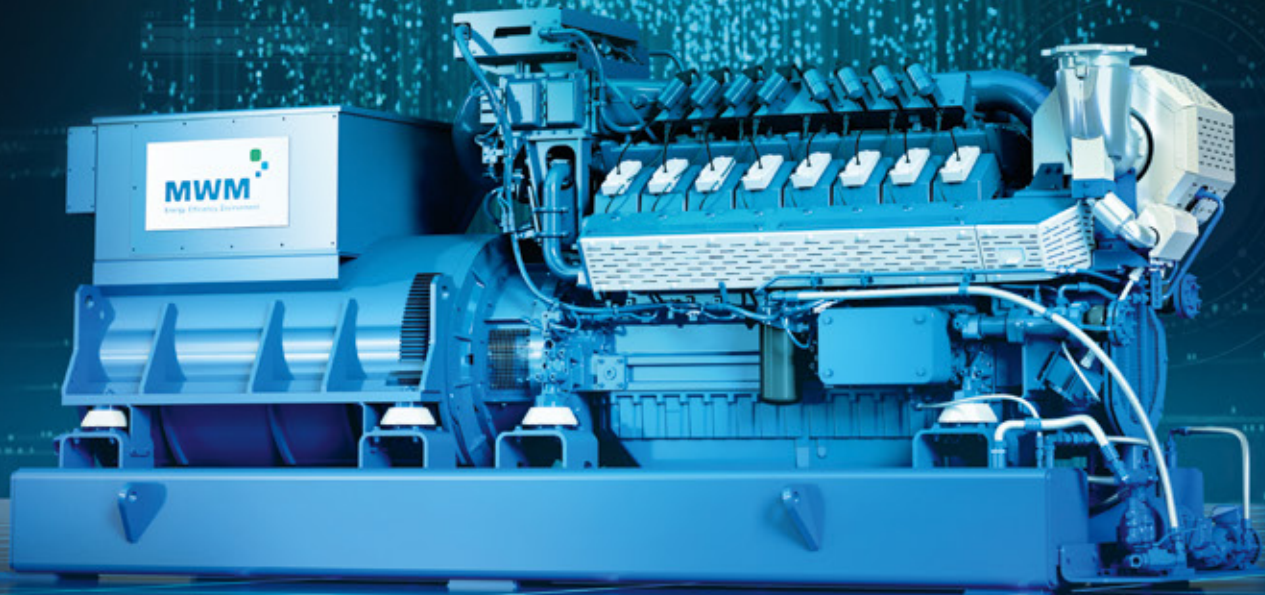


MWM DIGITAL POWER

www.mwm.net



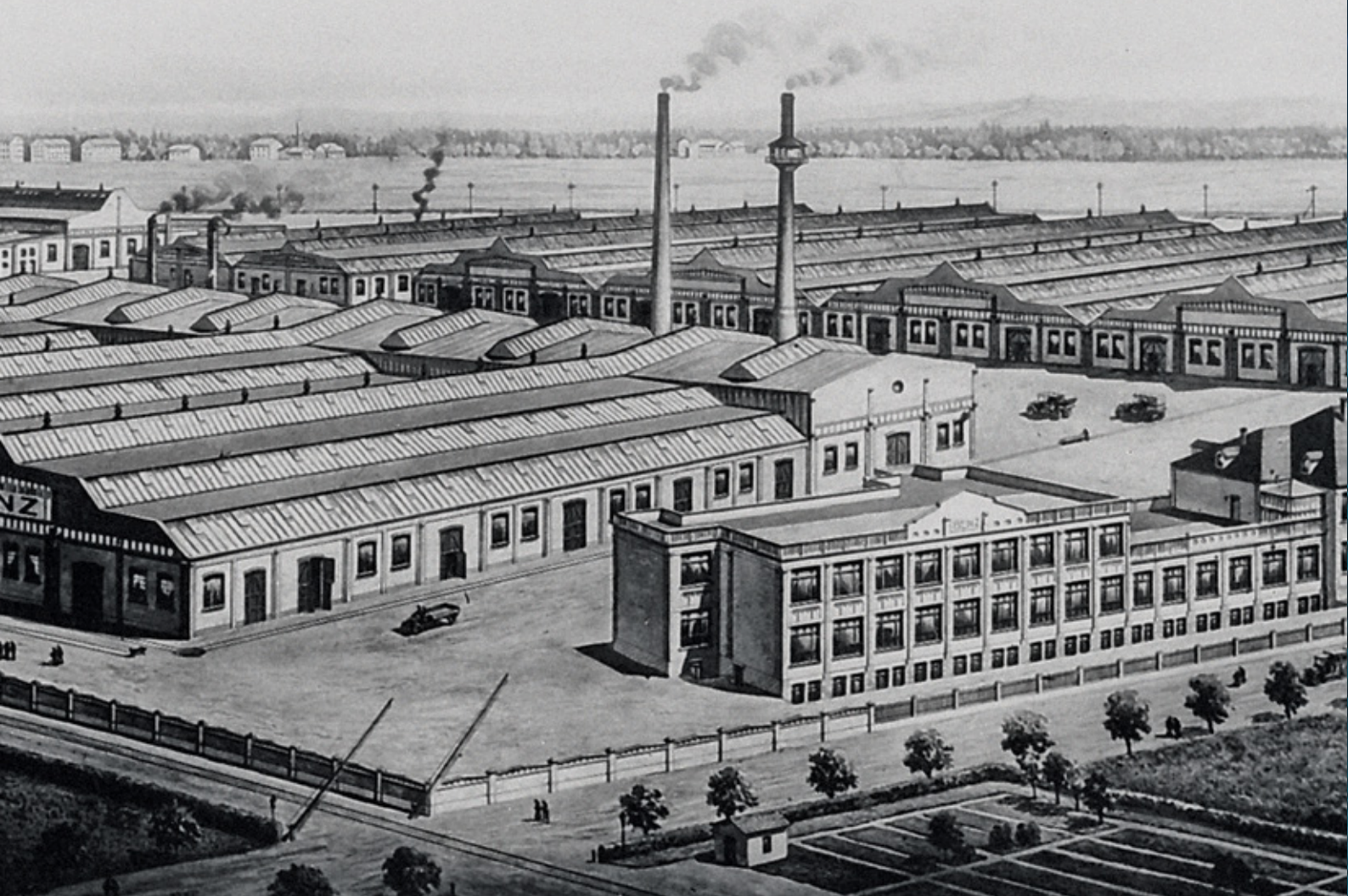
TCG 3016

— Robust. Efficient. Digital. —

MWM
Energy. Efficiency. Environment.

150 years of experience for your success.

With MWM, you benefit from about 150 years of experience in gas engine technology and energy generation. Since 2011, we have been part of the network of Caterpillar Inc., gaining access to international expertise and resources on the basis of which we can develop individual turnkey solutions for you. Draw on the security and experience of a specialist that has installed thousands of highly efficient and reliable plants around the globe.



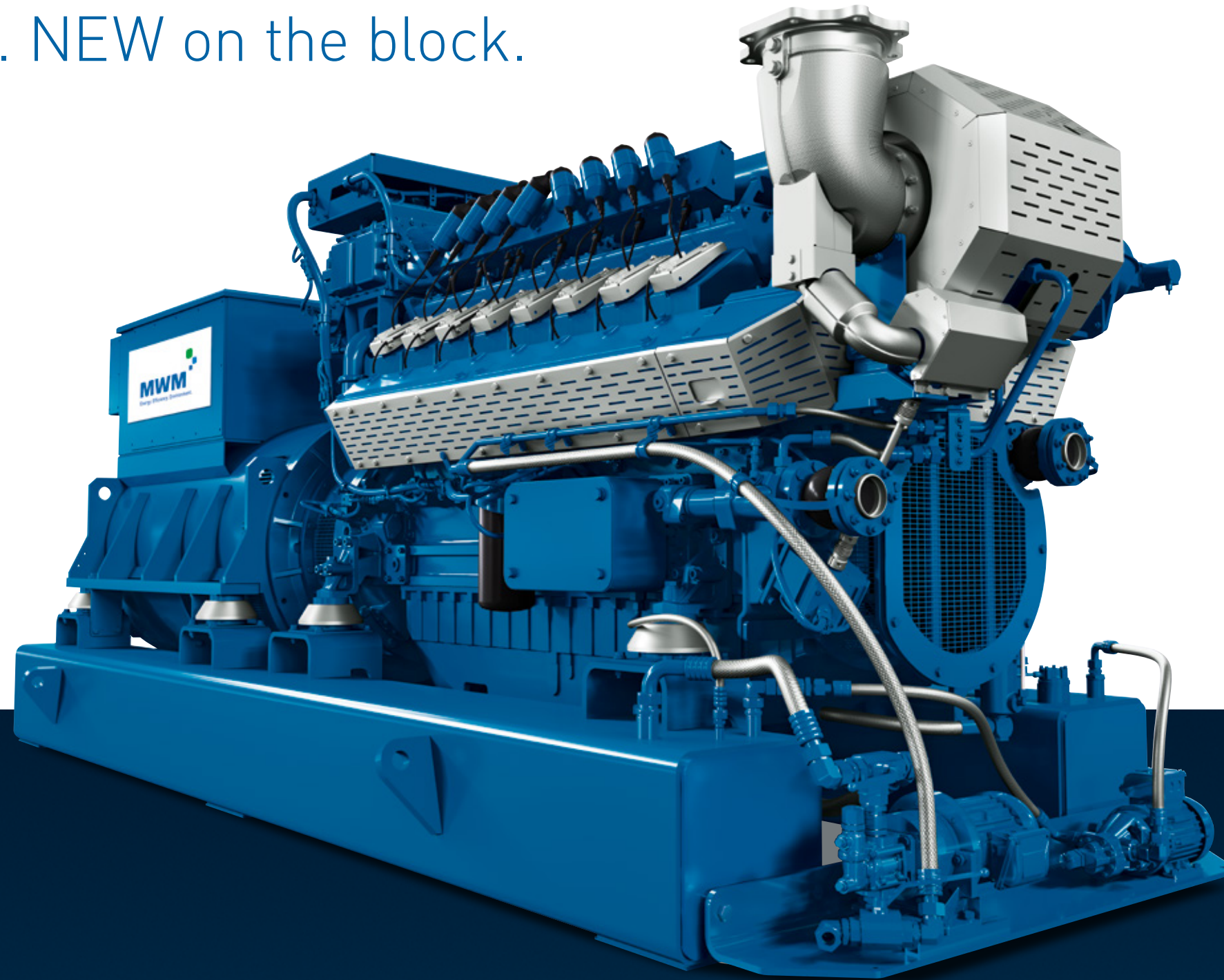
The future of efficiency is digital.

With MWM Digital Power, the energy market enters a new age. State-of-the-art components combined with smart and secure data analysis ensure improved maintenance, efficiency and optimized capacity utilization of your plants.

The MWM TCG 3016 gas engines are more than merely the next iteration of MWM's proven gas gensets. The new gas engines and turnkey solutions represent an entirely new development – perfectly tailored to the challenges of Industry 4.0 and the changed framework conditions of a dynamic energy market in the age of global value chains.



TCG 3016. NEW on the block.



Robust. Efficient. Digital.

The TCG 3016 is the first of a new generation: State-of-the-art components and the TPEM (Total Plant & Energy Management) control ensure maximum reliability and availability. The improved oil management and optimized cylinder and turbo chargers set new standards in terms of durability and reliability.

MWM DIGITALPOWER

- **Highest efficiency in its power range**
 - ✓ Electrical efficiency of up to 43.5 percent
 - ✓ Maximum profitability through rock-bottom operating costs
 - ✓ More efficiency through numerically optimized, low-loss flow design
- **Optimized lube oil management**
 - ✓ Lowest-in-class lube oil consumption: 0,1 g/kWh_{el}
 - ✓ Longer oil change intervals
 - ✓ Oil tank and integrated daily refill tank
- **Flanged genset concept**
 - ✓ Vibration-decoupled base frame for lower installation costs and reliable operation
 - ✓ Greater integrated lube oil volume
 - ✓ Integrated oil management
- **Improved turbo charger for a wide field of deployment**
 - ✓ Longer maintenance intervals
 - ✓ Wider suction air temperature window
- **Higher availability and longer useful life**
 - ✓ Optimized combustion through evenly charged cylinders
 - ✓ Optimized combustion with lower peak pressure
 - ✓ Smoothly running, low-vibration genset
- **Maximum reliability**
 - ✓ Very good island mode capability
 - ✓ Fulfills G1, G2 & G3 classes according to ISO 8528 with less than 10 steps in most applications
- **TPEM – the new control system**
 - ✓ Easy human-machine interface
 - ✓ Fully integrated remote access
 - ✓ Expanded scope, e.g. synchronization, power switch, and plant control

Benefit from the TCG 3016!

Contact us:
www.mwm.net or info@mwm.net

Superior operation and efficiency.

Maximum efficiency

Best total cost of ownership in its power range through unique combination of a long operating period until the major overhaul (80,000 oh for natural gas) and outstanding efficiency (electrical efficiency of up to 43.5 percent).



Lower gas consumption
through improved efficiency and fuel flexibility



Reduced maintenance costs
through longer service intervals and longer operating hours until the major overhaul



Lower lube oil consumption
lead to lower operating cost



Improved durability
ensures higher reliability and availability

The TCG 3016: Successful deployment.



Vereinigte Stadtwerke Bad Oldesloe

Holger Herzberg, project manager: "MWM/CES plants excel in terms of their adaptability to specific customer needs, by means of which the plants can be made even more efficient. Besides the plant's excellent efficiency, this feature really impresses me. The reduced lubricant consumption of less than 0.1 g/kWh is another positive aspect. Compared to the previous oil change interval of about 2,000 to 3,000 operating hours, the TCG 3016 only needs an oil change once every 5,000 operating hours, i.e. about once a year. The gas engine is extremely robust, which translates to longer service life."

MWM TCG 3016 | Go-live: 2016

Wentorf Biogas Plant

Norbert Hack, plant operator: "I've been running the TCG 3016 for a few months. As far as I'm concerned, this is the most efficient engine currently available on the market. Compared to its output, its biogas consumption is astonishingly low. The engine is perfectly tuned and runs very quietly. I have already seen many other gensets and models at my colleagues' facilities, but this engine's quality is truly outstanding – a genuine trend-setter. The new development (TPEM) from Mannheim will doubtlessly make the interaction between the control and the engine even more effective. The TPEM offers more possibilities for reading out engine data, which will further improve the plant operation."

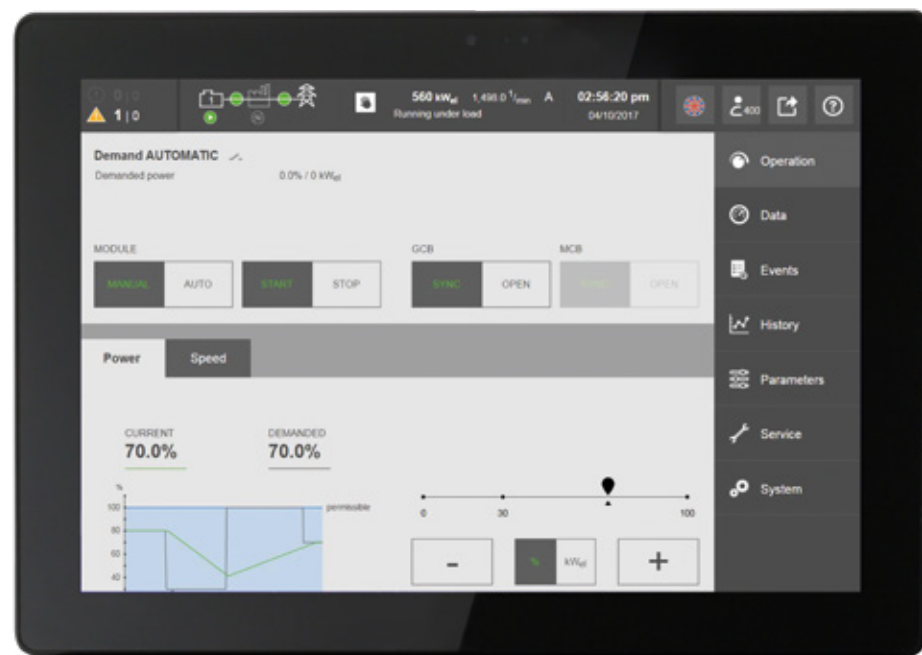
MWM TCG 3016 | Go-live: 2016



TPEM. The door to the digital age.

With its comprehensive digital power plant control TPEM (Total Plant & Energy Management), MWM redefines the control standard for energy solutions.

TPEM eliminates the need for additional control systems, as all power plant data for the genset and plant control are combined in one system. The optimum power plant control enables high economic efficiency, provided from a single source.



State-of-the-art system: economical, efficient and complete

One user interface

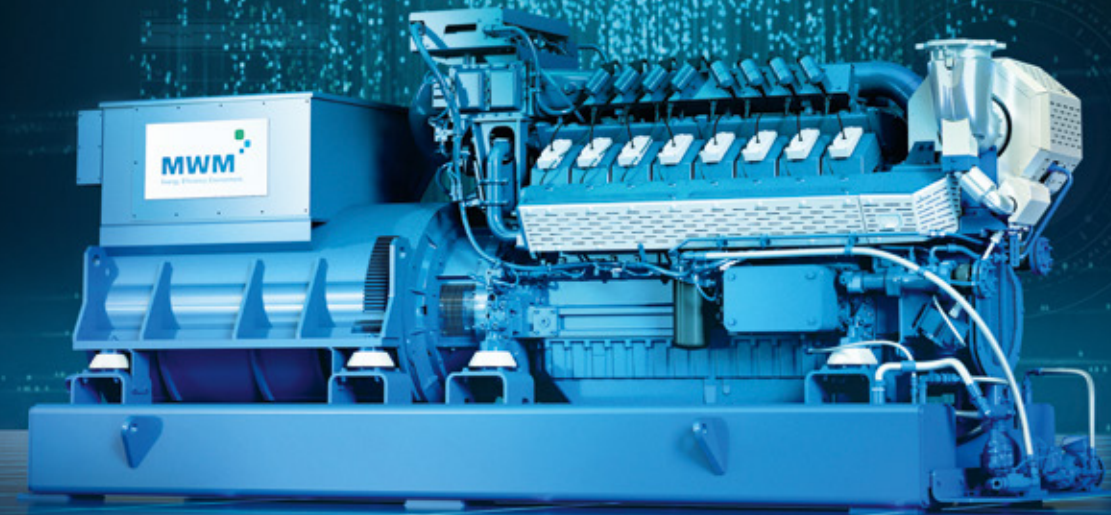
- ✓ Complete power plant control and setup

Remote access

- ✓ Remote power plant control on site and via VPN connection with the free visualization "TPEM Remote Client"

Security-oriented technology

- ✓ Meets latest ISO 27001 standards
- ✓ Safety chain for cogeneration plant monitoring (TUV-certified)



Set up

- ✓ Custom-tailored technical solutions
- ✓ One integrated, flexible control system for all electric power applications
- ✓ Multiple functionalities for individual solutions

Optimize

- ✓ Data management and analysis delivers information for optimizing the power plant
- ✓ Life cycle history enables the logging of and access to data throughout the life cycle of the genset and the peripherals

Operate

- ✓ High efficiency through optimal power plant control
- ✓ Custom-tailored technical solutions
- ✓ Enables remote power plant management and monitoring
- ✓ Use the full genset potential with maximum reliability



Technical data 50 Hz

Engine type	TCG 3016	V08	V12	V16
Bore/stroke	mm	132/160	132/160	132/160
Displacement	dm ³	17.5	26.3	35.0
Speed	min ⁻¹	1,500	1,500	1,500
Mean piston speed	m/s	8.0	8.0	8.0
Length ¹⁾	mm	3,100	3,830	4,200
Width ¹⁾	mm	1,780	1,780	1,780
Height ¹⁾	mm	2,150	2,150	2,150
Dry weight genset	kg	5,720	7,000	8,070

Natural gas applications

NO_x ≤ 500 mg/Nm^{3,2)}

Engine type	TCG 3016	V08	V12	V16
Electrical power ³⁾	kW	400	600	800
Mean effective pressure	bar	18.9	18.9	18.8
Thermal output ⁴⁾	±8% kW	404	618	821
Electrical efficiency ³⁾	%	43.1	43.3	43.5
Thermal efficiency ³⁾	%	43.6	44.6	44.6
Total efficiency ³⁾	%	86.7	87.9	88.1

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 3016	V08	V12	V16
Electrical power ³⁾	kW	400	600	800
Mean effective pressure	bar	18.9	18.9	18.8
Thermal output ⁴⁾	±8% kW	394	599	791
Electrical efficiency ³⁾	%	42.8	42.9	43.1
Thermal efficiency ³⁾	%	42.2	42.8	42.6
Total efficiency ³⁾	%	85.0	85.7	85.7

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 50 Hz, a minimum methane number of MN 70 for natural gas and MN 134 (sewage gas) for biogas applications.

4) Exhaust gas cooled to 120 °C for natural gas and 150 °C for biogas.

Data for special gases and dual gas operation on request.

The values given in these data sheets are for information only and are not binding. The information given in the offer is authoritative.

Technical data 60 Hz

Engine type	TCG 3016	V08	V12	V16
Bore/stroke	mm	132/160	132/160	132/160
Displacement	dm ³	17.5	26.3	35.0
Speed	min ⁻¹	1,800	1,800	1,800
Mean piston speed	m/s	9.6	9.6	9.6
Length ¹⁾	mm	3,100	3,830	4,200
Width ¹⁾	mm	1,780	1,780	1,780
Height ¹⁾	mm	2,150	2,150	2,150
Dry weight genset	kg	5,720	7,000	7,700

Natural gas applications

NO_x ≤ 500 mg/Nm^{3,2)}

Engine type	TCG 3016	V08	V12	V16
Electrical power ³⁾	kW	400	600	800
Mean effective pressure	bar	15.8	15.7	15.7
Thermal output ⁴⁾	±8% kW	427	648	856
Electrical efficiency ³⁾	%	42.1	42.4	42.6
Thermal efficiency ³⁾	%	45.0	45.7	45.5
Total efficiency ³⁾	%	87.1	88.1	88.1

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 3016	V08	V12	V16
Electrical power ³⁾	kW	400	600	800
Mean effective pressure	bar	15.8	15.7	15.7
Thermal output ⁴⁾	±8% kW	414	627	827
Electrical efficiency ³⁾	%	41.7	41.7	41.9
Thermal efficiency ³⁾	%	43.3	43.6	43.3
Total efficiency ³⁾	%	85.0	85.3	85.2

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 = 0,48 kV, cosphi = 1,0 for 60 Hz, a minimum methane number of MN 70 for natural gas and MN 134 (sewage gas) for biogas applications.

4) Exhaust gas cooled to 120 °C for natural gas and 150 °C for biogas.

Data for special gases and dual gas operation on request.

The values given in these data sheets are for information only and are not binding. The information given in the offer is authoritative.

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For a list of MWM sites,
go to www.mwm.net