

ژنراتور : Stamford

موتور دیزل : Cummins

Standby		Prime		دیزل ژنراتور
KVA	KW	KVA	KW	
38.5	31	35	28	



موتور دیزل		
Manufacturer	Cummins	تولید کننده
Type	X3.3G1	تیپ
Number of cylinders	4	تعداد سیلندر ها
Cylinder arrangement	Inline	آرایش سیلندر ها
Displacement , Liters	3.3 litre	جا به جایی
Bore × Stroke , mm	91.4 × 127 mm	قطر سیلندر × کورس پیستون
Compression Ratio	18.5 : 2	نسبت تراکم
Aspiration	Natutrally Aspirated	سیستم تنفس
Rotation	1500	چرخش
Gross engine power, kWb	32	قدرت نافالص موتور
Combustion air flow, m ³ /min	2.064	جریان هوای احتراق
Exhaust gas temp.(after turbo) , °C	600	دمای گاز خروجی از اگزوز
Exhaust gas flow (after turbo) , m ³ /min	2.292	جریان هوای خروجی از اگزوز
Mean Piston Speed , m/s	6.35	میانگین سرعت پیستون

ژنراتور

Manufacturer	Stamford	تولید کننده
Type	PI144H	تیپ
Standby power at rated voltage ,KVA	35	توان standby در ولتاژ نامی
Efficiency, %	87.7	راندمان
Power factor	0.8	ضریب قدرت
Phase	3	فاز
Frequency, Hz	50	فرکانس
Speed, Rpm	1500	سرعت
Voltage, V	380	ولتاژ
Stator windings	Double layer concentric	سیم پیچ استاتور
Voltage Regulation, %	$\pm 1.0 \%$	تنظیم ولتاژ
Over speed, Rpm	2250	مداکثر سرعت مجاز
Short circuit ratio	1/Xd	جریان اتصال کوتاه
Insulation class	H	کلاس عایق
Connection	Curve current value X 2	اتصال
Protection class	IP 23	کلاس حفاظتی
Cooling air volume,m ³ / sec	0.09	دبی هوای فنک کننده

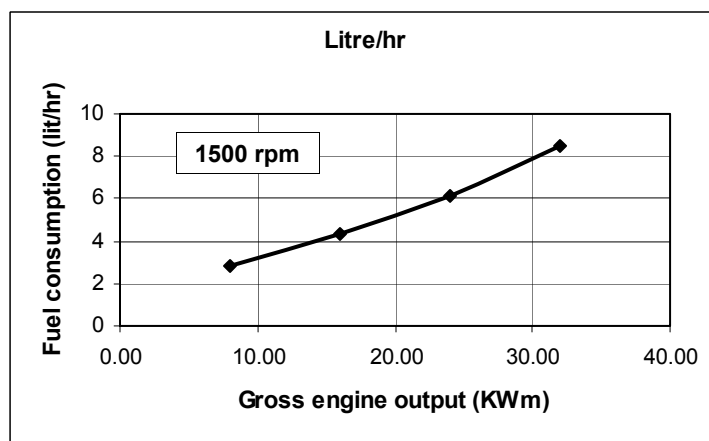
	Cummins India Limited Power Generation Business Unit Engine Data Sheet	Basic Engine Model: X3.3G1	Curve Number:	<i>G-DRIVE</i> X3.3 1
		Engine Critical Parts List:	Date: 28May09	
Displacement : 3.3litre (204in³)		Bore : 91.4mm (3.59 in.) Stroke : 127 mm (5 in.)		
No. of Cylinders : 4		Aspiration : Naturally Aspirated		

Engine Speed rpm	Standby Power		Prime Power		Continuous Power	
	kWm	hp	kWm	hp	kWm	hp
1500	36	48	32	43	25.2	33.78

Engine Performance Data @ 1500 rpm

litre/hour

OUTPUT POWER			FUEL CONSUMPTION			
%	kWm	hp	kg/ kWm·h	lb/ hp·h	litre/ hour	US gal/ hour
STANDBY POWER						
100	36	48	0.246	0.405	10.4	2.7
PRIME POWER						
100	32	43	0.226	0.372	8.5	2.3
75	24	33	0.217	0.357	6.1	1.7
50	16	22	0.227	0.373	4.3	1.2
25	8	11	0.293	0.482	2.8	0.7
CONTINUOUS POWER						
100	25.2	33.78	0.216	0.355	6.4	1.7



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

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

Data Subject to Change Without Notice

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 H₂O air intake restriction and 2 in Hg exhaust back pressure.

Data Status: Limited Production

Data Tolerance: ± 5%

Chief Engineer:



Cummins Inc.

Engine Data Sheet

ENGINE MODEL : **X 3.3G1**

DATA SHEET : DS-X 3.3
 CONFIGURATION NUMBER : _____ DATE :28May09
 PERFORMANCE CURVE : _____

INSTALLATION DIAGRAMCPL NUMBER**GENERAL ENGINE DATA**

Type	Inline 4-Cylinder Diesel		
Aspiration	Naturally Aspirated		
Bore x Stroke	— in x in (mm x mm)	3.59 x 5 (91.4 X 127)	
Displacement	— in ³ (litre)	205(3.3)	
Compression Ratio	18.5 : 2		
Dry Weight (Approximate),			
Fan to Flywheel Engine	— lb (kg)	654	(297)
Wet Weight (Approximate),			
Fan to Flywheel Engine	— lb (kg)	683	(310)
Moment of Inertia of Rotating Components			
• with standard Flywheel	— lb _m • ft ² (kg • m ²)	26.1	(1.1)
• with ____ Flywheel	— lb _m • ft ² (kg • m ²)	—	(N/A)
Center of Gravity from Rear Face of Block	— in (mm)	6.94	(176.45)
Center of Gravity Above Crankshaft Centerline	— in (mm)	6.57	(167)
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)	230.01 (311.85)
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EXHAUST SYSTEM

Maximum Back Pressure	— in Hg (kPa)	1.4 (4.74)
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AIR INDUCTION SYSTEM

Maximum Intake Air Restriction:		
• with Clean Filter Element (Normal Duty Air Cleaner)	— in H ₂ O (kPa)	10 (2.5)
• with Clean Filter Element (Heavy Duty Air Cleaner)	— in H ₂ O (kPa)	15 (4)
• with Dirty Filter Element (Heavy Duty Air Cleaner)	— in H ₂ O (kPa)	25 (6.2)

COOLING SYSTEMJacket Water Circuit Requirements

Coolant Capacity — Engine Only	— US gal (litre)	2.27 (8.6)
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 (48.26)
Maximum Top Tank Temperature for Standby / Prime Power	— °F (°C)	219/212 (104/100)
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 (minimum)	— psi (kPa)	64 (441)
@ Governed Speed	— psi (kPa)	50 (346)
Maximum Oil Temperature	— °F (°C)	250 (121)
Oil Capacity with std Oil Pan : Low - High	— US gal (litre)	(0.66-1.71). (6.5-2.5)
Total System Capacity (With Combo Filters)	— US gal (litre)	1.796. (6.8)

FUEL SYSTEM

Type Injection System.....	MICO Inline A-type
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)	140 (60)

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 300 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)	40 (4.4)

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 °C (77 °F)
Altitude : 100 m (300 ft)	Relative Humidity : 30%
Air Intake Restriction : N.A. mm H ₂ O (N.A. in H ₂ O)	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	N/A	1500	N/A	1500
Engine Idle Speed..... rpm	N/A	950	N/A	850
Gross Engine Power Output..... hp (kW)	N/A	48 (36)	N/A	43 (32)
Brake Mean Effective Pressure..... psi (kPa)	N/A	116 (804)	N/A	109 (757)
Piston Speed..... ft/min (m/s)	N/A	20.8 (6.35)	N/A	20.8 (6.35)
Friction Horsepower..... hp (kW)	N/A	2.6 (2.0)	N/A	2.6 (2.0)
Engine Water Flow at Stated Friction Head External to Engine:				
• 1 psi Friction Head..... US gpm (litre/min)	N/A	1.5 (23)	N/A	1.5 (23)
• Maximum Friction Head..... US gpm (litre/min)	N/A	1.2 (19)	N/A	1.2 (19)
Engine Data				
Intake Air Flow..... cfm (litre/s)	N/A	73 (34.4)	N/A	73 (34.4)
Exhaust Gas Temperature..... °F (°C)	N/A	1112 (600)	N/A	1022 (550)
Exhaust Gas Flow..... cfm (litre/s)	N/A	81 (38.2)	N/A	81 (38.2)
Air to Fuel Ratio..... air : fuel	N/A	22.7 : 1	N/A	21.2 : 1
Radiated Heat to Ambient BTU/min (kW)	N/A	496 (8.7)	N/A	467 (8.2)
Heat Rejection to Jacket Coolant..... BTU/min (kW)	N/A	1651 (29)	N/A	1537 (27)
Heat Rejection to Exhaust..... BTU/min (kW)	N/A	1650 (29)	N/A	1537 (27)
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 : X3.3G1
DATA SHEET : DS-X3.3
DATE : 28May 09
CURVE NO. :

PI144H

STAMFORD

WINDING 311

CONTROL SYSTEM	STANDARD AS480 AVR (SELF EXCITED)							
VOLTAGE REGULATION	± 1.0 %							
SUSTAINED SHORT CIRCUIT	SELF EXCITED MACHINES DO NOT SUSTAIN A SHORT CIRCUIT CURRENT							
CONTROL SYSTEM	AS480 AVR WITH OPTIONAL EXCITATION BOOST SYSTEM (EBS)							
SUSTAINED SHORT CIRCUIT	REFER TO SHORT CIRCUIT DECREMENT CURVE (page 7)							
STATOR WINDING	DOUBLE LAYER CONCENTRIC							
WINDING PITCH	TWO THIRDS							
WINDING LEADS	12							
STATOR WDG. RESISTANCE	0.171 Ohms PER PHASE AT 22°C SERIES STAR CONNECTED							
ROTOR WDG. RESISTANCE	0.89 Ohms at 22°C							
EXCITER STATOR RESISTANCE	22.9 Ohms at 22°C							
EXCITER ROTOR RESISTANCE	0.21 Ohms PER PHASE AT 22°C							
EBS STATOR RESISTANCE	12.9 Ohms at 22°C							
R.F.I. SUPPRESSION	BS EN 61000-6-2 & BS EN 61000-6-4,VDE 0875G, VDE 0875N. refer to factory for others							
WAVEFORM DISTORTION	NO LOAD < 1.5% NON-DISTORTING BALANCED LINEAR LOAD < 5.0%							
MAXIMUM OVERSPEED	2250 Rev/Min							
BEARING DRIVE END	BALL. 6310 - 2RS. (ISO)							
BEARING NON-DRIVE END	BALL. 6306 - 2RS. (ISO)							
	1 BEARING				2 BEARING			
WEIGHT COMP. GENERATOR	172.5 kg				175.5 kg			
WEIGHT WOUND STATOR	75 kg				75 kg			
WEIGHT WOUND ROTOR	65.63 kg				67.34 kg			
WR² INERTIA	0.2541 kgm²				0.2546 kgm²			
SHIPPING WEIGHTS in a crate	191 kg				200 kg			
PACKING CRATE SIZE	85 x 51 x 67 (cm)				85 x 51 x 67 (cm)			
	50 Hz				60 Hz			
TELEPHONE INTERFERENCE	THF<2%				TIF<50			
COOLING AIR	0.09 m³/sec 191cfm				0.108 m³/sec 229 cfm			
VOLTAGE SERIES STAR	380/220	400/231	415/240	440/254	416/240	440/254	460/266	480/277
VOLTAGE PARALLEL STAR	190/110	200/115	208/120	220/127	208/120	220/127	230/133	240/138
VOLTAGE SERIES DELTA	220/110	230/115	240/120	254/127	240/120	254/127	266/133	277/138
kVA BASE RATING FOR REACTANCE VALUES	35	35	35	33.3	38.5	41.1	42.4	43.8
Xd DIR. AXIS SYNCHRONOUS	1.85	1.67	1.55	1.31	2.20	2.10	1.98	1.88
X'd DIR. AXIS TRANSIENT	0.17	0.15	0.14	0.12	0.20	0.19	0.18	0.17
X" d DIR. AXIS SUBTRANSIENT	0.12	0.11	0.10	0.09	0.15	0.14	0.14	0.13
Xq QUAD. AXIS REACTANCE	0.89	0.80	0.74	0.63	1.05	1.00	0.95	0.90
X"q QUAD. AXIS SUBTRANSIENT	0.19	0.17	0.16	0.13	0.23	0.22	0.21	0.20
XL LEAKAGE REACTANCE	0.07	0.06	0.06	0.05	0.08	0.08	0.07	0.07
X2 NEGATIVE SEQUENCE	0.16	0.14	0.13	0.11	0.19	0.18	0.17	0.16
X0 ZERO SEQUENCE	0.08	0.07	0.07	0.06	0.09	0.09	0.08	0.08
REACTANCES ARE SATURATED								

PI144H

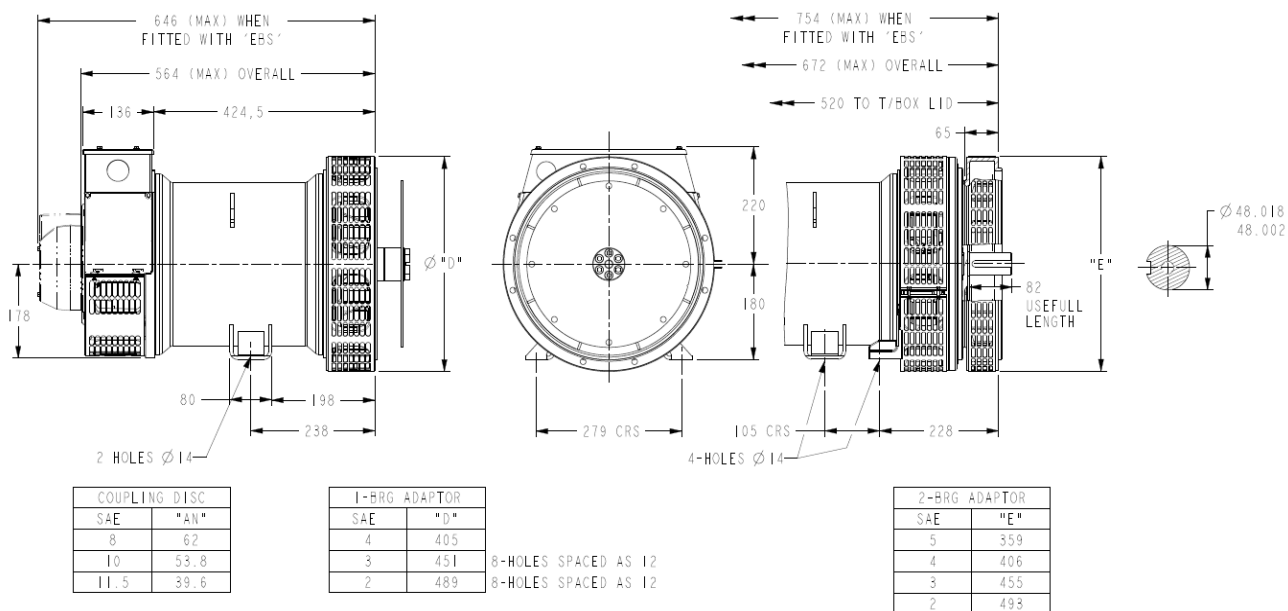
STAMFORD

Winding 311 / 0.8 Power Factor

RATINGS

Class - Temp Rise		Cont. F - 105/40°C				Cont. H - 125/40°C				Standby - 150/40°C				Standby - 163/27°C			
50 Hz	Series Star (V)	380	400	415	440	380	400	415	440	380	400	415	440	380	400	415	440
	Parallel Star (V)	190	200	208	220	190	200	208	220	190	200	208	220	190	200	208	220
	Series Delta (V)	220	230	240	254	220	230	240	254	220	230	240	254	220	230	240	254
	kVA	32.0	32.0	32.0	30.4	35.0	35.0	35.0	33.3	37.5	37.5	37.5	35.6	38.5	38.5	38.5	36.6
	kW	25.6	25.6	25.6	24.3	28.0	28.0	28.0	26.6	30.0	30.0	30.0	28.5	30.8	30.8	30.8	29.3
	Efficiency (%)	87.7	87.9	88.0	88.2	87.1	87.4	87.6	87.9	86.6	87.0	87.2	87.7	86.4	86.8	87.0	87.5
	kW Input	29.2	29.1	29.1	27.6	32.1	32.0	32.0	30.3	34.6	34.5	34.4	32.5	35.6	35.5	35.4	33.5
60 Hz	Series Star (V)	416	440	460	480	416	440	460	480	416	440	460	480	416	440	460	480
	Parallel Star (V)	208	220	230	240	208	220	230	240	208	220	230	240	208	220	230	240
	Delta (V)	240	254	266	277	240	254	266	277	240	254	266	277	240	254	266	277
	kVA	35.2	37.6	38.8	40.0	38.5	41.1	42.4	43.8	41.3	44.1	45.5	46.9	42.4	45.2	46.7	48.1
	kW	28.2	30.1	31.0	32.0	30.8	32.9	33.9	35.0	33.0	35.3	36.4	37.5	33.9	36.2	37.4	38.5
	Efficiency (%)	88.0	88.0	88.1	88.1	87.5	87.5	87.6	87.7	87.1	87.1	87.2	87.3	86.9	86.9	87.0	87.1
	kW Input	32.0	34.2	35.2	36.3	35.2	37.6	38.7	39.9	37.9	40.5	41.7	43.0	39.0	41.7	43.0	44.2

DIMENSIONS



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