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Mobile Power Generation Equipment

Nomad 5 - 3.3 MW/4875 KVA 50Hz 11KV



■ EQUIPMENT OVERVIEW

The Nomad 5 is a complete, single-trailer power package, capable of generating up to 3.3MW ISO. It can be moved easily and quickly by a standard road tractor unit, transferred from one location to another as changing circumstances dictate and made operational less than 48 hours after arrival on site.

- Proven Reliability
- Dual Fuel Capability
- Black Station Start Capability
- Generator 3.3MW, 4875 KVA, 50Hz, 11KV
- Robust Design Operational in Extreme Climatic Conditions
- Acoustic Treatment



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- **POWER STATION TRAILER EQUIPMENT PLAN COMPRISING**



E

D

C

B

A

- **Control Room - A**

The air-conditioned control room houses the turbine generator control and protection systems, auxiliary and control batteries, system battery charger, motor control centre and a selectable 415VAC distribution board. Distribution board inputs provide the facility for external customer supply, on board diesel generator supply

for “Power Station Black Start Capability” and auto transfer to auxiliary transformer supply derived from on trailer alternator once the turbine driver is running.

- **Diesel Compartment - B**

A 500 litre diesel fuel tank is integral to the trailer chassis Housing Perkins Turbocharged Diesel engine driving hydraulic package for turbine starting and auxiliary power generation to provide power to the on trailer 415VAC distribution board.

- **Turbine Compartment - C**

Housing a TB5400 Model Gas Turbine prime mover, turbine fuel and fluid systems, control devices, instrumentation, turbine lubrication oil tank, and Allen speed reduction gearbox.

- **Alternator Compartment - D**

Housing GEC-Unipac Alternator rated at 4785kVA, Auxiliary transformer 11KV to 415VAC for trailer internal power distribution,

- **Cooler and Switchgear Compartment - E**

Whipp & Bourne 11Kv Generator circuit breaker, HV terminal chamber for connection to customer load, turbine lubrication system air blast oil cooler and fire fighting equipment.



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ADDITIONAL TECHNICAL AND PERFORMANCE FEATURES OF NOMAD 5 MOBILE POWER STATION

TB5000 gas turbine generator set comprises the following:

▪ Turbine Engine Core

Model TB5000 (5400 bhp ISO Base Load rating on gas fuel), twin shaft, heavy duty industrial gas turbine, complete with:

- Air inlet casing phased vertically upwards
- Air inlet flexible joint
- Gas generator assembly
- Combustor assembly incorporating 4 combustion chambers
- Power turbine assembly
- Exhaust outlet casing phased vertically upwards
- Exhaust outlet flexible joint

▪ Underbase

- Turbine Trailer underbase of fabricated carbon steel construction, designed for three-point mounting on installation support jacks
- Turbine mounting, allowing thermal expansion towards the non-drive end
- Retractable lifting tubes to facilitate heavy lift handling

- Lubricating oil and auxiliary diesel fuel tanks integral to underbase

▪ Instrumentation

- Air inlet temperature thermocouples
- Exhaust outlet and power turbine exit temperature thermocouples
- Gas generator speed probe
- Power turbine speed probe
- Mechanical over-speed protection trip
- Engine mounted vibration probes for gas generator and power turbine with casing mounted seismic sensor to gearbox and driven unit

▪ Lubricating Oil System

- Integral lubricating oil system, including all pipework, serving the gas turbine, gearbox and driven unit
- Lubricating oil tank integral to trailer underbase
- Lube oil pressure and temperature transmitters



Main pump, gearbox-driven, Auxiliary pump, AC electric motor driven (pre start and post shutdown lubrication)

Emergency pump, DC electric motor driven (emergency cooling)

Lubricating oil supply piping in stainless steel downstream of filters

Duplex filters with manual changeover valve; differential pressure gauge and differential pressure transmitter

Lubricating oil pressure gauge and transmitter Oil tank temperature transmitter

Oil tank level gauge, Oil tank low oil level transmitter

▪ **Lubricating Oil Cooler**

Air blast simplex vertical matrix lubricating oil cooler, suitable for high ambient temperature range.

▪ **Lubricating Oil Breather**

Breather system internal to Acoustic Enclosure (Including a carbon steel Sand Trap)

Lube oil breather piping external vent

Stainless steel flame trap for mounting in the external breather piping

▪ **Starting System**

Diesel engine driven hydraulic start system

▪ **Ignition System**

High tension igniters (4)

Fully piped ignition system utilising propane gas fuel supply

▪ **Gas Fuel System**

Gas fuel piping in stainless steel

Gas fuel pressure gauges for fuel valve and burners

Gas fuel pressure relief valve

Gas fuel pressure transmitter

Gas fuel shutoff valve, emergency, rapid acting

Gas fuel shutoff valve, manually operated

Gas Fuel Valve

▪ **Off Package Gas Fuel System**

Gas fuel block and vent valve assembly (installation by others)



- **Liquid Fuel System**

Liquid fuel piping in stainless steel

On trailer Duplex fuel filter permitting on line duty filter replacement

AC motor driven liquid fuel boost pump, gearbox driven main fuel pump

Governor-actuated fuel valve

Solenoid-operated fuel shut-off valve

Manual emergency shut-off valve

Burner pressure gauge

Gas ignition system

Combustion chamber auto-drain valves

- **Combustion Air Inlet System**

Standard 2 stage Combustion Air Inlet Filter with particle extraction louver integral to trailer housing

Optional multistage off trailer Combustion Air Inlet Filter semi permanent installation (additional cost option)

- **Combustion Exhaust System**

Exhaust silencer for an overall 85 dB(A) rating (additional cost option for semi permanent installation)

Combustion Exhaust Ducting Stack to elevation of approx. 6m above ground level (additional cost option for semi-permanent installation)

- **Gearbox and Coupling**

Direct coupled Epicyclic type gearbox of Allen Gear manufacture giving an output shaft speed of 1,500 RPM

Low maintenance Turbo-flex dry diaphragm output coupling between gearbox and AC generator



▪ **Control System**

The new control system incorporates the following functions:

Turbine Sequencing and Protection

Fault Monitoring, Annunciation

Gas Turbine Speed Control

Temperature Monitoring

Turbine Vibration Monitoring

Turbine Gearbox Vibration Monitoring

Driven Unit Vibration Monitoring

Driven Unit Bearing Temperature Monitoring

Remote access and monitoring for operational review and fault diagnosis aids

Interlocking Control for standard Fire Protection and Gas Detection Monitor

English language on front panels

Control Power Supply

24V DC and 220/240V AC supply for controls from battery system

▪ **AC Generator**

Brushless AC generator, voltage 11kv and frequency to 50Hz, to sound attenuation of 85dba

Generator cooling type CACA

Generator bearing temperature detectors

Class F insulation / F total temperatures

AC generator lube oil system provided by the gas turbine

Underbase of fabricated steel construction

Generator alignment jacking screws

The generator is suitable for a non-hazardous area

▪ **Generator Control Panel**

Automatic voltage regulator

Generator metering equipment

Generator electrical protection relays

Automatic and manual synchronizing facility with check synch

Neutral Earth Resistor



- **Electrical Equipment**

On-package AC and DC interface cabling

Integral earth protection bonding

Emergency 'Stop' push-buttons externally mounted on turbine under base

Local stop push-buttons on turbine AC motors

- **Batteries**

Nickel-Cadmium batteries are mounted within a carbon steel battery storage cabinet located externally adjacent to control room

- **Battery Charger**

A simple Erskine battery charger / static inverter is supplied, incorporating a DC-controller to control the turbine DC supply

- **Acoustic Enclosure**

Fitted over the turbine, gearbox and alternator and bolted to turbine under base, for average sound attenuation to 85dB(A)

SPL at 1m distance measured at 1.2m above ground level incorporating:

Internal lighting

Painted carbon steel construction

Access Doors provide for personnel maintenance access

Removable panels for maintenance access

Acoustic enclosure ventilation inlet damper

Acoustic enclosure ventilation outlet damper

Acoustic enclosure ventilation air flow detector

Acoustic Enclosure Ventilation System

- **Ventilation Filter**

High efficiency cleanable pad type combustion air filter.

- **Ventilation Fan**

AC electric motor-driven ventilation outlet fan to Zone 1 classification, duct-mounted (Ex 'd' type).

- **Fire Protection and Gas Detection System**

2 - ultra-violet flame detectors

1 - heat detector

3 - gas detectors

Twin shot FM200 fire protection system

Extinguishant release audible and visible alarms

Enclosed rack-mounted FM200 bottles



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- **Turbine Compressor Cleaning System**

- Cold turbine compressor wash system

- Mobile wash trolley, incorporating cleaning fluid/rinse tank fitted with integral pressure relief valve, air pressure control solenoid valve, air/wash fluid flexible hose with quick closing air pressure

- release connections, and electrical cable

- Drain system incorporating automatic drain valve

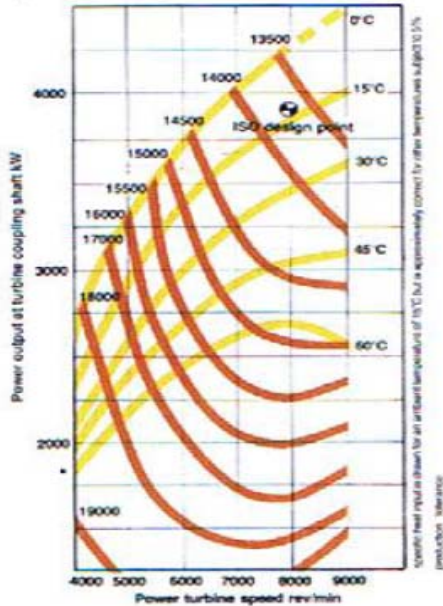
- Pressure transmitter to monitor intermediate stage blow-off valves



MECHANICAL DRIVE PERFORMANCE(GENERIC CHARACTERISTICS NEW AND CLEAN)

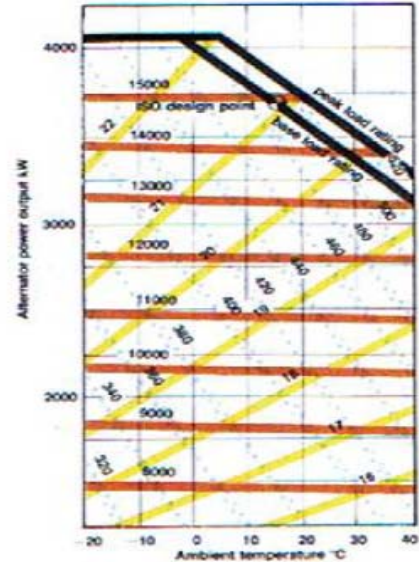


TB5000 specific heat input for power vs speed



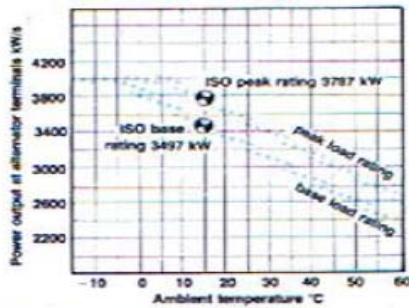
— Specific heat input kJ/kWh
 — Ambient temperature
 Intake loss 1.0 kPa
 Exhaust loss 1.0 kPa
 Gearbox loss not included
 Nominal power turbine speed 7950 rpm
 Ambient pressure 101.3 kPa
 Gas fuel

TB5000 alternator output vs ambient temperature



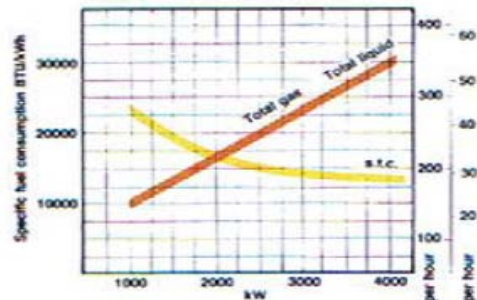
— Heat input kW
 — Exhaust gas temp °C
 — Exhaust gas flow kg/s
 Intake loss 1.0 kPa
 Exhaust loss 2.0 kPa
 Gearbox efficiency 98.5%
 Alternator efficiency 96.5%
 Nominal power turbine speed 7950 rpm
 Ambient pressure 101.3 kPa
 Gas fuel

Nomad 5 power output



ISO peak load rating: class B: range II
 Operation up to 2000 hours per year, up to 500 starts per year
 ISO base load rating: class D: range II
 Operation up to 8760 hours per year, up to 500 starts per year
 Power output includes allowances for ducting, gearbox and alternator losses

Nomad 5 fuel consumption



Liquid fuel LCV 18300 BTU/lb S.G. 0.85
 Gas fuel LCV 1000 BTU/scf
 At 15°C ambient temperature



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