

Basic characteristic

CHP unit TEDOM series Cento is a machine of medium outputs, with using gas engines. It forms series of outputs in range from 40 to 300kW_{el}. Block arrangement of these units contains set of engine-generator, heat equipment, control and power switchboard. Exhaust silencer is freely delivered with CHP unit to individual installation into machine room exhaust gas line.

CHP unit acc to this document is intended for operation with natural gas, with synchronous generator for parallel operation with system 400V / 50Hz for warm-water circuits 90/70°C and satisfy emission limits NO_x ≤ 500mg/Nm³, CO ≤ 650mg/Nm³ (at 5% O₂ vol. in exhaust gas). CHP unit acc to this document is in configuration without noise enclosure, intended for installation to covered machine room.

Basic technical data

nominal electric output	160	kW
max. heat output	192	kW
fuel input	416	kW
efficiency electric	38,5	%
efficiency heat	46,2	%
efficiency total (fuel use)	84,7	%
fuel consumption at 100% of output	44,0	m ³ /h
fuel consumption at 75% of output	35,4	m ³ /h
fuel consumption at 50% of output	26,1	m ³ /h

Basic technical data are valid for standard conditions acc to document „Technical data validity“, heat output of secondary circuit is related to exhaust gas cooling on temperature 150°C.

Requested min. continuing electric output is 50% of nominal output.

Gas consumption is given for invoicing conditions (15°C, 101,325kPa)

Engine

CHP unit is driven by combustion engine TEDOM M1.2C, configuration TGE 1232W, product of company TEDOM s.r.o.

number of cylinders	6	compression ratio	11 : 1
cylinder arrangement	in row	operational speed	1500 min ⁻¹
bore x stroke	130 × 150 mm	oil consumption, normal/max	0,3/0,7 g/kWh
displacement	11940 cm ³	max. engine output	168 kW

Generator

Source of electric energy is 1-bearing, synchronous generator LSA 46.2 L6, product of company Leroy Somer, France, with parameters given below.

generator output	250/200	kVA/kW	voltage	400	V
power factor (cos fi)	0,8/1	-	frequency	50	Hz
efficiency in working point	95,2	%	nominal speed	1500	min ⁻¹
stator winding connection	to star		cover	IP 23	
max. operation temperature	40	°C			

Heat system

Heat system of CHP unit is created, from view of heat output take-off, by two independent circuits, secondary and technological. Maximal heat output of CHP unit is sum of heat outputs of both circuits at their full use.

a) secondary circuit - represents circuit by which is secured unit heat output (gained by cooling of combustion engine and exhaust gas) extraction to heating system. Normally the circuit works with temperatures of returning water from 50 to 70°C. Compliance of the highest temperature of 70°C is necessary for failure-free run of unit. Circuit isn't equipped with circulating pump.

Parameters of secondary circuit:

heat output of circuit	172	KW
nominal temperature of water inlet / outlet	70/90	°C
returning water temperature min / max	50/70	°C
nominal flow	2,1	kg/s
max. working pressure	600	kPa
water volume of circuit in CHP unit	60	l
pressure loss at nominal flow	40	kPa
nominal temperature gradient	20	K

For exhaust gas heat output usage to other purposes, exhaust gas parameters are given:

exhaust gas heat output (for cooling on 150°C)	80,0	kW
exhaust gas temperature	540	°C

If it isn't able in side operating regimes extract total circuit heat output, it is possible to drain the output, or its part, by cooling unit for emergency cooling. It is able to deliver the cooling unit separately.

b) technological circuit - represents circuit of filling mixture cooling. Level of heat output used from this circuit and its cooling immediately affect achievement of basic technical data. Circuit works with temperatures of returning water from 35 to 55°C. To the lowest temperature answers nominal electric output. With temperature increase the output decreases. To different temperatures of returning water answer size of heat output of this circuit and if this output is used, total heat output of unit will change. This relations and basic parameters of circuit are mentioned in following tables. Circuit doesn't contain circulating pump.

*temperature of circuit returning water	35	45	55	°C
filling mixture temperature	45	55	65	°C
electric output	160	147	134	kW

** temperature of circuit returning water is informative data*

circuit heat output	20	kW
temperature of returning water min / max	35/55	°C
nominal flow	1,5	kg/s
minimal / maximal flow	1,2/1,8	kg/s
pressure loss at nominal flow	25	kPa
max. working pressure	300	kPa
hydraulic volume of circuit in CHP unit	4	l

Heat output of technological circuit can be use in low-temperature circuits (warming of domestic hot water, warming of water in pools or in other technologies). If its not possible to use this heat at request on achievement of continuing nominal electric output, it is necessary to baffle this heat in external cooling unit (exchanger water-air). It is able to deliver this cooling unit separately.

Fuel, fuel inlet

Technical parameters mentioned in this specification are valid for natural gas with given properties.

heating power	34	MJ/m ³
min. methane number	80	-
gas pressure	2 ÷ 10	kPa
max. change of gas pressure at changes of consumption	10	%
max. temperature	30	°C

Other gaseous fuels can be used besides natural gas (for example propane, biogas, waste gas). In this case please contact producer of CHP unit. . Input gas line is constructed according to TPG G 811 01 and contains a gas cleaner, set of two independent quick closing electromagnetic valves (with deaeration of spacer) for gas inlet closing after CHP unit stop, zero regulator of gas pressure and metal hose for connection to mixer. For correct CHP unit operation is requested gas connector with relevant dimension with adequate accumulative volume, that it will not come to gas pressure decrease in distribution during period of gas jump take-off, ended by gas hand closing and equipped by pressure gauge. Next it is necessary to connect outlet of electromagnetic valves spacer deaeration with deaeration pipeline of machine room.

Combustion and ventilation air

Unused heat (radiated from hot parts of the CHP unit) is removed from unit to space of machine room. With respect to local conditions of machine room (size, heat losses) is necessary to dimension change of air in machine room. For proposal of air exchange these parameters are mentioned:

unused heat, removed by cooling air	26	kW
unused heat, removed by cooling air	771	Nm ³ /h
temperature of suction air min / max	10/35	°C

Air entering the machine room must satisfy next conditions acc to document „Technical instruction – Combustion and ventilation air.“

Exhaust gas and condensate diversion

Exhaust gas are removed from unit by pipeline, which is connected to outlet flange of CHP unit. To exhaust gas line installation of exhaust silencer is performed (acc to relevant mounting instruction). Exhaust gas line must be tight from CHP unit flange to chimney flue. Gradient of exhaust gas pipeline must be in direction from unit. During unit start or at low temperature of water entering the CHP unit condensate arise in exhaust gas lines. It is from unit led out by pipe „G1/2“. Condensate is suitable to led out through steam separator with height min. 20 cm to channel. Material and heat isolation of exhaust gas line in machine room must be resistant to temperatures to 250°C. Maximal pressure loss of whole exhaust gas line from unit flange can not be higher than 10 mbar.

quantity of exhaust gas	817	Nm ³ /h
exhaust gas temperature nominal / max	150/180	°C
max. counter pressure of exhaust gas behind flange (with exhaust silencer) *	10*	mbar

* counter pressure created by connected exhaust gas line

Fillings

quantity of lubricating oil in engine	55	l
volume of oil tank for filling	42	l
quantity of cooling liquid in primary circuit	50	l

Heating water for filling of secondary and technological circuit must be modified, its composition must satisfy to document „Technical instruction – water circuits“.

Noise parameters

Noise parameters indicate level of acoustic pressure, measured in free acoustic field. Determination of measuring places and method of measurement must correspond with ČSN 09 0862.

CHP unit in 1 m from surface of engine-generator	99	dB(A)
exhaust gas outlet in 1 m from exhaust silencer flange	80	dB(A)

Color design

engine, generator, frame	RAL 7035	(grey)
basic frame	RAL 7035	(grey)

Proportions and weights of unit

length	3500	mm
width	1600	mm
total height	2200	mm
transport weight	3270	kg
operational weight of whole CHP unit	3490	kg

Consequential documents:

- dimensional drawing: CHP unit Cento - drawing no. R0588A
- technical specification of CHP unit electric part (TS electro)
- generally effectual data acc to document „List of valid tech. specifications“

Delivery range

standard

- whole module of CHP unit
- exhaust silencer to free installation to machine room exhaust gas line

out of standard range

- cooling unit for emergency cooling of secondary circuit
- cooling unit for cooling of technological circuit
- additional exhaust silencer
- steam separator

Warning

The producer reserves a privilege of change this document and consequential data.