

CHP Technical Data Sheet for T100 ST Natural Gas Open Module 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
- Digital 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	166 kWt	34.7 %	55.3 %	90.0 %

shentongroup 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 100 ST, natural gas, open module
Basic Technical Data

nominal electrical output	104			kW
maximum heat output ¹⁾	166			kW
load	50	75	100	%
maximum heat output	112	139	166	kW
fuel input	182	241	300	kW
electrical efficiency	28.6	32.3	34.7	%
heat efficiency	61.5	57.7	55.3	%
total efficiency (fuel utilization)	90.1	90.0	90.0	%
gas consumption	19.2	25.6	31.7	m ³ /h

Technical data for additional exhaust gas exchanger²⁾

electric output	104			kW
maximum heat output	170			kW
fuel input	300			kW
electrical efficiency	34.7			%
heat efficiency	56.8			%
total efficiency (fuel utilization)	91.5			%
gas consumption at 100% output	31.7			m ³ /h
gas consumption at 75% output	25.6			m ³ /h
gas consumption at 50% output	19.2			m ³ /h

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

2) Heat output indicated is based on inlet water temperature 70°C into additional exhaust gas exchanger and exhaust gas cooled to 85°C.

Emissions

emissions ¹⁾	CO	NOx	
with 5% of O ₂ in exhaust gases	150	50	mg/Nm ³

Generator

used type	LSA 44.3 L10		
producer	LEROY SOMER		
cos φ	1.0		
efficiency in the working point	94.6	%	
voltage	400	V	
frequency	50	Hz	

Engine

type	TG 110 G5V NX 88		
producer	TEDOM		
combustion	stoichiometric		
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 / max.	0.3 / 0.5	g/kWh	
max. engine output	110.4	kW	

TG 110 G5V NX 88_850; revize B: 1.11.2016

Thermal System
Secondary circuit

heat carrier	water		
circuit's heat output	166	kW	
nominal water temperature, input / output	80/90	°C	
nominal temperature drop	10	°C	
return water temperature, min / max	40/70	°C	
nominal flow rate	240	l/min	
max. working pressure	600	kPa	
water volume in CHP unit circuit	10	dm ³	
pressure loss at the nominal flow rate	15	kPa	

Utilization of exhaust gas output for other purposes

heat output of exhaust gases (cooling to 120°C)	65	kW	
exhaust gas temperature	614	°C	

Primary circuit

circuit's heat output	166	kW	
max. working pressure	250	kPa	
water volume in CHP unit circuit	110	dm ³	



Fuel, Gas Inlet

low heat value	34	MJ/m ³
min. methane number	80	
gas pressure	2 - 10	kPa
max. pressure change under varying consumption	10	%
max. gas temperature	35	°C

Combustion and Ventilation Air

unused heat removed by the ventilation air	18	kW
aspirated air temperature, min / max	10/35	°C
amount of combustion air	310	Nm ³ /h

Exhaust Gas and Condensate Outlet

amount of exhaust gases	332	Nm ³ /h
exhaust gas temperature, nominal / max	120/150	°C
max. back-pressure of exhaust gases downstream the CHP unit flange ¹⁾	20	mbar
pressure loss of the freely delivered silencer	10	mbar
permissible pressure loss of the interconnecting exhaust piping	10	mbar
speed of exhaust gases at the outlet (DN 125)	10.8	m/s

1) Valid for standard version (without economizer)

Lubricant Charges

amount of lubrication oil in the engine	56	dm ³
replenishment oil tank volume	125	dm ³

Noise Parameters

CHP unit at 1m	93	dB(A)
exhaust gas outlet at 1m from the silencer flange ¹⁾	65	dB(A)

1) The noise parameter can be reduced by optimizing the exhaust silencer to the required acoustic pressure level or by applying the exhaust silencer beyond the standard range designed for 60 dB(A) at 1 m.

Electrical Parameters

nominal voltage	230/400	V
nominal frequency	50	Hz
power factor ¹⁾	0.8	
nominal current at cos φ=0.8	188	A
generator circuit breaker	NSX250B3P	
short-circuit resistance of switchboard	20	kA
contribution of the actual source to the short-circuit current	< 2	kA
protection of switchboard's power part closed/open	IP 31/00	
protection of switchboard's control part closed/open	IP 31/00	
recommended superior protection	225	A
recommended connection cable ²⁾ 2(length < 50m, at t < 35°C)	NY Y-J 3x120+70	

1) Power factor adjustable from 0,8C ÷ 1 ÷ 0,8L (range from 0.8C ÷ 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	0,8
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

base frame, engine, and generator	RAL 5015 (blue)
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Unit Dimensions and Weights ¹⁾

length, total	3 610	mm
width	1 160	mm
height, total	2 160	mm
service weight of the entire CHP unit	3 200	kg

1) approximate values

Caution

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



General Description of CHP Unit

The combined heat and power generation units (hereinafter CHP units) of TEDOM Cento T series are medium-power machines within a range from 80 to 200kWel. The block arrangement of these CHP units contains the motor-generator unit, heating installation and the control system that provides all the operational and safety functions. The delivery includes freely supplied exhaust silencer. CHP units are equipped with synchronous generators and power switchboards with the power part and the control part. CHP units are intended to be run on the gas fuels. CHP unit is in the open module version intended to be installed into the housed machine room. You will find specific parameters of individual Cento T80 to T200 power series CHP units in relevant Datasheets.

version	open module
power series	Cento: T80, T100, T120, T160, T180, T200
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 is alternatively fitted with the BOSCH Motor Management which optimizes the engine operation
- CHP unit forms an easily attachable compact whole
- if the sound enclosure is used, CHP unit shows low noise level
- possibility to adapt to various temperature drops of the heating systems
- owing to the modular arrangement of the control system, a large 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 orders

As enacted by the Notified Body 1015*, the "E-30-01048-10" Certificate was issued to confirm the compliance of the Cento 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 Electrotechnical 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 the EAC countries and Ukraine.

* Machinery Testing Institute in Brno



Illustrative picture

Thermal System

In terms of the heat power extraction, the CHP unit's heat power is generated:

by the secondary circuit for T80 – T120 CHP units

by the secondary and aftercooler circuit for T160 – T200 CHP units. The maximum heat power of the unit is a sum of the heat powers 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 power of CHP unit to the heating system. Secondary circuit takes the heat power from the primary circuit. Observance of the maximum permissible return water temperature is an absolute prerequisite for the CHP unit to operate flawlessly. The circuit is not equipped with circulating pump.

The heating water to charge the hydraulic circuits must be treated, its composition must correspond to the "Technical Instructions" document.

Primary Circuit

It represents inner enclosed pressure circuit that takes off the heat from engine, exhaust gases to pass it into the secondary circuit. If the circuit's heat power cannot be removed in the marginal operation modes, this power or its part can be removed through the dry cooler for the emergency cooling that can be supplied individually.

Aftercooler Circuit

(Cento T160 - 200 CHP units only) it represents the filling mixture cooling circuit. The utilization level of the heat power from this circuit and its cooling both influence immediately the attainment of the basic technical data. The circuit is equipped with circulating pump.

The aftercooler circuit's heat power can be used in the low-temperature circuits (hot domestic water pre-heating, heating of water in swimming pools or other engineering units). If this heat cannot be utilized if the attainment of permanent rated electrical power is required, it must be wasted in the outer dry cooler (water-air heat exchanger). This dry cooler can be supplied individually.

Fuel, Gas Inlet

CHP units can be operated on natural gas, biogas, propane, 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. The CHP unit's gas line is constructed in conformity with TPG 811 01 and it contains a set of two independent quick-acting electromagnetic valves to shut off the gas inlet when the CHP unit is turned off, the gas pressure zero regulator, and the metal hose for connection to the mixer. Gas filter is installed for the biogas applications. Gas fixture of suitable size with adequate accumulation volume is required for the correct operation of CHP unit to avoid gas pressure drop in the distribution system at the moment of incremental gas offtake. The gas fixture will be terminated with a manual gas stop and fitted with a pressure gauge.

Combustion and Ventilation Air

The unusable heat (radiated from the hot CHP unit's parts) is shared into the ambient air of the machine room. The air exchange in machine room must be dimensioned with regard to the local conditions of the machine room (size, thermal losses).

Exhaust Gas and Condensate Outlet

Exhaust gases are delivered from CHP unit to the CHP unit's outlet flange that is located in the upper part of CHP unit.

The delivery includes freely supplied exhaust silencer that shall be mounted into the exit exhaust conduit. This exhaust conduit must be tight from the CHP unit's flange to the stack flue. Exhaust conduit must be inclined offward the unit. Condensate is formed in exhaust conduits at the CHP unit's start or at the low temperature of input water into CHP unit. It is convenient to remove condensate through the condensate separator. The exhaust conduit material and its heat insulation in the machine room must resist to the temperatures that correspond to the exhaust gas temperature in relevant exhaust conduits.

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

The switchboard is a part of CHP unit's frame, the power and control part are placed in separated, individual areas and each of these areas has its own door.

The power part of the switchboard contains:

the generator circuit breaker that protects the generator and the supply line's segment from overcurrent and short circuit

generator contactor that is used as a switching element when generator is being phased to the mains

XV terminal box intended to connect the cable to deliver power

XG terminal box intended to connect the generator metering current transformers

The control part of the switchboard contains:

central part of the control system and, alternatively, its extension modules

protecting and tripping elements

controlling elements intended for service purposes

power supply for 24VDC appliances

terminal boxes for the connection of analogue sensors, binary switches, controlled appliances, remote communication, etc.

customer's terminal box

Control System

The ProCon Sight control system that ensures fully automatic operation of the machine set is used to control CHP unit. It is a multi-processor modular system which consists of the central part, display unit, and extension modules of the analogue and binary inputs and outputs.

Owing to the colour display with high resolution and the context and navigation buttons, the display unit offers easy access to all the data on a machine set, the monitored values, and the time histories of quantities. The display unit of ProCon Sight control system communicates in up to seven various languages one of which can be the graphic language (Chinese, Korean).

Features of the display unit:

- large 8" colour TFT display with 800 × 600 pixel resolution
- easier and faster operation using the context buttons
- permanently displayed status line
- display of time histories for the selected quantities – graphs
- clearer display of history
- Windows CE operating system



Measured Quantities

The control system measures and evaluates the following quantities.

Electrical values:

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

The stated electrical quantities are used for:

- evaluation of the mains parameters
- automatic phasing of generator to the mains,
- calculations and evaluations of the required electrical quantities

Technological values:

CHP unit is equipped with a set of binary and analogue sensors that monitor all the necessary processes aimed at their optimization which takes place through the relevant outputs in control of relevant applications.

Operation Methods

Local:

with the buttons on the display unit

Remote (on request):

- through voltage-free contact (register clock, mass remote control receiver, etc.)
- depending on the required power level or the building consumption level
- from the local or remote PC
- through the SMS messages

Building consumption control (on request):

the system obtains information on the building consumption from the converter that measures direction and size of the demand/supply from/to the mains

Required power control (on request):

- by the analogue signal – e.g. 0/4-20mA signal
- through data path – e.g. by means of MODBUS-RTU protocol

Machine Set Operation Monitoring

From the local PC – connection possibilities:

- RS232
- RS485
- USB

From the remote PC – connection possibilities (on request):

- analogue modem
- GSM modem
- Internet

Through SMS messages (on request)

Linked Source Materials

- Datasheet
- dimensional drawing
- diagram
- dimensional drawing of the silencer
- offered accessories to CHP unit on request (option)
- generally binding source materials according to the "Technical Instructions" document

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