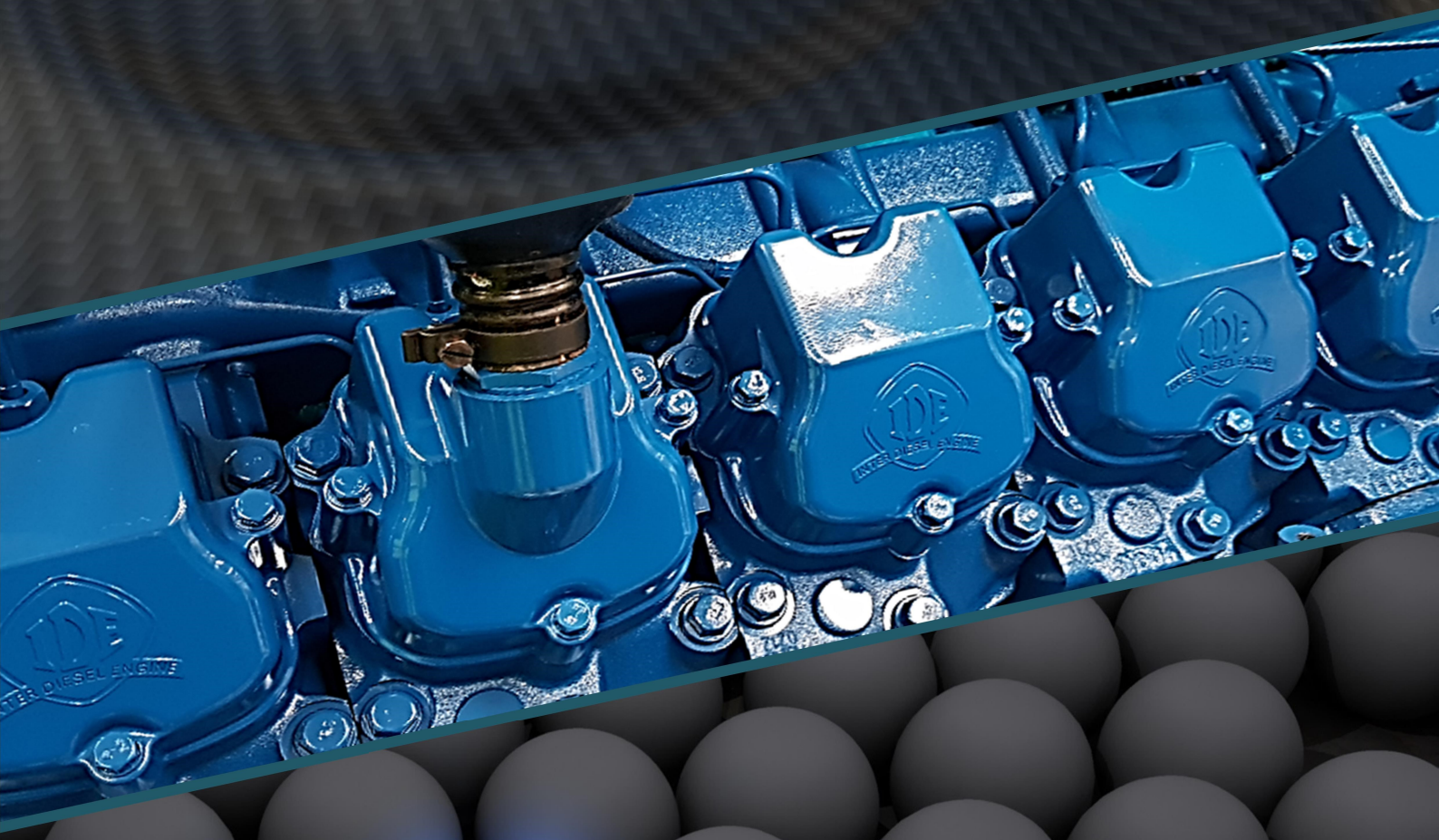
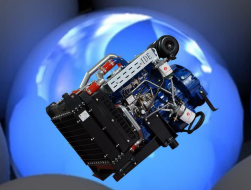
INTER®

EXCELLENT ENGINE





BII

BII SERIES

INTER ENGINE

INTER®

EXCELLENT ENGINE

About INTER

INTER DIESEL ENGINE was first established in USA in 1927 as an independent engine manufacturer.

Right now, they manufacture high quality diesel engines from 2 cylinders to 20 cylinders, in the factories that are in Brazil, Argentina, India and China. They manufacture with their original design.

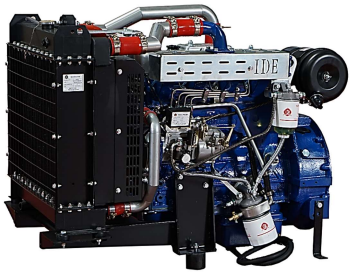
Apart from their own factories, in order to serve and meet the customer needs in other areas, they have their offices and distributors in Germany, UK, Spain, Italy, Turkey and South Africa. These distributors and offices deals with sales, after sales services and spare part supply.

INTER DIESEL ENGINE produces diesel engines from 7.5 kW to 3000kW to be used in agricultural equipment's, trucks, buses, tractors, construction equipment, generators, boats and ships.

They export to more than 100 countries and have 45 distributors, 160 dealers and more than 200 after sales service. With this service network, Inter Diesel Engine increases its global market share every day.

FEATURES AND BENEFITS

- Excellent Design
- High and Dependable Technology
- Heavy Duty
- Durability
- Low Noice
- Low Exhaust Emission
- Low Operating Cost
- World Class Product Support
- Flexible Application
- Direct Injection
- Tier II / Tier III / Tier IV Emission Regulations
- Low Fuel Consumption
- Low Oil Consumption
- Tropical Radiator
- Easy Service & Maintenance
- Mechanical / Electronic Governor
- Compact Design
- Noise Optimized Engine Design



Diesel Engine and Genset Rating Classifications

The below ratings represent the engine performance capabilities to conditions specified in TS ISO 8528/1, 8528-4, 8528-5, 8528-8, BS5000, ISO 3046/1:1986, NEMA MG-1.22.1, BS 5514/1.

STAND BY POWER RATING (ESP):

ESP 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 Stand By Power rating. This rating should be applied where reliable utility power is available. A Stand By rated engine should be sized for a maximum of an 70% average load factor and 200 hours of operation per year. This includes less than 25 hours per year at the Stand By Power rating. Stand By 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 (PRP):

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 (ULTP):

PRP (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 (LTP):

LTP (Limited Time Prime Power) is available for a limited number of hours in a nonvariable 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.

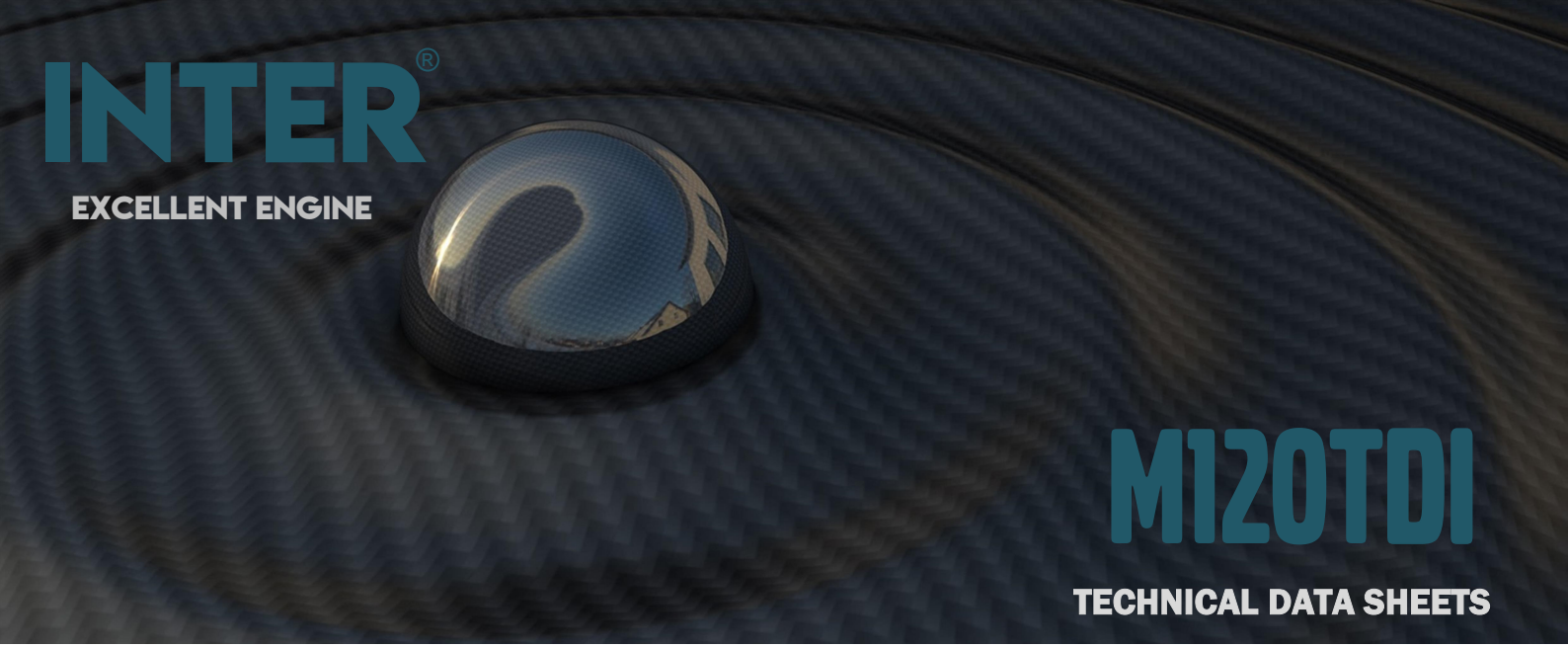
CONTINUOUS POWER RATING (COP):

COP is the power that the engine can continue to use under the prescribed speed and the specified environment condition in the normal maintenance period stipulated in the manufacturing plant. And Continuous Power 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.

M120TDI

3,76 Liter, In Line Type 4 Cylinder

G Drive Engine



Diesel Engine Main Technical Parameters

General		
Number of Cylinders		4
Configuration		Vertical, in line
Aspiration		Turbo & Intercooler
Combustion System		Direct injection
Compression Ratio		17.5:1
Bore	mm	102
Stroke	mm	115
Displacement	L	3,76
Governing Type		Mechanic
Governing Class		G2
Rotation		Counterclockwise
Firing Order		1-3-4-2
Emission		Tier II
Moments of Rotation Inertia		
Engine	kg • m²	0,16
Flywheel	kg • m²	1,2
Performance Rating		
Speed Droop	%	≤3
Steady State Speed Band	%	≤0,5
Test Conditions		
Ambient Temperature	%	25
Atmospheric Pressure	kPa	100
Relative Humidity	RH (%)	30
Max. Operating Intake Resistance	kPa	5
Exhaust Backpressure Limit	kPa	5
Fuel Temperature (Fuel Inlet Pump)	ºC	38 ± 2
Filters		
Air Filter		0
Fuel Filter		0
Oil Filter		0
Flywhell Housing and Flex Coupling		
Flywheel Housing	SAE (J620)	3
Flex Coupling Disc	Inch (")	11,5
Overall Dimensions		
Length *	mm	1260
Width	mm	700
Height	mm	838
Dry Weight	Kg	490

* From front end of radiator to rear end of air filter

Cooling System		
Radiator Type	50ºC	Tropical
Total Coolant Capacity	L	18
Max. Perm. Coolant Outlet Temperature	ºC	103
Max. Perm. Flow Resis. (Cool. System And Piping)	bar	0,5
Max.Temperature of Coolant Warning	ºC	95
Max. Temperature of Coolant Shutdown	ºC	98
Thermostat Operation Temperature - Initial Open	ºC	72
Thermostat Operation Temperature - Full Open	ºC	75
Delivery of Coolant Pump	m ³/ h	1,60
Min. Pressure Before Coolant Pump	bar	0,15
Radiator Face Area	m²	0,24
Rows	Row	2
Matrix Density	Per / Inch	15,5
Material		Aluminum
Width of Matrix	mm	538
Height of Matrix	mm	480
Pressure Cap Setting	kPa	90
Estimated Cooling Air Flow Reserve	kPa	0,125
Engine Pre Heater Tube (with Circulation Pump)	W	750
Lubrication System		
Total System	L	12
Minimum Oil Level	L	11
Nominal Motor Operating Temperature	ºC	40
Lubricating Oil Pressure (Rated Speed)	bar	5
Relief Valve Opens	kPa	352
Oil / Fuel Consumption Ratio	%	≤0,3
Normal Oil Temperature	ºC	110
Electrical System		
Voltage	V	12
Starter	kW	3,8
Alternator Output Ampers	A	25
Alternator Output Voltage	V	14
Batteries Capacity	Ah	55
Fan		
Diameter	mm	450
Drive Ratio		1,3:1
Number of Blades		8
Material		Plastic
Type		Blowing

Diesel Engine Matching Parameters

50 Hz @ 1500 r/min		Stand By	Prime
Gross Engine Power	kW	88,0	80,0
Net Engine Power	kW	84,0	76,0
Fan Power Consumption (Belt Pulley Driven)	kW	3,0	3,0
Other Power Loss	kW	1,0	1,0
Mean Effective Pressure	MPa	1,85	1,70
Intake Air Flow	m ³ / min	4,55	4,55
Exhaust Temperature Limit	ºC	500	470
Exhaust Flow	m ³ / min	5,40	4,90
Boost Pressure Ratio		10,70	9,90
Mean Piston Speed	m / s	5,9	5,9
Cooling Fan Air Flow	m ³ / min	75,4	75,4
Typical Generator Output Power	kVA	96	87
Heat Rejection			
Energy in Fuel (Heat of Combustion)	kW	190,0	172,0
Gross Heat to Power	kW	83,0	76,0
Energy to Coolant and Lubricating Oil	kW	46,5	42,2
Heat Dissipation Capacity*	kW	15,0	14,5
Energy to Exhaust	kW	54,9	49,8
Heat to Radiation	kW	12,1	10,9

*Intake Intercooled System

60 Hz @ 1800 r/min		Stand By	Prime
Gross Engine Power	kW	105,6	96,0
Net Engine Power	kW	100,8	91,2
Fan Power Consumption (Belt Pulley Driven)	kW	3,6	3,6
Other Power Loss	kW	1,2	1,0
Mean Effective Pressure	MPa	1,85	1,69
Intake Air Flow	m ³ / min	5,46	5,46
Exhaust Temperature Limit	ºC	600	602
Exhaust Flow	m ³ / min	6,48	5,86
Boost Pressure Ratio		12,88	11,90
Mean Piston Speed	m / s	7,0	7,0
Cooling Fan Air Flow	m ³ / min	90,5	90,5
Typical Generator Output Power	kVA	116	104
Heat Rejection			
Energy in Fuel (Heat of Combustion)	kW	228,0	201,5
Gross Heat to Power	kW	99,6	86,1
Energy to Coolant and Lubricating Oil	kW	55,8	50,4
Heat Dissipation Capacity*	kW	16,2	15,7
Energy to Exhaust	kW	65,9	59,6
Heat to Radiation	kW	14,5	13,1

*Intake Intercooled System

INTER®

EXCELLENT ENGINE

M120TDI

POWER RANGE

FUEL CONSUMPTION

OIL GRADES

DIMENSION

DIAGRAMS

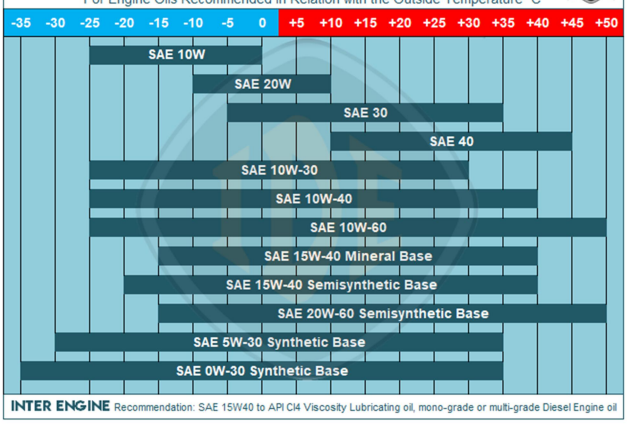
INTER Diesel Engine Power Ratings

Engine Model	M120TDI		Engine Family	ID71	Engine Series	BII	
Speed rpm	Type of Operation	Typical Generator Output (Net)		Engine Power			
				Gross		Net	
		kVA	kWe	kWm	Hp	kWm	Hp
1500	Stand By (Maximum)	100,0	80,0	88,0	120,0	84,0	114,7
	Prime	91,0	73,0	80,0	109,0	76,0	103,7
1800	Stand By (Maximum)	120,0	96,0	105,6	144,0	100,8	137,6
	Prime	109,0	87,0	96,0	130,8	91,2	124,4

Generator powers are typical and are based on an average alternator efficiency and a power factor (Cos. Q) of 0.8

SAE GRADES

For Engine Oils Recommended in Relation with the Outside Temperature °C



INTER ENGINE Recommendation: SAE 15W40 to API CI4 Viscosity Lubricating oil, mono-grade or multi-grade Diesel Engine oil

Fuel Consumption

Percent of Prime power	1500 rpm		1800 rpm	
	g/kWh	l/hr	g/kWh	l/hr
110%	231	23,6	231,0	26,0
100%	230	21,4	230,0	23,5
75%	235	16,4	235,0	18,0
50%	240,0	11,2	240,0	12,3

Note:The density of diesel is 0.835 kg/L

Fuel specification: BS 2869: Part 2 1998 Class A2 or (DIN EN 590) ASTM D975 D2 Diesel. The fuel must be clean and without water)

INTER ENGINES MAIN AND BIGGEST PARTNERS

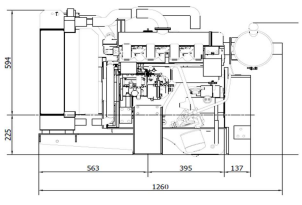
INTER® ENGINE GROUP

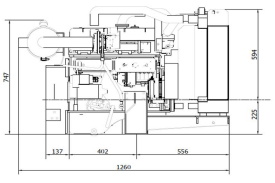
NAFTA — North America Business Unit

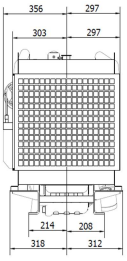
MERCOSUR — Mercosur Business Unit

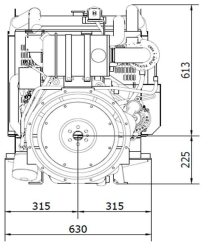
Global Business Unit

Diesel Engine Appearance and Installation Dimension Diagram









INTER® ENGINE GROUP

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