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TOTEM m-CHP

Onsite Micro Cogeneration

TOTEM micro-Cogeneration

*Reduce running costs by
more than*

25%

With gas prices and maintenance taken into consideration customers operating TOTEM m-CHP could save as much as 60p (T10) to £1.25 (T25) per hour of running time.



11mg/kWh

Ultra-low NO_x emissions



Onsite Power and Heat

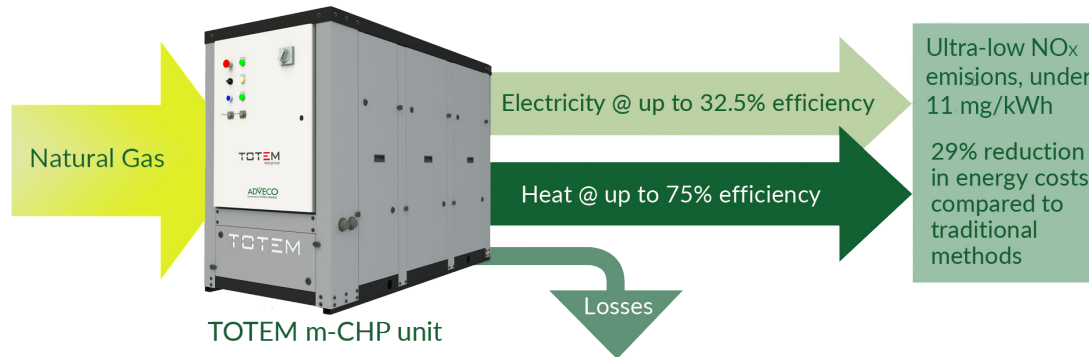
A micro combined heat and power (m-CHP) system allows a building to produce electricity on site and recover energy from the exhaust heat, which can then be used for central heating or water heating in the building.

For the end user, the greatest advantage of using combined heat and power is the reduction in energy costs.

Cogeneration utilises onsite production by a gas powered engine that uses free or waste heat, reducing consumption of carbon intensive grid-supplied electricity.

The electricity output from the cogenerator will be at a similar cost to electricity from the grid, however for each kWh of electricity generated approximately 2.5 kWh of free, high grade heat will be recovered.

Expertly managed engine control combined with high efficiency catalytic converters dramatically reduce NO_x and CO emissions.



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Advoco TOTEM m-CHP

Conceived and first brought to market in 1978, the latest generation of TOTEM m-CHP builds on this heritage, combining the automotive and engine expertise of Fiat Chrysler Automobiles' (FCA) new 1.4L Fiat Fire engine with that of partner Magneti Marelli providing the Engine Control Unit (ECU) and catalytic converter.



Incorporating the latest engineering practices and expertise from the automotive industry ensures an optimum design to meet the real-world needs of a building project. Components including condensing heat exchangers, condensate traps and noise attenuators that have traditionally been installed outside of the unit, have been neatly contained inside the box in a compact manner.

The casing has been specially designed to limit noise emissions to a very low level. The T10 is quiet enough to comfortably converse at a metre distance, and just half as loud the average radio or TV audio. T20-T50 appliances are notably quieter than a typical domestic vacuum cleaner (70 dB).



56.7 dB(a)

Comfortably quiet to operate

Fiat's engine, which boasts a reliability rate of 99.6% over 100,000 units per year, is fine-tuned by Magneti Marelli to suit the natural gas engine's stationary parameters. These relationships mean that the TOTEM has very high efficiencies, as well as ultra-low NO_x and CO emission rates - less than 10% of most micro-cogeneration units available on the market.

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107.1%

*NET total efficiency**

31.5%

*Electrical efficiency**

*Thermal efficiency**

75.6%

** Independent laboratory tested with cool incoming water*



High Efficiency Heat Exchange

Reclaims heat from every available source - engine, generator, oil and exhaust.

FEATURES & BENEFITS

- The building's central heating water is heated directly in two stainless steel shell and tube heat exchangers and a water to water stainless steel plate heat exchanger to transfer heat from the engine coolant system
- The engine coolant system is used to cool the engine, oil, and generator water jacket
- This level of heat exchange gives the TOTEM a thermal efficiency of 75.6% in fully condensing mode
- The TOTEM will condensate when the return water temperature is less than 60°C without the need for an additional flue heat exchanger

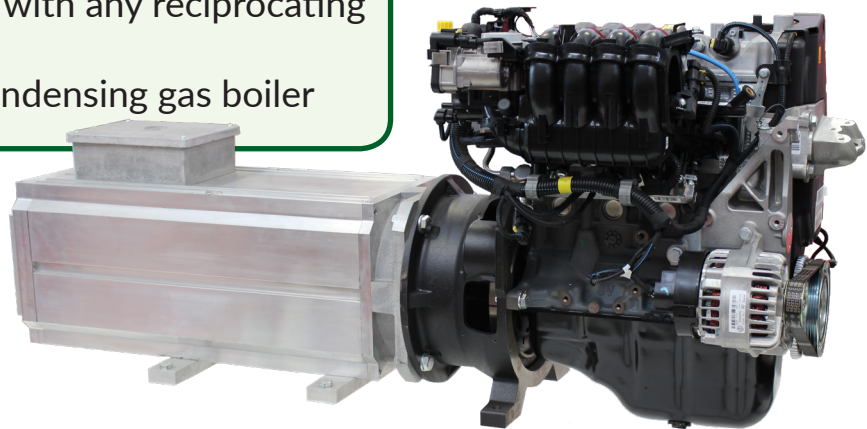
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Expertly Engineered m-CHP: TOTEM Engine

TOTEM internal combustion engines are specifically designed to run on natural gas. They are controlled with automotive engine control units with high efficiency catalytic converters which give ultra-low NO_x and CO emissions.

FEATURES & BENEFITS

- Lowest NO_x emissions < 11 mg/kWh
- Low CO emissions under 10 mg/Nm³
- Earn two BREEAM points for your project
- The lowest emissions available with any reciprocating engine CHP
- Lower NO_x emissions than a condensing gas boiler



NO_x (NO and NO_2) is a potentially deadly combination and a major factor in air pollution.

The average UK NO_x emissions from the production of electricity that enters the grid is 617 mg/kWh. In comparison, the NO_x emissions from a TOTEM unit are less than 40 mg/kWh of electricity output.

When taking the heat output into account, which is considered a waste product, TOTEM becomes NO_x free.

The BREEAM scheme awards two points for these reduced emissions. Combined heat and power systems also prove very beneficial against the Target Emission Rate within SBEM software.



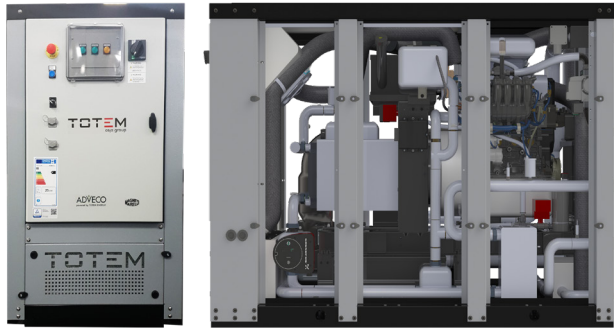
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Box Clever

TOTEM's compact design requires less space and the panels, the lid and the uprights can be removed from the baseplate to assist with on-site installation, servicing and maintenance. Dis-assembly, relocation and re-assembly takes less than a day.



Micro Combined Heat & Power



Compact H1280mm x W795mm x L1920mm

Exhaust and main plate heat exchangers housed within the casing

The casing prevents building water entering the engine

No need for additional exhaust or heat distributor pipework

Automatic oil change system built-in reducing engine wear and keeping efficiency high



Machine Control PLC for modulation, cascade control, power factor connection and mains synchronisation

Clean oil reservoir allows unit to automatically change the oil five times between service visits

The compact casing has sound proofing and is completely removable for maintenance

Internal silencer as standard keeps noise levels low

Engine directly coupled to generator

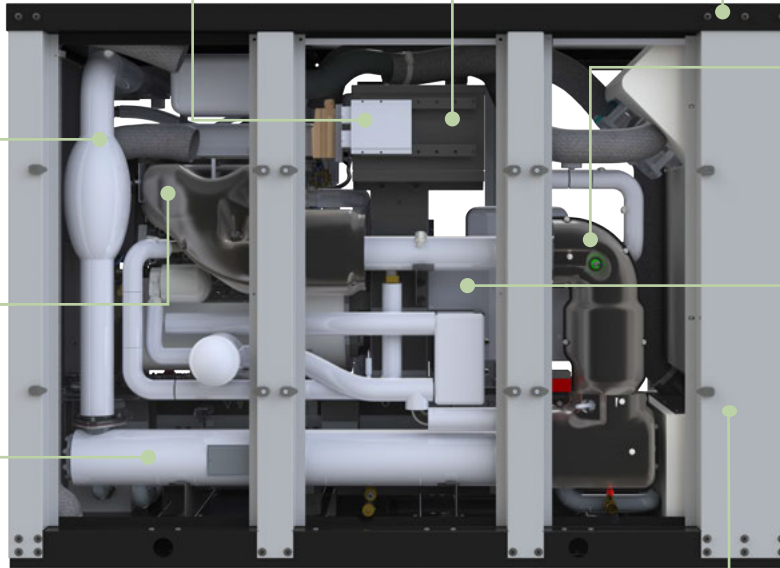
High efficiency shell & tube heat exchanger designed to condense exhaust gases

Catalytic converter and lambda sensor ensure ultra-low emissions

Water cooled generator achieves 31.5% electrical generation efficiency

GSM Modem & WiFi

External Panel with BX+ System Controller IP Relay



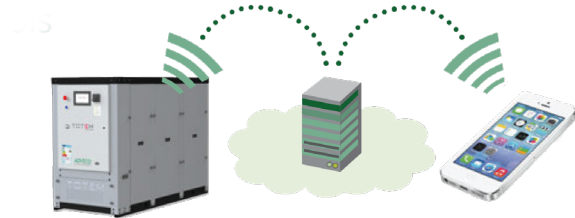
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TOTEM Smart Controls

An innovative cloud platform is standard to TOTEM. Designed for Smart Buildings, it allows remote monitoring of TOTEM performance by any online system online including laptop, tablet or smartphone.

TOTEM can provide this functionality through either a hard wire network connection or via a WiFi module installed in the unit.

- Interrogate for real time information
- Upload packet data every 24 hours detailing the unit performance over the past day
- Faults automatically create email alerts



Adveco Project Design, Commissioning & Service

Adveco Project Design and Commissioning

Personalised, hands-on application sizing and design for your project.

Accurately calculate running costs for lifetime savings and defined payback periods.

Appliance warranty periods covers parts, but to take full advantage it is recommended that TOTEM CHP are commissioned by us. This provides you with call out, labour and parts to ensure consistent operations and prolonged system life.

Risk-free, long-term savings

Adveco Servicing Plans

A range of complete servicing contracts are available for the Adveco TOTEM CHP product range, from basic warranty maintenance to full, long-term contracts that can guarantee a high minimum standard of cogeneration efficiency. This enables Adveco to ensure operation long after payback of capital investment is achieved.

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In-house team of fully qualified commissioning, servicing and repair engineers based across the country to support continuity of m-CHP system operation



2.5million

Equivalent lifetime mileage with regular monitoring and expert Adveco service



Choose Your Support

Basic Service Plan - Pay for each service. The Basic Service Plan schedules one minor and one major service. Once out of warranty Adveco recommends that the mCHP be monitored by the customer,

Fully Maintained Plan - charged every three months on actual run hours. This will provide full maintenance to cover: callouts; parts; labour; service and remote monitoring. Adveco will completely overhaul the engine when required.

Fully Maintained Long Term Plan - a contracted 10-year agreement offering the Fully Maintained Plan with the addition of a 10% discount. Adveco also guarantees efficiency stays above 85% of stated performance levels.

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Projects - Hotels and Leisure Facilities

Hotels, sports, swimming and leisure facilities serve as a perfect application for CHP, where there is a large and continuous demand for heating, hot water, and power.

Bromsgrove Leisure Centre

The TOTEM T25 at Bromsgrove Leisure Centre is designed for 7,000 operational hours a year, delivering annual savings as high as £10,000.

By producing both electricity and heat from the same supply of input fuel, the associated net reduction in carbon emissions is expected to be more than 65,000 kg per year.



Rugby School Sports Centre

Recent renovations replaced ageing plant with an Adveco TOTEM T20 m-CHP.

The sports centre, featuring a 25m swimming pool in addition to a fitness suite and an extensive range of indoor and outdoor courts and sports pitches, now generates equivalent fuel savings of £1,018 per month.

The building's emissions are being reduced by more than 51 tonnes of CO₂ and 123.8 kg of NO_x per year.



“A swimming pool is a perfect application. With a reasonable payback time on such a large investment, turning to Adveco for their CHP was a natural step.”

Brian Rollason, MBIFM, Building Services Engineering Manager,
Rugby School Estates Department

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Projects - Schools and Universities

"We are very conscious of the increasing impact NO_x emissions have on localised air quality. The Advenco TOTEM CHP enabled us to deliver an effective, efficient and environmentally friendly solution due to its combination of total efficiency, reductions in Carbon Dioxide and ultra-low NO_x emissions."

James Massey, Projects Director, TACE

University of Central Lancashire

Friargate Court is a 244-room residential scheme benefitting from a system designed around the TOTEM T10 m-CHP.

The CHP installation helped the building to meet Part L2A of the Building Regulations and local planning requirements, and additionally saves more than £3,600 per year in energy costs.



Bootham School

Seeking a sustainable way to reduce power and hot water heating costs Bootham School installed two 25 kW TOTEM m-CHP units providing a 50 kW electrical baseload.

With a full year's running (6,677 hours) the pay-back periods for the project will be achieved and the school is saving an estimated £36,996 per year.



"The installation was completed on time, to cost, and successfully due to the team effort. Everyone was on board and got on with it, otherwise I don't think we would be in the situation where we are, producing the results we are today. It's absolutely fantastic!"

Craig Pierotti, Estates Manager, Bootham School

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Projects - Care Homes and Health Estates

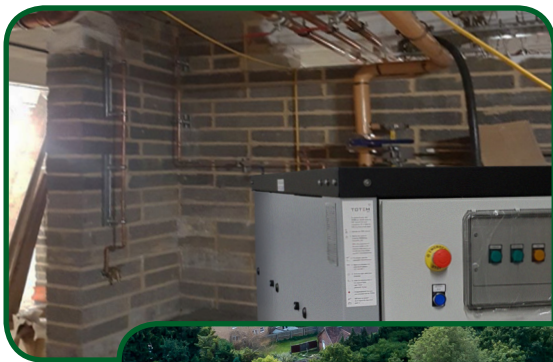
Well designed, reliable heating and hot water systems are paramount for the comfort and wellbeing of residents and patients who often require above average levels of heating year round.

Care South

Alexandra House, in Dorset, is a two-storey, 58-room residential care and nursing home with a heating and hot water system built around the TOTEM T20.

Designed to deliver 7,100 CHP operating hours per year, this results in annual carbon reductions in excess of 44.5 tonnes and energy savings, inclusive of CHP maintenance costs, of £7,500 per annum.





Our Wilton Trust

The Veterans Hub provides 44 high quality and contemporary studio, one-, and two-bedroom flats.

The TOTEM T20 allows the building to meet strict building standards, increasing energy efficiency while lowering harmful emissions in an environmentally friendly answer to the building's year-round domestic hot water requirements.

The Veterans' Hub will make an estimated annual carbon saving in excess of 9,000 kg CO₂.

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TOTEM Options and Ancillaries

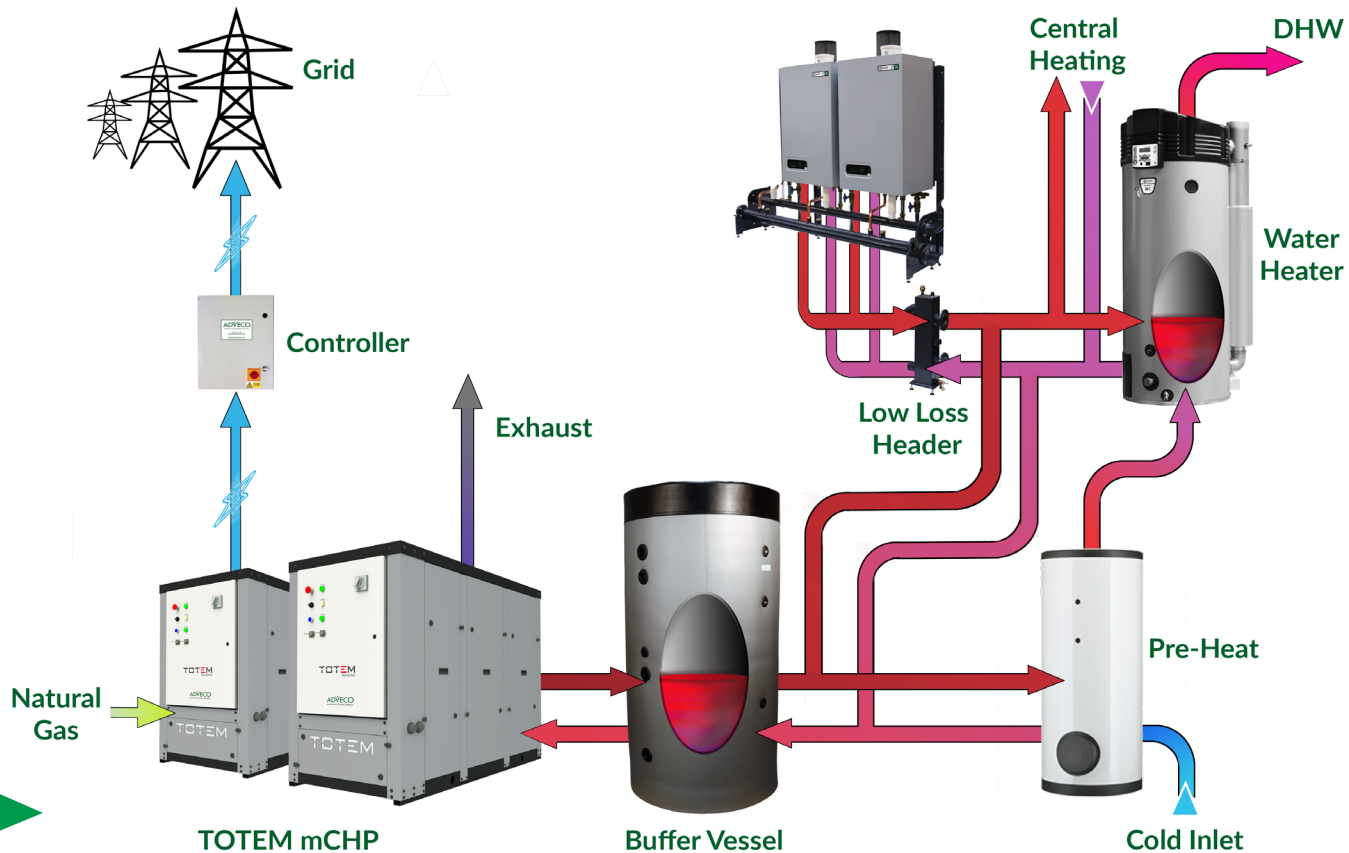
- System buffer vessels from 1,000L to 10,000L
- Primary and secondary pumps: single or twin head with controls to share load
- Installation kits for the CHP system and buffer vessel accounting for all fittings and components
- Submetering available for gas, electric and heat
- Expansion vessels and pressurisation units
- 698/699 interface protection panels
- Commissioning and witness testing
- 698/699 application assistance
- Maintenance and servicing plans, including guaranteed minimum efficiency contracts to ensure lasting CHP performance

m-CHP Maximum Flue Run Lengths

	T10	T20	T25
Total allowable equivalent length after silencer in 110mm diameter flue	50m	50m	50m
110mm 90 bend	-0.8m	-1.1m	-1.7m
110mm 45 bend	-0.2m	-0.3m	-0.5m
125mm Vertical terminal	-1m	-1m	-1.6m
110mm Horizontal terminal	-1m	-2m	-3.1m

TYPICAL SYSTEM SCHEMATIC





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TOTEM Product Range

MODEL		T10	T20	T25	T50
OUTPUT air inlet @ 25°C and 101.3 kPa, natural gas (G20) @ 20 mbar					As 2x T25
MAX Output:					
Rated electrical power	kW	10	20	25	50
Power modulation range	kW	≥5	≥7.5	≥7.5	≥7.5
Seasonal space heating efficiency†	%	200	226	251	251
Electrical efficiency (net of machine consumption)*	% LHV (HHV)	29.6 (26.9)	31.2 (28.4)	32.5 (29.5)	32.5 (29.5)
Thermal output (35°C return temperature)*	kW	25.2	48.5	57.6	115.2
Thermal output (70°C return temperature)*	kW	21.6	41.9	50.2	100.4
Thermal efficiency (35°C return temperature)*	% LHV (HHV)	74.7 (67.7)	75.6 (68.7)	74.9 (68.1)	74.9 (68.1)
Thermal efficiency (70°C return temperature)*	% LHV (HHV)	64.0 (58.1)	65.3 (59.4)	65.3 (59.4)	65.3 (59.4)
Total efficiency (35°C return temperature)*	% LHV (HHV)	104.3 (94.7)	106.8 (97.1)	107.4 (97.6)	107.4 (97.6)
Total efficiency (70°C return temperature)*	% LHV (HHV)	93.6 (84.8)	96.5 (87.7)	97.8 (88.9)	97.8 (88.9)
Gas energy input*	kW LHV (HHV)	33.7 (37.0)	64.1 (70.9)	76.9 (84.9)	153.8 (169.8)
Natural gas (G20)*	Nm³/hr	3.31	6.28	7.54	15.08
Heat to power ratio**		2.50	2.42	2.30	2.30

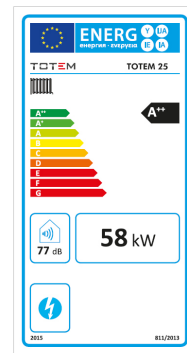
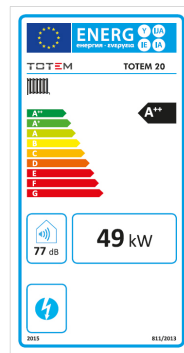
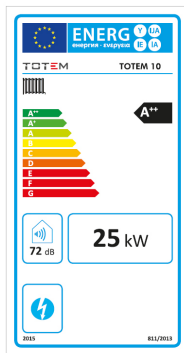
LHV = Lower Heat Value (Net)

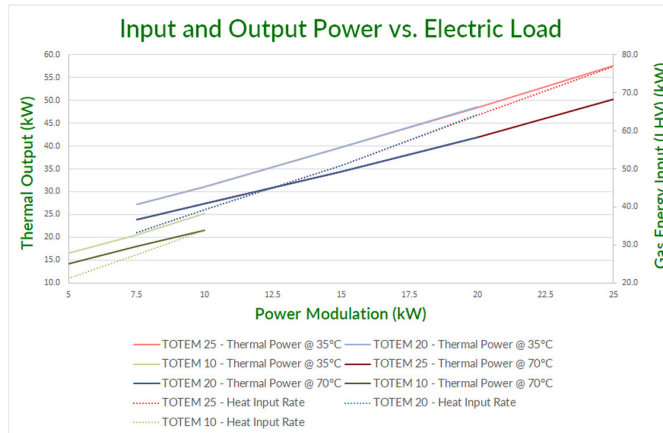
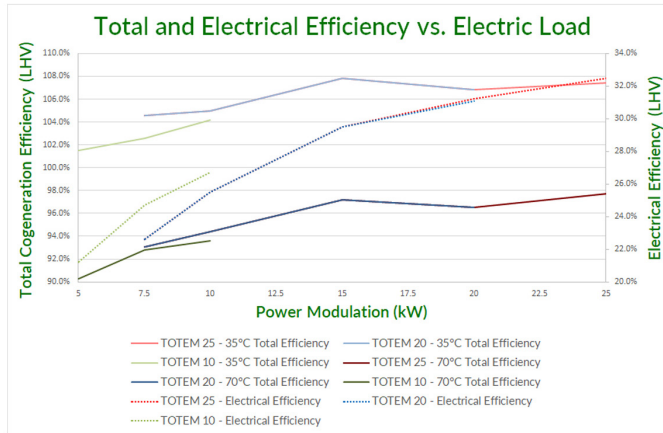
HHV = Higher Heat Value (Gross)

* Values from independent testing at Milan Technical University and verified by TÜV Rheinland. Unit certified by TÜV Rheinland.

** Heat to Power ratio must be input into SBEM calculations alongside Maximum Gross (HHV) Total Efficiency. For normally stated net efficiencies, divide by 1.1 to calculate gross efficiency.

† As defined by EU No. 811/2013, EN 50465/2015





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MODEL		T10	T20	T25	T50
OUTPUT air inlet @ 25°C and 101.3 kPa, natural gas (G20) @ 20 mbar					As 2x T25
Modulating 40/50% Output:					
Rated Electrical Power	kW	5	10	10	10
Electrical efficiency (net of machine consumption)*	% LHV (HHV)	21.2	25.5 (23.0)	25.5 (23.0)	25.5 (23.0)
Thermal output (35°C return temperature) *	kW	16.4	31.1	31.1	31.1
Thermal output (70°C return temperature)*	kW	14.1	27.5	27.5	27.5
Thermal efficiency (35°C return temperature)*	% LHV (HHV)	77.9 (70.5)	79.4 (71.7)	79.4 (71.7)	79.4 (71.7)
Thermal efficiency (70°C return temperature)*	% LHV (HHV)	70.0 (60.5)	69.2 (62.5)	69.2 (62.5)	69.2 (62.5)
Total efficiency (35°C return temperature)*	% LHV (HHV)	101.5 (91.6)	105.0 (94.8)	105.0 (94.8)	105.0 (94.8)
Total efficiency (70°C return temperature)*	% LHV (HHV)	90.3 (81.5)	94.4 (85.2)	94.4 (85.2)	94.4 (85.2)

DIMENSIONS AND WEIGHTS

h x w x l (rigged up with panels - standard version)	mm	1,280x795x1,920			1,280x2,390x1,920
Weight Full	kg	720	780	780	1560

HYDRAULIC CIRCUIT

Maximum inlet water temperature	°C	70			
Maximum outlet water temperature	°C	80			
Rated water flow	l/h	2,500	4,000	5,000	10,000
Maximum pressure drop through unit	kPa	60			
Maximum working pressure	bar	10			

ASYNCHRONOUS GENERATOR

Operation		In parallel with grid
Three phase voltage/Frequency	V/Hz	400/50
Engine starter		Starter motor
Electrical generator connection		3 phase and neutral



MODEL**T10****T20****T25****T50****WORKING CONDITIONS**

Max Ambient Conditions (temperature/relative humidity)	°C/RH	40/75%			
Acoustic impact Lp					
@ 1 m distance in open field	dB(A)	56.7	61.1	61.1	64.1
Exhaust emission					
NO _x Emissions @ 5% O ₂	mg/Nm ³	<10	<10	<10	<10
NO _x Emissions @ 0% O ₂	mg/kWh	<12	<12	<12	<12
CO Emissions @ 5% O ₂	mg/Nm ³	<10	<10	<10	<10
Max flue gas temperature (normal conditions)	°C	77			
Max flue gas temperature (fault condition)	°C	100			
Flue gas mass flow rate	kg/h	55	100	125	250
Condensate mass flow rate (35°C return temperature)*	kg/h	1.37	3.04	3.14	6.28
Max flue system pressure drop	Pa	500			
Flue material specification		T120 and H1			
Asynchronous three-phase alternator					
Rated power*	kW	10.10	20.09	25.06	50.12
Frequency	Hz	50			
Rated voltage	V	400			
Poles		4	2	2	2
Insulation Class		F			
Efficiency Class		IE3			
Power Factor		0.962			

* Values from independent testing at Milan Technical University and verified by TÜV Rheinland. Unit certified by TÜV Rheinland.

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† As defined by EU No. 811/2013, EN 50465/2015

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ADVECO TOTEM COGENERATION (CHP) PRODUCT GUIDE 2019

