

ГАЗОВА ГЕНЕРАТОРНА УСТАНОВКА

based on *mtu* 12V4000L64FNER
for continuous application
1521kWe 400V 50Hz, 1500 RPM NOx5008

General Description

- ❖ *mtu* gas genset powered by *mtu* gas engine 12V4000L64FNER
- ❖ containerized design with ISO 20' High Cube Container
- ❖ Cooling system for engine and mixture cooling circuit (heat recovery as optional for CHP applications)
- ❖ Generator output field including customer`s connection
- ❖ MCS (Module Control System) for containerized system control, regulating diagnosis and protection

Features of Container

- ❖ Full transportability of the system (Rail, Road, Sea)
- ❖ Lloyd`s CSC-certified (Convention Safety Container) for trouble-free conventional transport (Rail, Road, Sea) and stackable storage of the modules
- ❖ Plug & Play solution for the ease of "On site" installation and operation
- ❖ Versatile use of the gensets (different operating conditions)
- ❖ Weather-proof
- ❖ Minimum external dimensions, ISO 20' HQ container
- ❖ Proven tested design (extensive testing before launch as standard products)
- ❖ Combinable optional packages to suit various demands
- ❖ Environment friendly provision (e.g. low noise level, container floor sealed against leaking oil and water, optional catalytic converter and CHP unit)

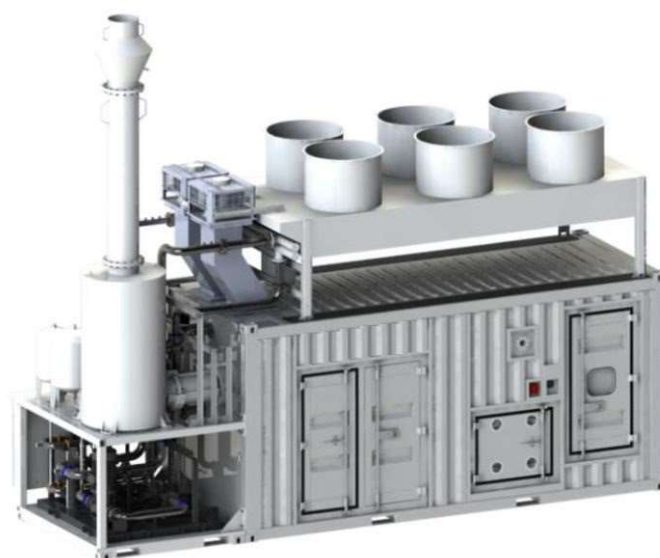
Acoustic

Sound pressure level	95dB(A)
Tolerance	+2dB(A)
Distance from genset	1 m
Reference height above ground	1.5 m
Optional	
Sound pressure level	65 / 75 dB(A)

ELENG



A Rolls-Royce
solution



Design Conditions

Ambient Temp.	0 °C ~ 30 °C
Ambient Humidity	60%
Altitude	100 m

Applicable standard

Low voltage Directive 2006/95/EG
EMV Directive 2004/108/EG
Lloyds CSC Certified
Corners of container (ISO1161)
Protective coating (CSN EN12944)
Safety instruction according to international standard (ISO3864 / ANSI Z535)
Conformite Europeenne (2006/42/EC, 2014/35/EU, 97/23/EC)

Color Scheme

Engine, generator	RAL7001
Frame	RAL5002
Control cabinet	RAL7035
External surface of contained if option is selected, customer shall advise the color	RAL9003

Technical Specification

Engine

Engine Model	12V4000L64FNER
Number of cylinders / configuration	12V
Engine speed	1500 rpm
Bore	170 mm
Stroke	210 mm
Displacement	57.2 l
Mean Piston Speed	10.5 m/s
Compression Ratio	12.5
BMEP	21.8 bar
At Nominal Engine Speed Min-1	
Lube Oil Consumption	0.27 dm ³ /h

Internal Consumption

Internal consumption for the radiator	10.68 kWe
Internal consumption for HT< Pump	20.7 kWe
Internal consumption of ventilation fans	6.2 kWe
Battery charger	4 kWe
Coolant heater	9 kWe
Anti-condensation heater	1.2 kWe

Engine Coolant

Coolant Temp.(in/out)	77/91 °C
Coolant flow rate	56.18 m ³ /h
Max.operation pressure	6 bar
Pressure drop, design	2.2 / 38.7 bar / m ³ /h

Mixture Cooler 2nd Stage, External

Coolant Temp.(in/out), design	58/60.2 °C
Coolant volumetric flow, design, Constant	33.0 m ³ /h
Pressure drop, design	0.52 / 46.7 bar / m ³ /h
Max. operation pressure before mixture cooler	6 bar

Exhaust Gas Emissions

NO _x , stated as	
NO ₂ (dry, 5% O ₂)	< 500 mg/m ³
CO (dry, 5% O ₂)	< 1000 mg/m ³
HCHO (dry, 5% O ₂)	< 120 mg/m ³



Reference Fuel

Natural gas	CH ₄ >95%
Minimum methane number	80 MN
Range of heating value: design/operation range	10-10.5 / 8.0-11.0 kWh/m ³ i.N
Nominal size / gas pressure min.-max.	80 DN / 142-250 mbar - mbar

Exhaust System

Exhaust gas temp. (after turbocharger)	417 °C
Exhaust gas volume flow, wet	5990 m ³ i.N./h
Exhaust gas volume flow, dry	5354 m ³ i.N./h
Exhaust gas mass flow, wet	7615 kg/h
Exhaust gas mass flow, min-max	30-60 mbar

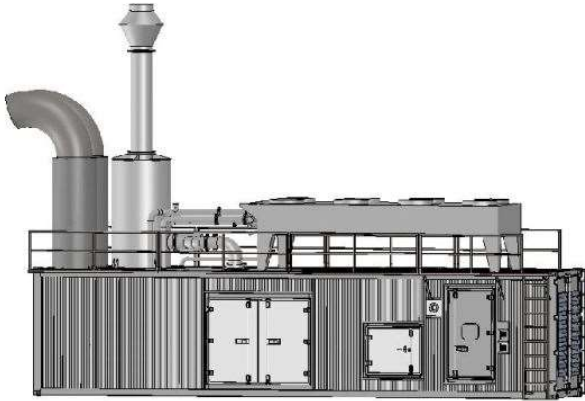
Liquid Capacity

Lube oil for engine	320 Liter
Coolant for engine	200 Liter
Intercooler coolant capacity	20 Liter

Alternator

Rating power (temp.rise class F)	1935 kVA
Insulation class / temp. rise class	H / F
Winding pitch	2/3
Protection	IP23
Max. allowable pf. Inductive (overexcited) / capacities (under excited)	0.8 / 1.0
Voltage tolerance / frequency tolerance	±5/±5

Technical Specification



Cooling System

Rated radiator temperature	35 ° C
Antifreeze cooling medium	35 %

Standard features:

- Radiator for engine cooling water circuit and gas mixture cooling circuit
- Radiator exhaust air via roof
- Stainless steel piping
- Temperature control via mixing valve in gas mixture cooling and engine cooling water circuit
- Integrated control, safety and shut-off devices in the cooling water circuits
- Closed cooling system
- Intake and exhaust air with protective grid
- Intake and exhaust air with sound attenuated louvers
- Exhaust air at the front part of container
- Intake and exhaust air with weatherproof grid
- Conveyance of the required air volume by means of axial fans

Optional Items:

- Air intake with sand filter and protective grid
- Air intake with filter mats
- Engine cooling water heat recovery

Protective Equipment (Standard Features)

- Fire alarm system (horn + light)
- Gas alarm system (horn + light)
- Leakage monitor for "oil sump"
- Optical alarm for "bus bar under voltage"
- Safety instructions according to international standard (ISO3864 / ANSI Z535)
- Fire extinguishers (hand held type) at the access doors
- EMERGENCY-STOP button at the access doors (outside)
- Complete generator output field installed on the container wall
- Access from outside at one side of the container through lockable access doors.

Optional Items:

- Work platform

Generator Output Field (Standard Features)

- Isolating switch for power supply of auxiliary drives
- 3P Isolating switch for generator voltage
- 3P Isolating switch for bus bar voltage
- Connection of customer power cable

Lighting

Standard features:

- Complete lighting consisting of 230 V 50 Hz
- Emergency lights
- Lighting for emergency exit in accordance with EU 89/654/EWG

Optional Item:

- Option DC 24V lighting

Gravity-operated lube oil system (Top UpSystem)

Optional

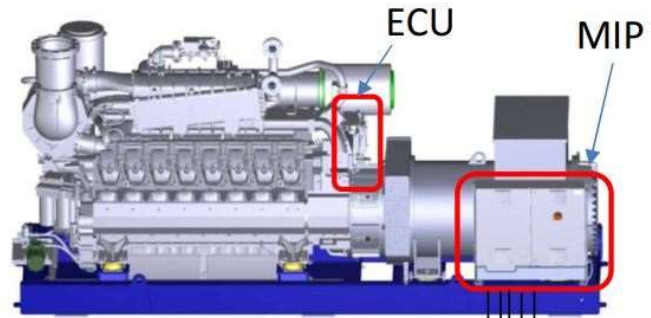
- Extra lube oil tank
- Controlled via MCS
- Automatic refilling system
- High/Low level monitor
- Minimum volume monitor for lube oil tank
- Lubricating oil pump for draining the oil sump (including two solenoid valves)

MIP & MCS GAS GENSET CONTROL SYSTEM

MIP (MTU Interface Panel)

Mounted directly on the base frame of all *mtu* systems, the *mtu* Interface Panel (MIP) manages engines and generator operation. It also controls paralleling and synchronizing with other sources of electricity, such as the utility or other generator sets, and provides remote access and software interfacing capabilities.

- Genset Control PLC
- Interface to Engine Control Unit ECU
- Interface to Alternator
- Bus interface to external (Modbus)
- On-base components cabled to MIP



MCS (Module Control System)

Highly customizable solution—the Module Control System (MCS)—seamlessly links with the MIP engine and generator set controls by cable, making all vital data and functions accessible to the operator from one convenient location.

- Operator interface
- DC power supply
- Data Logging capability
- Remote connection to *mtu* available
- Control of off base components

The MIP/MCS consolidates the following controls and functions:

Generator Set Controls

- Starter Battery Charger
- Gas train control
- Engine oil system (refilling)
- I/O's (Inputs/Outputs), auxiliary drives
- Parallel / Island operation
- Load sharing
- PLC (Programmable Logic Controller)
- AVR (Automatic Voltage Regulator)
- Energy-Measure-Module-controls

Engine Control Unit (ECU)

- Gas supply (mixture / lambda)
- Throttle / speed control
- Ignition control
- Turbo by pass
- Knocking detection / control
- Engine sensors / monitoring
- Emission sensor (NOx)
- Start / stop procedure

Accessory Controls

- Alarm system
- Data logging
- Visualization (Webserver)
- MCS interfaces (Ethernet)
- Customer interfaces (ex. Modbus)
- HMI touchscreen
- Remote monitoring and diagnostic

Rated Power

Energy balance	%	100	75	50
Electrical Power	kWe	1521	1140	760
Energy input	kWe	3428	2618	1822
Thermal output total	kWe	1566	1224	876
Thermal output engine (block, lube oil)	kWe	849	619	421
Thermal output mixture cooler 2 nd stage	kWe	79	49	29
Exhaust heat (120 °C)	kWe	717	605	455
Engine power ISO 3046-1	kWe	1560	1170	784
Generator efficiency at power factor = 1	%	97.5	97.4	97.0
Electrical efficiency	%	44.4	43.6	41.7
Total efficiency	%	90.1	90.3	89.8

Remarks:

- 1) Genset can operate at max. 1000m altitude and max. 35 °C intake air temperature; else power derating
- 2) Prime power operation will be designed specific to the project
- 3) Generator gross power at nominal voltage, power factor = 1 and nominal frequency
- 4) According to ISO 3046 (+5% tolerance), using reference fuel used at nominal voltage, power factor = 1 and nominal frequency
- 5) Emission values during grid parallel operation 8%
- 6) Thermal output at layout temperature; tolerance +/-
- 7) Optional voltage: 690V/6300V/10500V/11000V
- 8) Optional NOx value: 250 mg/m³ i.N.
- 9) Optional Ambient Temp: 25 °C/40 °Co
- 10) Optional Minimum methane number: 60MN ~ 80MN
- 11) Optional CHP applications for supplying hot water or steam
- 12) Optional Engine model: 12V4000L64

Dimensions and Weight (Typical Design)

