

ژنراتور : Meccalte

موتور دیزل : Cummins

Standby		Prime		دیزل ژنراتور
KVA	KW	KVA	KW	
44	35	40	32	



موتور دیزل		
Manufacturer	Cummins	تولید کننده
Type	S3.8G4	تیپ
Number of cylinders	4	تعداد سیلندر ها
Cylinder arrangement	In line	آرایش سیلندر ها
Displacement , Liters	3.8 litre	جا به جایی
Bore × Stroke , mm	97×128 mm	قطر سیلندر × کورس پیستون
Compression Ratio	17.5 : 1	نسبت تراکم
Aspiration	Turbocharged	سیستم تنفس
Gross engine power, kWb	43.4	قدرت ناخالص موتور
Combustion air flow, m ³ /min	3.5796	جریان هوای امتراق
Exhaust gas temp.(after turbo) , °C	471.4	دمای گاز خروجی از اگزوز
Exhaust gas flow (after turbo) , m ³ /min	3.78	جریان هوای خروجی از اگزوز
Mean Piston Speed , m/s	6.4	میانگین سرعت پیستون

ژنراتور

Manufacturer	Mecc Alte	تولید کننده
Type	ECO ₃ 2-3S ₄	تیپ
Standby power at rated voltage ,KVA	40	توان standby در ولتاژ نامی
Efficiency, %	88.5	راندمان
Power factor	0.8	ضریب قدرت
Phase	3	فاز
Frequency, Hz	50	فرکانس
Speed, Rpm	1500	سرعت
Voltage, V	380	ولتاژ
Stator windings	12 ends	سیم پیچ استاتور
Regulation	±1 % with any power factor	تنظیم ولتاژ
Rotor	with damping cage	روتور
Over speed, Rpm	2250	مداکثر سرعت مجاز
Short circuit current	% >300	جریان اتصال کوتاه
Insulation class	H	کلاس عایق
Protection class	IP 23	کلاس حفاظتی
Cooling air volume,m ³ / min	11.8	دبی هوای فنک کننده

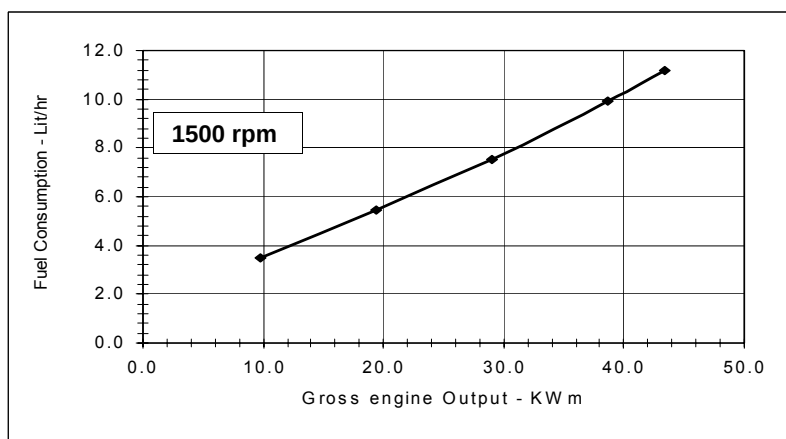
	Cummins India Limited Power Generation Business Unit Engine Data Sheet	Basic Engine Model: S3.8-G4	Curve Number:	<i>G-DRIVE</i> S3.8 1
		Engine Critical Parts List:	Date: 19JAN10	
Displacement : 3.8 litre (232 in ³)		Bore : 97 mm (3.82 in.) Stroke : 128 mm (5 in.)		
No. of Cylinders : 4		Aspiration : Turbocharged		

Engine Speed rpm	Standby Power		Prime Power		Continuous Power	
	kWm	hp	kWm	hp	kWm	hp
1500	43.4	58.2	38.7	51.9	27.1	36.3

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	43.4	58.2	0.219	0.360	11.2	3
PRIME POWER						
100	38.7	51.9	0.218	0.359	9.9	2.6
75	28.9	38.9	0.221	0.364	7.6	2
50	19.4	26.0	0.239	0.392	5.4	1.4
25	9.7	13	0.304	0.500	3.5	0.9
CONTINUOUS POWER						
100	27	36	0.226	0.371	7.2	1.9



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 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 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.

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:



Cummins Inc.

Engine Data Sheet

ENGINE MODEL : **S3.8-G4**

DATA SHEET : DS-S3.8_B
 CONFIGURATION NUMBER : N/A DATE : 19 JAN 10
 PERFORMANCE CURVE : N/A

INSTALLATION DIAGRAM

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CPL NUMBER**GENERAL ENGINE DATA**

Type	Inline 4-Cylinder Diesel	
Aspiration	Turbocharged	
Bore x Stroke	3.82 x 5 (97 X 128)	
Displacement	232 (3.8)	
Compression Ratio	17.5 : 1	
Dry Weight (Approximate), Fan to Flywheel Engine	— lb (kg)	842 (382)
Wet Weight (Approximate), Fan to Flywheel Engine	— lb (kg)	882 (400)
Moment of Inertia of Rotating Components • with ___ Flywheel	— lb _m • ft ² (kg • m ²)	23.19 (0.977)
Center of Gravity from Rear Face of Block	— in (mm)	9.84 (250)
Center of Gravity Above Crankshaft Centerline	— in (mm)	5.55 (141)
Maximum Static Loading at Rear Main Bearing	— lb (kg)	N.A. (N.A.)

ENGINE MOUNTING

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

Maximum Back Pressure	— in Hg (kPa)	2 (6.7)
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AIR INDUCTION SYSTEM

Maximum Intake Air Restriction:		
• with Clean Filter Element (Normal Duty Air Cleaner)	— in H ₂ O (kPa)	8 (2)
• with Clean Filter Element (Heavy Duty Air Cleaner)	— in H ₂ O (kPa)	N/A (N/A)
• with Dirty Filter Element (Normal Duty Air Cleaner)	— in H ₂ O (kPa)	25 (6.2)

COOLING SYSTEMJacket Water Circuit Requirements

Coolant Capacity — Engine Only	— US gal (litre)	1.85 (7)
Maximum Static Head of Coolant Above Engine Crank Centerline	— ft (m)	20 (6)
Standard Thermostat (Modulating) Range	— °F (°C)	169 - 189 (76 - 87)
Minimum Pressure Cap	— psi (kPa)	7 (48)
Maximum Top Tank Temperature for Standby / Prime Power	— °F (°C)	217 / 212 (103 / 100)
Maximum Coolant Friction Head External to Engine	— psi (kPa)	4 (28)

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)	14.5 (100)
@ Governed Speed	— psi (kPa)	58 (400)
Maximum Oil Temperature	— °F (°C)	266 (130)
Oil Capacity with ___ Oil Pan : Low - High	— US gal (litre)	2.4 - 1.85 (7 - 9)
Total System Capacity (With Combo Filters)	— US gal (litre)	3 (11)

FUEL SYSTEM

Type Injection System.....		Bosch Mechanical
Maximum Restriction at Lift Pump(clean/dirty filter).....	— in Hg (kPa)	N.A. (N.A.)
Maximum Allowable Head on Injector Return Line (Consisting of Friction Head and Static Head).....	— in Hg (kPa)	N.A. (N.A.)
Maximum Fuel Flow to Injector Pump	— US gph (litre/hr)	N.A. (N.A.)
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	40
Maximum Allowable Resistance of Cranking Circuit.....	— ohm	0.002
Minimum Recommended Battery Capacity		
• Cold Soak @ -18 °C to 0 °C (0 °F to 32 °F).....	— 0°F CCA	500

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)	N.A. (N.A.)

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 : 145 mm H ₂ O (5.7 in H ₂ O)	Exhaust Restriction : 2.6 kPa (0.77 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.

Governed Engine Speed	rpm
Engine High Idle Speed	rpm
Gross Engine Power Output.....	hp (kW)
Brake Mean Effective Pressure.....	psi (kPa)
Piston Speed	ft/min (m/s)
Friction Horsepower.....	hp (kW)
Engine Water Flow at Stated Friction Head External to Engine:	
• 1 psi Friction Head.....	US gpm (litre/min)
• Maximum Friction Head	US gpm (litre/min)

Engine Data

Intake Air Flow.....	cfm (litre/s)
Exhaust Gas Temperature	°F (°C)
Exhaust Gas Flow	cfm (litre/s)
Air to Fuel Ratio	air : fuel
Radiated Heat to Ambient	BTU/min (kW)
Heat Rejection to Jacket Coolant.....	BTU/min (kW)
Heat Rejection to Exhaust	BTU/min (kW)
Heat Rejected to Fuel	BTU/min (kW)
Charge Air Cooler Heat Rejection.....	BTU/min (kW)
Turbocharger Compressor Outlet Pressure	psi (kPa)
Turbocharger Compressor Outlet Temperature	°F (°C)

STANDBY POWER		PRIME POWER	
60 hz	50 hz	60 hz	50 hz
N/A	1500	N/A	1500
N/A	1570	N/A	1570
N/A	58.2 (43.4)	N/A	51.9 (38.7)
N/A	132 (911)	N/A	118 (815)
N/A	1260 (6.4)	N/A	1260 (6.4)
N/A	N.A. (N.A.)	N/A	N.A. (N.A.)
N/A	24.22 (91.7)	N/A	24.22 (91.7)
N/A	23.77 (90)	N/A	23.77 (90)
N/A	126.42 (59.66)	N/A	122.01 (57.58)
N/A	880.52 (471.4)	N/A	818.96 (437.2)
N/A	133 (63)	N/A	128 (60)
N/A	26.5 : 1	N/A	30.8 : 1
N/A	256 (5)	N/A	227 (4)
N/A	1005 (18)	N/A	920 (17)
N/A	2574 (47)	N/A	2326 (41)
N/A	N.A. (N.A.)	N/A	N.A. (N.A.)
N/A	N/A (N/A)	N/A	N/A (N/A)
N/A	9 (66)	N/A	8 (57)
N/A	162 (73)	N/A	146 (64)

N.A. - Not Available

N/A - Not Applicable to this Engine

TBD - To Be Determined

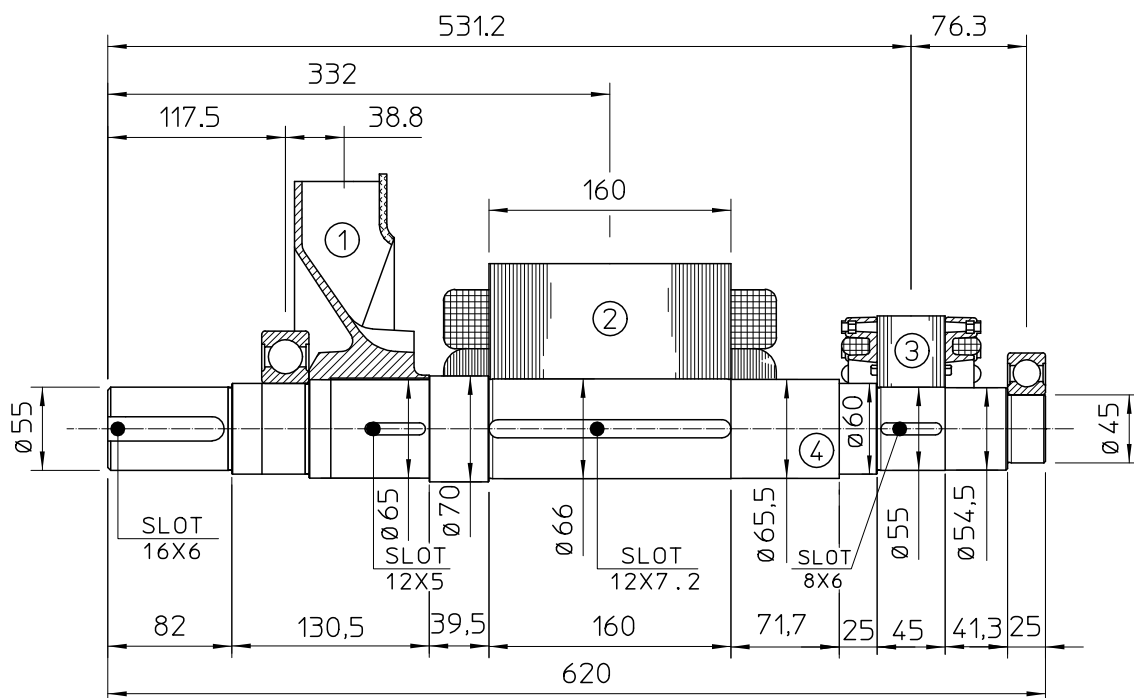
*This is the maximum heat rejection to fuel, which is at low load.

ENGINE MODEL : S3.8-G4
DATA SHEET : DS-S3.8_B
DATE : 19 JAN 10
CURVE NO. :

Electrical Characteristics										
Frequency		Hz	50				60			
Voltage (series star)		V	380	400	415	440	415	440	460	480
Rated power class H		kVA	42,5	42,5	42,5	34	50	51	51	51
		kW	34	34	34	27,2	40	40,8	40,8	40,8
Rated power class F		kVA	39	39	39	31	46	49	49	49
		kW	31,2	31,2	31,2	25	37	39,2	39,2	39,2
Regulation with		DSR	±1 % with any power factor and speed variations between -5% +30%							
Insulation class			H							
Execution			Brushless							
Stator winding			12 ends							
Rotor			with damping cage							
Efficiencies class H	4/4	%	88,5	88,6	88,3	88,1	89,1	89,6	89,8	90
(see graph. for details)	3/4	%	88,8	89,1	89	88,7	89,9	90,2	90,4	90,6
	2/4	%	87,2	87,3	87,3	87,3	88,7	88,8	88,9	89
	1/4	%	84,9	85	84,8	84,3	87	87	87	87
Reactances (f. l.cl. F)	Xd	%	210,5	190	176,5	125,6	249,2	226,1	206,9	190
	Xd'	%	15,84	14,3	13,28	9,45	18,76	17,02	15,57	14,3
	Xd"	%	11,08	10	9,29	6,61	13,12	11,90	10,89	10
	Xq	%	108,6	98	91,0	64,8	128,5	116,6	106,7	98
	Xq'	%	108,6	98	91,0	64,8	128,5	116,6	106,7	98
	Xq"	%	33,9	30,6	28,4	20,2	40,1	36,4	33,3	30,6
	X ₂	%	23,82	21,5	19,97	14,21	28,20	25,59	23,41	21,5
	X ₀	%	2,99	2,7	2,51	1,79	3,54	3,21	2,94	2,7
Short Circuit Ratio	Kcc		0,70	0,80	0,90	1,30	0,40	0,60	0,70	0,80
Time Constants	Td'	sec.	0,061							
	Td"	sec.	0,015							
	Tdo'	sec.	1,32							
	Tα	sec.	0,031							
Short Circuit Current Capacity		%	>300				>350			
Excitation at no load	Amp.		0,6	0,7	1	1,3	0,3	0,4	0,5	0,6
Excitation at full load	Amp.		2,3	2,4	2,6	2,9	2,1	2	2,2	2,3
Overload (long-term)	%	1 hour in a 6 hours period 110% rated load								
Overload per 20 sec.	%	300								
Stator Winding Resistance (20 °C)	Ω	0,078								
Rotor Winding Resistance (20 °C)	Ω	2,163								
Exciter Resistance (20 °C)	Ω	Rotor : 0,417				Stator : 10,6				
Heat dissipation at f.l.cl.H	W	4418	4375	4505	3674	4893	4736	4634	4533	
Telephone Interference		THF < 2%					TIF < 45			
Radio interference		EN61000-6-3, EN61000-6-1. For others standards apply to factory								
Waveform Distors.(THD) at f. load	LL/LN %	3,7 / 3,6								
Waveform Distors.(THD) at no load	LL/LN %	3,2 / 3,1								
Mechanical characteristics										
Protection			IP 21 (other protection on request)							
DE bearing			6312-2RS							
NDE bearing			6309-2RS							
Weight of wound stator assembly	kg		62,5							
Weight of wound rotor assembly	kg		43,5							
Weight of complete generator	kg		214							
Maximun overspeed	rpm		2250							
Unbalanced magnetic pull at f.l.cl.F	kN/mm		4,5							
Cooling air requirement	m³/min		11,8				14,5			
Inertia Constant (H)	sec.		0,102				0,122			
Noise level at 1m/7m	dB(A)		75 / 60				79 / 64			

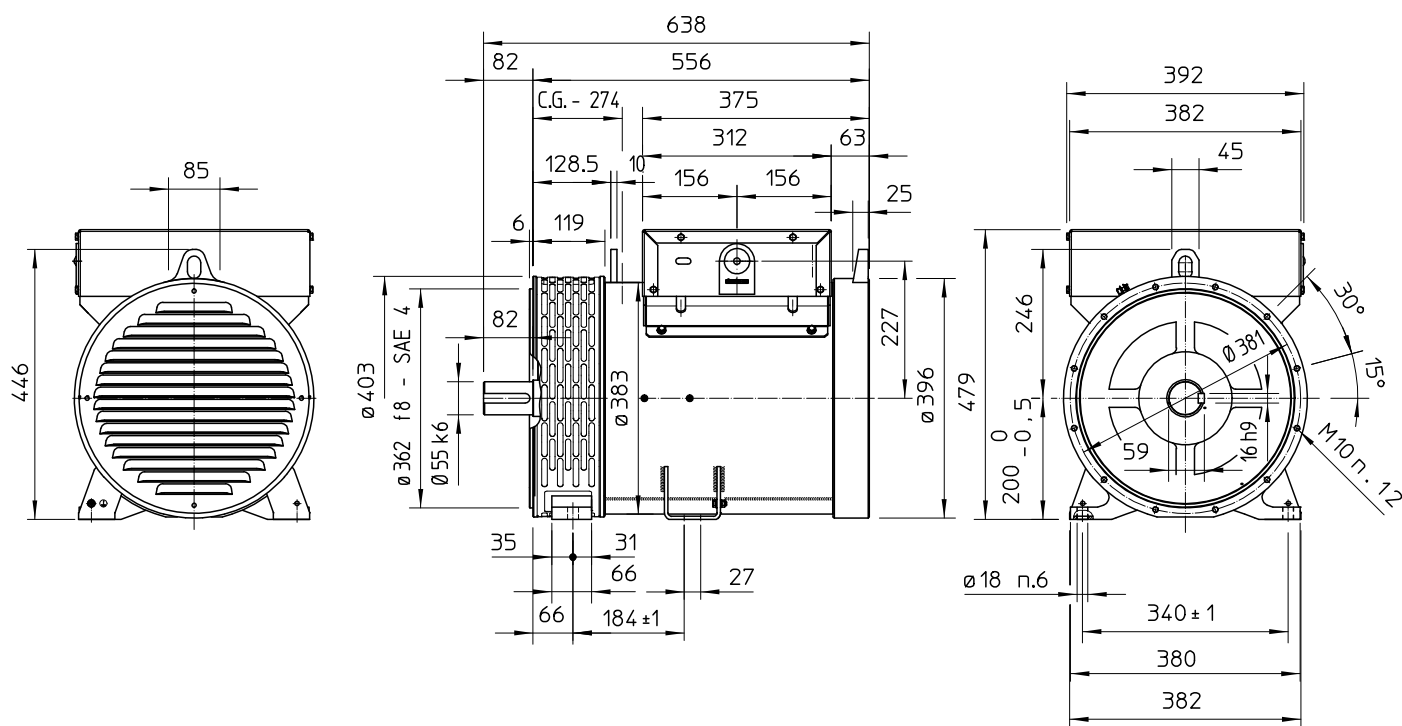
All technical data are to be considered as a reference and they can be modified without any notice.

TWO BEARING MOMENTS OF INERTIA



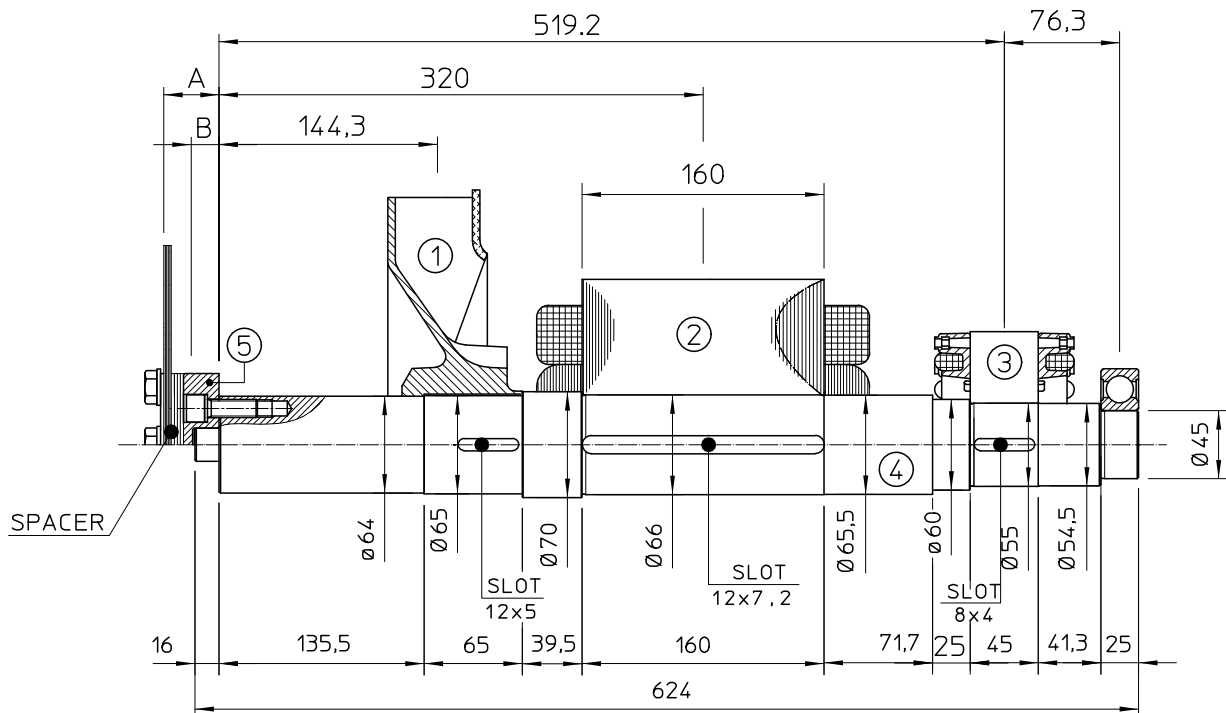
POS.	COMPONENT	WEIGHT (kg)	J (kgm ²)
1	FAN	2.3	0.0224
2	MAIN ROTOR	43.5	0.3088
3	EX. ROTOR	5.4	0.012
4	SHAFT	14.1	0.0069
TOTAL		65.3	0.3501

TWO BEARING DIMENSIONS



C.G.= GRAVITY CENTER

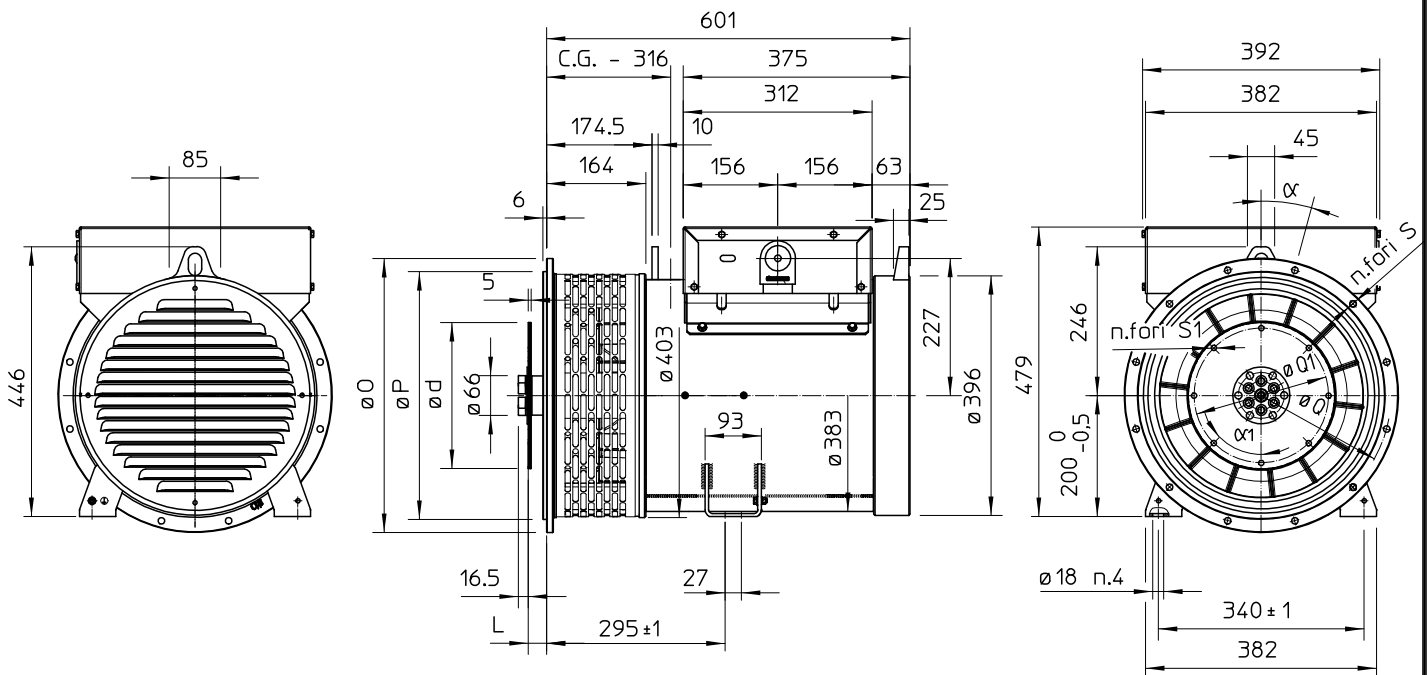
SINGLE BEARING MOMENTS OF INERTIA



POS.	COMPONENT	WEIGHT (kg)	J (kgm ²)
1	FAN	2.3	0.0224
2	MAIN ROTOR	43.5	0.3088
3	EX. ROTOR	5.4	0.012
4	SHAFT	14.5	0.0074
TOTAL		65.7	0.3506

SAE N°	5	SHAFTS COUPLING FLEX PLATE		
A	B	WEIGHT kg	J kgm ²	
6.5	5	2.5	1.74	0.0084
7.5	5	2.5	2.1	0.013
8	36.6	28.1	3.9	0.02
10	28.6	21.6	4.47	0.038
11.5	15	11.5	4.51	0.059

SINGLE BEARING DIMENSIONS



SAE N.	O	P	Q	S	N. FORI HOLES N°	α
5	356	314.3	333.4	11	8	45
4	403	362	381	11	12	30
3	451	409.6	428.6	11	12	30
2	490	447.7	466.7	11	12	30
1	552	511.2	530.2	11	12	30

SAE N.	d	L	Q1	S1	N. FORI HOLES N°	α1
6 1/2	215.9	30.2	200	9	6	60
7 1/2	241.3	30.2	222.25	9	8	45
8	263.52	62	244.47	11	6	60
10	314.32	53.8	295.27	11	8	45
11 1/2	352.42	39.6	333.37	11	8	45