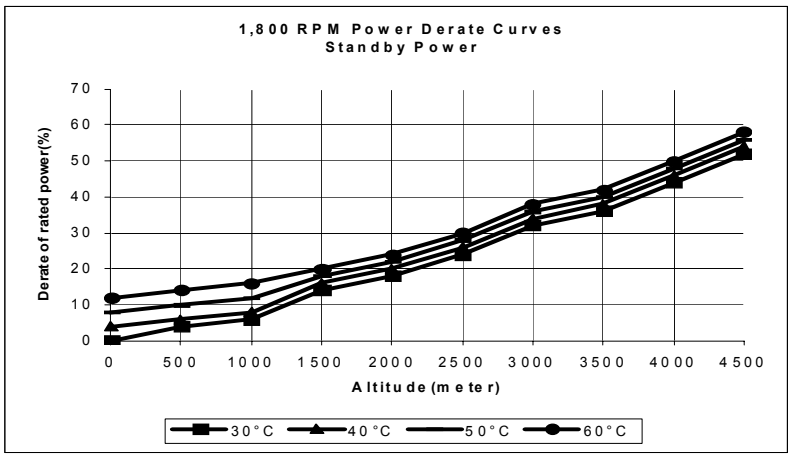
The fuel consumption data is based on No. 2 diesel fuel weight at 0.85 kg/litre (7.1 lbs/US gal). Power output curves are based on the engine operating with fuel system, water pump and lubricating oil pump; not included are battery charging alternator, fan, optional equipment and driven components.

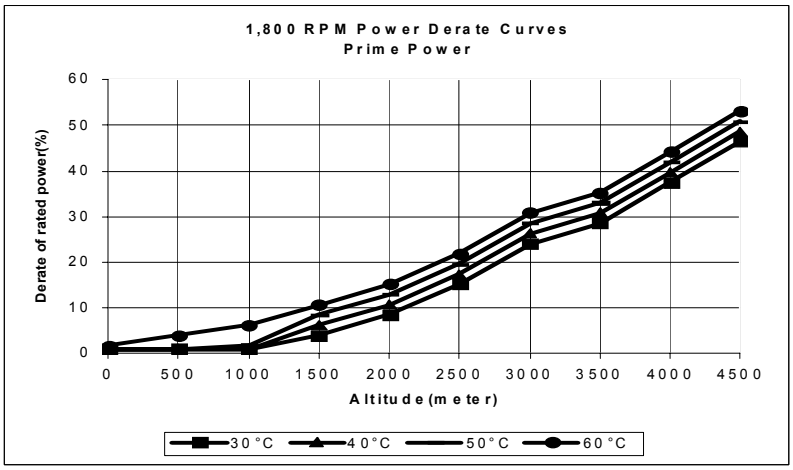
Data Status: Limited Production

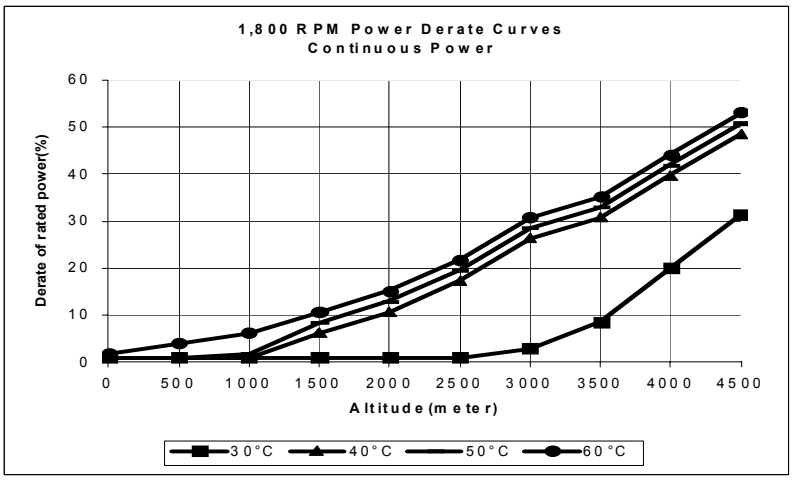
Data Tolerance: ± 5%

Chief Engineer:

1800 RPM Power Derate Curves







Operation At Elevated Temperature And Altitude:

For **Standby Operation** above these conditions, derate by an additional 10% per 300 m (1000 ft), and 3.5% per 10 ^{o}C (18 ^{o}F).

For **Prime Operation** above these conditions, derate by an additional 7% per 300 m (1000 ft), and 2% per 10 ^{o}C (18 ^{o}F).

For **Continuous Operation** above these conditions, derate by an additional 3.5% per 300 m (1000 ft), and 1.75% per 10 ^{o}C (18 ^{o}F).

Cummins Inc.
Engine Data Sheet

ENGINE MODEL : X 2.5

DATA SHEET : DS-X 2.5
CONFIGURATION NUMBER : ____ **DATE :**29 June 09
PERFORMANCE CURVE : _____

INSTALLATION DIAGRAM
•

CPL NUMBER
•

GENERAL ENGINE DATA

Type	Inline 3-Cylinder Diesel	
Aspiration	Natutrally Aspirated	
Bore x Stroke — in x in (mm x mm)	3.59 x 5 (91.4 X 127)	
Displacement — in^3 (litre)	153 (2.5)	
Compression Ratio	18.5 : 1	
Dry Weight (Approximate),		
Fan to Flywheel Engine — lb (kg)	595	(270)
Wet Weight (Approximate),		
Fan to Flywheel Engine — lb (kg)	617	(280)
Moment of Inertia of Rotating Components		
• with ___ Flywheel — $lb_m \cdot ft^2$ ($kg \cdot m^2$)	22.453	(1.1)
• with ____Flywheel — $lb_m \cdot ft^2$ ($kg \cdot m^2$)	_	(N/A)
Center of Gravity from Rear Face of Block — in (mm)	10	(254)
Center of Gravity Above Crankshaft Centerline — in (mm)	4.724	(120)
Maximum Static Loading at Rear Main Bearing — lb (kg)	TBD	TBD

ENGINE MOUNTING

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

EXHAUST SYSTEM

Maximum Back Pressure — in Hg (kPa)	1	(3.38)

AIR INDUCTION SYSTEM

Maximum Intake Air Restriction:		
• withClean Filter Element (Normal Duty Air Cleaner) — in H_2O (kPa)	10	(2.5)
• with Clean Filter Element (Heavy Duty Air Cleaner) — in H_2O (kPa)	15	(4)
• with Dirty Filter Element (Heavy Duty Air Cleaner) — in H_2O (kPa)	25	(6.2)

COOLING SYSTEM

Jacket Water Circuit Requirements

Coolant Capacity — Engine Only — US gal (litre)	1.85	(7)
Maximum Static Head of Coolant Above Engine Crank Centerline — ft (m)	46	(14)
Standard Thermostat (Modulating) Range — °F (°C)	167-192	(75-89)
Minimum Pressure Cap — psi (kPa)	7	(48)
Maximum Top Tank Temperature for Standby / Prime Power — °F (°C)	212	(100)
Maximum Coolant Friction Head External to Engine — psi (kPa)	5	(36)

Charge Air Cooler Requirements

Maximum Temp. Rise Between Engine Air Intake and Aftercooler Air Outlet- 1500/1800 rpm — °F (°C)	N/A	(N/A)
Maximum Air Pressure Drop from Turbo Air outlet to Intake Manifold - 1500/1800 rpm . — in Hg (kPa)	N/A	(N/A)
Maximum Intake Manifold Temperature @ 77 °F (25 °C) ambient - 1500/1800 rpm — °F (°C)	N/A	(N/A)
Maximum Compressor Outlet Temperature — °F (°C)	N/A	(N/A)
Maximum Intake Manifold Temperature for engine protection (Shut Down Threshold) — °F (°C)	N/A	(N/A)

LUBRICATION SYSTEM

Oil Pressure @ Idle Speed (miniumum) — psi (kPa)	64	(441)
@ Governed Speed — psi (kPa)	50.7	(350)
Maximum Oil Temperature — °F (°C)	250	(121)
Oil Capacity with ___ Oil Pan : Low - High — US gal (litre)	1.85-N.A.	(7 -N.A.)
Total System Capacity (With Combo Filters) — US gal (litre)	N.A.	(N.A.)

FUEL SYSTEM

Type Injection System		Bosch Mechanical	
Maximum Restriction at Lift Pump(clean/dirty filter)	— in Hg (kPa)	2.9/N.A.	(9.8/N.A.)
Maximum Allowable Head on Injector Return Line (Consisting of Friction Head and Static Head)	— in Hg (kPa)	11	(37.2)
Maximum Fuel Flow to Injector Pump	— US gph (litre/hr)	10.5	(40)
Maximum Return Fuel Flow	— US gph (litre/hr)	N.A.	(N.A.)
Maximum Fuel Inlet Temperature	— °F (°C)	N.A.	(N.A.)

ELECTRICAL SYSTEM

Cranking Motor (Heavy Duty, Positive Engagement)	— volt	12
Battery Charging System, Negative Ground	— ampere	36
Maximum Allowable Resistance of Cranking Circuit	— ohm	0.002
Minimum Recommended Battery Capacity		
• Cold Soak @ -12 °C to 0 °C (10 °F to 32 °F)	— 0°F CCA	638

COLD START CAPABILITY

Minimum Ambient Temperature for Cold Start with ___watt Coolant Heater to Rated Speed	— °F (°C)	14	(-10)
Minimum Ambient Temperature for Unaided Cold Start to Idle Speed	— °F (°C)	32	(0)
Minimum Ambient Temperature for NFPA 110 Cold Start (90° F Minimum Coolant Temperature)	— °F (°C)	TBD	TBD

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	: 100 m (300 ft)	Relative Humidity	: 30%
Air Intake Restriction	: N.A. mm H_2O (N.A. in H_2O)	Exhaust Restriction	: N.A. kPa (N.A. in Hg)

Steady State Stability Band at any Constant Load	— %	+/- 0.5
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 rpm	— dBA	105
Exhaust Noise at 1 m Horizontally from Centerline of Exhaust Pipe Outlet Upwards at 45°	— dBA	N.A.

		STANDBY POWER		PRIME POWER	
		60 hz	***50 hz***	***60 hz***	***50 hz***
Governed Engine Speed	rpm	1800	N/A	1800	N/A
Engine Idle Speed	rpm	900	N/A	800	N/A
Gross Engine Power Output	hp (kW)	38.50 (28.70)	N/A	34.65 (25.85)	N/A
Brake Mean Effective Pressure	psi (kPa)	131.2 (904.54)	N/A	118.2 (814.72)	N/A
Piston Speed	ft/min (m/s)	1499 (7.62)	N/A	1499 (7.62)	N/A
Friction Horsepower	hp (kW)	2.6 (2.0)	N/A	2.6 (2.0)	N/A
Engine Water Flow at Stated Friction Head External to Engine:					
• 1 psi Friction Head	US gpm (litre/min)	1.5 (1380)	N/A	1.5 (1380)	N/A
• Maximum Friction Head	US gpm (litre/min)	1.2 (1140)	N/A	1.2 (1140)	N/A
Engine Data					
Intake Air Flow	cfm (litre/s)	82.4 (38.88)	N/A	82.4 (38.88)	N/A
Exhaust Gas Temperature	°F (°C)	1220 (660)	N/A	1220 (660)	N/A
Exhaust Gas Flow	cfm (litre/s)	N.A. (N.A.)	N/A	N.A. (N.A.)	N/A
Air to Fuel Ratio	air : fuel	15:01	N/A	15:01	N/A
Radiated Heat to Ambient	BTU/min (kW)	427 (7.5)	N/A	N.A. (N.A.)	N/A
Heat Rejection to Jacket Coolant	BTU/min (kW)	882 (15.5)	N/A	N.A. (N.A.)	N/A
Heat Rejection to Exhaust	BTU/min (kW)	1252 (22)	N/A	N.A. (N.A.)	N/A
Heat Rejected to Fuel	BTU/min (kW)	N.A. (N.A.)	N/A	N.A. (N.A.)	N/A
Charge Air Cooler Heat Rejection	BTU/min (kW)	N.A. (N.A.)	N/A	N.A. (N.A.)	N/A
Turbocharger Compressor Outlet Pressure	psi (kPa)	N.A. (N.A.)	N/A	N.A. (N.A.)	N/A
Turbocharger Compressor Outlet Temperature	°F (°C)	N.A. (N.A.)	N/A	N.A. (N.A.)	N/A

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

*This is the maximum heat rejection to fuel, which is at low load.

ENGINE MODEL : **X2.5**
DATA SHEET : DS-X2.5
DATE : 29 June 09
CURVE NO. :

Cummins India Ltd. (Power Generation Business Unit)
Pune, 411038