CHP Technical Data Sheet for

T160 Natural Gas Open Module

Cento Series

Power Therm

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.

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

ELECTRICITY OUTPUT	THERMAL OUTPUT	ELECTRIC EFFICIENCY	THERMAL EFFICIENCY	TOTAL EFFICIENCY
164 kWe	209 kWt	37.8 %	48.1 %	85.9 %

shenton**group** 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.

t. +44 (0)844 888 444 5 **e.** info@shentongroup.co.uk **www.shentongroup.co.uk**
Shenton House, Walworth Road, Walworth Business Park, Andover, SP10 5LH

Basic Technical Data

nominal electrical output			164	kW
maximum heat output[1)]			209	kW
load	50	75	100	%
maximum heat output	108	159	209	kW
fuel input	247	343	434	kW
electrical efficiency	33.2	35.86	37.79	%
heat efficiency	43.32	46.28	48.16	%
total efficiency (fuel utilization)	76.52	82.14	85.95	%
gas consumption	26.1	36.3	45.9	m^3/h

Option

TA70 - Technical data for TA70
EKO - Technical data for additional exhaust gas exchanger

	TA70[2)]	EKO[3)]	
electric output	162	164	kW
maximum heat output	243	231	kW
fuel input	454	434	kW
electrical efficiency	35.6	37.8	%
heat efficiency	53.4	53.3	%
total efficiency (fuel utilization)	89.0	91.1	%
gas consumption at 100% output	48.1	45.9	m^3/h
gas consumption at 75% output	38.5	36.3	m^3/h
gas consumption at 50% output	28.9	26.1	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 and aftercooler circuit
2) It is the version out of the standard scope of delivery where water of a temperature of 70°C from the secondary circuit enters the intercooler's 2nd level.
3) Heat output indicated is based on inlet water temperature 70°C into additional exhaust gas exchanger and exhaust gas cooled to 85°C.Observance of Emission Limits

Emissions	CO	NOx	
with 5% of O_2 in exhaust gases	650	500	mg/Nm^3

Generator

used types	LSA 46.3 S5 LSA 46.2 L6	
producer	LEROY SOMER	
cos	1.0	
efficiency in the working point	95.1	%
voltage	400	V
frequency	50	Hz

Engine

used type	TG 170 G5V TW 86	
producer	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 / max.	0.3 / 0.5	g/kWh
max. engine output	173.2	kW

TG 170 G5V TW 86_850; revision F: 18.9.2013

Thermal System

Secondary circuit

heat carrier	water	
circuit's heat output	209	kW
nominal temperature drop	20	°C
return water temperature, min / max	40/70	°C
nominal flow rate	150	l/min
max. working pressure	600	kPa
water volume in CHP unit circuit	12	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)	123	kW
exhaust gas temperature	561	°C

Primary circuit

max. working pressure	250	kPa
water volume in CHP unit circuit	146	dm^3

Aftercooler circuit

heat carrier	water + ethylene glycol	
ethylene glycol's concentration	35	%
circuit's heat output	12	kW
max coolant temperature at the input	35	°C
nominal flow rate	90	l/min
pressure reserve at the nominal flow rate	60	kPa
max. working pressure	300	kPa
water volume in CHP unit circuit	15	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	22	kW
aspirated air temperature, min / max	10/35	°C
amount of combustion air	689	Nm^3/h

Exhaust Gas and Condensate Outlet

amount of exhaust gases	728	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 150)	16.5	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	94	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	296 (292 for TA 70)	A
generator circuit breaker	NSX400F 3P	
short-circuit resistance of switchboard	25	kA
contribution of the actual source to the short-circuit current	< 3	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	315	A
recommended connection cable [2)] (length< 50m, at t<35°C)	NYY-J 3×150+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)

Unit Dimensions and Weights

length, total	4000	mm
width	1500	mm
total height	2220	mm
service weight of the entire CHP unit	4555	kg

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

Caution

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