# **Natural Gas Engines**



# LP6E77NG1 Natural Gas Engine

PRIME 140 kW @1500 RPM
PRIME 140 kW @1800 RPM



Remark: Photos are for reference only, please refer to the actual product

1600×1000×1350

## **ENGINE BASIC DATA**

Length X Width X Height (mm)

Туре	4-stroke-cycle, in-line, 6 cylinders
Bore / Stroke (mm)	110 / 135
Piston displacement (L)	7.7
Compression Ratio	10.5 : 1
Aspiration	Turbocharged intercooled
Rated speed (rpm)	1500/1800
Direction of rotation (flywheel end)	CCW
Flywheel housing	SAE3
Flywheel diameter	11.5"
Number of flywheel teeth	130
Ignition system	Digital ignition
Ignition order	1-5-3-6-2-4
Governor type	ECU
GHTS AND DIMENSIONS	
Net weight (kg)	620

Mechanical efficiency (%)         37.5         37.3         37           Thermal efficiency (%)         48.5         48.5         48           Total efficiency (%)         86         85.8         85           NGINE EMISSIONS DATA         NOX @(5% oxygen content, 100% load)         <	NGINE PERFORMANCE DATA			
Engine power (kW)         140         105         70           Brake mean effective pressure (bar)         13         9.8         6.5           Gas consumption (m³/h)         40.7         30.7         20.6           Air to fuel ratio         12:1         12:1         11:1           Heat rejection to jacket water (kW)         59.7         46.7         32.2           Heat rejection to aftercooler (kW)         28.0         21.1         14.2           Heat rejection to exhaust (kW)         121.3         89.8         58.6           Heat rejection to atmosphere (kW)         24.3         18.9         18.6           Heat rejection to atmosphere (kW)         37.5         37.3         37           Mechanical efficiency (%)         37.5         37.3         37           Thermal efficiency (%)         48.5         48.5         48           Total efficiency (%)         48.5         48.5         48           NGINE EMISSIONS DATA         ***         ***           NCO @(5% oxygen content, 100% load)         <500 mg/Nm³	Load (%)	100	75	50
Brake mean effective pressure (bar)         13         9.8         6.5           Gas consumption (m³/h)         40.7         30.7         20.6           Air to fuel ratio         12:1         12:1         11:1           Heat rejection to jacket water (kW)         59.7         46.7         32.2           Heat rejection to aftercooler (kW)         28.0         21.1         14.2           Heat rejection to exhaust (kW)         121.3         89.8         58.6           Heat rejection to atmosphere (kW)         24.3         18.9         14.2           **FICIENCY***           Mechanical efficiency (%)         37.5         37.3         37           Thermal efficiency (%)         36         85.8         85           ***********************************	Input gas energy (kW)	373.3	281.5	189.2
Gas consumption (m³/h)         40.7         30.7         20.6           Air to fuel ratio         12:1         12:1         11:1           Heat rejection to jacket water (kW)         59.7         46.7         32.2           Heat rejection to aftercooler (kW)         28.0         21.1         14.2           Heat rejection to exhaust (kW)         121.3         89.8         58.6           Heat rejection to atmosphere (kW)         24.3         18.9         14.2           FFICIENCY           Mechanical efficiency (%)         37.5         37.3         37           Thermal efficiency (%)         48.5         48.5         48           Total efficiency (%)         86         85.8         85           NGINE EMISSIONS DATA           NOX @(5% oxygen content, 100% load)         <500 mg/Nm³	Engine power (kW)	140	105	70
Air to fuel ratio 12:1 12:1 11:1   Heat rejection to jacket water (kW) 59.7 46.7 32.2   Heat rejection to aftercooler (kW) 28.0 21.1 14.2   Heat rejection to exhaust (kW) 121.3 89.8 58.6   Heat rejection to atmosphere (kW) 24.3 18.9 14.2   FICIENCY  Mechanical efficiency (%) 37.5 37.3 37.   Thermal efficiency (%) 48.5 48.5 48.   Total efficiency (%) 86 85.8 85    NOINE EMISSIONS DATA  NOX @(5% oxygen content, 100% load) 50.0   CO @(5% oxygen content, 100% load) 50.0   CO @(5% oxygen content, 100% load) 50.0   CO @(5% oxygen content, 100% load) 50.0   ASSEOUS FUEL SYSTEM  Gaseous fuel type Natural gas  Acceptable gas fuel Pipeline quality natural gas  Combustion system type Standard  Minimum fuel supply pressure (kPa) 50.0   Maximum fuel supply pressure (kPa) 50.0   Maximum fuel temperature (*C) 50.0   Minimum Gas methane number (MN) 80.0   Minimum Gas methane number (MN) 80.0   Minimum low heat value (LHV, MJ/m³) 33.  ITAKE AND EXHAUST SYSTEM  Combustion air inlet flow rate (m²/h) 61.0   Maximum allowable intake air restriction (kPa) 6.5   Intake manifold pressure (kPa) 12.9   Exhaust gas flow rate (m²/h) 146.4   Exhaust gas flow rate (m²/h	Brake mean effective pressure (bar)	13	9.8	6.5
Heat rejection to jacket water (kW) 59.7 46.7 32.2 Heat rejection to aftercooler (kW) 28.0 21.1 14.2 Heat rejection to exhaust (kW) 121.3 89.8 58.6 Heat rejection to atmosphere (kW) 24.3 18.9 14.2  FICIENCY  Mechanical efficiency (%) 37.5 37.3 37. Thermal efficiency (%) 48.5 48.5 48. Total efficiency (%) 86 85.8 85  NGINE EMISSIONS DATA  NOX @(5% oxygen content, 100% load) 50.0 mg/Nm³ CO @(5% oxygen content, 100% load) 50.0 mg/Nm³ ASEOUS FUEL SYSTEM  Gaseous fuel type Natural gas Acceptable gas fuel Pipeline quality natural gas Combustion system type Standard  Minimum fuel supply pressure (kPa) 52.0 mg/mmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmm	Gas consumption (m³/h)	40.7	30.7	20.6
Heat rejection to aftercooler (kW)  Heat rejection to exhaust (kW)  Heat rejection to exhaust (kW)  Heat rejection to atmosphere (kW)  Petar rejection to atmosphere (kPa)  Petar rejec	Air to fuel ratio	12:1	12:1	11 : 1
Heat rejection to exhaust (kW) 121.3 89.8 58.6 Heat rejection to atmosphere (kW) 24.3 18.9 14.2 14.2 18.9 14.2 18.9 14.2 18.9 14.2 18.9 14.2 18.9 14.2 18.9 14.2 18.9 14.2 18.9 18.9 14.2 18.9 18.5 18.5 18.5 18.5 18.5 18.5 18.5 18.5	Heat rejection to jacket water (kW)	59.7	46.7	32.2
Heat rejection to atmosphere (kW) 24.3 18.9 14.2 FICIENCY  Mechanical efficiency (₩) 37.5 37.3 37  Thermal efficiency (₩) 48.5 48.5 48  Total efficiency (₩) 86 85.8 85  NGINE EMISSIONS DATA  NOX @(5% oxygen content, 100% load) <500 mg/Nm³  CO @(5% oxygen content, 100% load) <650 mg/Nm³  ASEOUS FUEL SYSTEM  Gaseous fuel type Natural gas  Acceptable gas fuel Pipeline quality natural gas  Combustion system type Standard  Minimum fuel supply pressure (kPa) \$20  Maximum fuel supply pressure (kPa) 480  Maximum fuel pressure variation +/-3¾  Maximum fuel temperature (°C)  Minimum Gas methane number (MN) 80  Minimum low heat value (LHV, MJ/m³) 33  ITAKE AND EXHAUST SYSTEM  Combustion air inlet flow rate (m³/h) 610  Maximum allowable intake air restriction (kPa) 6.5  Intake manifold pressure (kPa) 129  Exhaust gas flow rate (m³/h) 1464  Exhaust gas flow rate (m³/h) 1464  Exhaust stack temperature (°C) 680	Heat rejection to aftercooler (kW)	28.0	21.1	14.2
#####################################	Heat rejection to exhaust (kW)	121.3	89.8	58.6
Mechanical efficiency (%)         37.5         37.3         37           Thermal efficiency (%)         48.5         48.5         48           Total efficiency (%)         86         85.8         85           NGINE EMISSIONS DATA           NOx @(5% oxygen content, 100% load)         <500 mg/Nm³	Heat rejection to atmosphere (kW)	24.3	18.9	14.2
Thermal efficiency (%)         48.5         48.5         48           Total efficiency (%)         86         85.8         85           NGINE EMISSIONS DATA         NOX @(5% oxygen content, 100% load)         <500 mg/Nm³	FFICIENCY			
Total efficiency (%) 86 85.8 85  NGINE EMISSIONS DATA  NOx @(5% oxygen content, 100% load) <500 mg/Nm³ CO @(5% oxygen content, 100% load) <650 mg/Nm³  ASEOUS FUEL SYSTEM  Gaseous fuel type Natural gas Acceptable gas fuel Pipeline quality natural gas Combustion system type Standard Minimum fuel supply pressure (kPa) >20  Maximum fuel supply pressure (kPa) <80  Maximum fuel pressure variation +/-3% Maximum fuel temperature (°C) \$40  Minimum Gas methane number (MN) 80  Minimum low heat value (LHV, MJ/m³) 33  ITAKE AND EXHAUST SYSTEM  Combustion air inlet flow rate (m³/h) 610  Maximum allowable intake air restriction (kPa) 129  Exhaust gas flow rate (m³/h) 1464  Exhaust stack temperature (°C) 680	Mechanical efficiency (%)	37.5	37.3	37
NGINE EMISSIONS DATA  NOx @(5% oxygen content, 100% load) <500 mg/Nm³ CO @(5% oxygen content, 100% load) <650 mg/Nm³ ASEOUS FUEL SYSTEM  Gaseous fuel type Natural gas Acceptable gas fuel Pipeline quality natural gas Combustion system type Standard Minimum fuel supply pressure (kPa) ≥20  Maximum fuel supply pressure (kPa) <80  Maximum fuel pressure variation +/-3%  Maximum fuel temperature (°C) ≤40  Minimum Gas methane number (MN) 80  Minimum low heat value (LHV, MJ/m³) 33  ITAKE AND EXHAUST SYSTEM  Combustion air inlet flow rate (m³/h) 610  Maximum allowable intake air restriction (kPa) 6.5  Intake manifold pressure (kPa) 129  Exhaust gas flow rate (m³/h) 1464  Exhaust stack temperature (°C) 680	Thermal efficiency (%)	48.5	48.5	48
NOx @(5% oxygen content, 100% load) CO @(5% oxygen content, 100% load)  ASEOUS FUEL SYSTEM  Gaseous fuel type Natural gas Acceptable gas fuel Pipeline quality natural gas  Combustion system type Standard Minimum fuel supply pressure (kPa) Maximum fuel supply pressure (kPa)  Maximum fuel pressure variation H/-3% Maximum fuel temperature (°C) Minimum Gas methane number (MN) Minimum low heat value (LHV, MJ/m³)  ASTAKE AND EXHAUST SYSTEM Combustion air inlet flow rate (m³/h) Maximum allowable intake air restriction (kPa)  Exhaust gas flow rate (m³/h) Exhaust stack temperature (°C) 680	Total efficiency (%)	86	85.8	85
CO @(5% oxygen content, 100% load)  ASEOUS FUEL SYSTEM  Gaseous fuel type  Acceptable gas fuel  Combustion system type  Maximum fuel supply pressure (kPa)  Maximum fuel supply pressure (kPa)  Maximum fuel pressure variation  Minimum Gas methane number (MN)  Minimum low heat value (LHV, MJ/m³)  ASEOUS FUEL SYSTEM  Combustion air inlet flow rate (m³/h)  Maximum allowable intake air restriction (kPa)  Exhaust gas flow rate (m³/h)  Exhaust stack temperature (°C)  680	NGINE EMISSIONS DATA			
ASEOUS FUEL SYSTEM  Gaseous fuel type  Acceptable gas fuel  Combustion system type  Maximum fuel supply pressure (kPa)  Maximum fuel supply pressure (kPa)  Maximum fuel pressure variation  Minimum Gas methane number (MN)  Minimum low heat value (LHV, MJ/m³)  ASTAKE AND EXHAUST SYSTEM  Combustion air inlet flow rate (m³/h)  Maximum allowable intake air restriction (kPa)  Exhaust gas flow rate (m³/h)  Exhaust gas flow rate (m³/h)  Exhaust stack temperature (°C)  Matural gas  Natural gas  Pipeline quality natural gas  Standard  Pipeline quality natural gas	NOx @(5% oxygen content, 100% load)	<500 mg/Nm³		
Gaseous fuel typeNatural gasAcceptable gas fuelPipeline quality natural gasCombustion system typeStandardMinimum fuel supply pressure (kPa)≥20Maximum fuel supply pressure (kPa)<80	CO @(5% oxygen content, 100% load)	<650 mg/Nm³		
Acceptable gas fuel Combustion system type Standard Minimum fuel supply pressure (kPa)  Maximum fuel supply pressure (kPa)  Maximum fuel pressure variation  Maximum fuel temperature (°C)  Minimum Gas methane number (MN)  Minimum low heat value (LHV, MJ/m³)  ### Combustion air inlet flow rate (m³/h)  Maximum allowable intake air restriction (kPa)  Exhaust gas flow rate (m³/h)  Exhaust stack temperature (°C)  ### Standard  Standard  **National **20  **National **Nationa	ASEOUS FUEL SYSTEM			
Combustion system type Standard   Minimum fuel supply pressure (kPa) ≥20   Maximum fuel supply pressure (kPa) <80	Gaseous fuel type	Natural gas		
Minimum fuel supply pressure (kPa) ≥20   Maximum fuel supply pressure (kPa) <80	Acceptable gas fuel	Pipeline quality natural gas		
Maximum fuel supply pressure (kPa)<80Maximum fuel pressure variation+/-3%Maximum fuel temperature (°C)≤40Minimum Gas methane number (MN)80Minimum low heat value (LHV, MJ/m³)33ITAKE AND EXHAUST SYSTEMCombustion air inlet flow rate (m³/h)610Maximum allowable intake air restriction (kPa)6.5Intake manifold pressure (kPa)129Exhaust gas flow rate (m³/h)1464Exhaust stack temperature (°C)680	Combustion system type	Standard		
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Minimum low heat value (LHV, MJ/m³)  ITAKE AND EXHAUST SYSTEM  Combustion air inlet flow rate (m³/h)  Maximum allowable intake air restriction (kPa)  Intake manifold pressure (kPa)  Exhaust gas flow rate (m³/h)  Exhaust stack temperature (°C)  33  610  620  630	Maximum fuel temperature (°C)	≤40		
Combustion air inlet flow rate (m³/h) 610  Maximum allowable intake air restriction (kPa) 6.5  Intake manifold pressure (kPa) 129  Exhaust gas flow rate (m³/h) 1464  Exhaust stack temperature (°C) 680	Minimum Gas methane number (MN)	80		
Combustion air inlet flow rate (m³/h) 610  Maximum allowable intake air restriction (kPa) 6.5  Intake manifold pressure (kPa) 129  Exhaust gas flow rate (m³/h) 1464  Exhaust stack temperature (°C) 680	Minimum low heat value (LHV, MJ/m³)	33		
Maximum allowable intake air restriction (kPa) 6.5 Intake manifold pressure (kPa) 129 Exhaust gas flow rate (m³/h) 1464 Exhaust stack temperature (°C) 680	NTAKE AND EXHAUST SYSTEM			
Intake manifold pressure (kPa)  Exhaust gas flow rate (m³/h)  Exhaust stack temperature (°C)  129  1464  680	Combustion air inlet flow rate (m³/h)	610		
Exhaust gas flow rate (m³/h)  Exhaust stack temperature (°C)  1464  680	Maximum allowable intake air restriction (kPa)	6.5		
Exhaust stack temperature (°C) 680	Intake manifold pressure (kPa)	129		
	Exhaust gas flow rate (m³/h)	1464		
Exhaust system backpressure (maximum allowable) (kPa) 10±1	Exhaust stack temperature (°C)	680		
	Exhaust system backpressure (maximum allowable) (kPa)		10±1	

#### **LUBRICATION SYSTEM**

Oil pressure @ low idle (kPa)	100~250
Oil pressure @ rated speed (kPa)	250~450
Maximum allowable oil temperature (°C)	120
Lube oil consumption (g/kW·h)	≤0.6
Total system capacity (including filter) (L)	18
COOLING SYSTEM	
Engine coolant capacity (L)	9
Radiator coolant capacity (L)	19
Total coolant capacity (L)	28
ENGINE NOISE DATA - @ 100% LOAD	

### **Technical parameters:**

Noise level @ 1 m

Applicable standards: Based on ISO-3046

Standard conditions: Air pressure: 1000 mbar or 100 m above sea level

Air temperature: 25°C or 298 K

Relative humidity: 30%

Engine output derating:

for plants installed at > 500 m above sea level and/or intake temperature >

≤96 dB (A)

30°C, the reduction of engine power is determined for each project.

Gas quality: according to TA

Gas flow

pressure: mbar

## **Ratings Definitions**

#### Standby

Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby rated kWe. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

### Prime

Output available with varying load for an unlimited time. Average power output is 70% of the prime rated kWe. Typical peak demand is 100% of prime rated kWe with 10% overload capability for emergency use for a maximum of 1 hour in 12. Overload operation cannot exceed 25 hours per year.

## Continuous

Output available with non-varying load for an unlimited time. Average power output is 70-100% of the continuous rated kWe. Typical peak demand is 100% of continuous rated kWe for 100% of the operating hours.



Head Office

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<sup>\*</sup>Note: Due to the difference in gas composition, the above data is for reference only.