TOTEM by asja

TOTEM micro-cogeneration

heat, power, efficiency, saving

www.totem.energy

Reduce energy costs and emissions

The smart way to produce electricity and hot water

Today, caring about our Planet means consuming energy in a smart and sustainable way.
Micro-cogeneration allows you to produce electricity and heat using less energy than conventional boilers and thermal power plants.

Cut the energy costs of your facility or business and contribute to protect the environment you live in. With TOTEM you will enjoy the benefits of micro-cogeneration thanks to an innovative and reliable product.

Find out how to join the energy revolution.

Micro-cogeneration Combined Heat and Power

Efficient production of electrical and thermal energy

What

Micro-cogeneration, or micro-CHP (Combined Heat and Power), is the simultaneous production of heat and power using a single fuel source in systems with <50 kW rated electric power. With a micro-cogeneration system you will save money by producing low-cost heat, in the form of hot water, and electricity, that you don't have to buy from the grid.

Why

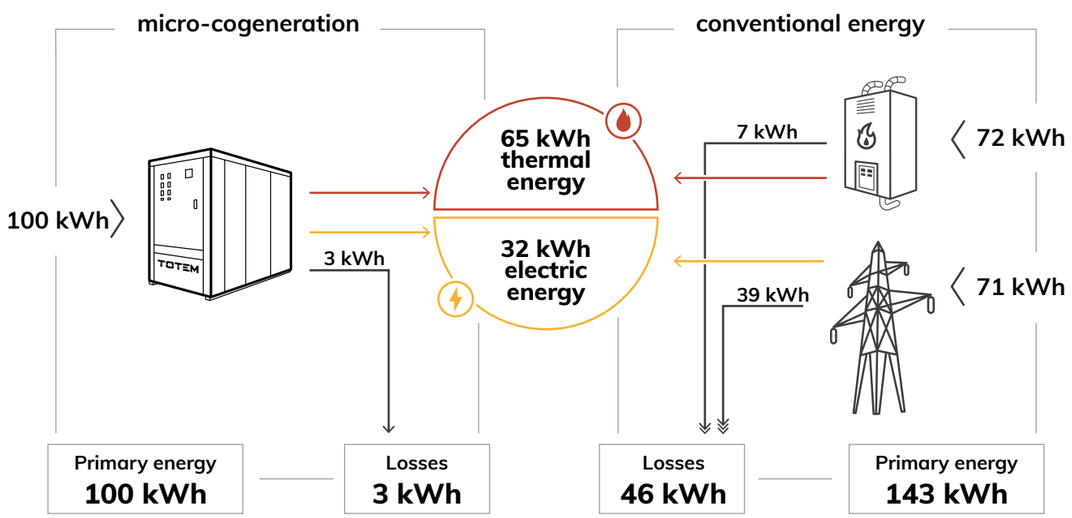
Micro-cogeneration is efficient: the thermal energy is recovered and supplied to the user in the form of hot water, while power losses are excluded since elctricity is produced where it is consumed.

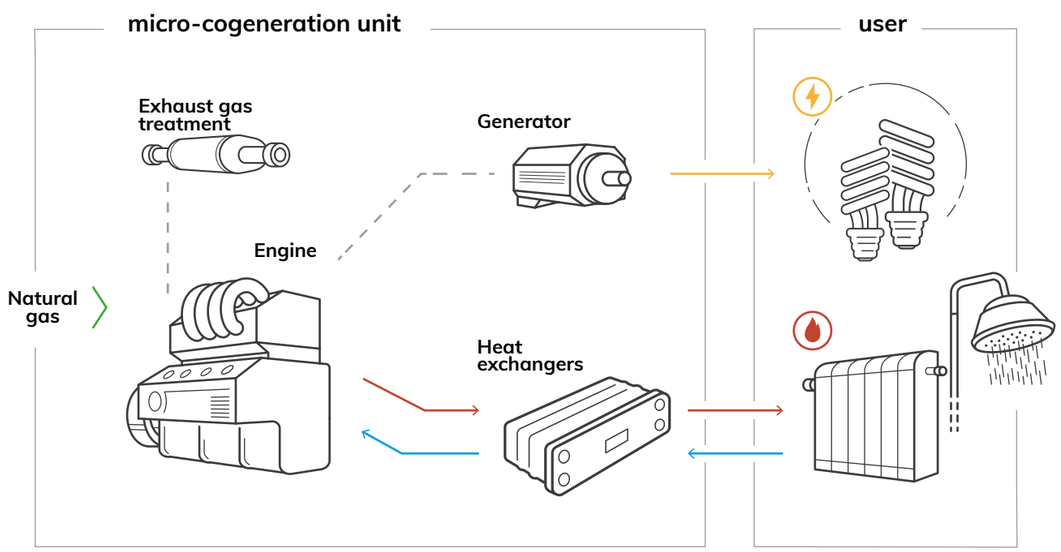
How

TOTEM micro-cogeneration systems are equipped with an internal combustion engine fueled by natural gas (or biomethane, LPG) which drives a generator to produce electricity.
The heat produced by the engine coolant, engine oil and exhaust fume, is recovered by the exchangers and supplied to the user through a thermo-hydraulic circuit.

When

Micro-cogeneration systems can be applied optimally where there is a stable demand for electricity and heat all year round. For example: swimming pools, hotels, retirement homes, sports centers, small and medium-sized enterprises, cured meats and cheese factories, galvanic plants etc.

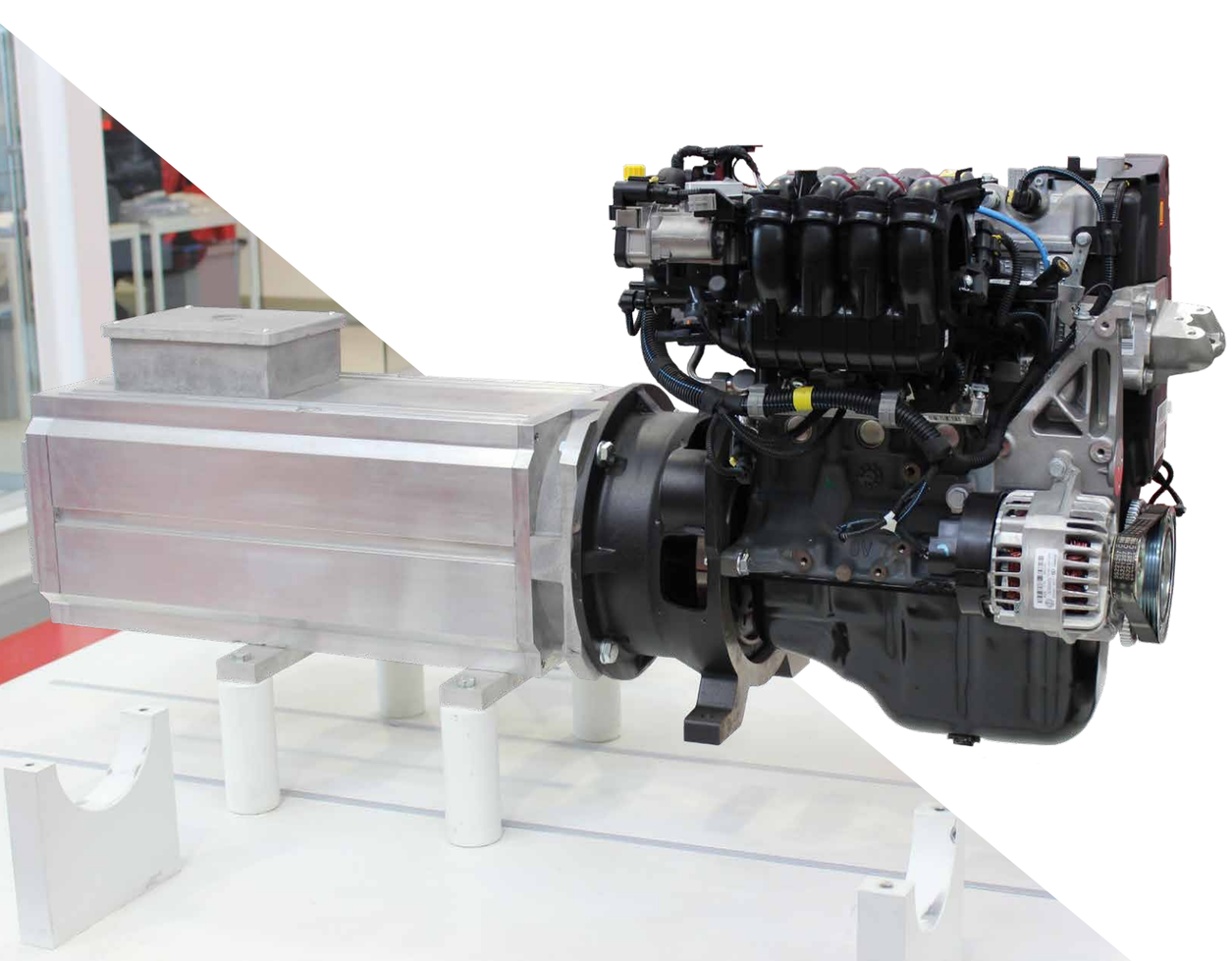




TOTEM

Italian micro-cogeneration systems

TOTEM is an innovative micro-cogeneration system made in Italy. It is the evolution of the first micro-cogeneration system in the world designed by FIAT Research and Development Center in 1977.
The core of TOTEM is the FCA Fire 1400 cc engine. The brain is the TOTEM OS operative system.



Eco friendly

Emissions of pollutants several times lower than modern boilers

Efficient

Electricity and thermal energy with an efficiency close to 100%

A+++

Rewarding

Payback time from 2 to 4 years

Compact

Easy to install, also in thight spaces or outdoor

100% Italian

Designed and manufactured in Italy with FCA engines

Multi fuel

Natural gas, biomethane, LPG

Modular

Cascade operation up to 100 kWe

Reliable

Full-service, telemonitoring and remote control

Certified

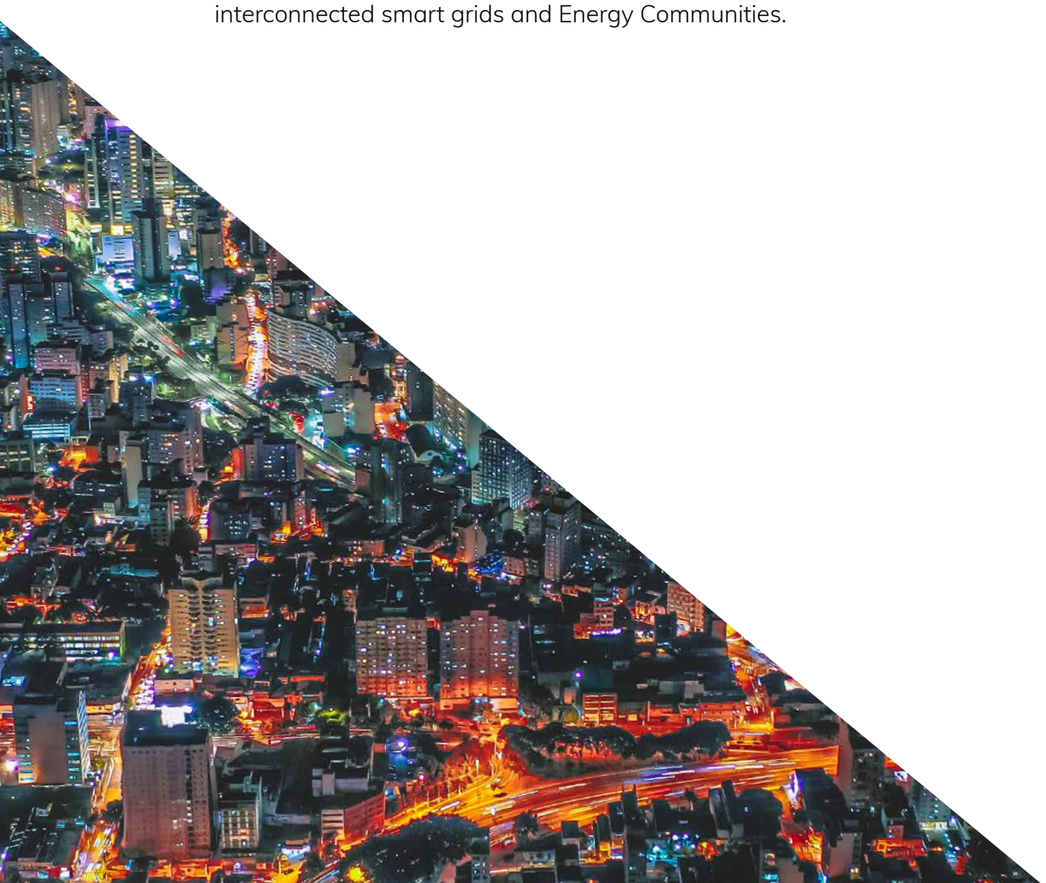
Technical performances certified in laboratory

Smart and sustainable energy

The transition from centralized to distributed energy generation is a fundamental feature of modern energy systems.

Producing electricity where it is consumed means reducing energy consumption and emissions.

With TOTEM you will contribute to this evolution by becoming part of interconnected smart grids and Energy Communities.



The environmental benefits of producing heat and power with TOTEM

NOx emissions

TOTEM [1]
≤7 mg/Nm³

boilers class 6 (lowest emissions)
≤51 mg/Nm³

limits for boilers in the Region of Lombardia [2]
178 mg/Nm³

average of the boilers installed nationwide [3]
230 mg/Nm³

TOTEM is the most efficient and lowest emitting micro-cogeneration system thanks to the stoichiometric control of the carburation and to an efficient catalyst.

NOx (nitrogen oxides) emissions of TOTEM are:

- 25 times lower than the most stringent limits set for boilers in the region of Lombardia, that are the most stringent at national level;
- 7 times lower than the boilers with the lowest emissions (class 6).

NOx is one of the most dangerous atmospheric pollutant for human health because it is a precursor for the formation of other harmful substances (mainly PM, particulate matter).

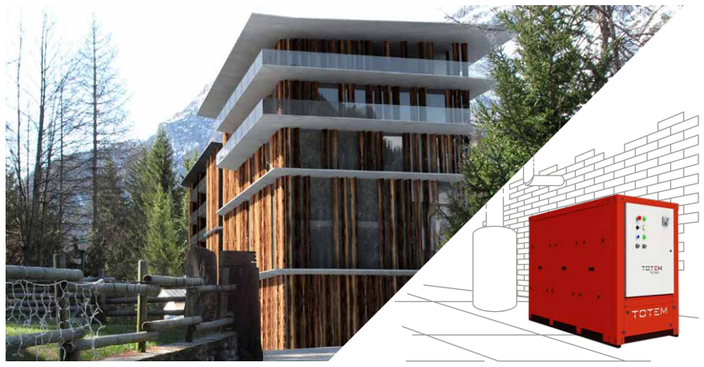
[1] quota relative to the thermal output; total emissions: ≤10 mg/Nm³
[2] limits set by the Region of Lombardia for “Rehabilitation zones”
[3] data from the ISPRA 319/2020

TOTEM range

An efficient solution for each application

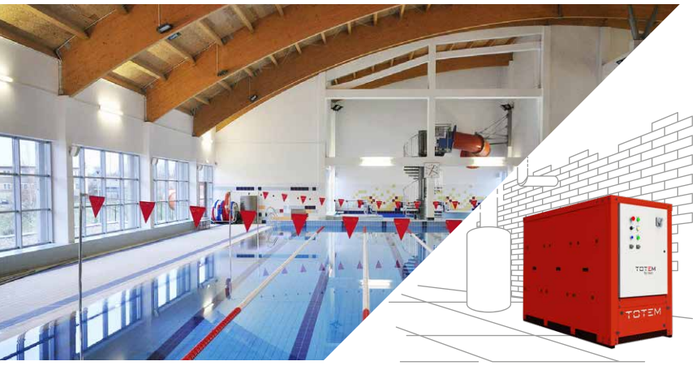
TOTEM 10/12 - Condominium

The smaller units of TOTEM range provide 10 and 12 kWe (21.6 and 25 kWt) and are the ideal solution for residential applications such as large villas or condominiums with central heating.



TOTEM 25 - Hotel

TOTEM 25 is the most powerful unit in TOTEM range (25 kWe and 50,2 kWt). With an overall efficiency close to 100%, it is the most suitable solution for the hospitality and healthcare sectors (hotels, retirement homes), for super condominiums and for SMEs that use hot water for production processes.



TOTEM 20 - Swimming pool

With 20 kWe of electric power and 41.9 kWt of thermal power, TOTEM 20 suits perfectly to the consumption patterns of swimming pools and sports centers. In these structures, it can supply hot water for DHW and for space and pool heating.

4 TOTEM 25 - Shopping center

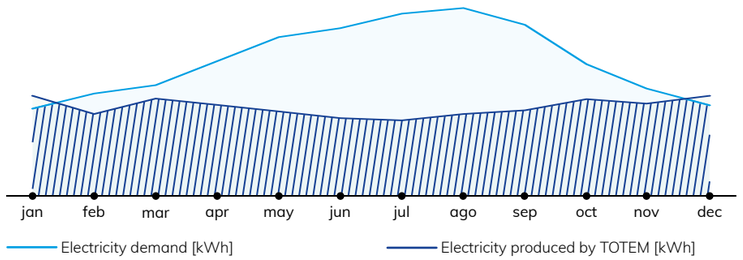
All TOTEM micro-cogeneration units are designed to operate in parallel to adapt to the user's electricity and heath demand. Compared to large-sized cogeneration units, the use of small micro-cogeneration systems in cascade operation allows avoiding downtime for maintenance while preserving high levels of efficiency.

The proper sizing to maximize savings

Savings depend on the hours of operation

A micro-cogeneration system has to be sized according to the user's average thermal and electrical demand, in order to maximize operating hours and savings.

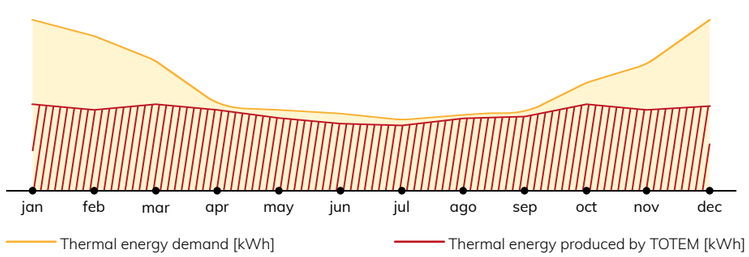
Annual electricity demand



For a proper sizing the electrical and thermal base load have to be covered.

Peak demands are met by existing systems (boilers, heat pumps, photovoltaic systems) or by the network (district heating, electricity grid).

Annual heating demand



The goal is to maximize the total number of operating hours, which can still be increased thanks to the thermal buffer.

The economic benefits of producing heat and power with TOTEM[1]

White certificates and tax credits

TOTEM micro-cogeneration systems have access to the White Certificates scheme for energy efficiency or, alternatively, to tax credits for energy efficiency improvements (Superbonus 110%, Ecobonus 65%).

Self-consumption of electricity energy

The electricity generated by micro-cogeneration systems will be self-consumed. You might no longer need to purchase this part from the grid.

Net metering

The electricity generated by TOTEM that is not consumed istantaneously has access to net metering schemes.

Reduced excise tax

A reduced excise duty is applied to a part of the fuel used for cogeneration.

[1] The list of benefits is intended to reflect the Italian regulation and support schemes as of 2020. It may vary from Country to Country.

Business case studies

Swimming pool
Solution adopted: 1 TOTEM 25

annual expenditure without TOTEM

Heating	41,000 €
Electricity	50,000 €
Total expenditure without TOTEM	91,000 €

annual expenditure with TOTEM

Heating	24,000 €
Electricity	16,000 €
TOTEM operation[1]	25,000 €
Total expenditure with TOTEM	65,000 €

Annual savings with TOTEM	**26,000 €**
Payback time	**2.6 years**

Operating hours
7,468

Electric power
25 kW

Thermal power
50.2 kW

Energy produced by TOTEM
68% of the electricity demand
41% of the heat demand

[1] It includes the cost of natural gas consumption by TOTEM, the cost of service and remote control, the payment of the excise duty on self-consumed electricity minus the economic benefit from White Certificates.

Super condominium
Solution adopted: 1 TOTEM 25

annual expenditure without TOTEM

Heating	30.000 €
Electricity	20.000 €
Total expenditure without TOTEM	50.000 €

annual expenditure with TOTEM

Heating	13.000 €
Electricity	0 €
TOTEM operation[1]	14.000 €
Total expenditure with TOTEM	27.000 €

Annual savings with TOTEM	**23.000 €**
Payback time	**2,9 years**

with Superbonus 110%[2]

Annual savings with TOTEM	**18.000 €**
Total investment amount	**0 €**

Operating hours
4.373

Electric power
25 kW

Thermal power
50,2 kW

Energy produced by TOTEM
100% of the electricity demand
58% of the heat demand

[2] Applicable for building energy renovations that lead to an improvement of at least two energy-efficiency classes. It cannot be combined with White Certificates.

Energy efficiency in every sector

Gym

solution adopted **1 TOTEM 20**

for **space heating, small swimming pools and domestic hot water**

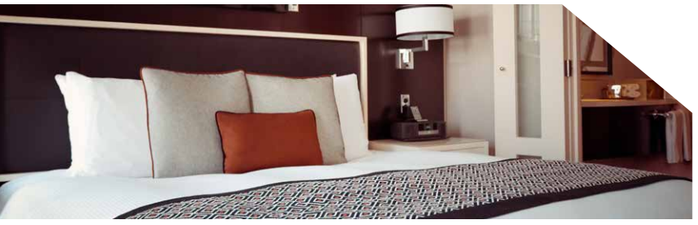
annual savings **14,000 €**

Spa center

solution adopted **2 TOTEM 25**

for **space heating, pools and domestic hot water**

annual savings **57,600 €**



Hotel

solution adopted **1 TOTEM 25**

for **space heating and domestic hot water**

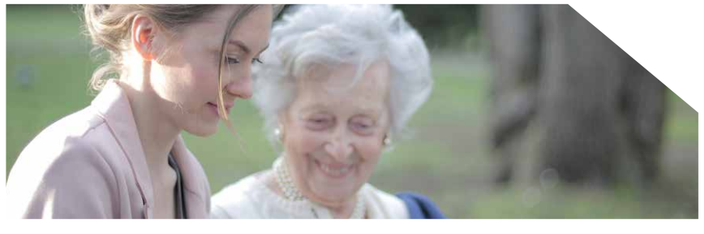
annual savings **21,800 €**

Rehabilitation Center

solution adopted **1 TOTEM 25**

for **space heating, pools, rehabilitation**

annual savings **26,800 €**



Nursing home

solution adopted **2 TOTEM 25**

for **space heating and domestic hot water**

annual savings **52,800 €**

Condominium

solution adopted **1 TOTEM 12**

for **space heating and domestic hot water**

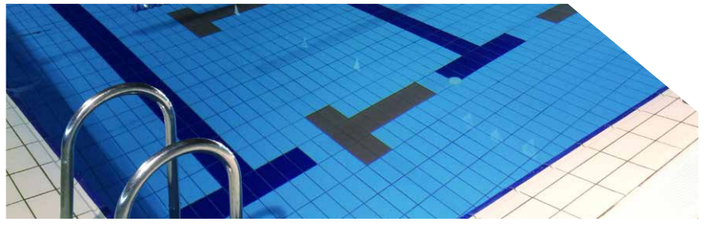
annual savings **12,300 €**

Agribusiness

solution adopted **2 TOTEM 20**

for **space heating and hot water for production processes**

annual savings **38,000 €**



Swimming pool

solution adopted **1 TOTEM 25**

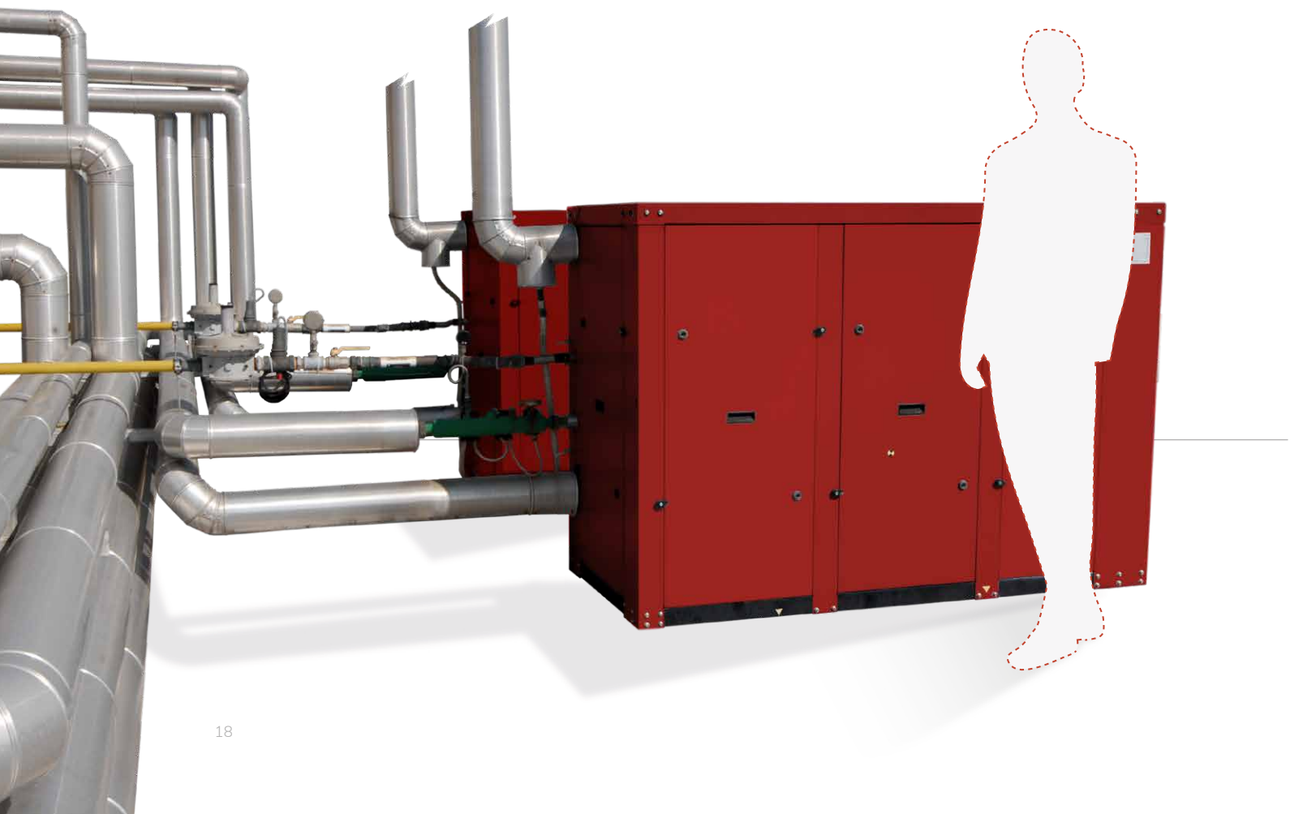
for **semi-olympic pool, children's pool, domestic hot water**

annual savings **22,100 €**

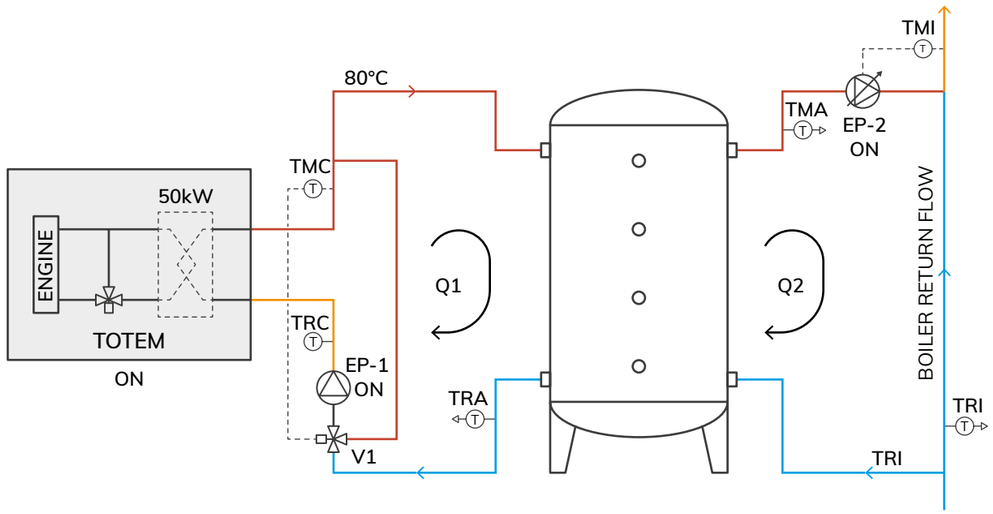
Easy installation

Connect it to the existing thermal system

TOTEM micro-cogeneration units can be easily integrated into existing thermal systems without requiring substantial changes. The hydraulic connections are very similar to those of a boiler. The electrical connections are very similar to those of a photovoltaic system.



TOTEM micro-cogeneration systems produce electricity when there is a simultaneous demand for thermal energy. The installation of a thermal accumulator (puffer), sized according to the power of the micro-cogeneration unit, allows the system to store thermal energy even when it is not required, to increase its inertia.



TMC	TOTEM outlet temperature
TRC	TOTEM return temperature
TMI	System outlet temperature
TRI	System return temperature

TMA	Puffer outlet temperature
TRA	Puffer return temperature
EP-1 EP-2	Pumps
V1	3-way valve

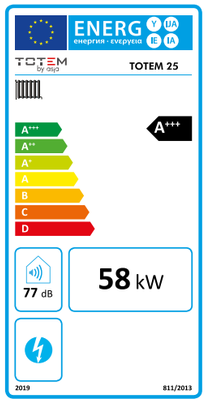
Certified quality

Micro-CHP manufacturer ASJA AMBIENTE ITALIA (ISO 9001- BS OHSAS 18001 - ISO 14001 certified) carries out proof tests on each TOTEM produced.

TOTEM micro-cogeneration systems' performances are measured by the Micro-cogeneration laboratory of Politecnico di Milano and certified by a certification body that attests also the compliance with relevant legislation.

A+++

TOTEM micro-cogeneration systems conform to the strict energy efficiency requirements set by Delegated Regulation EU 811/2013 (energy labelling).



Remote control and maintenance

Energy efficiency remote control and monitoring

TOTEM micro-cogeneration units are equipped with an innovative Cloud platform that allows real-time monitoring of the system's performances from any Internet-enabled device (laptop, tablet, smartphone) or connecting to the machine's hotspot.

It is thus possible to keep under control, at any time and from any place, all the process parameters of the TOTEM.

Full-Service solution

TOTEM offers a full service formula that includes the mainteinance service (both preventive and extraordinary maintenance) by qualified technicians and the provision of spare parts.

This solution, that lasts 30.000 hours or 5 years and is renewable, is based on a hourly rate.

Maintenance is performed by TOTEM technicians and our specialized partners who offers specialized assistance with wide geographical coverage.

TOTEM 10

Datasheet

POWER @ data recorded at the rated electric power and water inlet of 70°C unless specified; methane @ 20mbar, the data related to LHV= 10.2 kWh/Nm³; air inlet @ 25°C and 101.3 kPa		
Rated electric power	kW	10.0
Self-consumption	kW	0.195
Power modulation range*	kW	≥ 5
Rated thermal power	kW	21.6 (25.2**)
Net electrical efficiency	%	29.6
Total efficiency	%	93.6 (104.3**)
Seasonal space heating energy efficiency***	%	200
Fuel		metano
Fuel consumption	Nm³/h	3.31
Input power	kW	33.7

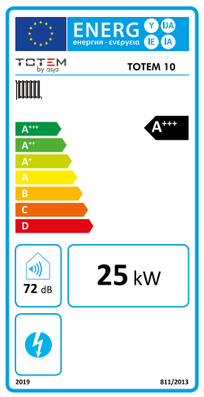
DIMENSIONS AND WEIGHT		
h x w x l (rigged up with panels - standard version)	cm	128 x 79.5 x 192
Weight (fluid-filled)	kg	720

HYDRAULIC CIRCUIT		
Inlet water temperature range	°C	15÷70
Outlet water temperature range	°C	25÷80
Rated water flow	l/h	2,500
Maximum pressure drop	kPa	60
Maximum exhaust gas temperature	°C	<90
Condensate	kg/h	0 (1.37 **)

ELECTRIC GENERATOR		
Type		asynchronous three phase
Voltage/frequency	V/Hz	400/50
Engine starter		starter motor
Electrical generator connection		Delta
Poles		4
Insulation class		F
Efficiency class		IE3

WORKING CONDITIONS		
External air temperature	°C	-5÷40
Relative humidity	%	0÷75
Acoustic impact Lp @ 1 m distance in open field	dB(A)	56.7
Emissions CO a 5% O_2	mg/Nm³	≤10
Emissions NOx a 5% O_2	mg/Nm³	≤10
Precautions to be taken during assembly, installation or service		refer to installation and user manual
Technical specifications tolerance		+/- 5%

*Subject to local grid connection technical requirements.
**Referred to the input water temperature 35°C.
***As defined by regulation EU No. 811/2013, EN 50465/2015.



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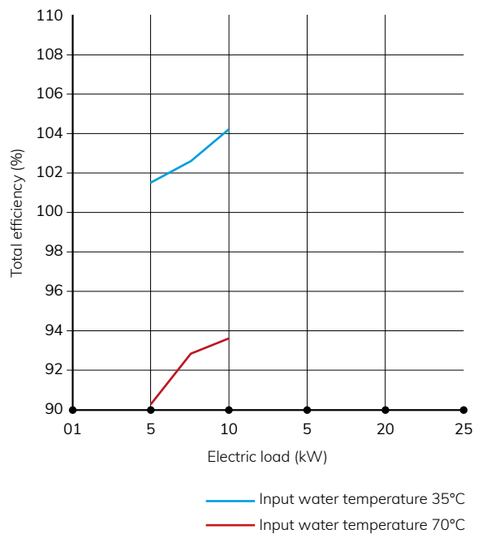
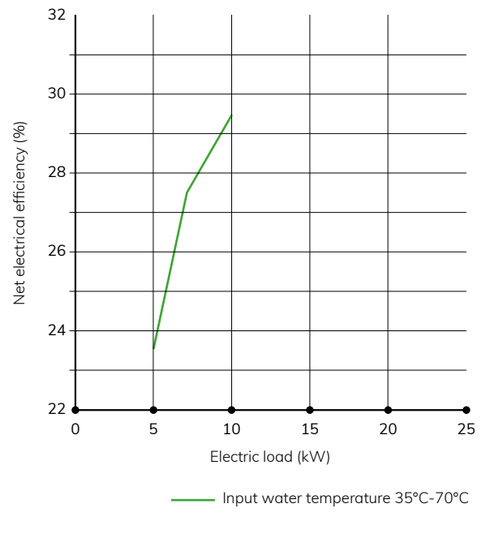
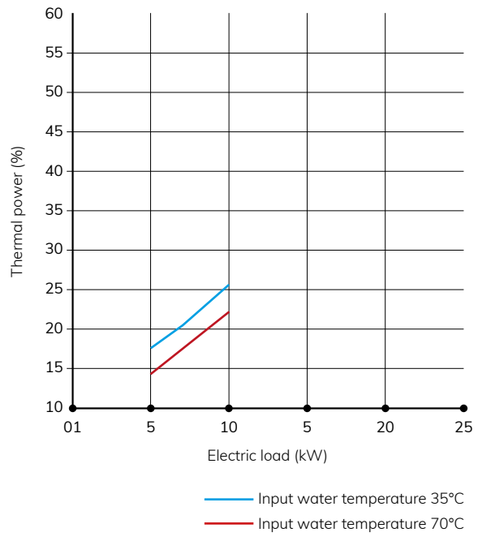
Total efficiency vs electric load



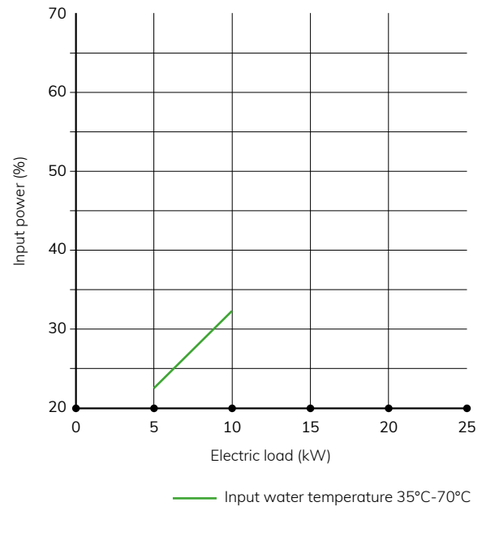
Net electrical efficiency vs electric load



Thermal power vs electric load



Input power vs electric load



TOTEM 12

Datasheet

POWER @ data recorded at the rated electric power and water inlet of 70°C unless specified; methane @ 20mbar, the data related to LHV= 10.2 kWh/Nm³; air inlet @ 25°C and 101.3 kPa		
Rated electric power	kW	12.0
Self-consumption	kW	0.195
Power modulation range*	kW	≥ 5
Rated thermal power	kW	25 (28.6**)
Net electrical efficiency	%	31.2
Total efficiency	%	96.3 (105.6**)
Seasonal space heating energy efficiency***	%	224
Fuel		metano
Fuel consumption	Nm³/h	3.77
Input power	kW	38.5

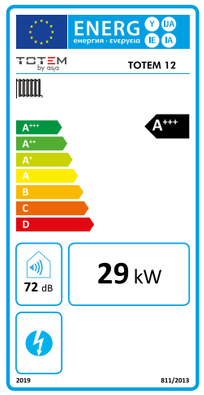
DIMENSIONS AND WEIGHT		
h x w x l (rigged up with panels - standard version)	cm	128 x 79.5 x 192
Weight (fluid-filled)	kg	720

HYDRAULIC CIRCUIT		
Inlet water temperature range	°C	15÷70
Outlet water temperature range	°C	25÷80
Rated water flow	l/h	3.000
Maximum pressure drop	kPa	60
Maximum exhaust gas temperature	°C	<90
Condensate	kg/h	0 (1.56**)

ELECTRIC GENERATOR		
Type		asynchronous three phase
Voltage/frequency	V/Hz	400/50
Engine starter		starter motor
Electrical generator connection		Delta
Poles		4
Insulation class		F
Efficiency class		IE3

WORKING CONDITIONS		
External air temperature	°C	-5÷40
Relative humidity	%	0÷75
Acoustic impact Lp @ 1 m distance in open field	dB(A)	56,7
Emissions CO a 5% O_2	mg/Nm³	≤10
Emissions NOx a 5% O_2	mg/Nm³	≤10
Precautions to be taken during assembly, installation or service		refer to installation and user manual
Technical specifications tolerance		+/- 5%

*Subject to local grid connection technical requirements.
**Referred to the input water temperature 35°C.
***As defined by regulation EU No. 811/2013, EN 50465/2015.



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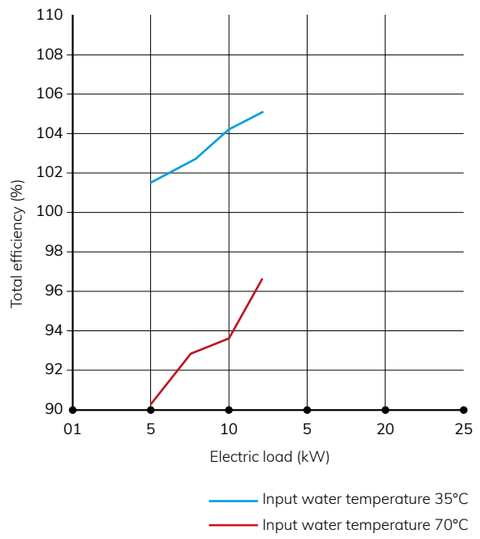
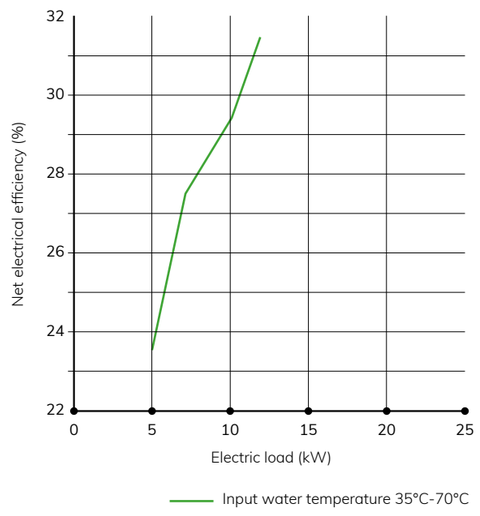
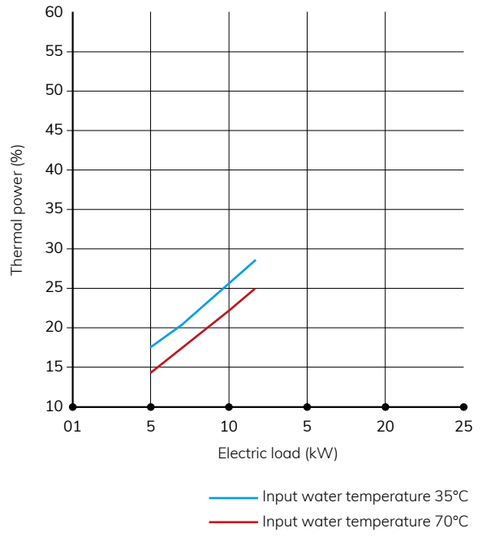
Total efficiency vs electric load



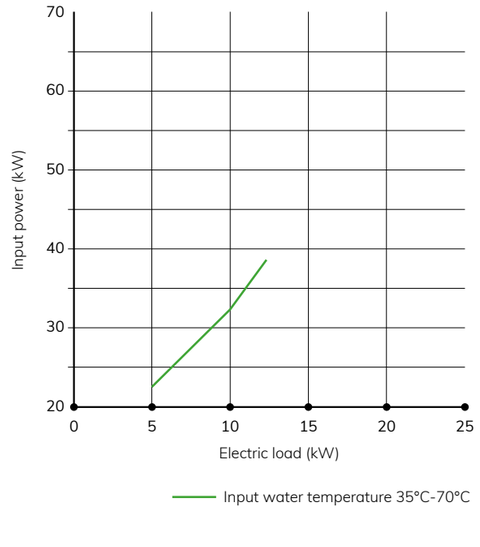
Net electrical efficiency vs electric load



Thermal power vs electric load



Input power vs electric load



TOTEM 20

Datasheet

POWER @ data recorded at the rated electric power and water inlet of 70°C unless specified; methane @ 20mbar, the data related to LHV= 10.2 kWh/Nm³; air inlet @ 25°C and 101.3 kPa		
Rated electric power	kW	20.0
Self-consumption	kW	0.205
Power modulation range*	kW	≥ 7.5
Rated thermal power	kW	41.9 (48.5**)
Net electrical efficiency	%	31.2
Total efficiency	%	96.5 (106.8**)
Seasonal space heating energy efficiency***	%	226
Fuel		metano
Fuel consumption	Nm³/h	6.28
Input power	kW	64.1

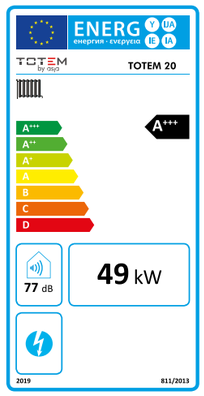
DIMENSIONS AND WEIGHT		
h x w x l (rigged up with panels - standard version)	cm	128 x 79.5 x 192
Weight (fluid-filled)	kg	780

HYDRAULIC CIRCUIT		
Inlet water temperature range	°C	15÷70
Outlet water temperature range	°C	25÷80
Rated water flow	l/h	4.000
Maximum pressure drop	kPa	60
Maximum exhaust gas temperature	°C	<90
Condensate	kg/h	0 (3.04**)

ELECTRIC GENERATOR		
Type		asynchronous three phase
Voltage/frequency	V/Hz	400/50
Engine starter		starter motor
Electrical generator connection		Delta
Poles		2
Insulation class		H
Efficiency class		IE3

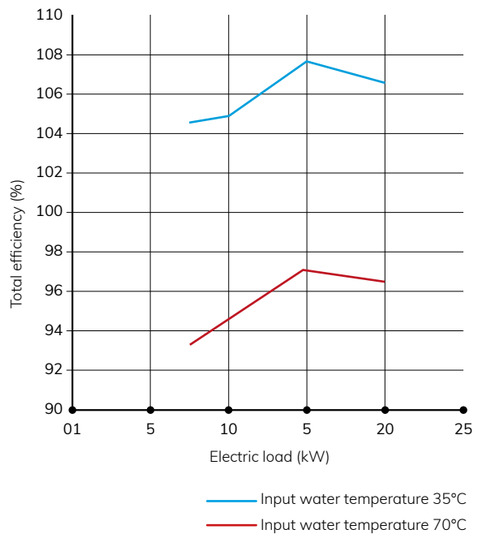
WORKING CONDITIONS		
External air temperature	°C	-5÷40
Relative humidity	%	0÷75
Acoustic impact Lp @ 1 m distance in open field	dB(A)	61.1
Emissions CO a 5% O_2	mg/Nm³	≤10
Emissions NOx a 5% O_2	mg/Nm³	≤10
Precautions to be taken during assembly, installation or service		refer to installation and user manual
Technical specifications tolerance		+/- 5%

*Subject to local grid connection technical requirements.
**Referred to the input water temperature 35°C.
***As defined by regulation EU No. 811/2013, EN 50465/2015.

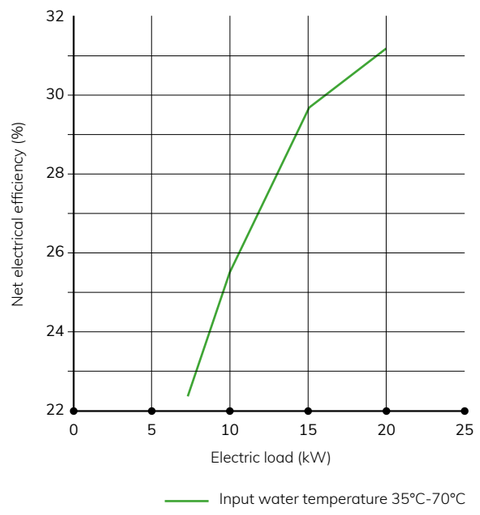


CE 1936-18 CE-1936CT0009

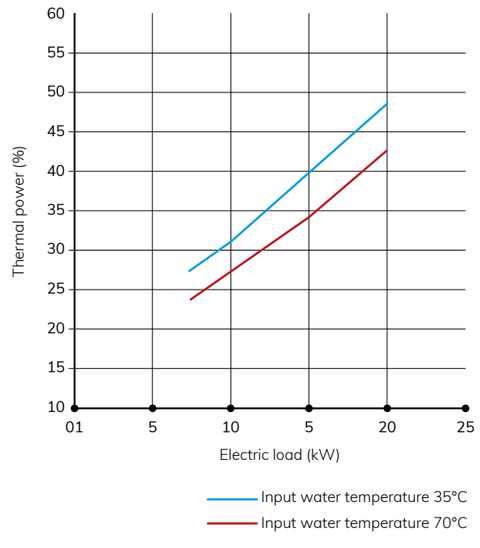
Total efficiency vs electric load



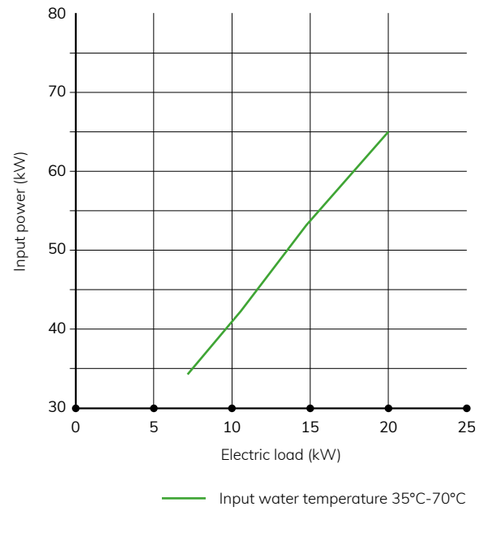
Net electrical efficiency vs electric load



Thermal power vs electric load



Input power vs electric load



TOTEM 25

Datasheet

POWER @ data recorded at the rated electric power and water inlet of 70°C unless specified; methane @ 20mbar, the data related to LHV= 10.2 kWh/Nm³; air inlet @ 25°C and 101.3 kPa

Rated electric power	kW	25.0
Self-consumption	kW	0.205
Power modulation range*	kW	≥ 7.5
Rated thermal power	kW	50.2 (57.6**)
Net electrical efficiency	%	32.5
Total efficiency	%	97.8 (107.4**)
Seasonal space heating energy efficiency***	%	251
Fuel		metano
Fuel consumption	Nm³/h	7.54
Input power	kW	76.9

DIMENSIONS AND WEIGHT

h x w x l (rigged up with panels - standard version)	cm	128 x 79.5 x 192
Weight (fluid-filled)	kg	780

HYDRAULIC CIRCUIT

Inlet water temperature range	°C	15÷70
Outlet water temperature range	°C	25÷80
Rated water flow	l/h	5.000
Maximum pressure drop	kPa	60
Maximum exhaust gas temperature	°C	<90
Condensate	kg/h	0 (3.14**)

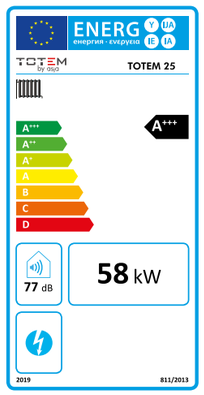
ELECTRIC GENERATOR

Type		asynchronous three phase
Voltage/frequency	V/Hz	400/50
Engine starter		starter motor
Electrical generator connection		Delta
Poles		2
Insulation class		H
Efficiency class		IE3

WORKING CONDITIONS

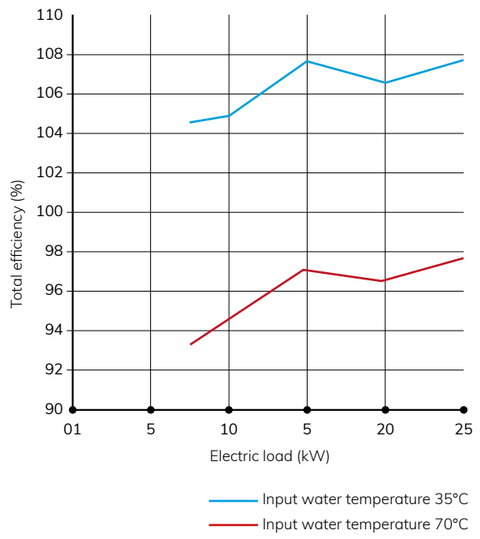
External air temperature	°C	-5÷40
Relative humidity	%	0÷75
Acoustic impact Lp @ 1 m distance in open field	dB(A)	61.1
Emissions CO a 5% O_2	mg/Nm³	≤10
Emissions NOx a 5% O_2	mg/Nm³	≤10
Precautions to be taken during assembly, installation or service		refer to installation and user manual
Technical specifications tolerance		+/- 5%

*Subject to local grid connection technical requirements.
**Referred to the input water temperature 35°C.
***As defined by regulation EU No. 811/2013, EN 50465/2015.

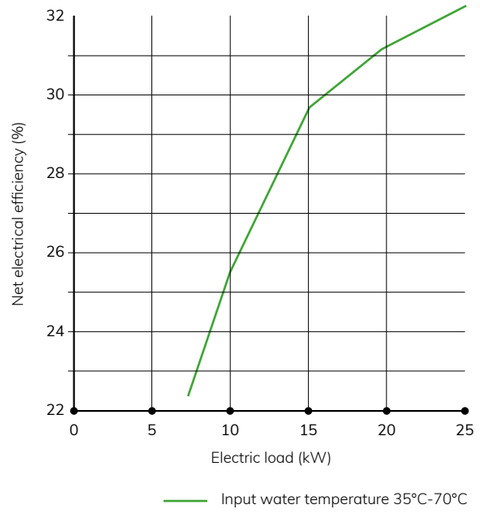


CE 1936-18 CE-1936CT0009

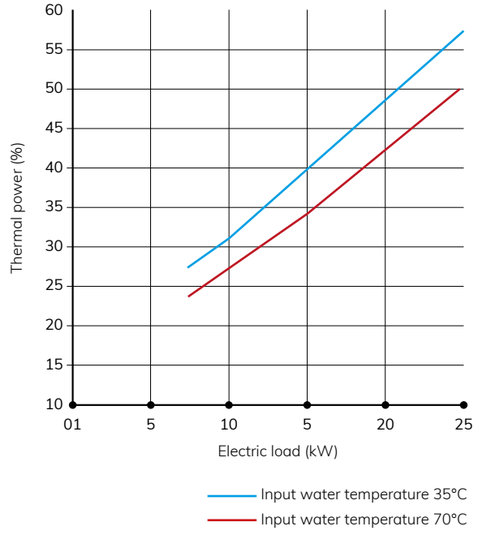
Total efficiency vs electric load



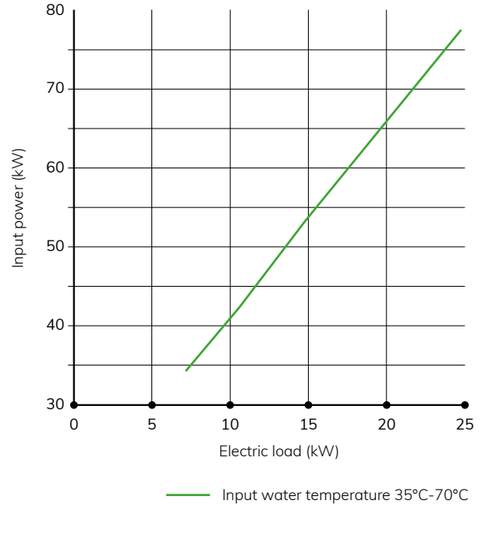
Net electrical efficiency vs electric load



Thermal power vs electric load



Input power vs electric load



PARTNER

TOTEM micro-cogeneration systems are designed and manufactured by Asja Ambiente Italia spa in Italy. Since 1995 Asja has been operating in the sector of renewable energy production and energy efficiency, contributing to the reduction of GHG emissions.

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