



CHP Technical Data Sheet for T100 Natural Gas Containerised Cento Series



Power Therm



Standard Features

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

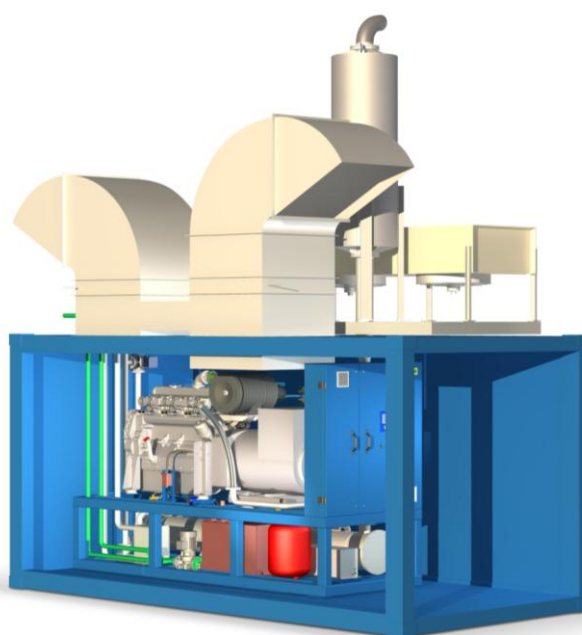
The Cento series benefits from having Tedom's own built in-house high performance gas engines. Available to run on a variety of gas fuels. Multiple units can be run in synch, and high-end digital controllers make synchronising with the mains simple.

ELECTRICITY OUTPUT	THERMAL OUTPUT	ELECTRIC EFFICIENCY	THERMAL EFFICIENCY	TOTAL EFFICIENCY
104 kWe	142 kWt	36.9 %	50.5 %	87.4 %

shentonggroup has the exclusive distributorship for Tedom products in the UK, Ireland and Channel Islands.

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.



Cento Series Features

The TEDOM Cento series of CHP units are machines of medium outputs, using gas engines, which originate from automotive engines. They form the performance series within a range of outputs from 80 to 200 kW. The CHP unit’s arrangement is in container design, which contains engine-generator set, complete heat installation, plus an exhaust silencer, and electric switchboard with power and control parts. It is intended for biogas operation, and for outdoor installation.

TEDOM CHP Unit Merits:

- Automatic air-fuel ratio control - this method of reducing emissions is in the standard supply of CHP unit.
- CHP units are fitted with BOSCH engine-management which optimises engine operation.
- CHP units form easily connect-able compact complex.
- By use of containerised enclosure, CHP units are characterized by low noise output and are protected against external conditions.
- Ability to adapt to different temperature gradients of heating systems.
- Due to modular conception of control system, the number of binary and analogue inlets for monitoring and controlling following devices can be extended easily.
- Basic signals for CHP unit control (external emergency stop, external start, etc) can be connected to the customer’s terminal box.
- Units are functionally tested for operation in production plant.
- TEDOM CHP units are continuously innovated from the knowledge of previous projects.

By decision of Notified Body 1015*, certificate ‘E-30-01048-10’ was issued, to confirm the compliance of the Cento series with the requirements of Directive 2009/142/EC (Government Regulation No. 22/2003 Coll.). TEDOM is also the holder of QMS and EMS Quality Management Certificates. In terms of tests performed on the control switchboard, the Electrotechnical Testing Institute (Certification Body No. 3018, accredited by Czech Accreditation Institute) granted certificate according to ČSN EN 45011. Amongst others, the product is also certified for Russia, Ukraine and White Russia.

* Machinery Testing Institute, Brno, Czech Republic.

Design	Containerised
Operation	SP - synchronous, parallel with mains
Fuel	Natural gas

Basic Technical Data

Nominal electric output	104	kW		
Maximum heat output	142	kW		
Load	50	75	100	%
Heat output	95	118	142	kW
Fuel input	168	225	282	kW
Electrical efficiency	31.0	34.7	36.9	%
Heat efficiency	56.5	52.7	50.5	%
Total efficiency (fuel use)	87.5	87.4	87.4	%
Fuel consumption	17.7	23.8	29.8	m ³ /h

Basic technical data above is valid for standard conditions according to the ‘Guarantee Conditions’ document.

The minimum permanent electric output is 50% of nominal output.

Gas consumption is expressed under standard conditions (15°C, 101,325 kPa).

Emissions

Emissions	CO	NOx
At 5% O ₂ in exhaust gas	650 mg/Nm ³	500 mg/Nm ³
With oxidative catalyst	300 mg/Nm ³	500 mg/Nm ³

Generator

Source of electric energy is synchronous generator with basic parameters according to the following table:

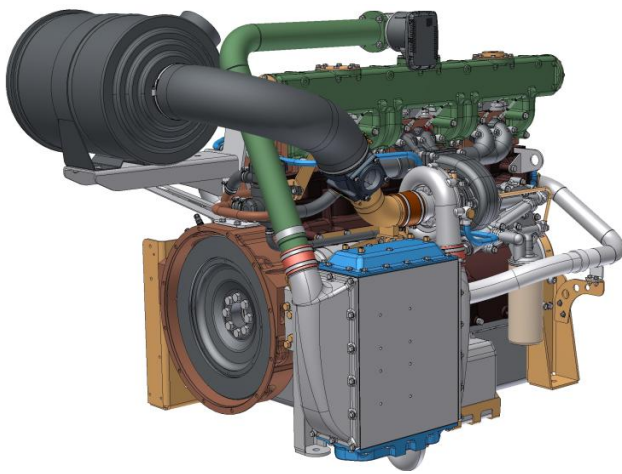
Cos φ	1.0
Efficiency in working point	94.6 %
Voltage	400 V
Frequency	50 Hz

Engine

CHP unit is driven by gas combustion engine TG 110 G5V TX 86, product of TEDOM.

Number of cylinders	6
Arrangement of cylinders	In Series
Bore × stroke	130 × 150 mm
Displacement	11946 cm ³
Compression ratio	12 : 1
Speed	1500 rpm
Oil consumption normal / maximum	0.3 / 0.5 g/kWh
Maximum output of engine	110.4 kW

TG 110 G5V TX 86_850; Revision C: 10.1.2013



Illustrative Picture

Thermal System

In terms of heat output extraction, the CHP unit’s heat output is generated by the secondary circuit.

Secondary Circuit:

This circuit is used to deliver the main heat output of the CHP unit to the heating system. Observance of the maximum permissible return water temperature is essential for trouble-free operation of the unit. Parts of the secondary circuit located outdoors (interconnecting pipe) must be protected against freezing (insulation, temperature treatment etc). The circuit is not equipped with circulating pump.

Heat carrier	Water
Heat output of circuit	142 kW
Nominal water temperature inlet / outlet	70 / 90 °C
Temperature of return water min / max	40 / 70 °C
Nominal flow rate	102 l/min
Maximum working pressure	600 kPa
Water volume in CHP unit circuit	30 dm ³
Pressure loss at nominal flow rate	25 kPa
Nominal temperature drop	20 °C

Primary Circuit:

This is the internal closed pressure circuit, which takes heat from engine water jacket and exhaust gases and passes it into the secondary circuit. If this circuit’s thermal output cannot be removed in marginal modes of operation, this output or its part can be removed by cooling unit for emergency cooling, which can be also supplied.

Heat output of circuit	142 kW
Maximum working pressure	250 kPa
Water volume in CHP unit circuit	200 dm ³

Fuel, Gas Inlet

Technical data mentioned in this specification is valid for natural gas with parameters given below:

Heat value	34 MJ/m ³
Minimum methane number	80
Gas pressure	5 -10 kPa
Maximum pressure change under varying consumption	10 %
Maximum gas temperature	30 °C

CHP units can be operated on natural gas, biogas, propane, landfill gas (the fuels can be further modified as agreed with the technical design department). The limit parameters of biogas and other fuels that limit their fitness for use are given in the ‘Guarantee Conditions’ document. The CHP unit’s gas route is constructed in conformity to TPG 811 01 and contains a set of two independent quick-closing electromagnetic valves to shut off the gas inlet when the CHP unit is turned off, gas pressure zero regulator and metal hose for connection to mixer. Gas filter is installed for biogas applications. Gas connection of suitable size with adequate accumulation volume is required for the correct operation of CHP unit, to avoid gas pressure decrease in distribution system at the moment of incremental gas off-take. This gas connection will be terminated by manual gas stop and fitted with a pressure gauge.

Combustion & Ventilation Air

The unusable heat (radiated from hot parts of the CHP unit) is removed from the container by forced air ventilation, which enters the unit by the fan in the inlet port on the container roof. Ventilation air leaves the container through the ceiling port in the opposite area.

Both Inlet and outlet openings of the ventilation system are fitted with rain protection canopies and the air-conditioning flap with servo-drive. Part of the air inside the container is separated from ventilation air and used as combustion air.

Electric heating elements are installed for temperature treatment of the container interior. These elements will allow temperature treatment during CHP unit shut-down in the heating season, to ensure the temperature inside the container doesn't fall below the minimum necessary to start the engine-generator.

Unusable heat removed by ventilation air	17 kW
Quantity of combustion air	472 Nm ³ /h
Quantity of ventilation air	7700 Nm ³ /h
Outdoor air temperature min / max	-20 / 35 °C

Exhaust Gas & Condensate Outlet

Combustion products exit from the CHP unit through the outlet exhaust conduit connected to exhaust silencer's outlet flange. Exhaust silencer is placed on the container roof. Exhaust gases can be removed as required into suitable stack through an exhaust conduit, or can leave directly into atmosphere. The linked exhaust conduit (if used) must be inclined offward the CHP unit.

Exhaust gas quantity	496 Nm ³ /h
Exhaust gas temperature nominal / maximum	120 / 150 °C
Maximum back-pressure behind CHP unit flange	10 mbar
Exhaust gas speed at outlet (DN 150)	11.2 m/s

Lubricants

Quantity of lubricating oil in engine	56 dm ³
Volume of replenishment oil tank	125 dm ³

Noise Parameters

Noise parameters indicate the acoustic pressure level measured in free field conditions. Determination of measuring point and method of evaluation comply with ČSN 09 0862 and ČSN EN ISO 3746.

CHP unit 10m from sound enclosure ⁽¹⁾	70 dB(A)
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⁽¹⁾ Noise related to engine-generator set and cooling units in operation.

⁽²⁾ The noise may contain a tone component with a frequency of 75 Hz.

Electrical Parameters

Nominal voltage	230 / 400 V
Nominal frequency	50 Hz
Power factor	0.8L - 0.8C
Nominal current at cos φ=0.8	188 A
Generator circuit breaker	NSX250B 3P
Short-circuit resistance of switchboard	20 kA
Contribution of the actual source to short-circuit current	< 2.0 kA
Power switchboard protection closed/opened	IP 31/00
Control switchboard protection closed/opened	IP 31/00
Recommended superior circuit breaker	200 A
Recommended connection cable** (length <50m, at temperature <35°C)	NYJ-J 3×95+50

** 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 cable (maximum allowed voltage drop is 10 V).

Switchboard Design

The electrical part of the CHP unit is located in sheet-steel switchboard that includes both the power and control parts.

Power Switchboard Contains:

- Generator circuit breaker, which protects generator and part of power line against over-current and short circuit.
- Generator contactor that is used as a switching component for synchronizing generator to mains.
- XV terminal for connecting the power cable.
- XG terminal for connecting the generator.
- Current measuring transformers.

Control Switchboard Contains:

- Central part of the control system, and any extension modules.
- Protecting and switching components.
- Controlling components for maintenance purposes.
- 24VDC power supply.
- Terminals for connecting analogue sensors, binary switches, controlled devices, remote communication etc.
- Customer terminal box.

Control System

Control of the CHP unit is enabled by ProCon Sight control system, which allows fully automated operation. It is a multi-processor modular system, consisting of the control unit, display unit and extension modules with analogue and binary inputs and outputs.

Due to colour display with high resolution, plus the context and navigation buttons, the display unit provides easy access to all data about gen-set, monitored values, and time trends of these values. ProCon Sight display unit can communication in up to seven languages, one of which can be graphical (e.g. Chinese, Korean).



Main Features of Display Unit:

- Large 8" colour TFT display with 800 × 600 pixel resolution.
- Easier and faster operation by using the context buttons.
- Permanently displayed status bar.
- Time history display of selected values - graphs.
- Clearer history display.
- Windows CE operating system.

Measured Values

The control system measures and evaluates following values:

Electrical Values:

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

Listed Electrical Values Are Used For:

- Evaluation of the mains parameters.
- Automatic synchronization of generator to mains.
- Calculations and evaluation of required electrical values.

Technological Values:

CHP unit is equipped with set of binary and analogue sensors that monitor all the necessary processes to optimize them. Optimization is performed by the relevant outputs in control of relevant applications.

Operation Methods

Local:

- By buttons located on the display unit.

Remote (on request):

- By voltage-free contacts (external timer, superior control system etc.)
- According to the required power level or building consumption level.
- From local or remote PC.
- Via SMS messaging.

Building Consumption Control (on request):

- The system obtains information on the building consumption from the converter which measures direction and size of the demand/supply from/to the mains.

Required Power Control (on request):

- By analogue signal - e.g. 0/4-20mA
- Via data path - e.g. MODBUS-RTU protocol.

Gen-set Operation Monitoring

From Local PC - Connection Possibilities:

- RS232
- RS485
- USB

From Remote PC - Connection Possibilities (on request):

- Analogue modem
- GSM modem
- Internet

Via SMS Messaging (on request)

Colour Design

Engine, generator and internal parts of unit	RAL 5015 (Blue)
Container	RAL 5013 (Blue)

Dimensions & Weight Information

Dimensions vary depending on optional extras included. Please see GA drawing for full details.

Length Total / Transport	5400 / 5000 mm
Width Total	2500 mm
Height Total / Transport	5900 / 2660 mm
Transport weight of CHP unit	6950 Kg
Transport weight of other parts	900 Kg
Operational weight of entire CHP unit	8265 Kg

Additional Documents

- Dimensional drawing of CHP: Cento T80-T120 Containerised GA Drawing_ R1262.
- P&ID: Cento T80 Containerised P&ID_S0497A.
- Generally binding source materials according to the 'Guarantee Conditions' document.

Delivery Range

Standard:

- Complete CHP unit in container.
- Separate exhaust silencer.

Out of Standard Range:

- Cooling unit for primary circuit emergency cooling.
- Oxidative catalyzer.
- Additional exhaust silencer.
- Condensate drain.
- Firestop automatic extinguishing system.
- Additional electrical refitting as required by customer - see 'Operation Methods' section.

Amendments

Due to our policy of continual improvement, we reserve the privilege to change this document and consequential documents without notice.