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# TCG 2020

Efficiency straight down the line.

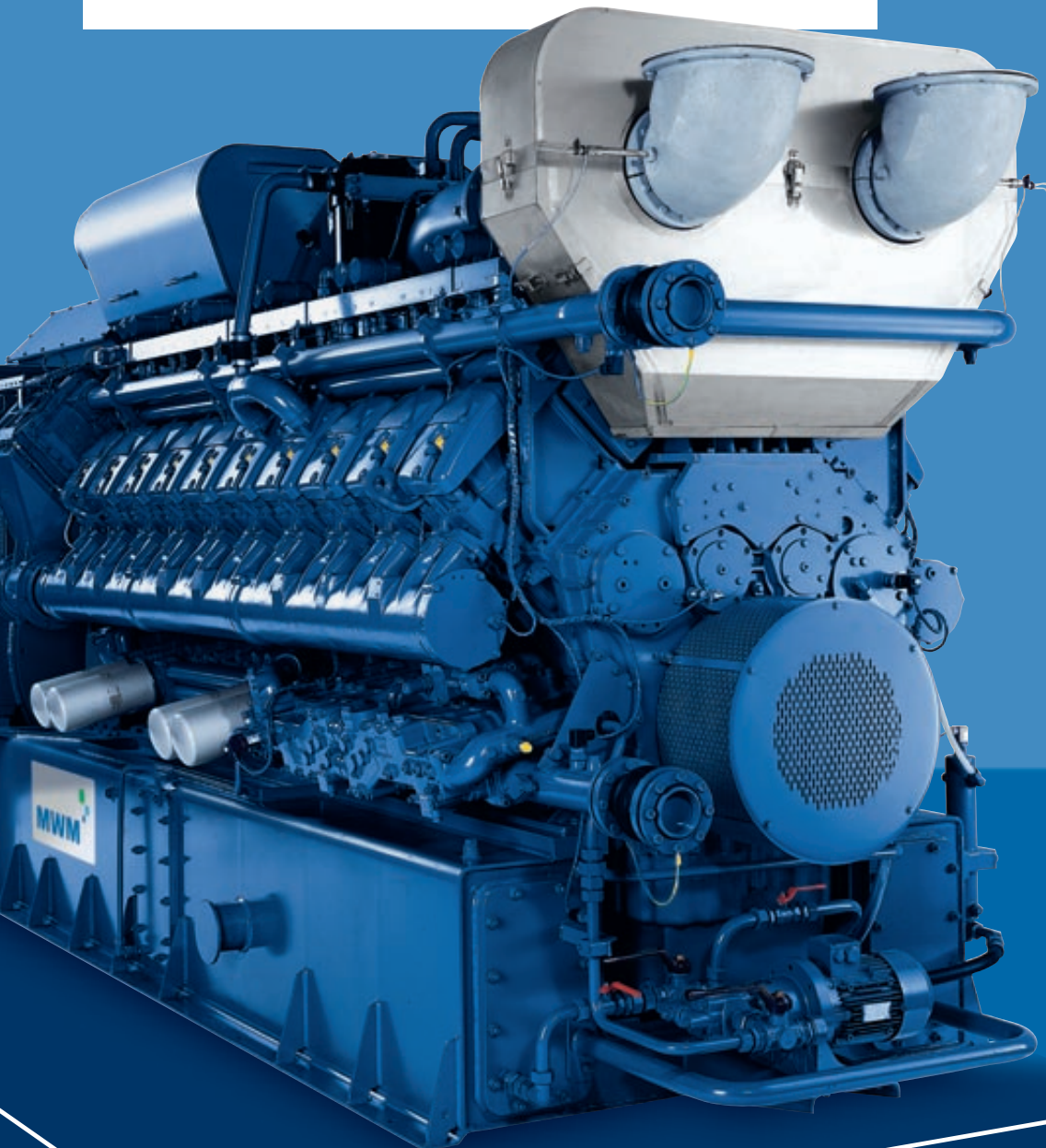


Reliability

System

Service

Profit



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

## Brandenburg Cogeneration Plant, Germany

The City of Brandenburg's cogeneration plant produces 15,992 MWh of district heating and 15,920 MWh of cogenerated electricity each year. MWM supplied the powerful genset for commissioning in 2009, and assisted a partner company in designing and installing the entire cogeneration plant. Other MWM plants are at the planning stage, using the same, successful arrangement.



## Viikinmäki Sewage Plant, Finland

Viikinmäki Sewage Plant treats 3.53 million cubic meters of effluent per year for the Greater Helsinki area. Installed in 1994, the four original units were supplemented in 2009 by another TCG 2020 V12 producing 1 MW<sub>el</sub>, which enables the sewage gas to be converted into energy to power the entire plant. Today, thanks to their high efficiency and low maintenance requirements, the MWM units produce 100% of the heat and 50% of the power needed by the sewage works.



## Taiyuan City Coal Mine, China

MWM equipped Taiyuan's state coal mine with a total of three Type TCG 2020 V20 units. The system utilizes gases from the mine and the steam and heat from the cooling water, in order to generate electricity. This process obtained CDM certification with ease, meaning it qualifies for CDM credits. All in all there were plenty of good reasons for the client to order a further four TCG 2020 V20 units.



## Delta Energy B.V. Greenhouse Complex, Netherlands

The Dutch branch of MWM built one of Europe's biggest gas engine plants. Seventeen TCG 2020 V16 engines, generating a total of 27 MW<sub>el</sub>, produce the heat and electricity required to run a 51 hectare greenhouse complex. This complex produces around 4,000 tons of tomatoes each year, enough to satisfy the fresh tomato demand of more than half a million people.



## Strong arguments for a strong brand: MWM.

### MWM has 140 years of experience

MWM has made a tradition out of innovation. We have been developing and building engines and gensets for a wide range of uses since 1871. Our global success is founded on having invented the most advanced four-stroke diesel engines. And, 30 years ago, we became one of the first manufacturers to revolutionize generator technology using high-performance gas engines. To this day we continue to work constantly on making our systems more efficient.

### MWM understands what's really needed

Today, cost-effectiveness is crucial! MWM offers cooperation all along the line, which pays off right across the process chain. We are the complete partner to our customers: from the selection of the system layout for the project, all the way to service and repair.

### MWM offers the most economical service concepts

With its worldwide service network, long service intervals and low maintenance costs, MWM Service is an important factor for lasting efficiency. Innovative offerings such as remote diagnosis, remote parameter configuration and the generation of operating values can be

provided cheaply anywhere in the world using the Internet. The new MWM Logistics Centre also means fast deliveries and low spares costs. Shortblocks can be delivered and assembled easily, so your system will be ready for operation in the shortest possible time. Another benefit is that our own training centre offers top-level, practically oriented courses for your technicians.

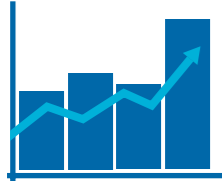
### MWM thinks in terms of the complete solution

Only if all of the components in your system are selected and configured perfectly for your needs will you achieve optimum overall efficiency. We have the experience, the technology and the capacity. Our engineers can develop tailor-made complete solutions especially for you. From comprehensive cogeneration concepts for electricity, heat and cooling, to containerized solutions, to turn-key systems – MWM can develop complete concepts to suit your needs, and implement them reliably too. All in all, system engineering just the way you want it.

### You can rely on MWM

Clear statements, transparent offers: we keep our promise. We are always there when you need us. Test us – on site, at your plant.

# 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 costs

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.



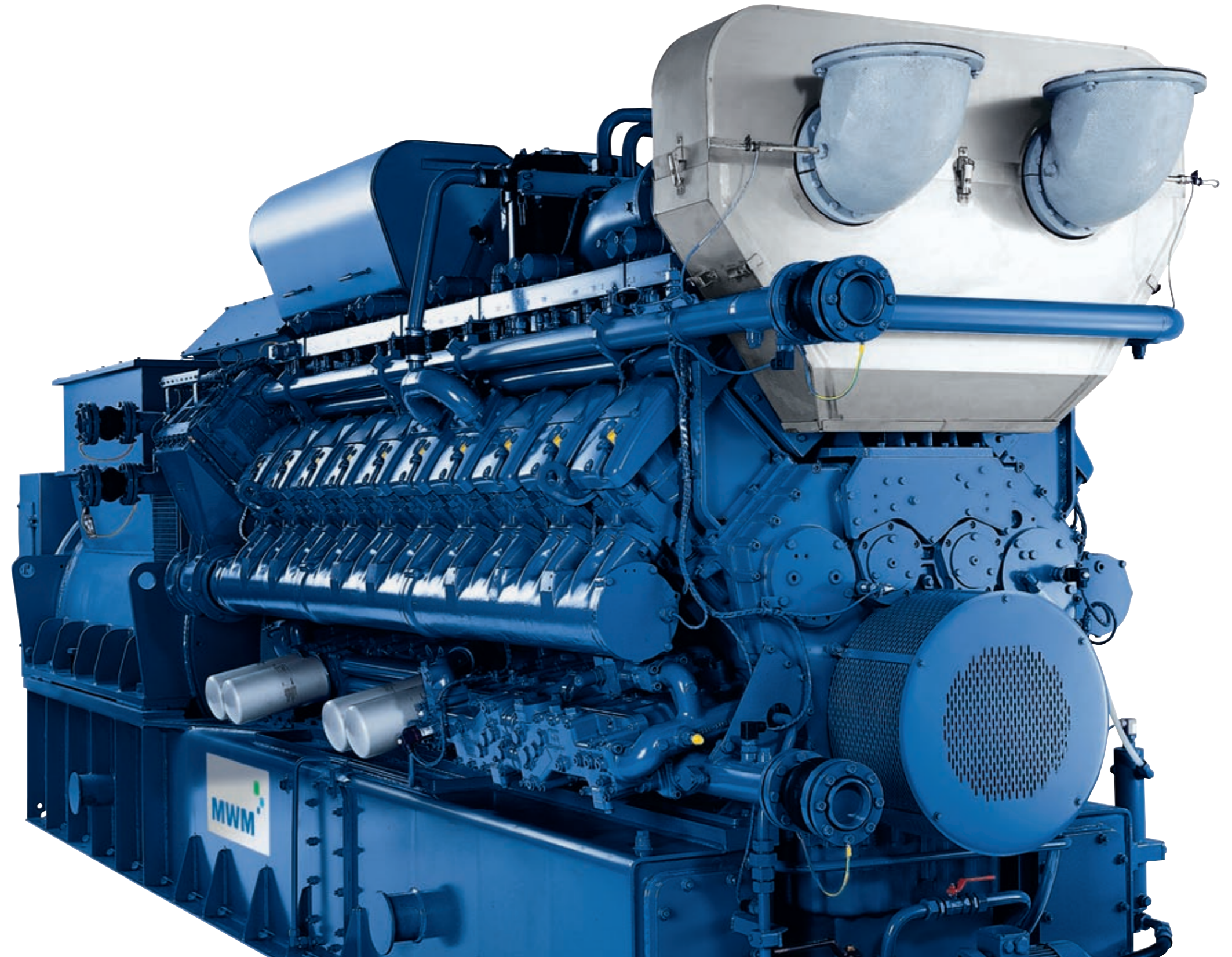
## Optimum control concept

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 colliery gas, landfill gas and sewage gas can be used without difficulty.



# Technical data 50 Hz

Engine type	TCG 2020	V12 K1 <sup>1)</sup>	V12 K <sup>1)</sup>	V12 <sup>2)</sup>	V16 K <sup>1)</sup>	V16 <sup>2)</sup>	V20 <sup>2)</sup>
Bore/stroke	mm	170/195	170/195	170/195	170/195	170/195	170/195
Displacement	dm <sup>3</sup>	53.1	53.1	53.1	70.8	70.8	88.5
Speed	min <sup>-1</sup>	1500	1500	1500	1500	1500	1500
Mean piston speed	m/s	9.8	9.8	9.8	9.8	9.8	9.8
Length	mm	4636	5450	5450	6170	6170	7820
Width	mm	1870	1870	1870	1870	1870	2140
Height	mm	2490	2490	2490	2490	2490	2620
Dry weight genset	kg	9520	9920	9920	12810	12810	17110

## Natural gas applications

NO<sub>x</sub> ≤ 500 mg/m<sub>n</sub><sup>3</sup>

dry exhaust manifolds

Engine type	TCG 2020	V12 K1 <sup>1)</sup>	V12 K <sup>1)</sup>	V12 <sup>2)</sup>	V16 K <sup>1)</sup>	V16 <sup>2)</sup>	V20 <sup>2)</sup>
Electrical power <sup>3)</sup>	kW	1000	1125	1200	1500	1560	2000
Mean effective pressure	bar	15.5	17.4	18.6	17.4	18.1	18.6
Thermal output <sup>4)</sup>	±8 % kW	1177	1272	1197	1691	1586	1990
Electrical efficiency	%	40.0	41.0	43.7	41.0	43.3	43.7
Thermal efficiency	%	47.0	46.4	43.5	46.2	44.0	43.3
Total efficiency	%	87.0	87.4	87.2	87.2	87.3	87.0

## Biogas applications

NO<sub>x</sub> ≤ 500 mg/m<sub>n</sub><sup>3</sup>

Sewage gas (65 % CH<sub>4</sub> / 35 % CO<sub>2</sub>)

Biogas (60 % CH<sub>4</sub> / 32 % CO<sub>2</sub>, rest N<sub>2</sub>)

Landfill gas (50 % CH<sub>4</sub> / 27 % CO<sub>2</sub>, rest N<sub>2</sub>)

Minimum heating value (LHV) H<sub>u</sub> = 5,0 kWh/m<sub>n</sub><sup>3</sup>  
dry exhaust manifolds

Engine type	TCG 2020	V12 <sup>2)</sup>	V16 <sup>2)</sup>	V20 <sup>2)</sup>
Electrical power <sup>3)</sup>	kW	1200	1560	2000
Mean effective pressure	bar	18.6	18.1	18.6
Thermal output <sup>4)</sup>	±8 % kW	1255	1655	2085
Electrical efficiency	%	42.0	41.7	42.0
Thermal efficiency	%	43.9	44.2	43.8
Total efficiency	%	85.9	85.9	85.9

1) Optimized efficiency version.  
2) Version optimized for standalone operation and load compensation.  
3) Electrical output as defined in ISO 3046; cosφ<sub>hi</sub> = 1.0, generator voltage of U = 0.4 kV at 50 Hz or U = 0.48 kV

at 60 Hz and a minimum methane number of MN 80 (TCG 2020) or MN 70 (TCG 2020 K) for natural gas; minimum heating value of 5.0 kWh/m<sup>3</sup> for biogas.  
4) Exhaust gas cooled to 120 °C with natural gas and 150 °C with biogas.

Data for special gas and dual gas operation on request.

The values given in this data sheet 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 <sup>1)</sup>	V12 <sup>2)</sup>	V16 K <sup>1)</sup>	V16 <sup>2)</sup>	V20 <sup>2)</sup>
Bore/stroke	mm	170/195	170/195	170/195	170/195	170/195
Displacement	dm <sup>3</sup>	53.1	53.1	70.8	70.8	88.5
Speed	min <sup>-1</sup>	1500	1500	1500	1500	1500
Mean piston speed	m/s	9.8	9.8	9.8	9.8	9.8
Length	mm	6660	6660	7340	7340	8180
Width	mm	2010	2010	2010	2010	2140
Height	mm	2490	2490	2490	2490	2620
Dry weight genset	kg	12050	12050	14780	14780	19490

## Natural gas applications

NO<sub>x</sub> ≤ 500 mg/m<sub>n</sub><sup>3</sup>

dry exhaust manifolds

Engine type	TCG 2020	V12 K <sup>1)</sup>	V12 <sup>2)</sup>	V16 K <sup>1)</sup>	V16 <sup>2)</sup>	V20 <sup>2)</sup>
Electrical power <sup>3)</sup>	kW	1125	1200	1500	1550	2000
Mean effective pressure	bar	17.7	18.8	17.7	18.2	18.8
Thermal output <sup>4)</sup>	±8 % kW	1291	1210	1714	1590	2003
Electrical efficiency	%	40.4	43.1	40.4	42.8	43.2
Thermal efficiency	%	46.4	43.5	46.2	43.9	43.2
Total efficiency	%	86.8	86.6	86.6	86.7	86.4

## Biogas applications

NO<sub>x</sub> ≤ 500 mg/m<sub>n</sub><sup>3</sup>

Sewage gas (65 % CH<sub>4</sub> / 35 % CO<sub>2</sub>)

Biogas (60 % CH<sub>4</sub> / 32 % CO<sub>2</sub>, rest N<sub>2</sub>)

Landfill gas (50 % CH<sub>4</sub> / 27 % CO<sub>2</sub>, rest N<sub>2</sub>)

Minimum heating value (LHV) H<sub>u</sub> = 5,0 kWh/m<sub>n</sub><sup>3</sup>  
dry exhaust manifolds

Engine type	TCG 2020	V12 <sup>2)</sup>	V16 <sup>2)</sup>	V20 <sup>2)</sup>
Electrical power <sup>3)</sup>	kW	1200	1550	2000
Mean effective pressure	bar	18.8	18.2	18.8
Thermal output <sup>4)</sup>	±8 % kW	1268	1662	2107
Electrical efficiency	%	41.5	41.1	41.5
Thermal efficiency	%	43.9	44.1	43.7
Total efficiency	%	85.4	85.2	85.2

1) Optimized efficiency version.  
2) Version optimized for standalone operation and load compensation.  
3) Electrical output as defined in ISO 3046; cosφ<sub>hi</sub> = 1.0, generator voltage of U = 0.4 kV at 50 Hz or U = 0.48 kV

at 60 Hz and a minimum methane number of MN 80 (TCG 2020) or MN 70 (TCG 2020 K) for natural gas; minimum heating value of 5.0 kWh/m<sup>3</sup> for biogas.  
4) Exhaust gas cooled to 120 °C with natural gas and 150 °C with biogas.

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Performance

