

#### **CUMMINS ENGINE COMPANY, INC**

Columbus, Indiana 47201

#### **ENGINE PERFORMANCE CURVE**

Basic Engine Model: VTA28-G5

Curve Number: FR-5122

Page No.

Engine Critical Parts List:

CPL: 1651

Date:

9Sept96

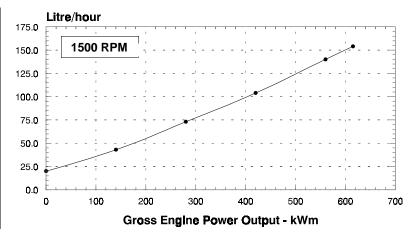
Displacement : **28.0** litre (**1710** in<sup>3</sup>) Bore : **140** mm (**5.5** in.) Stroke : **152** mm (**6.0** in.)

No. of Cylinders: 12 Aspiration: Turbocharged and Aftercooled

Engine Speed	Standby Power		Prime Power		Continuous Power	
RPM	kWm BHP		kWm BHP		kWm BHP	
1500	615	825	560	750	492	660
1800	671	900	608	815	504	675

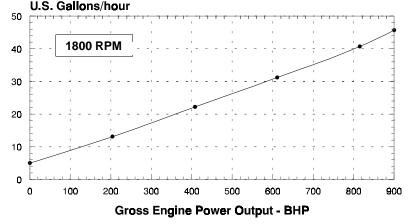
# **Engine Performance Data @ 1500 RPM**

OUTPUT POWER			FUEL CONSUMPTION				
% kWm B		kg/ kWm∙h	lb/ BHP∙h	litre/ hour	U.S. Gal/ hour		
STANDBY POWER							
615	825	0.213	0.351	154	40.8		
POWE	R						
560	750	0.213	0.350	140	37.0		
420	563	0.211	0.347	104	27.5		
280	375	0.222	0.365	73	19.3		
140	188	0.61	0.427	43	11.3		
CONTINUOUS POWER							
100 492 660		0.202	0.345	122	32.1		
	9BY PO 615 POWE 560 420 280 140 NUOUS	PBY POWER 615 825 POWER 560 750 420 563 280 375 140 188 NUOUS POWE	BHP kWm-h  BBY POWER  615 825 0.213  POWER  560 750 0.213  420 563 0.211  280 375 0.222  140 188 0.61  NUOUS POWER	BHP	kWm         BHP         kWm·h         BHP·h         hour           BY POWER         615         825         0.213         0.351         154           POWER           560         750         0.213         0.350         140           420         563         0.211         0.347         104           280         375         0.222         0.365         73           140         188         0.61         0.427         43           NUOUS POWER		



# **Engine Performance Data @ 1800 RPM**

OUTPUT POWER			FUEL CONSUMPTION					
%	kWm BHP		kg/ kWm∙h	•		U.S. Gal/ hour		
STAN	STANDBY POWER							
100	671	900	0.219	0.361	173	45.7		
PRIME	POWE		•	•				
100	608	815	0.215	0.355	154	40.7		
75	456	611	0.220	0.363	118	31.2		
50	304	408	0.235	0.386	84	22.2		
25	152	204	0.280	0.456	50	13.1		
CONT	CONTINUOUS POWER							
100 504 675		0.216	0.356	128	33.9			



**CONVERSIONS:** 

(Litres = U.S. Gal x 3.785)

(Engine kWm = BHP x 0.746)

 $(U.S. Gal = Litres \times 0.2642)$ 

(Engine BHP = Engine kWm x 1.34)

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. Truebloo

# POWER RATING APPLICATION GUIDELINES FOR GENERATOR DRIVE ENGINES

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 is 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.

CONTINUOUS POWER RATING is 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.

PRIME POWER RATING is 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**

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.

#### Reference Standards:

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

#### **Operation At Elevated Temperature And Altitude:**

The engine may be operated at:

1800 RPM up to 4,000 ft (1220 m) and 104 $^{\rm o}$  F (40 $^{\rm o}$  C) without power deration.

1500 RPM up to 4,000 ft (1220 m) and  $104^{\circ}$  F ( $40^{\circ}$  C) without power deration.

For sustained operation above these conditions, derate by 4% per 1,000 ft (300 m), and 1% per 10° F (2% per 11° C).

# **Cummins Engine Company, Inc.**

## **Engine Data Sheet**

DATA SHEET: DS-4886-B ENGINE MODEL: VTA28-G5 DATE: 9Sept96
PERFORMANCE CURVE: FR-5122 **CONFIGURATION NUMBER:** D153103DX02

**CPL NUMBER** 

 Engine Critical Parts List : 1651

INSTALLATION DIAGRAM

• Fan to Flywheel : 3626364

• Heat Exchanger Cooled : N.A.

Type		4-Cycle; 40° Vee	e; 12-Cylinder Die
Aspiration		Turbocharged a	and Aftercooled
Bore x Stroke	` _ /	5.5 x 6.0 (140 x	152)
Displacement	— in <sup>3</sup> (liter)	1710 (28.0)	
Compression Ratio		13.1 : 1	
Dry Weight			
Fan to Flywheel Engine	— lb (kg)	6395	(2900)
Heat Exchanger Cooled Engine	— lb (kg)	6571	(2980)
Wet Weight			
Fan to Flywheel Engine	— lb (kg)	6725	(3050)
Heat Exchanger Cooled Engine	— lb (kg)	7012	(3180)
Moment of Inertia of Rotating Components			
with FW 5013 Flywheel		256	(10.8)
with FW —— Flywheel			
Center of Gravity from Rear Face of Flywheel Housing (FH 5020)	— in (mm)	33.7	(856)
Center of Gravity Above Crankshaft Centerline	` '	14.0	(356)
Maximum Static Loading at Rear Main Bearing	— lb (kg)	1950	(885)
ENGINE MOUNTING			
Maximum Bending Moment at Rear Face of Block	— lb • ft (N • m)	1000	(1356)
EXHAUST SYSTEM			
Maximum Back Pressure	— in Hg (mm Hg)	3	(76)
AIR INDUCTION SYSTEM			
Maximum Intake Air Restriction	:- II O ( II O)	05	(005)
• with Dirty Filter Element		25	(635)
with Normal Duty Air Cleaner and Clean Filter Element		10	(254)
with Heavy Duty Air Cleaner and Clean Filter Element	— In H <sub>2</sub> O (mm H <sub>2</sub> O)	15	(381)
COOLING SYSTEM			(2.2)
Coolant Capacity — Engine Only		21.2	(80)
— with HX 5149 Heat Exchanger	— US gal (liter)	35.0	(132)
Maximum Coolant Friction Head External to Engine — 1800 rpm	. , ,	10	(69)
— 1500 rpm		8	(55)
Maximum Static Head of Coolant Above Engine Crank Centerline		60	(18.3)
Standard Thermostat (Modulating) Range		180 - 200	(82 - 93)
Minimum Pressure Cap		10	(69)
Maximum Top Tank Temperature for Standby / Prime Power		220 / 212	(104 / 100)
Minimum Raw Water Flow @ 90°F to HX 5149 Heat Exchanger		61	(231)
Maximum Raw Water Inlet Pressure at HX 5149 Heat Exchanger	— psi (кРа)	150	(1034)
LUBRICATION SYSTEM			
Oil Pressure @ Idle Speed	. , ,	20	(138)
@ Governed Speed		50 - 90	(345 - 621)
Maximum Oil Temperature		250	(121)
Oil Capacity with OP 5127 Oil Pan : High - Low	• , ,	18 - 16	(68 - 61)
Total System Capacity (including Bypass Filter)	• , ,	21.9	(83)
Angularity of OP 5127 Oil Pan — Front Down			30°
— Front Up			35°
— Side to Side			35°

#### **FUEL SYSTEM**

I OLL OTOTLIN		
Type Injection System	Direct Injection	Cummins PT
Maximum Restriction at PT Fuel Injection Pump — with Clean Fuel Filter	4.0	(102)
— with Dirty Fuel Filter — in Hg (mm Hg)	8.0	(203)
Maximum Allowable Head on Injector Return Line (Consisting of Friction Head and Static Head)	6.5	(165)
Maximum Fuel Flow to Injection Pump — US gph (liter / hr)	89	(337)
ELECTRICAL SYSTEM		
Cranking Motor (Heavy Duty, Positive Engagement)	24	
Battery Charging System, Negative Ground — ampere	35	
Maximum Allowable Resistance of Cranking Circuit — ohm	0.002	
Minimum Recommended Battery Capacity		
• Cold Soak @ 50 °F (10 °C) and Above	1200	
• Cold Soak @ 32 °F to 50 °F (0 °C to 10 °C)	1280	
• Cold Soak @ 0 °F to 32 °F (-18 °C to 0 °C)	1800	
COLD START CAPABILITY		
Minimum Ambient Temperature for Aided (with Coolant Heater) Cold Start within 10 seconds	50	(10)
Minimum Ambient Temperature for Unaided Cold Start	40	`(4)

### 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 :  $25 ^{\circ}\text{C} (77 ^{\circ}\text{F})$  Altitude : 110 m (361 ft) Relative Humidity : 30%

Estimated Free Field Sound Pressure Level of a Typical Generator Set;

Exhaust Noise at 1 m Horizontally from C<sub>L</sub> of Exhaust Pipe Outlet Upwards at 45° [1800 / 1500 RPM] ...... — dBA 112 / 112

Governed Engine Speed	— rpm
Engine Idle Speed	— rpm
Gross Engine Power Output	BHP (kW <sub>m</sub> )
Brake Mean Effective Pressure	psi (kPa)
Piston Speed	ft / min (m / s)
Friction Horsepower	— HP (kW <sub>m</sub> )
Engine Water Flow at Stated Friction Head E	xternal to Engine:
3 psi Friction Head	— US gpm (liter / s)
Maximum Friction Head	— US gpm (liter / s)

	31 ( )
Engine Data with Dry Type Exhaust Manifo	<u>old</u>
Intake Air Flow	— cfm (liter / s)
Exhaust Gas Temperature	°F (°C)
Exhaust Gas Flow	
Radiated Heat to Ambient	- BTU / min (kW <sub>m</sub> )
Heat Rejection to Coolant	- BTU / min (kW <sub>m</sub> )
Heat Rejection to Exhaust	- BTU / min (kW <sub>m</sub> )

6	STA 0 hz	NDBY 50	) hz	PRIME POWER 60 hz 50 hz			
1800		00 1500		1800		1500	
575	5 - 650	575	- 650	575 - 650		575 - 650	
900	(671)	825	(615)	815	(608)	750	(560)
232	(1599)	254	(1751)	210	(1448)	232	(1599)
1800	(9.1)	1500	(7.6)	1800	(9.1)	1500	(7.6)
105	(78)	75	(56)	105	(78)	75	(56)
236	(14.9)	194	(12.2)	236	(14.9)	194	(12.2)
212	(13.4)	173	(10.9)	212	(13.4)	173	(10.9)
2202	(1076)	1000	(070)	2065	(07E)	1750	(006)
2280	(1076)	1860	(878)	2065	(975)	1750	(826)
935	(502)	945	(507)	885	(474)	920	(493)
5040	(2379)	4340	(2048)	4635	(2188)	4210	(1987)
5950	(105)	5325	(94)	5250	(92)	4795	(84)
26065	(458)	21610	(380)	20985	(369)	19310	(339)
28920	(508)	26805	(471)	26710	(469)	24015	(422)

N.A. - Data is Not Available

N/A - Not Applicable to this Engine

**TBD** - To Be Determined

ENGINE MODEL: VTA28-G5
DATA SHEET: DS-4886-B

+/- 0.25

DATE: 9Sept96 CURVE NO.: FR-5122