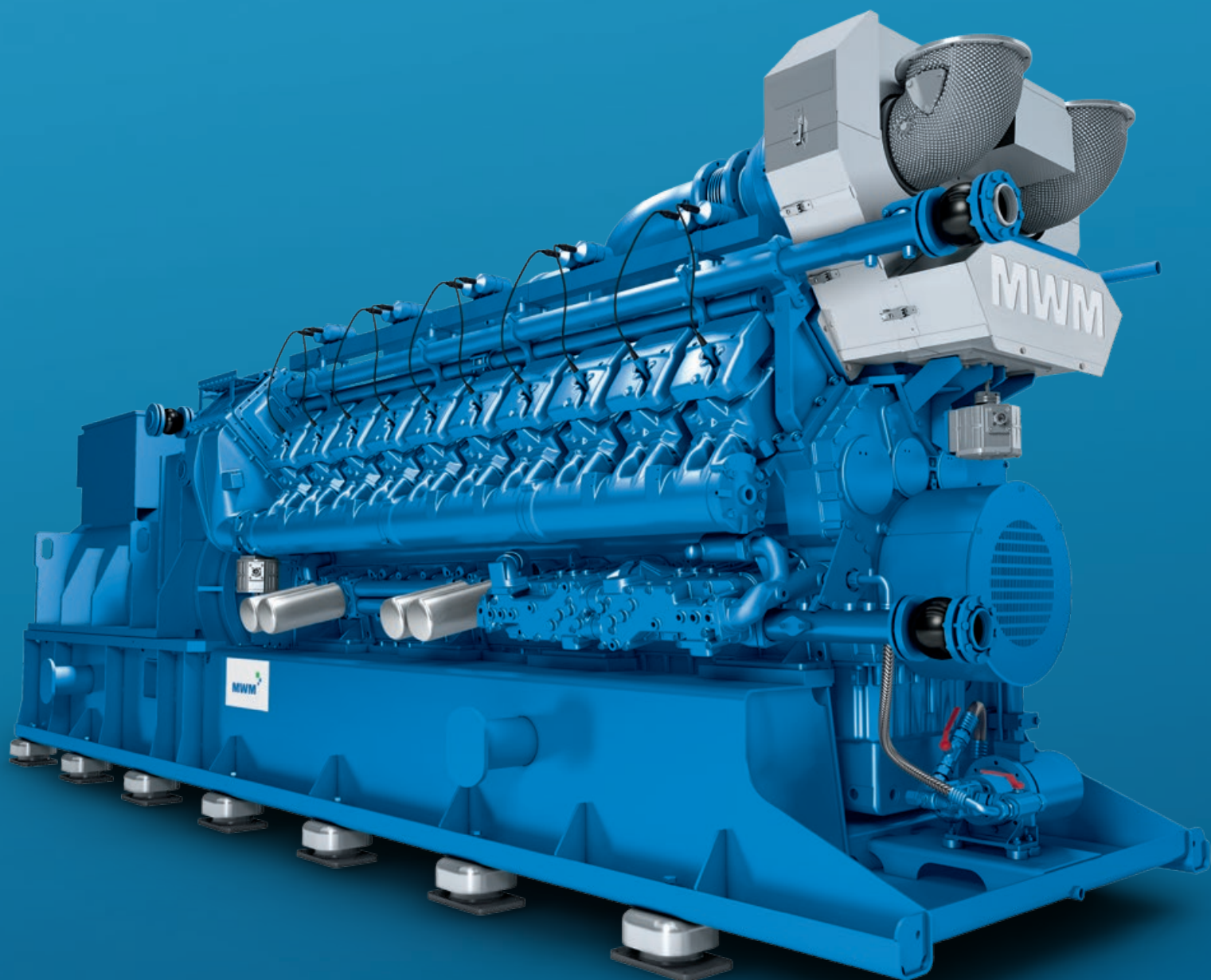


TCG 2020

Top marks for ecology and economy.

For natural gas and biogas with an output from 1,000 to 2,000 kW_{el}



Our experience for your success.

The TCG 2020. Top performance from MWM – used successfully worldwide.

Strong partner for your progress

With MWM you can benefit from 150 years of experience in gas engine technology and energy production. Since 2011 the traditional company, Motorenwerke Mannheim, has belonged to the worldwide network of Caterpillar Inc. This gives us an even more unique expertise that benefits you in the development of individual complete solutions.

Worldwide successful technology

MWM offers you the confidence and experience of a specialist who has already successfully installed hundreds of biogas systems with gas power plants within and outside of the European region. Efficiency and reliability are the decisive factors everywhere.

Competent, reliable, and uncomplicated

We want you to be satisfied with us in every phase of the project: That is why we clearly spell out all agreements in a written order confirmation with a detailed schedule. MWM stands for reliability and quality of planning, right down to commissioning.

We stick to our agreements

If you put great value in an optimal return on your investment in a biogas system and smooth handling, MWM is a natural first choice. We offer comprehensive experience and always keep a close eye on the entire process. Seamless and turnkey ready – from initial consultation to handling of the completed system by our customer service. We say what we do, and we do what we say.



NanJi Water Recycle Centre, Korea

Korea District Heating Corp. is one of the largest suppliers of district heating in the world. In March 2013, two TCG 2020 V16 engines were taken into operation, providing an electrical output of 1.6MW each. The units are part of the first plant installed in South Korea that generates electricity and heat from biogas.

2 x MWM TCG 2020 V16 | Commissioning: 2013



Queen Elizabeth University Hospital, UK

The modular CHP plant consists of three MWM manufactured TCG 2020 V12 gas engines with a combined output of 3.6 MW_{el} and 3.6 MW_{th} with an absorption chiller for cooling, the MWM gas engines have a potential to deliver an annual energy saving of up to £ 1 million and a carbon emission reduction by around one fifth.

3 x MWM TCG 2020 V12 | Commissioning: 2014

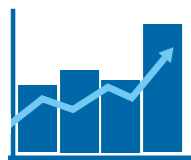


STOR, UK

10 MW_{el} containerised peak-opping power plant provides security and stability to the grid and can be demanded during peak hours or during high electrical demand. The goal was to achieve a quick ramp-up time with the TCG 2020 V20 genset to meet the demand of the grid.

5 x MWM TCG 2020 V20 | Commissioning: 2014

Top marks for ecology and economy.



More profit

The TCG 2020 is highly efficient thanks to its optimized inlet duct, combustion chamber and spark plugs. Save as much as 15% per annum on fuel costs – and increase your plant's profitability.



Less overall cost

With its optimized engine components, the TCG 2020 requires up to 50% less lubricating oil than other similar gensets. In terms of efficiency that means long-term savings.



Different engines to suit your needs

Whether you need high efficiency or an optimized standalone unit with good load compensation and black start properties – we can provide you with an engine tailored exactly to your needs.



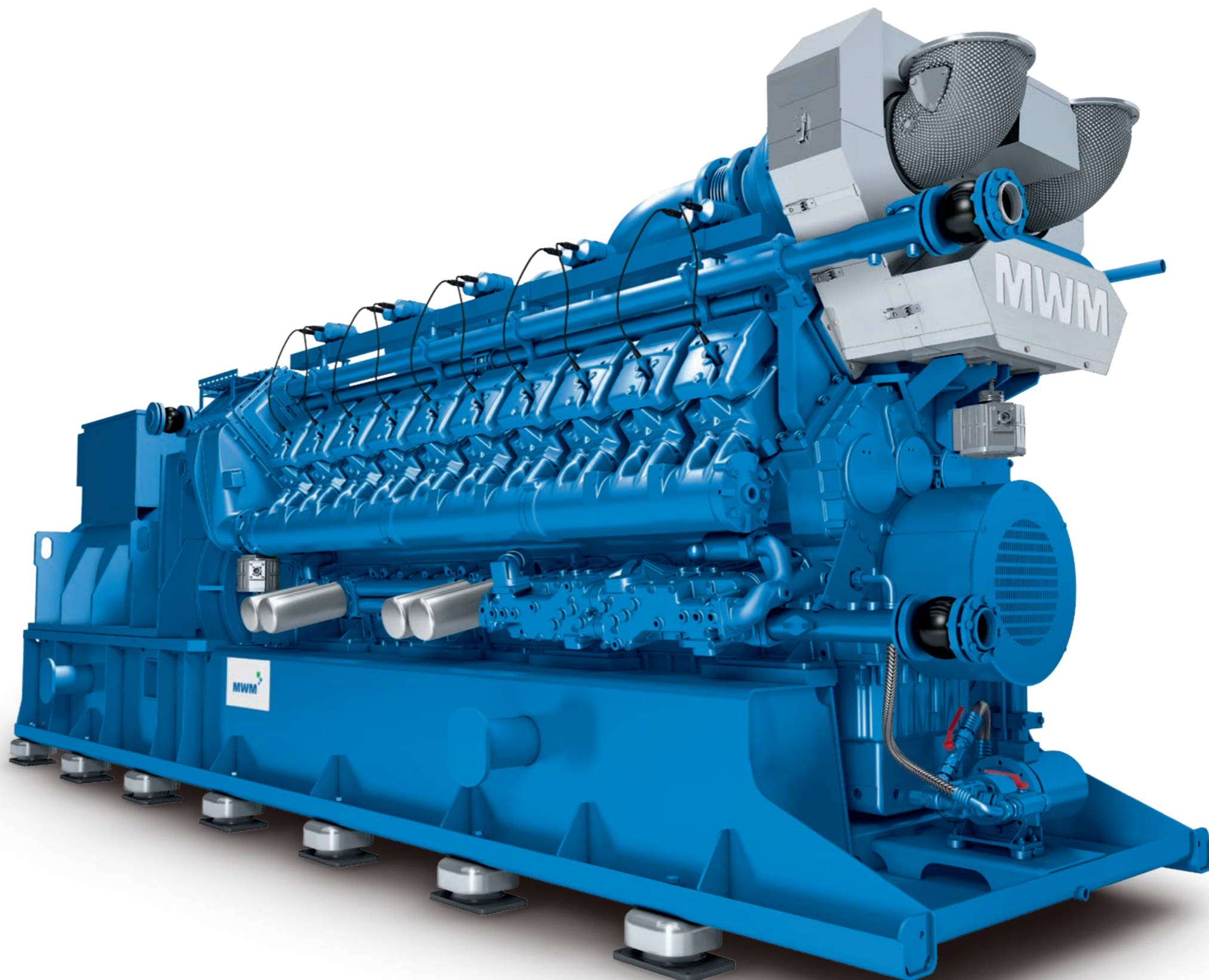
Optimum control concept

TEM (Total Electronic Management) controls not just the engine but the entire system including the heat supply from cogeneration. Temperature monitoring for each cylinder and anti-knock control ensure the best possible utilization of fuel and maximum power output, even if gas composition fluctuates.



Flexible usage

The latest technology such as our gas-mixer and TEM allows you to use a wide variety of gases. Even the most problematic gases such as coal mine gas, landfill gas and sewage gas can be used without difficulty.



Technical data 50 Hz

Engine type	TCG 2020	V12	V12 K1	V12 K	V12	V16 K	V16	V20	V20
Bore/stroke	mm	170/195	170/195	170/195	170/195	170/195	170/195	170/195	170/195
Displacement	dm ³	53.1	53.1	53.1	53.1	70.8	70.8	88.5	88.5
Speed	min ⁻¹	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Mean piston speed	m/s	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
Length ¹⁾	mm	4,660	4,660	4,790	4,790	5,430	5,430	6,200	6,200
Width ¹⁾	mm	1,810	1,810	1,810	1,810	1,810	1,810	1,710	1,710
Height ¹⁾	mm	2,210	2,210	2,210	2,210	2,210	2,210	2,190	2,190
Dry weight genset	kg	11,200	11,200	11,700	11,700	13,300	13,300	17,900	17,900

Natural gas applications

NO_x ≤ 500 mg/Nm^{3,2)}

Engine type	TCG 2020	V12	V12 K1	V12 K	V12	V16 K	V16	V20	V20
Configuration		RW ⁵⁾	KW ⁶⁾	K ⁷⁾	R ⁸⁾	K ⁷⁾	R ⁸⁾	R ⁸⁾	P ⁹⁾
Electrical power ³⁾	kW	1,000	1,000	1,125	1,200	1,500	1,560	2,000	2,000
Mean effective pressure	bar	15.5	15.5	17.4	18.6	17.5	18.1	18.6	18.6
Thermal output ⁴⁾	±8% kW	1,056	1,191	1,267	1,189	1,688	1,576	1,983	1,912
Electrical efficiency ³⁾	%	43.0	40.0	40.7	43.7	40.8	43.3	43.7	44.4
Thermal efficiency ³⁾	%	45.4	47.6	45.8	43.3	45.9	43.8	43.3	42.5
Total efficiency ³⁾	%	88.4	87.6	86.6	87.0	86.7	87.1	87.0	86.9

Biogas applications

NO_x ≤ 500 mg/Nm^{3,2)}

Sewage gas (65% CH₄ / 35% CO₂)
Biogas (60% CH₄ / 32% CO₂, Rest N₂)
Landfill gas (50% CH₄ / 27% CO₂, Rest N₂)

Minimum heating value H_U = 5.0 kWh/Nm³

Engine type	TCG 2020	V12	V12	V16	V20
Configuration		XW ¹⁰⁾	X ¹¹⁾	X ¹¹⁾	X ¹¹⁾
Electrical power ³⁾	kW	1,000	1,200	1,560	2,000
Mean effective pressure	bar	15.5	18.6	18.1	18.6
Thermal output ⁴⁾	±8% kW	1,035	1,192	1,566	2,010
Electrical efficiency ³⁾	%	42.6	43.0	42.7	43.0
Thermal efficiency ³⁾	%	44.1	42.7	42.9	43.2
Total efficiency ³⁾	%	86.7	85.7	85.6	86.2

1) Transport dimensions for gensets, components set up separately must be taken into consideration.
2) NO_x ≤ 500 mg/Nm³; exhaust gas dry at 5% O₂.
3) According to ISO 3046-1 at U = 0.4 kV, cosphi = 1.0 for 50Hz and a methane number of MN 80 (TCG 2020) or MN 70 (TCG 2020K) for natural gas.
4) Exhaust gas cooled to 120 °C for natural gas and 150 °C for biogas.

5) RW = High Response for Requested Power. Optimized for high total efficiency at requested power.
6) KW = Robustness for Requested Power. Optimized for robustness and low CAPEX at requested power.
7) K = Robustness. Optimized for robustness and low CAPEX.
8) R = High Response. Optimized for high total efficiency.
9) P = High Efficiency. Optimized for high electrical efficiency.

10) XW = Biogas for Requested Power. Optimized for operation with biogases at requested power.
11) X = Biogas. Optimized for operation with biogases.
Data for special gas and dual gas operation on request. The values given on these datasheets are for information purposes only and not binding. The information given in the offer is decisive.

Technical data 60 Hz

Engine type	TCG 2020	V12 K	V12	V16 K	V16	V20
Bore/stroke	mm	170/195	170/195	170/195	170/195	170/195
Displacement	dm ³	53.1	53.1	70.8	70.8	88.5
Speed	min ⁻¹	1,500	1,500	1,500	1,500	1,500
Mean piston speed	m/s	9.8	9.8	9.8	9.8	9.8
Length ¹⁾	mm	5,970	5,970	6,640	6,640	7,470
Width ¹⁾	mm	1,790	1,790	1,790	1,790	1,710
Height ¹⁾	mm	2,210	2,210	2,210	2,210	2,190
Dry weight genset	kg	13,000	13,000	14,900	14,900	19,800

Natural gas applications

NO_x ≤ 500 mg/Nm^{3,2)}

Engine type	TCG 2020	V12 K	V12	V16 K	V16	V20
Configuration		K ⁵⁾	R ⁶⁾	K ⁵⁾	R ⁶⁾	R ⁶⁾
Electrical power ³⁾	kW	1,125	1,200	1,500	1,560	2,000
Mean effective pressure	bar	17.4	18.7	17.6	18.3	18.7
Thermal output ⁴⁾	±8% kW	1,274	1,196	1,703	1,589	1,997
Electrical efficiency ³⁾	%	40.4	43.4	40.4	43.0	43.4
Thermal efficiency ³⁾	%	45.8	43.2	45.9	43.8	43.3
Total efficiency ³⁾	%	86.2	86.6	86.3	86.8	86.7

Biogas applications

NO_x ≤ 500 mg/Nm^{3,2)}

Sewage gas (65% CH₄ / 35% CO₂)
Biogas (60% CH₄ / 32% CO₂, Rest N₂)
Landfill gas (50% CH₄ / 27% CO₂, Rest N₂)

Minimum heating value H_U = 5.0 kWh/Nm³

Engine type	TCG 2020	V12	V16	V20
Configuration		X ⁷⁾	X ⁷⁾	X ⁷⁾
Electrical power ³⁾	kW	1,200	1,560	2,000
Mean effective pressure	bar	18.7	18.3	18.7
Thermal output ⁴⁾	±8% kW	1,201	1,580	2,024
Electrical efficiency ³⁾	%	42.7	42.3	42.7
Thermal efficiency ³⁾	%	42.7	42.8	43.2
Total efficiency ³⁾	%	85.4	85.1	85.9

1) Transport dimensions for gensets, components set up separately must be taken into consideration.
2) NO_x ≤ 500 mg/Nm³; exhaust gas dry at 5% O₂.
3) According to ISO 3046-1 at U = 0.48kV, cosphi = 1.0 for 60Hz and a methane number of MN 80 (TCG 2020) or MN 70 (TCG 2020K) for natural gas.

4) Exhaust gas cooled to 120 °C for natural gas and 150 °C for biogas.
5) K = Robustness. Optimized for robustness and low CAPEX.
6) R = High Response. Optimized for high total efficiency.
7) X = Biogas. Optimized for operation with biogases.

Data for special gas and dual gas operation on request. The values given on these datasheets are for information purposes only and not binding. The information given in the offer is decisive.

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