CHP Technical Data Sheet for

Cento 100 Natural Gas Indoor Canopy

COMBINED HEAT & POWER

Standard Features

- High reformance 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 some of the most high performance gas engines available. TEDOM's own experience of gas engine manufacturing in conjunction with other world leading gas engine manufacturers makes the Tedom Cento series of CHP engines one of the most efficient in its class. Available to run on a variety of gas fuels, multiple units can be synchronised to run together with intelligent digital controllers allowing parallel running with the mains.

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

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 leading global CHP manufacturer with more than 600 employees. There are over 2,000 TEDOM CHP units in service in over 35 countries.

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Basic Technical Data

nominal electrical output			104	kW
maximum heat output [1)]			142	kW
load	50	75	100	%
maximum 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 utilization)	87,5	87,4	87,4	%
gas consumption	17,7	23,8	29,8	m^3/h

Technical data for additional exhaust gas exchanger[2)]

electric output	104	kW
maximum heat output	149	kW
fuel input	282	kW
electrical efficiency	36,9	%
heat efficiency	52,9	%
total efficiency (fuel utilization)	89,8	%
gas consumption at 100% output	29,8	m^3/h
gas consumption at 75% output	23,8	m^3/h
gas consumption at 50% output	17,7	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°

Emissions

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

Engine

type	TG 110 G5V TX 86	
producer	TEDOM	
number of cylinders	6	
arrangement of cylinders	inline	
bore ´ stroke	130/150	mm
displacement	11946	cm^3
compression ratio	12 : 1	
speed	1500	min^{-1}
oil consumption, normal / max.	0,3/0,5	g/kWh
max. engine output	110.4	kW

E 3262 LE232 M18;NG;250NOx;25.07.2017

Generator

used types	LSA 44.3 L10	
producer	LEROY SOMER	
cos j	1,0	
efficiency in the working point	94.6	%
voltage	400	V
frequency	50	Hz

Thermal System

Secondary circuit

heat carrier	water	
circuit's heat output	142	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	102	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)	75	kW
exhaust gas temperature	513	°C

Primary circuit

circuit's heat output	142	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	17	kW
aspirated air temperature, min / max	10/35	°C
amount of combustion air	470	Nm^3/h
max. amount of ventilation air at the outlet flange	4430	m^3/h
max. air temperature at the outlet flange	50	°C
max. counter-pressure at the ventilation air outlet flange [1]	110	Pa
max. counter-pressure at the ventilation air outlet flange in Silent version [2]	90	Pa
max. counter-pressure at the ventilation air flanges in Super Silent version[2]	50	Pa

1) applies to standard noise parameters
2) Silent and Super Silent version is not included in the standard scope of delivery, but can be ordered as an option

Exhaust Gas and Condensate Outlet

amount of exhaust gases	496	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)	16.2	m/s

1) Valid for standard version without Economizer

Lubricant Charges

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

Noise Parameters

version:	standard	Silent[1]	Super Silent[1]	
sound enclosure of CHP unit at 1m	76	70	63	dB(A)
ventilation outlet of sound enclosure at 1m	84	74	64	dB(A)
exhaust gas outlet at 1m from the silencer flange [2]	65	65	60	dB(A)

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] (length< 50m, at t<35°C)	3× (NYY-J 3×120+70)	

power factor [-]	1	0,95	0,8
output [% Pnom]	100	100	98

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 .

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, generator	RAL 7035 (gray)
base frame	RAL 5015 (blue)
sound enclosure	RAL 5015 (blue)

Unit Dimensions and Weights*

length, total	3840	mm
width	1300	mm
total height	2100	mm
service weight of the entire CHP unit	3750	kg

*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 co-generation units (hereinafter CHP units) of TEDOM Cento series are medium-power machines. The block arrangement of these CHP units consists of the engine, alternator, heat recovery, 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 alternators. CHP units have a built-in switchboard to house the control equipment and power distribution equipment. CHP units are configured to run on gas fuels. CHP unit as an indoor canopy version is designed to be installed in a plant room environment.

Advantages of TEDOM CHP Unit

Version	Indoor Canopy
Power Range	Cento: 70, 80, 100, 120, 130, 160, 180, 200, 210, 260, 350, 430, 530
Fuel Type	Natural Gas

- Automatic air-fuel ratio control to cut down emissions.
- CHP is a compact self-contained unit.
- Acoustic enclosure for low noise break-out levels.
- Options to accommodate different Delta T temperatures of heating systems.
- Modular arrangement of the control system with a large number of binary and analogue inputs to monitor and control ancillary items of equipment.
- Output signals from the CHP unit control (external emergency stop, external activation, fire alarm, etc) can be connected to the customer's BMS system.
- TEDOM CHP units are subject to an ongoing improvement program based on feedback from installed units.

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.

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 160 - 530 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 parts) is removed from CHP unit through the forced ventilation system. Ventilation air enters CHP unit through the holes in the frame to exit in the face of the sound enclosure through the air supply system elbow. Air-pipe silencer that can be supplied can be attached to the ventilation air outlet flange. The flow of ventilation air is ensured by the fan.

Exhaust Gas and Condensate Outlet

Exhaust gases are delivered from the CHP unit to the outlet flange that is located on the sound enclosure's roof.
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

Switchboard is a part of the sound enclosure, the power part 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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