

**Available for Immediate Delivery 3 x 3.345 MWe Containerised Natural Gas sets**

Clarke Energy is pleased to announce the availability of 3 brand new containerised GE Jenbacher J620 natural gas gensets.

For more information please contact Clarke Energy UK's sales department on +44 (0) 151 546 4446

**New Equipment Details**

Manufacturer:	GE Jenbacher
Model:	JGC 620 GS-NL F101
Electrical output:	3349 kW
Ambient temp:	45 degrees Celsius
Altitude:	100 metres
Owned by:	Clarke Energy
Location:	Europe
Number of sets:	3
Delivery:	Immediate
Year of manufacturer:	2011
Technical Specification:	Please refer to document
Price:	Contact Clarke Energy UK sales department on + 44 (0) 151 546 4446

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## **Technical Description**

**Genset-Container**

**JGC 620 GS-N.L**

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**CEI-10-014**

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**Electrical output**

**3349 kW el.**

### **Emission values**

**NO<sub>x</sub> < 500 mg/Nm<sup>3</sup> (5% O<sub>2</sub>)**



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## 0.01 Technical Data (container)

Data at:

				Full load	Part Load	
					75%	50%
Fuel gas LHV		kWh/Nm <sup>3</sup>		9,5		
				100%	75%	50%
Energy input		kW	[2]	7.707	5.941	4.175
Gas volume		Nm <sup>3</sup> /h	*)	811	625	439
Mechanical output		kW	[1]	3.431	2.573	1.715
Electrical output		kW el.	[4]	3.349	2.509	1.661
Heat to be dissipated			[5]			
~ Intercooler 1st stage (Engine jacket water cooling circuit)		kW		1.000		
~ Intercooler 2nd stage (Engine jacket water cooling circuit)		kW		124		
~ Lube oil (Engine jacket water cooling circuit)		kW		310		
~ Jacket water		kW		532		
~ Surface heat	ca.	kW	[7]	239		
~ Balance heat		kW		77		
Spec. fuel consumption of engine		kWh/kWh	[2]	2,25	2,31	2,43
Lube oil consumption	ca.	kg/h	[3]	1,03	~	~
Electrical efficiency		%		43,5%	42,2%	39,8%

\*) approximate value for pipework dimensioning

[ ] Explanations: see 0.10 - Technical parameters

All heat data is based on standard conditions according to attachment 0.10. Deviations from the standard conditions can result in a change of values within the heat balance, and must be taken into consideration in the layout of the cooling circuit/equipment (intercooler; emergency cooling; ...). In the specifications in addition to the general tolerance of +/- 8% on the thermal output a further reserve of 10% is recommended for the dimensioning of the cooling requirements.



### Main dimensions and weights (container)

Length	mm	~ 12.000
Width	mm	~ 6.000
Height	mm	~ 5.800

### Engine - Container

Weight empty	kg	~ 40.400
Weight filled	kg	~ 41.800

### Infra - Container

Weight empty	kg	~ 9.200
Weight filled	kg	~ 9.700

### Ventilation - Container

Weight empty	kg	~ 10.000
Weight filled	kg	~ 10.100

### Connections

Jacket water inlet and outlet	DN/PN	100/10
Exhaust gas outlet	DN/PN	600/10
Fuel gas connection (container)	mm	100/16
Fresh oil connection	G	28x2"
Waste oil connection	G	28x2"
Cable outlet	mm	800x400
Condensate drain	mm	18

### Output / fuel consumption

ISO standard fuel stop power ICFN	kW	3.431
Mean effe. press. at stand. power and nom. speed	bar	22,00
Fuel gas type		Natural gas
Based on methane number Min. methane number	MZ d)	94 80
Compression ratio	Epsilon	10,50
Min. fuel gas pressure for the pre chamber	bar	4,2
Min./Max. fuel gas pressure at inlet to gas train	mbar	4000 - 5000 c)
Allowed Fluctuation of fuel gas pressure	%	± 10
Max. rate of gas pressure fluctuation	mbar/sec	10
Maximum Intercooler 2nd stage inlet water temperature	°C	60
Spec. fuel consumption of engine	kWh/kWh	2,25
Specific lube oil consumption	g/kWh	0,30
Max. Oil temperature	°C	80
Jacket-water temperature max.	°C	95
Filling capacity lube oil (refill)	lit	~ 765

c) Lower gas pressures upon inquiry

d) based on methane number calculation software AVL 3.1 (calculated without N2 and CO2)



## 0.02 Technical data of engine

Manufacturer		GE Jenbacher
Engine type		J 620 GS-F101
Working principle		4-Stroke
Configuration		V 60°
No. of cylinders		20
Bore	mm	190
Stroke	mm	220
Piston displacement	lit	124,75
Nominal speed	rpm	1.500
Mean piston speed	m/s	11,00
Length	mm	5.542
Width	mm	1.900
Height	mm	2.540
Weight dry	kg	12.000
Weight filled	kg	13.000
Moment of inertia	kgm <sup>2</sup>	69,21
Direction of rotation (from flywheel view)		left
Flywheel connection		SAE 24"
Radio interference level to VDE 0875		N
Starter motor output	kW	20
Starter motor voltage	V	24

### Thermal energy balance

Energy input	kW	7.707
Intercooler	kW	1.124
Lube oil	kW	310
Jacket water	kW	532
Exhaust gas total	kW	2.089
Exhaust gas cooled to 180 °C	kW	1.222
Exhaust gas cooled to 100 °C	kW	1.672
Surface heat	kW	157
Balance heat	kW	77

### Exhaust gas data

Exhaust gas temperature at full load	°C [8]	390
Exhaust gas mass flow rate, wet	kg/h	18.796
Exhaust gas mass flow rate, dry	kg/h	17.551
Exhaust gas volume, wet	Nm <sup>3</sup> /h	14.827
Exhaust gas volume, dry	Nm <sup>3</sup> /h	13.332
Max.admissible exhaust back pressure after engine	mbar	50

### Combustion air data

Combustion air mass flow rate	kg/h	18.241
Combustion air volume	Nm <sup>3</sup> /h	14.111
Max. admissible pressure drop in front of intake-air filter	mbar	10



### Sound pressure level

Aggregate b)		dB(A) re 20 $\mu$ Pa	101
31,5	Hz	dB	88
63	Hz	dB	95
125	Hz	dB	101
250	Hz	dB	99
500	Hz	dB	94
1000	Hz	dB	93
2000	Hz	dB	92
4000	Hz	dB	94
8000	Hz	dB	95
Exhaust gas a)		dB(A) re 20 $\mu$ Pa	123
31,5	Hz	dB	112
63	Hz	dB	121
125	Hz	dB	131
250	Hz	dB	119
500	Hz	dB	117
1000	Hz	dB	118
2000	Hz	dB	117
4000	Hz	dB	112
8000	Hz	dB	98

### Sound power level

Aggregate		dB(A) re 1pW	122
Measurement surface		m <sup>2</sup>	144
Exhaust gas		dB(A) re 1pW	131
Measurement surface		m <sup>2</sup>	6,28

a) average sound pressure level on measurement surface in a distance of 1m according to DIN 45635, precision class 2.

b) average sound pressure level on measurement surface in a distance of 1m (converted to free field) according to DIN 45635, precision class 3.

Operation with 1200 rpm see upper values, operation with 1800 rpm add 3 dB to upper values.

Engine tolerance  $\pm$  3 dB



### 0.03 Technical data of generator

Manufacturer		AVK e)
Type		DIG 142 e/4 e)
Type rating	kVA	4.450
Driving power	kW	3.431
Ratings at p.f. = 1,0	kW	3.349
Ratings at p.f. = 0,8	kW	3.328
Rated output at p.f. = 0,8	kVA	4.160
Rated current at p.f. = 0,8	A	218
Frequency	Hz	50
Voltage	kV	11
Speed	rpm	1.500
Permissible overspeed	rpm	2.250
Power factor lagging		0,8 - 1,0
Efficiency at p.f. = 1,0	%	97,6%
Efficiency at p.f. = 0,8	%	97,0%
Moment of inertia	kgm <sup>2</sup>	177,00
Mass	kg	10.250
Radio interference level to VDE 0875		N
Construction		IMB 24
Protection Class		IP 23
Insulation class		F
Temperature (rise at driving power)		F
Maximum ambient temperature	°C	40
Total harmonic distortion	%	5,0

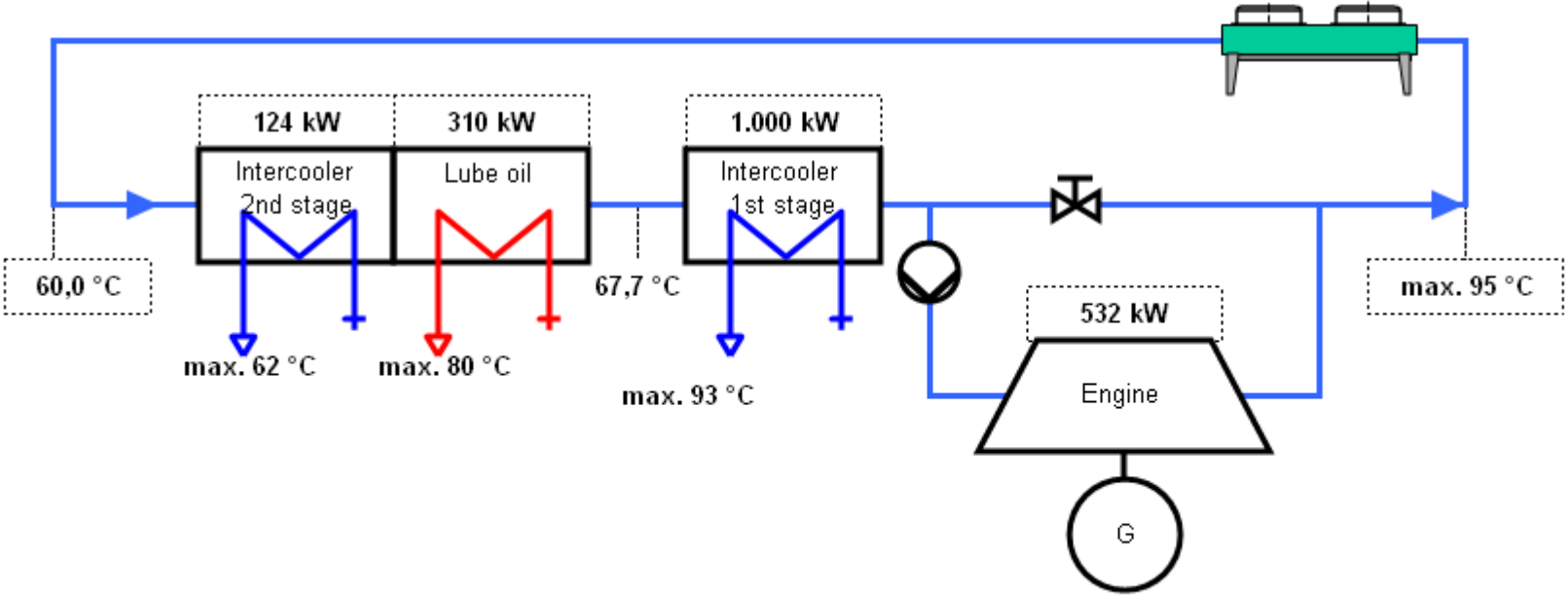
#### Reactance and time constants

xd direct axis synchronous reactance	p.u.	2,23
xd' direct axis transient reactance	p.u.	0,22
xd'' direct axis sub transient reactance	p.u.	0,15
Td'' sub transient reactance time constant	ms	20
Ta Time constant direct-current	ms	120
Tdo' open circuit field time constant	s	3,70

e) GE Jenbacher reserves the right to change the generator supplier and the generator type. The contractual data of the generator may thereby change slightly. The contractual produced electrical power will not change.

**Engine jacket water cooling circuit (calculated with Glykol 37%)**

Heat to be dissipated = 1.966 kW  
(±8% tolerance +10% reserve for cooling requirements)  
Engine jacket water flow rate = 54,1 m³/h





## 0.05 Cooling water circuit

### Oil - heat (Engine jacket water cooling circuit)

Nominal output	kW	310
Max. Oil temperature	°C	80
Nominal pressure of cooling water	bar	10
Loss of nominal pressure of cooling water	bar	0,40
Safety valve - max press. set point	bar	2,50

### Engine jacket water - heat (Engine jacket water cooling circuit)

Nominal output	kW	532
Max. engine jacket water temperature (outlet engine)	°C	95
Engine jacket water flow rate	m <sup>3</sup> /h	54,1
Safety valve - max press. set point	bar	2,50

### Intercooler - heat (Engine jacket water cooling circuit)

Nominal output	kW	1.124
Max. inlet cooling water temp. (intercooler)	°C	60
Aftercooler water flow rate	m <sup>3</sup> /h	54,1
Nominal pressure of cooling water	bar	10
Intercooler water pressure drop	bar	1,20
Safety valve - max press. set point	bar	2,50



## 0.10 Technical parameters

All data in the technical specification are based on engine full load (unless stated otherwise) at specified temperatures and the methane number and subject to technical development and modifications.

All pressure indications are to be measured and read with pressure gauges (psi.g.).

- (1) At nominal speed and standard reference conditions ICFN according to DIN-ISO 3046 and DIN 6271, respectively
- (2) According to DIN-ISO 3046 and DIN 6271, respectively, with a tolerance of + 5 %. Efficiency performance is based on a new unit (immediately upon commissioning). Effects of degradation during normal operation can be mitigated through regular service and maintenance work.
- (3) Average value between oil change intervals according to maintenance schedule, without oil change amount
- (4) At p. f. = 1.0 according to VDE 0530 REM / IEC 34.1 with relative tolerances
- (5) Total output with a tolerance of +/- 8 %
- (6) According to above parameters (1) through (5)
- (7) Only valid for engine and generator; module and peripheral equipment not considered
- (8) Exhaust temperature with a tolerance of +/- 5 %

### Radio interference level

The ignition system of the gas engines complies the radio interference levels of CISPR 12 and EN 55011 class B, (30-75 MHz, 75-400 MHz, 400-1000 MHz) and (30-230 MHz, 230-1000 MHz), respectively.

### Definition of output

- ISO-ICFN continuous rated power:  
Net break power that the engine manufacturer declares an engine is capable of delivering continuously, at stated speed, between the normal maintenance intervals and overhauls as required by the manufacturer. Power determined under the operating conditions of the manufacturer's test bench and adjusted to the standard reference conditions.
- Standard reference conditions:  
Barometric pressure: 1000 mbar (14.5 psi) or 100 m (328 ft) above sea level  
Air temperature: 25°C (77°F) or 298 K  
Relative humidity: 30 %
- Volume values at standard conditions (fuel gas, combustion air, exhaust gas)  
Pressure: 1013 mbar (14.7 psi)  
Temperature: 0°C (32°F) or 273 K

### Output adjustment for turbo charged engines

Standard rating of the engines is for an installation at an altitude  $\leq 100$  m and an air intake temperature  $\leq 45^\circ\text{C}$ .

The minimum distance to the sea is  $> 5000$ m.

If the actual methane number is lower than the specified, the knock control responds. First the ignition timing is changed at full rated power. Secondly the rated power is reduced. These functions are carried out by the engine management system.

Exceedance of the voltage and frequency limits for generators according to IEC 60034-1 Zone A will lead to a derate in output.



### **Parameters for the operation of GE Jenbacher gas engines**

The genset fulfills the limits for mechanical vibrations according to ISO 8528-9.

If possible, railway trucks must not be used for transport (**TI 1000-0046**).

The following "Technical Instruction of GE JENBACHER" forms an integral part of a contract and must be strictly observed: **TI 1100-0110, TI 1100-0111, and TI 1100-0112.**

## **1.00 Scope of supply - Genset**

### **Design:**

The genset is built as a compact package. Engine and generator are connected through a coupling and are mounted to the base frame. To provide the best possible isolation from the transmission of vibrations the engine is mounted to the frame by means of anti-vibrational mounts. The remaining vibrations are eliminated by mounting the module on isolating pads (e.g. Sylomer). This, in principle, allows the genset to be placed directly on any floor capable of carrying the static load. No special foundation is required. Prevention of sound conducted through solids has to be provided locally.

## **1.01 Spark ignited gas engine**

Four-stroke, air/gas mixture turbocharged, aftercooled, with high performance ignition system and electronically controlled air/gas mixture system.

The engine is equipped with the most advanced

LEANOX® LEAN-BURN COMBUSTION SYSTEM

developed by GE JENBACHER.

### **1.01.01 Engine design**

#### **Engine block**

Single-piece crankcase and cylinder block made of special casting; crank case covers for engine inspection, welded steel oil pan.

#### **Crankshaft and main bearings**

Drop-forged, precision ground, surface hardened, statically and dynamically balanced; main bearings (upper bearing shell: grooved bearing / lower bearing shell: sputter bearing) arranged between crank pins, drilled oil passages for forced-feed lubrication of connecting rods.

#### **Vibration damper**

Maintenance free viscous damper

#### **Flywheel**

With ring gear for starter motor and additionally screwed on.

#### **Pistons**



Single-piece made of light metal alloy, with piston ring carrier and oil passages for cooling; piston rings made of high quality material, main combustion chamber specially designed for lean burn operation.

#### **Connecting rods**

Drop-forged, heat-treated, big end diagonally split and toothed. Big end bearings (upper bearing shell: sputter bearing / lower bearing shell: sputter bearing) and connecting rod bushing for piston pin.

#### **Cylinder liner**

Chromium alloy gray cast iron, wet, individually replaceable.

#### **Cylinder head**

Specially designed and developed for GE JENBACHER-lean burn engines with optimized fuel consumption and emissions; water cooled, made of special casting, individually replaceable; Valve seats, valve guides and spark plug sleeves individually replaceable; exhaust and inlet valves made of high quality material; Pre-chamber with check-valve.

#### **Crankcase breather**

Connected to combustion air intake system.

#### **Valve train**

Camshaft, with replaceable bushings, driven by crankshaft through intermediate gears, valve lubrication by splash oil through rocker arms.

#### **Combustion air/fuel gas system**

Motorized carburetor for automatic adjustment according to fuel gas characteristic. Exhaust driven turbocharger, mixture manifold with bellows, water-cooled intercooler, throttle valve and distribution manifolds to cylinders.

#### **Ignition system**

Most advanced, fully electronic high performance ignition system, external ignition control.

#### **Lubricating system**

Gear-type lube oil pump to supply all moving parts with filtered lube oil, pressure control valve, pressure relief valve and full-flow filter cartridges. Cooling of the lube oil is arranged by a heat exchanger.

#### **Engine cooling system**

Jacket water pump complete with distribution pipework and manifolds.

#### **Exhaust system**

Turbocharger and exhaust manifold

#### **Exhaust gas temperature measuring**

Thermocouple for each cylinder

#### **Electric actuator**

For electronic speed and output control

#### **Electronic speed monitoring for speed and output control**

By magnetic inductive pick up over ring gear on flywheel



### **Starter motor**

Engine mounted electric starter motor

## **1.01.02 Engine accessories**

### **Insulation of exhaust manifold:**

Insulation of exhaust manifold is easily installed and removed

### **Sensors at the engine:**

- Jacket water temperature sensor
- Jacket water pressure sensor
- Lube oil temperature sensor
- Lube oil pressure sensor
- Mixture temperature sensor
- Charge pressure sensor
- Minimum and maximum lube oil level switch
- Exhaust gas thermocouple for each cylinder
- Knock sensors
- Gas mixer / gas dosing valve position reporting.

### **Actuator at the engine:**

- Actuator - throttle valve
- Bypass-valve for turbocharger
- Control of the gas mixer / gas dosing valve

## **1.01.02 Engine accessories – Commissioning spare parts**

### **Commissioning spare parts:**

Initial equipment with necessary spare parts for operation after commissioning.

- Spark plug sealing rings (20 pieces)
- Spark plug carrier (1 piece)
- Sparking plug (1 piece)
- Per-chamber gas valve (1 piece)
- Thermo element (Cylinder exhaust gas temperature – 1 piece)
- Sealing ring for thermo element(1 piece)
- Fuse for 6 A, 24 V(1 piece)
- Main gas filter(1 piece)

## **1.01.03 Standard tools (1/plant)**

- Tools for spark plugs (special socket, extension, torque wrench)
- Tools for removal of oil filter cartridges
- Feeler gauges
- Feeler gauge 0,35 mm
- 1 wrench 7 x 19
- Screwdriver 10



- Grease gun
- Measuring device for valve wear
- Test equipment for DISN-ignition
- Strobe light
- Digital hand manometer
- Adapter for measurements (BNC-BNC, MIL-ZZP)
- Assembly paste Never-Seez Nickel Special Grade
- Pointed pliers (cornered)
- Box for tools

## 1.02 Generator-medium voltage

The generator consists of the main generator (built as rotating field machine), the exciter machine (built as rotating armature machine) and the voltage regulator with cos. phi-regulator. The regulator is powered by an auxiliary winding at the main stator.

### Main components

- Main stator with frame
- Winding at two layers
- Terminal box includes main terminals plus auxiliary terminals for thermistor connection and control for regulator
- Main rotor with sufficiently sized shaft dynamically balanced as per VDI 2060, Grade Q1
- Drive end bracket with bearing
- Non-drive end bracket with bearing
- Exciter unit
- Power factor controller
- Voltage regulator
- Anti-condensation heater

### Electrical data and features

- Voltage adjustment: +/- 10% rated voltage
- Static voltage accuracy: +/- 1% at no load to full load and power factor 0.8-1
- speed variation +/- 3%, cold and hot machine
- Maximum deviation of wave form according to VDE is 5% phase to phase at open circuit
- Generator suitable for parallel operating with mains and other generators
- Sustained short circuit current at 3-pole terminal short circuit: minimum 3 times rated current for 5 seconds.
- Overload capacity according. to IEC 32 - I/VDE 0530

According to VDE 0530 the overspeed test ensues with 1.2 times of rated speed for 2 minutes.

### Additional components:

- Electronic voltage regulator
- Electronic power factor regulator
- 3 Pt 100 for winding temperature monitoring
- 2 Pt 100 for bearing temperature monitoring
- Current transformer for protection and measuring uses



## 1.03 Module accessories

### Base frame

Welded structural steel to accommodate engine, generator and heat exchangers.

### Flexible coupling

With torque limiter to couple engine with generator. The coupling isolates the major subharmonics of engine firing impulses from the generator.

### Bell housing

To connect engine with generator housing. With two ventilation and control windows.

### Anti-vibration mounts

Arranged between engine/generator assembly and base frame. Isolating pads (SYLOMER) for placement between base frame and foundation, delivered loose.

### Exhaust gas connection

Connection of exhaust gas turbocharger; including flexible connection to compensate for expansions and vibrations.

### Combustion air filter

Dry type air filter with replaceable filter cartridges, including flexible connection to carburetor and service indicator.

### Interface panel

Totally enclosed sheet steel cubicle with front door, wired to terminals, ready to operate. Cable entry at bottom.

Painting: RAL 7035

Protection: IP 54 external, IP 10 internal (protection against direct contact with live parts)

Design according to IEC 439-1 (EN 60 439-1/1990) and DIN VDE 0660 part 500, respectively.

Ambient temperature: 5 - 40 °C (41 - 104 °F), Relative humidity: 70 %

Dimensions:

- Height: 1300 mm (51 in)
- Width: 1200 mm (47 in)
- Depth: 400 mm (16 in)

Power supply from the starter battery charger.

Power distribution to the engine mounted auxiliaries (power input from the supplier of the auxiliaries power supply):

3 x **415/240 V**, **50 Hz**, 50 A

### Essential components installed in interface panel:

- Terminal strip



- Decentralized input and output cards, connected by a data bus interface to the central engine control of the module control panel.
- Speed monitoring
- Relays, contacts, fuses, engine contact switch to control valves and auxiliaries
- Measuring transducer for excitation voltage

#### **Exhaust gas scavenging blower**

The exhaust gas scavenging blower is used to scavenge the remaining exhaust gas out of the exhaust gas pipe work, to prevent the appearance of deflagrations.

##### **Function:**

Before each start scavenging by blower is done for app. 1 minute (except at black out – start)

##### **Supervisions:**

- Scavenging air fan failure
- Scavenging air flap failure

##### **Consisting of:**

- Fan
- Exhaust gas flap
- Temperature switch
- Compensator and pipe work

### **1.03.01 Engine jacket water system**

#### **Engine jacket water system**

Closed cooling circuit, consisting of:

- Expansion tank
- Filling device (check and pressure reducing valves, pressure gauge)
- Safety valve(s)
- Thermostatic valve
- Required pipework on module
- Vents and drains
- Electrical jacket water pump, including check valve
- Jacket water preheat device

### **1.03.02 Automatic lube oil replenishing system**

#### **Automatic lube oil replenishing system:**

Includes float valve in lube oil feed line, including inspection glass. Electric monitoring system will be provided for engine shut-down at lube oil levels "MINIMUM" and "MAXIMUM". Solenoid valve in oil feed line is only activated during engine operation. Manual override of the solenoid valve, for filling procedure during oil changes is included.

#### **Oil drain**

By set mounted cock

#### **Pre-lubrication- and aftercooling oil pump:**



Mounted on the module base frame; it is used for pre-lubrication and aftercooling of the turbochargers.

Period of operation:                   Pre-lubrication: 1 minute both pumps  
  Aftercooling: 15 minutes from engine stop only the **415/240 V** pump

Consisting of:

- 1 piece oil pump 1500 W, **415/240 V**
- 1 piece oil pump 1500 W, 24 V
- All necessary vents
- Necessary pipework

## 1.05 Gas train

Pre-assembled, delivered loose, for installation into gas pipework to the module.

**Consisting of:**

- **Main gas train:**
  - Shut off valve
  - Gas filter, filter fineness <3 µm
  - Adapter with dismount to the pre-chamber gas train
  - Gas admission pressure regulator
  - Pressure gauge with push button valve, 0-6 bar (0-87 psi)
  - High pressure regulator with safety-cut-off-valve (SAV)
  - Calming distance with reducer
  - Safety-blow-off-valve (SBV)
  - Pressure gauge with push button valve, 0-100 mbar (0-1,45 psi)
  - Solenoid valves
  - Leakage detector
  - Gas pressure regulator
  - Gas pressure switches (min., max.)
  - TEC JET (has to be implemented horizontal)
  - Gas flow meter (option)
  - p/t compensation (option)

The gas train complies with DIN - DVGW regulations.

Maximum distance from TEC JET outlet to gas entry on engine, including flexible connections, is 1 m (39,37 in).

• **Pre-chamber gas train:**

- Ball valve
- Gas filter, filter fineness <3 µm
- Solenoid valves
- Pressure regulator
- Calming distance with reducer
- Pressure gauge with push button valve, 1-5 bar (0-72,5 psi)

Pre chamber gas pressure regulator (incl. stabilization section) assembled at the flexible connection pre chamber gas.



## 1.07 Painting

- Quality: Oil resistant prime layer  
Synthetic resin varnish finishing coat
- Colour:

Engine:	RAL 6018 (green)
Base frame:	RAL 6018 (green)
Generator:	RAL 6018 (green)
Module interface panel:	RAL 7035 (light grey)
Control panel:	RAL 7035 (light grey)

## 1.11 Engine generator control panel – DIA.NE XT

### Dimensions:

- Height: 2200 mm (87 in) [including 200 mm (8 in) pedestal]
- Width: 1000 mm (40 in)
- Depth: 600 mm (24 in)

Control supply voltage from starter and control panel batteries: 24V DC

Supply of power for auxiliaries from auxiliary power panel:  
3 x 415/240 V, 50 Hz, 35 A

Consisting of:

**DIA.NE XT 3** (Dialog Network new generation) **motor management system**

### System elements visualisation with central engine and module control

#### 1) Visualisation:

Industrial control with 10,4" QVGA TFT colour graphics display and 8 function keys.  
10-key numeric keyboard for parameter input.

Keys for START, STOP, Generator circuit breaker OPEN, Generator circuit breaker CLOSED/SELECTED, display selection keys and special functions.

#### Interfaces:

- Ethernet (twisted pair) for connection to DIA.NE WIN server
- CAN-Bus: bus connection to the intelligent sensors and actuators
- Data bus connection to the control in- and outputs  
Interfacing with the customer's plant management PROFIBUS-DP slave)

Protection class: IP 65 (front)

Dimensions: W x H x D = approx. 212 x 255 x 95 mm (8,4 x 10 x 3,75 in)

A clear and functional graphic compilation of measured values is displayed on the screen. User prompts are by means of direct-acting display selection keys and function keys.

#### Main displays:

- Electrical schematic
- Oil and hydraulic schematic
- Gas data



- Engine controllers
- Cylinder data
- Exhaust gas data
- Auxiliaries controllers
- Spare screen for customer specific purposes
- System display screens
- Parameter manager
- User setting
- Alarm management

**Recipe handling:**

Setting, display and storage of all module parameters

**Alarm management:**

Efficient diagnostic instrumentation listing all active fault messages both tabular and chronologically, with the recorded time.

**2) Central engine and module control:**

A real-time, modular industrial control system which handles all jobs for module and engine-side sequencing control (start preparation, start, stop, synchronizing, after-cooling, control of auxiliaries), as well as all control functions.

**Control functions:**

- Speed control in no-load and isolated operation
  - Power output control in parallel operation system; job-specific with respect to internal and external set point values.
  - LEANOX control system for control of boost pressure; dependent upon the generator terminal power and the mixture temperature via the engine-driven air-gas mixer
  - Knocking control: adjustment of the ignition point, power output and (insofar as is locally possible) the mixture temperature in the event of detection of knocking.
  - Load sharing between several modules in isolated operation
  - Linear reduction of power output in the event of excessive mixture temperature and ignition failures
- 
- Interface relays as per the interface list
  - Multi-transducer, to record the following electrically measured variables of the generator:
    - Phase current (with slave pointer)
    - Neutral conductor current
    - Voltages Ph/Ph and Ph/N
    - Active power (with slave pointer)
    - Reactive power
    - Apparent power
    - Power factor
    - Frequency

An additional 0 - 20 mA output is produced for active power, as well as a pulse output for active power demand.

**The following alternator supervisions are integrated with the multi-transducer (max. 8 functions simultaneous):**

- Overload/short-circuit [51], [50]
- Over voltage [59]
- Undervoltage [27]



- Asymmetric voltage [64], [59N]
- Unbalance current [46]
- Failure Excitation [40]
- Overfrequency [81>]
- Underfrequency [81<]
- Lockable operation mode selector switch positions:
  - "OFF"  
No operation is possible, running set will shut down;
  - "MANUAL"  
Manual operation using (start, stop) is possible, unit is not available for fully automatic operation.
  - "AUTOMATIC"  
Fully automatic operation, according to remote demand signal:
    - Automatic start  
Fully automatic operation at full load
    - Stop with cooling down run for 1 minute  
Continuous operation of auxiliaries for 5 minutes after engine shutdown
- Demand switch with the positions:
  - Demand OFF
  - Demand ON
  - Remote demand
- Supply disconnecting device for auxiliaries with lockable circuit breaker

**Shut-down functions with display:**

- Low lube oil pressure
- Low lube oil level
- High lube oil level
- High lube oil temperature
- Low jacket water pressure
- High jacket water pressure
- High jacket water temperature
- Overspeed
- Emergency stop/safety loop
- Gas train failure
- Start failure
- Stop failure
- Engine start blocked
- Engine operation blocked
- Misfiring
- High mixture temperature
- Measuring signal failure
- Overload/output signal failure
- Generator overload/short circuit
- Generator over/undervoltage
- Generator over/underfrequency
- Generator asymmetric voltage
- Generator unbalanced load
- Generator reverse power
- High generator winding temperature
- Synchronising failure
- Knocking failure



**Warning functions with display:**

- Low jacket water temperature
- CPU battery failure

**Operational functions with display:**

- Ready to start
- Operation (engine running)
- Generator circuit breaker "CLOSED"

**Remote signals:**

(volt free contacts)

1NO = 1 normally open

1NC = 1 normally closed

1 COC = 1 change over contact

- |   |     |
|---|-----|
| • Ready for automatic start (to Master control) | 1NO |
| • Operation (engine runs)                       | 1NO |
| • Collective signal "shut down"                 | 1NC |
| • Collective signal "warning"                   | 1NC |

**External (by others) provided command/status signals:**

- |                                       |     |
|---------------------------------------|-----|
| • Engine demand (from Master control) | 1NO |
|---------------------------------------|-----|

**Single synchronizing Automatic  
With voltage balance**

For automatic synchronizing of the module with the generator circuit breaker to the grid by PLC-technology, integrated within the module control panel.

**Consisting of:**

- Lockable synchronizing mode selector switch, with positions "MANUAL - OFF - AUTOMATIC"
  - AUTOMATIC:  
Automatic module synchronization, after synchronizing release from the control panel
  - MANUAL:  
Manual initiation of synchronizing by push button. Speed adjustment and closing of the circuit breaker is automatically controlled via microprocessor
  - OFF:  
Synchronization is disabled
- Additional PLC hardware for the fully automatic synchronizing of each module, and monitoring of the "CIRCUIT BREAKER CLOSED" signal.  
Logic for monitoring of:
  - Non-logic breaker positions
  - Switch "ON" trouble
  - Switch "OFF" trouble
- Automatic synchronizing device to control the electronic speed governor adjustment, double voltmeter, double frequency meter and synchronoscope
- Automatic voltage balancing
- Luminous push button "GENERATOR CIRCUIT BREAKER OPEN / SELECT"



- To indicate synchronizing mode
- To indicate “Generator circuit breaker closed”
- For manual synchronizing selection with the synchronizing mode selector switch in the MANUAL position
- For manual closing of the generator circuit breaker to the voltage free bus bar (first connection) with synchronizing mode selector switch in the MANUAL position
- Luminous push button “GENERATOR CIRCUIT BREAKER OPEN”
  - To indicate “Generator circuit breaker open”
  - To manually open the generator circuit breaker
- Control switch
- Required relays for control and monitoring
- Voltage relay for monitoring of bussbar voltage (only for island operation)

**Operational indications for:**

- Generator circuit breaker CLOSED
- Generator circuit breaker OPEN

**Fault indications for:**

- Generator circuit breaker return signal fault
- Generator circuit breaker closing fault
- Generator circuit breaker opening fault

**Remote signals**

(Volt free contacts)

- Generator circuit breaker CLOSED 1 NO

**The following reference and status signals must be provided by the switchgear supplier:**

Generator circuit breaker CLOSED	1 NO
Generator circuit breaker OPEN	1 NO
Generator circuit breaker READY TO CLOSE	1 NO
Mains circuit breaker CLOSED	1 NO
Mains circuit breaker OPEN	1 NO

- Mains voltage 3 x 415/240V or 3x 110V/v3 – other measurement voltages available on request
- Bus bar voltage 3 x 415/240 V or 3x 110V/v3 – other measurement voltages available on request
- Generator voltage 3 x **11 kV** or 3x 110V/v3 – other measurement voltages available on request

Voltage transformers in star point with minimum 50VA, Class 1

**The following volt free interface-signals will be provided by GE Jenbacher to be incorporated in switchgear:**

- CLOSING/OPENING command for generator circuit breaker (permanent contact) 1 NO + 1 NC
- Signal for circuit breaker undervoltage trip 1 NO



## 1.11.02 Remote information by PROFIBUS-DP

Data transfer from GE JENBACHER-module control to customer's plant management system by PROFIBUS-DP-network according to EN 50170/2.

Data transfer rates: up to 1,5 Mbits/s.

The data transmission by the customer's MASTER must be cyclical.

### **Transmitted data:**

Individual failure information, plant operating information, measuring values for generator power, oil pressure, oil temperature, jacket water pressure, jacket water temperature, cylinder and average exhaust gas temperatures.

### **GE Jenbacher limit of delivery:**

Bus terminals RS 485 in the module control panel.

## 1.11.03 Remote Data-Transfer with DIA.NE XT - HERMES

### **General**

HERMES is the remote data transfer solution for DIA.NE XT. HERMES is available via three connection methods and two applications.

### **Connections methods**

#### **1.) Modem**

Site - Customer connection via a Modem (analogue, ISDN, GSM).

#### **Scope of supply**

- DIA.NE WIN – Server (Industrial PC without display, keyboard or mouse, built into the control panel, including operating system)
- Modem (analogue, ISDN, GSM)

#### **Customer Requirements**

- Modem (analogue, ISDN, GSM) in the customers PC
- Public telephone connection with connection port for the DIA.NE WIN – Server (in the control panel) including over-voltage protection corresponding to the local telecommunication regulations.
- Public telephone connection with connection port for the customer's PC corresponding to the local telecommunication regulations.

#### **2.) LAN**

Site - Customer connection via a local network.

#### **Scope of supply**

- DIA.NE WIN – Server (Industrial PC without display, keyboard or mouse, built into the control panel, including operating system)
- Ethernet – Network card (10/100 BASE T)

#### **Customer Requirements**

- Ethernet – Network card (10/100 BASE T)
- Ethernet – Cabling between the DIA.NE WIN – Server the customers PC.



### **3.) Internet**

Site – Customer connection via secure Internet access

See comments under Technical instruction **TI 2300 - 0006**

#### **Scope of Supply**

- DIA.NE WIN – Server (Industrial PC without display, keyboard or mouse, built into the control panel, including operating system)
- Ethernet–Network card (10/100 BASE T)
- Firewall–Appliance with connection feasibility to a customer network with a maximum of 10 Hosts (Installation and service by GE Jenbacher; during warranty period included, afterwards as a service package with costs) (built into the control panel)
- Feature – service package (access monitoring, clock synchronization for server)

#### **Customer Requirements**

- Broad band Internet access with at least two official IP addresses.  
Connection feasibility for the Firewall–Appliance to the Internet–Router via Ethernet (RJ45 Connector, Network Address Translation (NAT) is not permitted)

### **Applications**

#### **1.) DIA.NE WIN**

DIA.NE WIN is the Windows based „man-machine interface“ for GE Jenbacher gas engines. The system offers extensive facilities for commissioning, monitoring, servicing and analysis of the site. The option DIA.NE WIN extends the visualization of DIA.NE XT with respect to user friendliness, historical analysis and remote use. Several service stations can be independently operated in parallel. The system consists of a central PC (DIA.NE WIN – Server) which is built in to the control panel and one or more service stations (DIA.NE WIN – Clients). The system runs on a Microsoft Internet Explorer platform.

#### **Function**

Service and monitoring, trend analysis, alarm management, parameter management, long-term data analysis, multi-user system, remote control, OPC (OLE for process control), print and export functions, operating data protocols, available in several languages.

#### **Scope of supply**

- Software package DIA.NE WIN on the DIA.NE WIN – Server
- DIA.NE WIN – Client License (Right to access of the user to the server on site)

#### **Customer requirements**

- Standard PC with keyboard, mouse and monitor (min. resolution 1024\*768)
- **240 V** supply for the customers' PC
- Operating system Windows 98, Windows NT, Windows 2000 or Windows XP
- Microsoft Internet Explorer (min. Version 6.0) including Java support



## 1.20.01 Starting system

### Starter battery:

2 x 2 piece Pb battery with 12 cells, 2 x 12 V, 400 Ah (according to DIN 72311), complete with cover plate, terminals and acid tester.

### Battery voltage monitoring:

Monitoring by an under voltage relay.

### Battery charging equipment:

Capable for charging the starter battery with I/U characteristic and for the supply of all connected D.C. consumers.

Charging device is mounted inside of the module interface panel or module control panel.

#### • General data:

• Power supply	<b>3 x 320 - 550 V, 47 - 63 Hz</b>
• max. power consumption	2120 W
• Nominal D.C. voltage	24 V(+/-1%)
• Voltage setting range	24V to 28,8V ( adjustable)
• Nominal current (max.)	2 x 2 x 40 A
• Dimensions	240 x 125 x 125 mm
• Degree of protection	IP20 to IEC 529
• Operating temperature	0 °C - 60 °C
• Protection class	1
• Humidity class	3K3, no condensation.
• Natural air convection	
• Standards	EN60950, EN50178 UL/cUL (UL508/CSA 22.2)

#### Signalling:

Green Led:	Output voltage > 20,5V
Yellow Led:	Overload, Output Voltage < 20,5V
Red Led:	shutdown

#### Control accumulator:

- Pb battery 24 VDC/18 Ah

## 1.20.03 Electric jacket water preheating

Installed in the jacket water cooling circuit, consisting of:

- Heating elements
- Water circulating pump

The jacket water temperature of a stopped engine is maintained between 56°C (133 °F) and 60°C (140°F), to allow for immediate loading after engine start.



## 1.20.04 Flexible connections

Following flexible connections per module are included in the GE Jenbacher -scope of supply:

No. Connection	Unit	Dimension	Material
2 Warm water in-/outlet	<b>DN/PN</b>	<b>100/10</b>	Stainless steel
1 Exhaust gas outlet	<b>DN/PN</b>	<b>600/10</b>	Stainless steel
1 Fuel gas inlet	<b>DN/PN</b>	<b>100/16</b>	Stainless steel
2 Intercooler in-/outlet	<b>DN/PN</b>	<b>100/10</b>	Stainless steel
2 Lube oil connection	<b>mm</b>	<b>28</b>	Hose

Sealings and flanges for all flexible connections are included.

## 2.00 Electrical equipment

Totally enclosed floor mounted sheet steel cubicle with front door wired to terminals. Ready to operate, with cable entry at bottom. Naturally ventilated.

Protection: IP 40 external  
IP 10 internal (protection against direct contact with live parts)

Design according to EN 60439-1 / IEC 60439-1 and ISO 8528-4.  
Ambient temperature 5 - 40 °C (41 - 104 °F), 70 % Relative humidity

Standard painting: Panel: RAL 7035  
Pedestal: RAL 7020

## 2.02 Grid monitoring device

### Function:

For immediate disconnection of the generator from the grid in case of grid failures.

### Consisting of:

- High/low voltage monitoring
- High/low frequency monitoring
- Specially adjustable independent time for voltage and frequency monitoring
- Vector jump monitoring or df/dt monitoring for immediate disconnection of the generator from the grid for example at short interruptions
- Indication of all reference dimensions and adjustable parameters for normal operation and at the case of disturbance over LCD and LED
- Adjusting authority through password protection against adjusting of strangers

### Scope of supply:

Digital grid protection relay with storage of defect data, indication of reference dimensions as well as monitoring by itself.





- Exhaust gas silencer
- Flanges, seals, fixings

**Insulation:**

The insulation for reducing surface irradiations (heat and sound) of the exhaust gas silencer is not included in our scope of supply and must be provided locally. The insulation (100 mm (4 inch) rock wool covered with 0,75 mm (0,03 inch) galvanized steel sheet) is required to keep the sound pressure level of the container (65 dB(A) in 10 m (32 ft)).

### 3.10 Cooling system - Radiator

Radiator is used to dissipate the heat from the jacket water cooling circuit.

**Sound pressure level 55 dB(A) at 10 m (32 ft)**

(as measuring area level according to ISO 3744 bzw. EN 13487)

**Consisting of (delivered loose):**

- Radiator
- Pump
- Short-circuit thermostat
- Safety valve
- Expansion tank

The radiator is designed for an ambient temperature of 45°C

### 3.20 Container Type BR6

**STEEL-CONTAINER for module**

mounted on the container roofs:  
radiator for emergency cooling

**Base frame:**

Self-supporting, i.e. the base frame is designed to withstand static loads from the installation of parts such as the engine, control panels, exhaust gas silencer and radiator.

**Module and container installation are essentially performed as follows:**

- Installation and setup of the module
- Installation of the control equipment in a separate control equipment room
- Installation of the gas train
- Installation of the lube oil equipment
- Installation of the air intake and outlet ventilation system
- Installation of lighting in the container
- Installation of the auxiliary electrical installations
- Completion of exhaust, fuel, oil and water piping, according to the defined scope of supply, including all necessary fittings, flexible connections and reinforcements.
- Footboard above the tubes



- Total signage

**Fire protection classification:**

The container is not classified for fire protection.

- Colour Container:  
RAL7035 (grey)
- Colour roof installation:  
RAL9006 (white aluminium)

## **4.00 Delivery, installation and commissioning**

### **4.01 Carriage**

Ex works Container suppliers factory.

### **4.02 Unloading**

Unloading, moving of equipment to point of installation, mounting and adjustment of delivered equipment on intended foundations **is not** included in GE Jenbacher scope of supply.

### **4.03 Assembly and installation**

Assembly and installation of all GE Jenbacher -components **is not** included in GE Jenbacher scope of supply.

### **4.04 Storage**

The customer is responsible for secure and appropriate storage of all delivered equipment.

### **4.05 Start-up and commissioning**

Start-up and commissioning with the GE Jenbacher start-up and commissioning checklist **is** included.

## **5.03 Documentation**

**Preliminary documentation 60 days after receipt of a technically and commercially clarified order:**

- Module drawing 1)
- Technical diagram 1)
- Drawing of control panel 3)
- List of electrical interfaces 2)
- Technical specification of control system 2)
- Technical drawing auxiliaries (if included in GE Jenbacher-limit of delivery) 1)

**At delivery:**

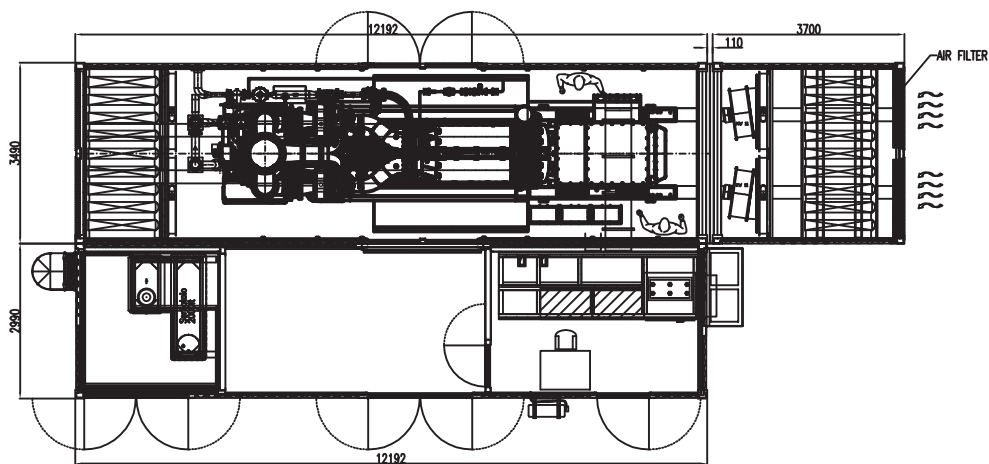
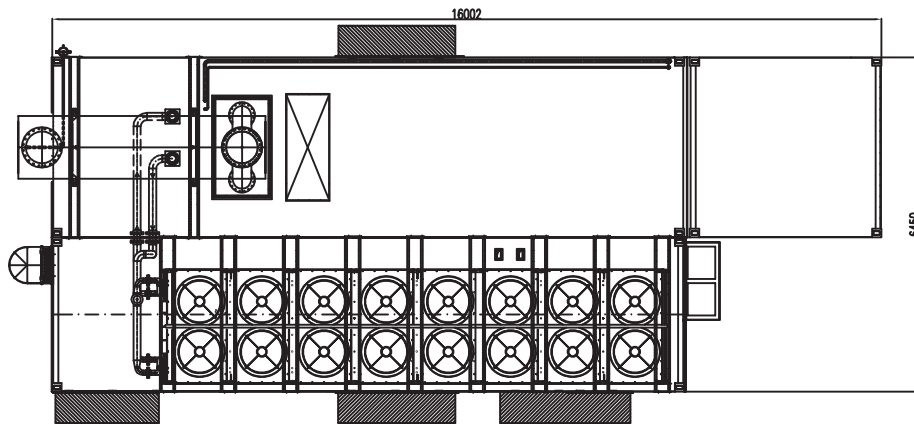
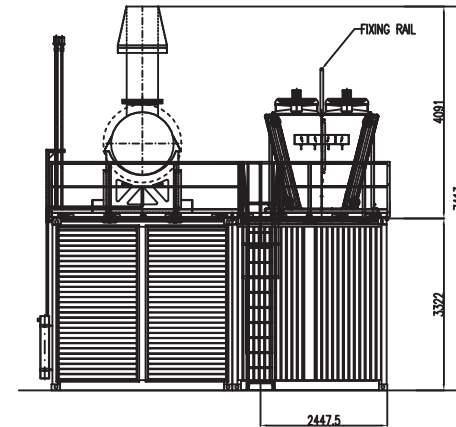
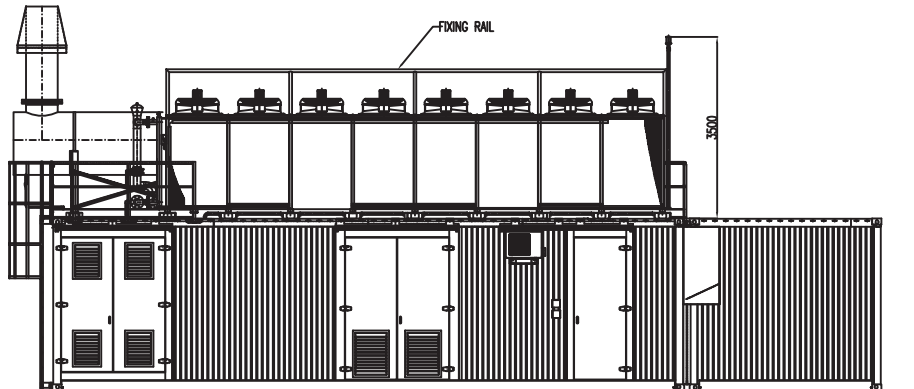
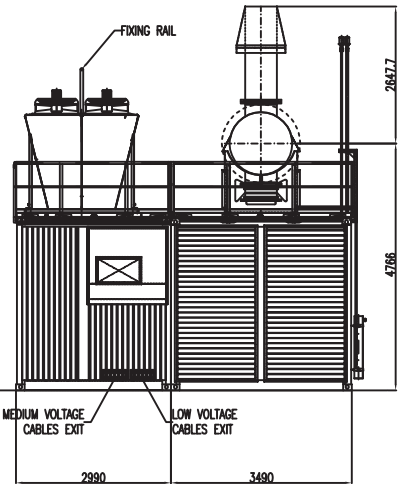
- Wiring diagrams 3)
- Cable list 3)

**At start-up and commissioning (or on clients request):**

- Operating and maintenance manual 4)
- Spare parts manual 4)



- Operation report log 4)



3						
2						
1						
0						
Rev.	Date	Issue	Drawn	Checked	Approved	
			Confection: <b>GE Jenbacher</b> Final Confection:			
Drawing object: <b>Lay-out and prospect</b>			Installation site:			
Drawing: <b>[PMC A15122 01]</b>			Model: <b>JGC 620 GS NL</b>			
Order: <b>A15122</b>			Office:		Scale: <b>1:50</b>	
File: <b>PMC-A15122-01.dwg</b>			Format: <b>A1</b>			