CHP Technical Data Sheet for

Quanto D1000 Natural Gas Containerised

Quanto Series

Power Therm

Standard Features

- High performance electrical efficiency
- Fully modulating output
- 3 packages – Open frame, Indoor Canopy, Outdoor Container
- Sophisticated web remote monitoring
- Digital engine management
- Long service intervals
- 27 month warranty
- Standby power options
- Low noise options

The Quanto series benefits from having MWM's high performance gas engines. Available to run on a variety of gas fuels. Multiple units can be run in synch, and high-end digital controllers make synchronising with the mains simple.

ELECTRICITY OUTPUT	THERMAL OUTPUT	ELECTRIC EFFICIENCY	THERMAL EFFICIENCY	TOTAL EFFICIENCY
999kWE	1041kWt	43.0%	44.8%	87.8%

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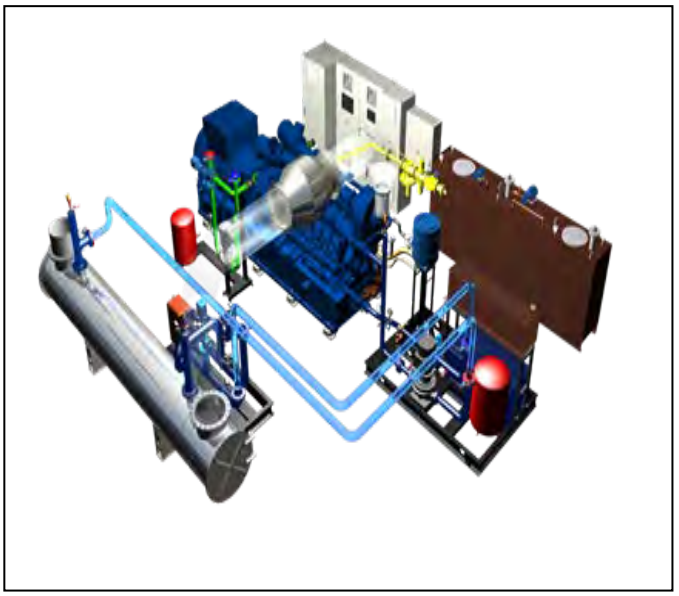
We provide dedicated services for CHP projects, ranging from design assistance, through project management, to commissioning and long-life support.

Tedom is a global CHP manufacturer with 600 employees. There are over 2,000 Tedom CHP units in service in over 35 countries worldwide.



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TEDOM

shentongroup

Quanto 1000, Natural Gas, Container

Basic Technical Data

nominal electrical output			**999**	kW
maximum heat output[1)]			1041	kW
load	50	75	100	%
maximum heat output	626	838	1041	kW
fuel input	1289	1803	2325	kW
electrical efficiency	38.8	41.6	43.0	%
heat efficiency	48.6	46.5	44.8	%
total efficiency (fuel utilization)	87.4	87.9	87.8	%
gas consumption	136	191	246	m^3/hr

The Basic Technical Data are applicable for the standard conditions pursuant to the "Technical instructions" document.
The minimum permanent electrical output must not drop below 50 % of the nominal output.
Gas consumption is expressed under the invoicing conditions (15°C, 101.325 kPa).
Gas consumption tolerance, or fuel input tolerance, at 100% load is +5%.
Tolerances of other parameters are mentioned in "Technical Instructions-Validity of Technical Data" document.
1) Maximum heat output is a sum of heat outputs of secondary circuit with exhaust gas cooled to 120°C and aftercooler circuit

Emissions

emissions [1)]	CO	NOx	
with 5% of O_2 in exhaust gases	300	500	mg/Nm^3

1) Mentioned emission values of NOx are possible to decrease down to 100mg/Nm^3 (an option).

Generator

type	MJB 450 LA4	
producer	MARELLI	
cos φ	0.8/1.0	
efficiency in the working point	97.3	%
voltage	400	V
frequency	50	Hz

Engine

type	TCG 2020 V12	
producer	MWM	
number of cylinders	12	
arrangement of cylinders	V	
bore × stroke	170/195	mm
displacement	53	dm^3
compression ratio	13.0 : 1	
speed	1500	rpm
nominal oil consumption	0.15	g/kWh
max. engine output	1027	kW

TCG2020V12 400V _NG_NON-NAB_999kW; 05.10.2016

Thermal System

Secondary Circuit

heat carrier	water	
circuit's heat output	1041	kW
nominal water temperature, input / output	70/90	°C
nominal temperature drop	20	°C
return water temperature, min / max	40/70	°C
nominal flow rate	750	l/min
max. working pressure	600	kPa
allowed operation over-pressure on connecting flanges [1)]	450	kPa
min. pressure in system	100	kPa
water volume in CHP unit circuit	150	dm^3
pressure reserve of pump for covering pressure losses outside container	50	kPa

1) highest allowed over-pressure created by connected system to secondary circuit in place of connecting flanges.

Primary Circuit

heat carrier	water + ethylene glycol	
ethylene glycol's concentration	35	%
circuit's heat output	1041	kW
max. working pressure	300	kPa
water volume in CHP unit circuit	1500	dm^3

Aftercooler Circuit [1)]

heat carrier	water + ethylene glycol	
ethylene glycol's concentration	35	%
circuit's heat output	67	kW
coolant temperature (outlet from CHP unit – informative)	52.0	°C
coolant temperature (inlet into CHP unit) max	50.0	°C
nominal flow rate	666	l/min
max. working pressure	300	kPa
water volume in CHP unit circuit	225	dm^3

1) Parameters are valid if the dry cooler (optional) is part of delivery

Fuel, Gas Inlet

low heat value	34	MJ/m^3
min. methane number	80	
gas pressure	8 - 15	kPa
max. pressure change under varying consumption	10	%
max. gas temperature	35	°C

Combustion and Ventilation Air

unused heat removed by the ventilation air	68	kW
amount of combustion air	4096	Nm^3/hr
outdoor air temperature, min / max	-20/35	°C
max. air temperature at the outlet flange	50	°C

Exhaust Gas and Condensate Outlet

amount of exhaust gases	4238	Nm^3/hr
exhaust gas temperature, nominal / max	120/150	°C
max. back-pressure of exhaust gases downstream the CHP unit flange	10	mbar
speed of exhaust gases at the outlet (DN 400)	13.5	m/s

Lubricant Charges

amount of lubrication oil in the engine	205	dm^3
volume of engine additional oil tank	510	dm^3
replenishment oil tank volume	800	dm^3

Noise Parameters

CHP unit in 10 m from container	78	dB(A)

Electrical Parameters

nominal voltage	230/400	V
nominal frequency	50	Hz
power factor[1)]	0.87	
nominal current at cos φ=0.8	1802	A
generator circuit breaker	NW25 H1 3P	
short-circuit resistance of switchboard R1	40	kA
short-circuit resistance of switchboards R2, R3, R4 and R5	10	kA
contribution of the actual source to the short-circuit current	< 20	kA
protection of power switchboard R1 closed/open	IP 31/00	
protection of control switchboard R2 closed/open	IP 31/00	
protection of frequency changers' switchboard R3 closed/open	IP 31/00	
protection of engine switchboard R4 closed/open	IP 31/00	
protection of cooling switchboard R5 closed/open	IP 66/00	
recommended superior protection	2250	A
recommended connection cable [2)] (l< 50m, at t<35°C)	5×NYY (3×240+120)	

1) Power factor adjustable from 0,87C ÷ 1 ÷ 0,87L (range from 0.87C ÷ 1 must be verified according to the various types of generators).
L = inductive load - overexcited
C = capacitive load - underexcited
Operation of the generator with a power factor of less than 0.95 causes a power limitation sets the following table:

power factor [-]	1	0.95	0.87
output [% Pnom]	100	100	98

2) The stated cables are for information only. A check calculation for temperature rise and voltage drop must be made according to the actual length, placement and type of the cable (maximum allowed voltage drop is 10 V)

Colour Version

engine and generator, internal parts of unit	RAL 5010 (blue)
container	RAL 5013 (blue)

Unit Dimensions and Weights

total length	14500	mm
width total / transport	6000 / 3000	mm
height total / transport	10000 / 3000	mm
service weight of the entire CHP unit	37230	kg

Caution

Manufacturer reserves the right to alter this document and the linked source materials.

General Description of CHP Unit

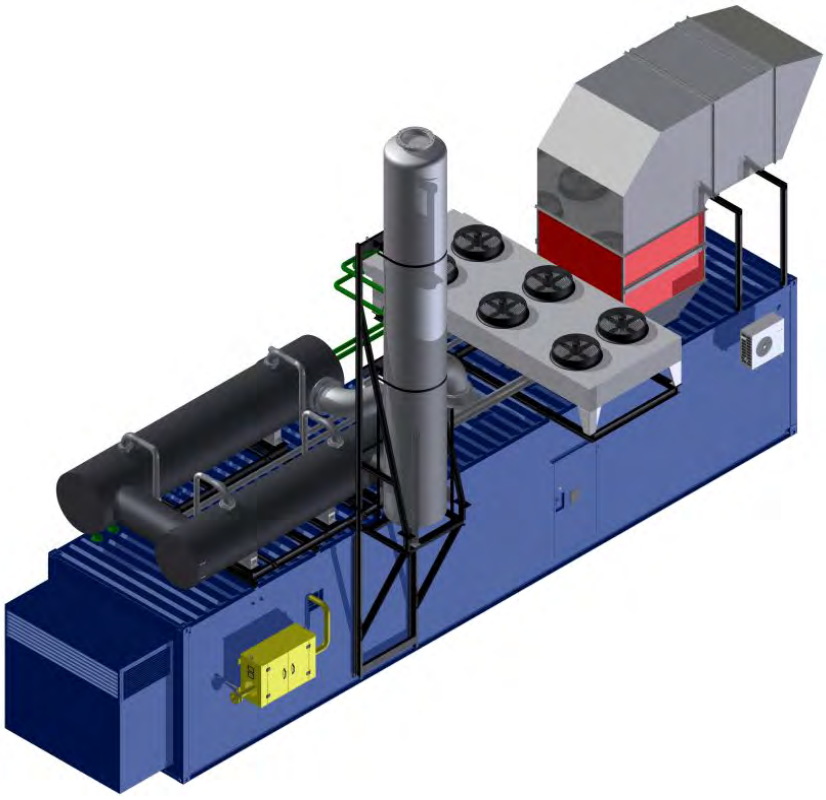
The Quanto D series TEDOM Combined Heat and Power Generation Units (hereinafter CHP units) are the high-performance machines within a range from 400 to 2000kWel, in which industrial engines of renowned producers are used. . The block arrangement of these units contains the motor-generator set, complete heat installation of the CHP unit, including the exhaust silencer and the power switchboard with the control part and the power part. CHP units are equipped with the synchronous generators. CHP unit is intended to be operated on the gas fuels. CHP unit is in container version, which is intended for the outdoor operation. You will find specific parameters of individual Quanto D400 to D2000 output series CHP units in relevant Datasheets.

version	container
power series	Quanto: D400, D600, D800, D1200, D1600, D2000
fuel	natural gas, biogas

Advantages of TEDOM CHP unit

- automatic air-fuel ratio control – the way to cut down emissions belongs to the standard equipment of CHP unit
- CHP unit forms an easily attachable compact whole
- application of the container assures a low noise of CHP unit and it protects CHP unit from the external influences
- possibility to adapt to various temperature drops of the heating systems
- owing to the modular arrangement of the control system, the number of binary and analogue inputs to monitor and control the follow-up plants can be extended easily
- the basic signals for the CHP unit control (external emergency stop, external activation) can be connected to the customer's terminal box
- TEDOM CHP units are unceasingly innovated on the basis of the knowledge from the already realized job orders

As enacted by the Notified Body 1015*, the " E-30-01001-10“ Certificate was issued to confirm the compliance of the Quanto series products with the requirements of Directive 2009/142/EC (Government Decree No. 22/2003 Coll.). TEDOM is also the holder of the QMS and EMS Quality Management Certificates. On the basis of the tests performed on the control switchboard, the Electro-technical Testing Institute, Certification Body No. 3018, accredited by the Czech Accreditation Institute, Public Service Company, granted Certificate according to ČSN EN 45011. Among others, the product is certified for EAC states and Ukraine.
** Machinery Testing Institute in Brno*



Illustrative picture

Thermal System

In terms of the heat output extraction, the CHP unit's heat system is formed by secondary and aftercooler circuit. The maximum heat output of the unit is a sum of the heat outputs of both circuits when they are utilized to their full capacity.

Secondary circuit

It represents a circuit which is used to deliver the main heat output of CHP unit to the heating system. Secondary circuit transfers heat output from primary circuit's plate exchanger and from exhaust gas exchanger. Observance of the maximum permissible return water temperature is an absolute prerequisite for the CHP unit to operate flawlessly. Parts of the secondary circuit located outdoors (interconnection pipe) must be protected in convenient manner against freezing (insulation, temperature treatment, etc.). The circuit is equipped with circulating pump.

The heating water to charge the hydraulic circuits must be treated; its composition must correspond to the "Technical instructions".

Primary circuit

It represents inner enclosed pressure circuit that takes off the heat from engine jacket water and exhaust gas exchanger to pass it into the secondary circuit. If utilization of the circuit's heat output is undesirable, it must be wasted in the dry cooler which can be delivered as the option.
If the dry cooler is in the supply it is installed on the container roof (this is valid only for Quanto D400 - 1200).

Aftercooler circuit

It represents the filling mixture cooling circuit. . The chilling level of the heat output from this circuit influences immediately the attainment of the basic technical data. The circuit is equipped circulating pump.

If the aftercooler circuit's heat power is not utilized it must be wasted in the dry cooler which can be delivered as the option.
If the dry cooler is in the supply it is installed on the container roof.

Fuel, Gas Inlet

T CHP units can be operated on natural gas, biogas, landfill gas (the fuels can be further modified as agreed upon with the Technical Office. The limit parameters of biogas and other fuels that limit their fitness for use are given in the "Technical instructions" document. Before gas inlet into inside gas train, there is a gas box on outside container wall, which includes gas filter and safety quick-closing valve. Engine-generator gas train is formed acc to TPG 811 01 and contains ball valve, gas filter and set of two independent quick-closing electromagnetic valves with de-aeration of spacer for gas inlet closure at unit stop, zero regulator of gas pressure and expansion joint for connection to mixer. For correct CHP unit operation is required connection gas piping with corresponding diameter with corresponding accumulative volume (preventing before gas pressure decrease in period of jump gas off-take), ended by hand gas closing and equipped by pressure gauge. Next is necessary to connect outlet of electromagnetic valves spacer de-aeration with de-aeration pipe.

Combustion and Ventilation Air

Non-usable heat (radiated from hot parts of the CHP unit) is removed from unit by ventilation air, which enters into CHP unit via ducts in a front side of container. Air goes through the inner space diagonally and leaves it through ventilation silencer in an opposite side of container. Flow of ventilation air is secured by fan inside container.

Exhaust Gas and Condensate Outlet

Exhaust gas outlet from CHP unit is ended by outlet into free space. It is possible to lead the exhaust gas (acc to need) into chimney by exhaust gas line or it can leaves directly into outdoor environment.

Noise Parameters

Noise parameters indicate the acoustic pressure level measured in a free acoustic field. The measuring point determination and the evaluation method both comply with ČSN 09 0862, ČSN EN ISO 3746. The noise may contain a tone component.

Power Switchboard

Electrical part of CHP unit is placed in three separate iron-plate switchboard cabinets (R1, R2 and R3), in switchboard of engine control (R4) and in switchboard of cooling (R5) if needed

Switchboard K01, K02 (HV) contains:

- generator circuit breaker, which protects generator and part of power line against over-current and works like contacting component for synchronizing generator to mains.
- current measuring transformers
- voltage measuring transformers
- electrometers are fitted here if required

Switchboard R2 (control) contains:

- central part of control system, eventually extension modules
- control panel of TEM-EVO engine control system and extension I/O modules
- protecting and switching components
- controlling components for maintenance purposes
- power supply 24VDC
- terminals for connecting of analogous sensors, binary switches, controlled devices, remote communication etc.
- X4 customer terminal

Switchboard R3 contains:

- frequency changers based on needs (aftercooler circuit fans, emergency cooling fans)

Switchboard R4 contains:

- engine control system TEM-EVO

Switchboard R5 contains:

- controlling and starting components for aftercooler and emergency cooling fans

Control system

Control of the unit provides control system ProCon Sight, which allows fully automated operation. It is multiprocessor modular system, consisting from control unit, display unit and extension modules with analogous and binary inputs and outputs.

Display unit

Thanks to colour display with high resolution, context and navigation buttons provides this display unit easy accessibility of all data about gen-set, measured values and time trends of these values. ProCon Sight display unit can contain up to seven languages, one of them can be graphical (e.g. Chinese, Korean).

Main features of display unit:

- large 8“ colour TFT display with resolution of 800 x 600 pixels
- simpler, faster and more intuitive control by context buttons
- continuous display of status bar
- TRENDS monitoring screen of selected values - diagrams
- clear history display
- Windows CE operating system

Display unit of TEM EVO control system

Main features of display unit:

- large 15" colour TFT display
- simpler, faster and more intuitive control by context buttons
- continuous display of status bar
- TRENDS monitoring screen of selected values - diagrams

Measured values

Control system measures and evaluates following values.

Electrical values:

- 3×generator voltage
- 3×generator current
- 3×mains voltage

Listed electrical values are used for:

- mains parameters evaluating
- automatic synchronization of generator to mains
- calculations and evaluation of needed electrical values

Technological values:

CHP unit is equipped with set of analogous and binary sensors for monitoring of all needed processes to optimize them. Optimization is performed by appropriate self-consumption outputs.

Ways of control

Local:

- by buttons located on control system or on display unit

Remote (at request):

- by voltage-free contacts (external timer, superior control system etc.)
- according object consumption level or to requested power level
- from local or remote PC
- via SMS messaging

Regulation according to object consumption (at request):

- information about object consumption is provided to controller by power transducer, which evaluates direction and quantity of import /export from/to mains

Regulation to required power (at request):

- by analogous signal – e.g. 0/4÷20mA
- via data communication – e.g. protocol MODBUS-RTU

Gen-set operation monitoring

From local PC – connection possibilities:

- RS232
- RS485
- USB

From remote PC – connection possibilities:

- analogous modem
- GSM modem
- internet

Via SMS messaging

Linked Source Materials

- Datasheet
- dimensional drawing
- diagram
- offered accessories for CHP unit at request (options)
- generally binding source materials according to the "Technical instructions" document

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