



Type 4

efficient
durable
reliable

For more than 45 years we have specialized in developing and producing gas engines for optimized power and heat generation. Drawing on our vast experience, we are able to supply our customers with fully developed products to cover their specific needs. Our high-tech engines in the 0.3 - 3 Megawatt range are designed for stationary, continuous operation and are characterized by extremely high degrees of efficiency, low exhaust gas emissions, durability and a high level of reliability. GE Jenbacher engines can be operated using a broad spectrum of different gases to ensure our customers the best possible availability of fuel for an efficient and safe energy supply. Our comprehensive product and service portfolio includes a full range of equipment from generator sets to complete cogeneration systems and an extensive selection of maintenance and service packages.

efficient

Type 4 engines are characterized by high capacity rates and outstanding degrees of efficiency.

durable

This state-of-the-art engine in the 1.5 MW power range is based on the proven and perfected design concepts of types 3 and 6.

reliable

The refined, optimally designed control and monitoring system results in ideal preventive maintenance and ensures a maximum degree of reliability and availability.

3



4



5



Type



Technical Features

1 Four-valve cylinder head The cylinder head is equipped with two intake and two exhaust valves and a centrally positioned spark plug. The new design features like the optimized swirl and channel geometry were developed using state-of-the-art calculation and simulation methods (CFD).

Crossflow cylinder head Our unique engine design concept utilizes a crossflow of gases through individual cylinder heads.

2 TecJet™ gas dosing valve Electronically controlled gas dosing valve with high degree of control accuracy.

3 Dry exhaust gas manifold The uncooled exhaust gas manifold enables a maximum energy supply to the exhaust gas turbocharger.

4 Turbocharger bypass An electronically controlled valve installed behind the compressor enables an efficient mixture return and supports the output control through the throttle valve.

5 Crack connecting rod We successfully apply this technology – tried and tested in the automotive industry – in our powerful stationary engines.

Heat recovery The oil heat exchanger can be specified as a two-stage plate heat exchanger.

Spark plug We continuously develop and optimize the electrode alloys and geometry to keep pace with the requirements of modern gas engines.

Combustion Optimized combustion is the basis for high engine efficiency at the lowest emission rates. This is one of the core areas of research & development activities at GE Jenbacher.

Scraper ring Integrated into the cylinder liner to prevent carbon deposit on the piston crown.

- minimized charge-exchange losses • central spark-plug position resulting in optimal cooling and combustion conditions

- separation of cold mixture side and hot exhaust gas side
- long cylinder head service life of up to 30,000 operating hours • exhaust gas manifold easily accessible

- very quick response time • rapid adjustment of air/gas ratio • large adjustable calorific value range

- high specific output • increased electrical efficiency • increased usable energy content in exhaust gas

- high dynamism in the output control over the entire control range • high degree of control over the system when in isolated operation, increased reserve for adding and/or shedding load
- optimal adaptation to varying ambient conditions (intake temperature, altitude)

- high dimensional stability and accuracy • reduced connecting rod bearing wear • easy to maintain

- maximum thermal efficiency, even at high and fluctuating return temperatures

- long adjustment cycles • service life of up to 15,000 operating hours • outstanding reliability of operation, even at low emission levels

- maximum degree of efficiency and environmental compatibility

- stabilized oil consumption • reduced risk of piston seizing
- reduced wear • perfect partial load behaviour

Technical Data

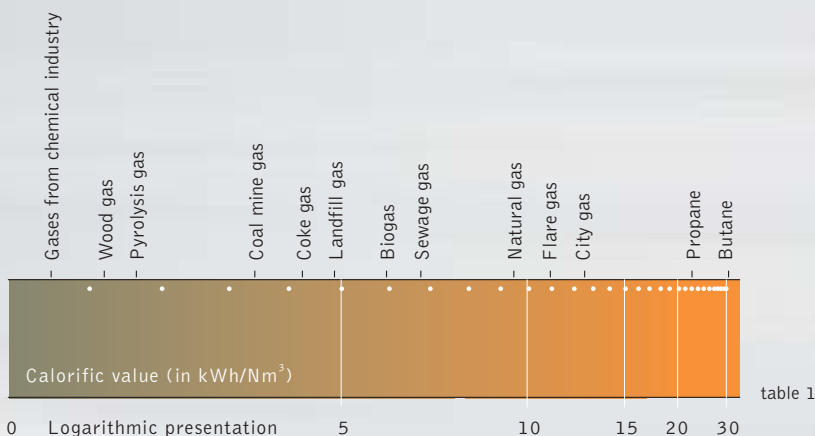
Configuration	V 70°
Bore (mm)	145
Stroke (mm)	185
Displacement/cylinder (lit)	3.06
Speed (rpm)	1,500 (50 Hz)
Mean piston speed (m/s)	9.3 (1,500 rpm)
Scope of supply	Generator set, Cogeneration system, Generator set/Cogeneration in container
Applicable gas types	Natural gas, flare gas, biogas, landfill gas, sewage gas Special gases as coal mine gas, coke gas, wood gas, pyrolysis gas, ...
Engine type	J420 GS
No. of cylinders	20
Total displacement (lit)	61.1
Dimensions (l x w x h in mm)	
Generator set	6,500x1,800x2,200
Cogeneration system	6,500x1,800x2,200
Container (Generator set/Cogeneration)	12,200x3,000x2,600
Weights empty (kg)	
Generator set	14,800
Cogeneration system	15,400
Container (Generator set/Cogeneration)	32,600/33,200

Scope of supply Our scope of supply comprises electrical power generator sets and cogeneration systems for optimized heat and electrical power generation. Depending on customer specifications, various heat sources such as engine cooling water, oil, mixture and exhaust gas can be

incorporated, resulting in increased levels of efficiency. In addition, our type 4 modules can be supplied as turnkey installations in 40-foot containers. Before being shipped to our customers, all modules are performance and load tested at our manufacturing facilities in Jenbach.

Applicable gas types Increased ecological consciousness and the need to reduce air emissions have led to an increased use of alternative energy sources. Along with natural gas operation, our technology makes it possible to dispose of environmentally offensive gases (e.g. from landfill sites, agriculture, mining and chemical industries) while

simultaneously using these gases for power generation. This helps to reduce industrial emissions and encourage efficient use of natural resources while ensuring the efficiency of a plant. The continuous refinement of our engines and our focus on special gas applications enable the use of a broad spectrum of gases with different calorific values (see table 1).



Type

Outputs and Efficiencies

Natural gas

1,500 rpm | 50 Hz

NOx <	Type	PeI (kW) ₁	ηel (%)	Pth (kW) ₂	ηth (%)	ηtot (%)
500 mg/Nm ³	420	1,413	42.4	1,505	45.1	87.5
350 mg/Nm ³	420	1,413	41.4	1,580	46.3	87.7
250 mg/Nm ³	420	1,413	41.0	1,598	46.3	87.3

Biogas

1,500 rpm | 50 Hz

NOx <	Type	PeI (kW) ₁	ηel (%)	Pth (kW) ₂	ηth (%)	ηtot (%)
500 mg/Nm ³	420	1,413	41.9	1,459	43.2	85.1

- 1 electrical output based on ISO standard output and standard reference conditions according to ISO 3046/I-1991 and p.f. = 1.0/low voltage alternator according to VDE 0530 REM with respective tolerance; minimum methane number 70 for natural gas
- 2 total heat output with a tolerance of +/- 8%, exhaust gas outlet temperature 120 °C, for biogas exhaust gas outlet temperature 180 °C

All data according to full load and subject to technical development and modification.



1

DIA.NE[®] – Dialog Network

DIA.NE[®] XT is the new GE Jenbacher engine management system designed for use with all GE Jenbacher engines. The system comprises powerful central industrial controls that handle master control and feedback control for the engine-plant, as well as visualization. A link with central process control is provided to meet the specific requirements of each customer, via standardized industry buses or using direct signal lines.

The particular focus of the DIA.NE[®] XT design lies in combining powerful and flexible open- and closed-loop control electronics with a user-friendly operating concept. The novel hardware design employs the most modern components and sets new standards for performance, functionality and operating safety. The visual display uses a color graphics display screen, providing clear and comprehensible presentation of information and measured values while offering the greatest possible ease of use.

Features of our DIA.NE[®] XT module control system:

- control of all systems relevant to the module (closed-loop LEANOX[®], speed, output, knocking and isolated operation control system, ignition system)
- 8 additional controllers available
- clear visualization of the systems and display of all relevant data
- graphical online trends and alarm management

Using the following additional components, DIA.NE[®] can be customized to individual needs:

- DIA.NE[®] RMC – Dialog Network for Remote Message Control
- DIA.NE[®] WIN – Dialog Network for Windows Systems: Analysis and trend identification in the familiar Windows environment
- HERMES – Data remote transmission (via LAN or modem)
- MONIC – Monitoring Ignition Control: Ignition voltage monitoring

LEANOX[®] Lean mixture combustion This lean mixture combustion control was developed and patented by GE Jenbacher. It ensures the correct air/gas ratio under all operational circumstances in order to simultaneously achieve the lowest exhaust gas emission rates and stable engine operation.

- sensors used in non-critical measurement ranges
- permanent monitoring of emission limit values using stable sensor technology
- controlled combustion resulting in controlled loading of the components surrounding the combustion chamber (resulting in longer service life for the cylinder head, valves, spark plugs, pistons, ...)
- compensation for deviating gas characteristics

Ignition system The microprocessor-controlled ignition system is connected to DIA.NE[®] XT via CAN (Controlled Area Network) bus. This makes it possible to vary the

firing point depending on operating conditions and/or type of fuel gas used.

Knock control system All GE Jenbacher gas engines come standard with a knock control system. The resulting specific firing point, output and mixture temperature

control protects the engine from inadmissible loads, resulting in increased reliability and availability.

Type

Reference Installations

J420 GS

1 Plant: Landfill site Bootham Lane; Doncaster, England

Type of gas: Landfill gas

Engine type: 2 x JGC 420 GS-L.L

Electrical output: 2,666 kW

Start-up: May 2001, December 2002



2

This installation uses landfill gas, the methane content of which can drop to 35% without resulting in a power reduction. In the UK approximately 300 MW of installed electrical capacity are generated using GE Jenbacher landfill gas engines.

2 Plant: Coal mine Thoresby Colliery; Mansfield, England

Type of gas: Coal mine gas

Engine type: 2 x JGC 420 GS-S.L

Electrical output: 2,830 kW

Start-up: July 2001

In this active coal mine, the mine gas which normally escapes unburned into the atmosphere is converted into valuable electrical energy. The potential annual CO₂ reduction of this installation is more than 100,000 tonnes.



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3 Plant: Hospital of Padua; Italy

Type of gas: Natural gas

Engine type: 2 x JMS 420 GS-N.LC

Electrical output: 2,832 kW

Thermal output: 2,576 kW

Start-up: February 2002, beginning of 2003

To optimize the electricity and heat supply savings at the Padua hospital, two GE Jenbacher cogeneration systems with an electrical efficiency of 42.3% each were installed.



GE Jenbacher

GE Jenbacher is one of the world's leading manufacturers of gas-fueled reciprocating engines, packaged generator sets and cogeneration units for power generation. It is one of the only companies in the world focusing exclusively on gas engine technology.

GE Jenbacher's engines range in power from 0.3 to 3 MW and run on either natural gas or a variety of other gases (e.g. biogas, landfill gas, coal mine gas, sewage gas, combustible industrial waste gases). Patented combustion systems, engine controls, and monitoring enable its products to meet the strictest international emission standards, while offering high levels of efficiency, durability, and reliability.

GE Jenbacher's products are used by a broad range of commercial, industrial, and municipal customers for on-site generation of power, heat, and cooling. In addition, the company offers a comprehensive spectrum of services including full plant operation and maintenance as well as turnkey packages.

GE Jenbacher has its headquarters and production facilities with 1,000 of its more than 1,300 worldwide employees in Jenbach, Austria.

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