PowerBloc EG(20)
Combined heat and power plant

Hoval

Responsibility for energy and environment

PowerBloc EG (20) combined heat and power plant:
Description, Technical Data & Dimensions

Combined heat and power plant

The Hoval PowerBloc EG-20 is a natural gas combined heat and power unit with an electrical output of 20kW and a thermal output of 43kW in a pre-packaged compact design.
It is based on the technical principles of efficently producing heat and electricity in a unit that is both compact and also exceptionally quiet.

The ethos of all Hoval PowerBloc CHP units is uncompromised energy efficency in relation to both electrical and thermal energy. This high level of energy efficiency is achieved using an asynchronous generator and cast iron engine with full utilisation of condensing technology.

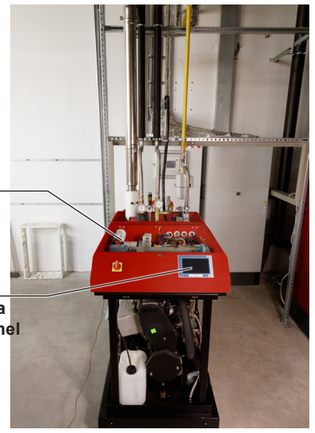
The unit is powered by an electrically controlled VW industrial engine complete with twin knock sensors and lambda sensors to ensure the most efficient operation possible. This in turn drives a water-cooled asynchronous generator for the production of electricity.

The engine coolant and exhaust manifold heat exchanger ensure maximum thermal yield whilst retaining a high electrical output. The touchscreen PLC controller allows the unit to be adapted for individual requirements and site circumstances

Added value

Efficiency	▪ High total efficiency due to integrated condensing heat exchanger
Complete, installation-friendly solution	▪ Simple to install due to coming with all required components with no hidden extras ▪ Delivered fully assembled with all components including controls fully fitted and factory tested
Conservation of resources and reduction in emissions	▪ Significant contribution to conservation of resources due to producing heat and electricity in a single piece of plant ▪ Reduction in energy consumption, including CO_2 and other pollutants
Maintenance	▪ Long maintenance intervals ▪ Automatic oil change/refilling function

Side view when open



Front view when open

Rear view

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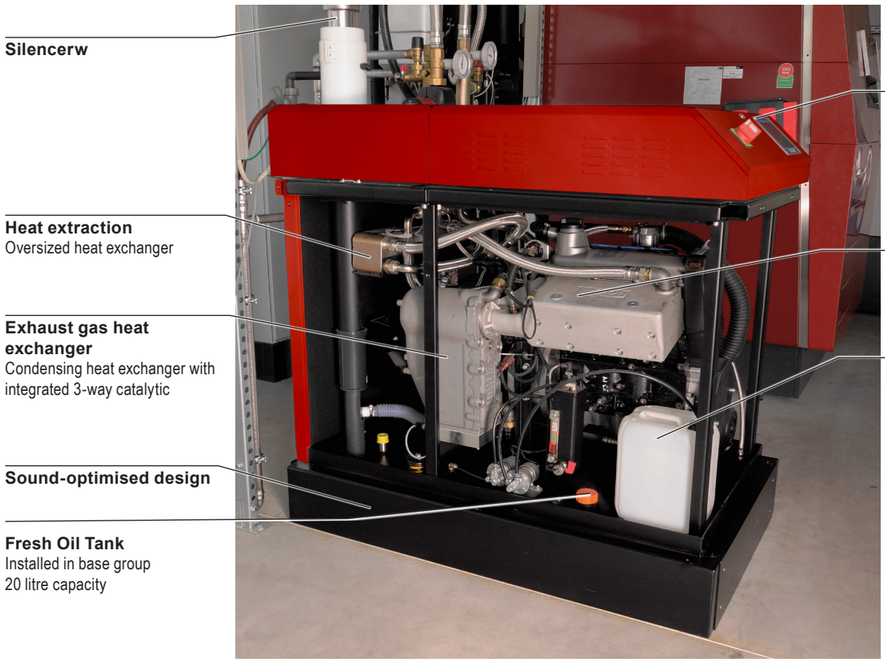
Basic equipment

▪ Compact powerdercoated chassis complete with ▪ 3-chamber base for fresh oil tank, acoustic attenuation and fresh air supply. ▪ Volkswagen 4-cylinder, 2.0l engine with cast iron block, twin knock sensors and twin lambda sensors. ▪ Water cooled asynchronous generator in an encapsulated design complete with vibration isolation for generating three-phase electricity in parallel with the mains.	▪ Condensing heat exchanger made from cast aluminium comprising of a water-cooled chamber for extracting heat from the exhaust gasses. ▪ NOx and CO reduction technology in the form of a three-way catalytic convertor and an oxidation resistant primary coolant circuit complete with integrated pressure monitoring. ▪ Automatic oil change and replenishment function consisting of an oil pump group connected to fresh and used oil tanks.

Structure: components



Model overview

PowerBloc EG (20)		Electrical	Thermal	Total input
Output (modulating)	kW	5 - 20	18 - 43	22 - 65 [1]
Efficiency	%	33.2 [2]	70 [1]	103.2 [1]
Efficiency class		A^{+++}	A^{+++}	

[1] At a return temperature of 35°C
[2] At an electrical output of 20 kW

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Technical data

Performance data *			
Electrical output [1)]	kW	5 - 20	modulating
Thermal output	kW	18 - 43	modulating, at a return temperature of 35°C
Fuel input	kW	22 - 65	
Electrical efficiency	%	33.2	at an electrical output of 20 kW
Thermal efficiency	%	70.0	at a return temperature of 35°C
Total efficiency	%	103.2	at a return temperature of 35°C
Efficiency class		A^{+++}	
Exhaust emission	mg/Nm³	NOx <45mg/Nm³ max. CO <180mg/Nmg³ max.	at 13% O_2
Current coefficient		0.47	0.53 without condensing technology

Engine		
Manufacturer		Volkswagen
Type		Industrial engine, electronically controlled
Approx. nominal rotation speed	rpm	1500
Fuel	%	Natural gas
Cylinders		4R
Cylinder capacity	dm³	2.0
Oil supply		auto. oil replenishment/ change function
Oil sump capacity	l	approx. 4
Fresh oil tank capacity	l	20

Generator		
Manufacturer		EMOD
Type		asynchronous, 4-pole, water-cooled
Voltage	V	400
Current	A	42.3
Frequency	Hz	50

Heating circuit		
Max. flow temperature	°C	95
Flow connection	DN	25, 1" int. thread
Max. return temperature	°C	85
Return connection	DN	25, 1" int. thread
Flow rate	m³/h	1.8 at Δt = 20 K
Max. water pressure	bar	4
Water quality		acc. to VDI 2035

Exhaust gas system		
Exhaust gas connection	DN	80, PPs type B
Max. operating temperature	°C	85
Min. temperature class	°C	120
Max. overpressure	mbar	10, at exhaust gas system test port
Exhaust gas mass flow rate	kg/h	90 (at full load)
Flow rate	m³/h	75 (at full load)

Fuel system		
Gas connection	DN	20, ¾" ext. thread
Flow pressure	mbar	18 - 55
Min. methane number		60

Condensate drain		
Connection	DN	40

Electrical system		
Connections	mm²	5 x 16
Protection	A	3 x 63, type NH00

Sound pressure level		
Module noise at 1 m	dB(A)	approx. 50, acc. to DIN 45635-01-KL2

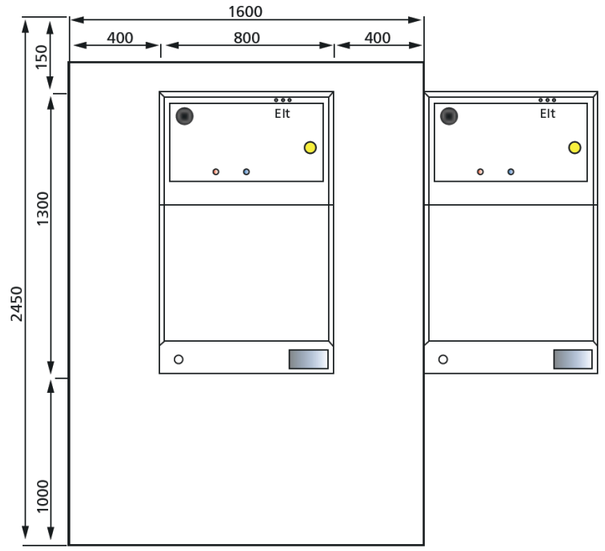
Dimensions and weight		
Length	mm	1300
Width	mm	800
Height	mm	1300
Weight	kg	approx. 700

* All performance and efficiency information is based on a return temperature of 35°C, the use of optional equipment and natural gas operation (calorific value Hi = 8.8 kWh/m³ under normal conditions). The values relate to a relative air humidity of 30%, an air pressure of 1013.25 mbar, a room temperature of 30°C at a room height of 1.5 m and an intake air temperature of 25°C. Deviations are possible if there is a different gas quality and other air values.

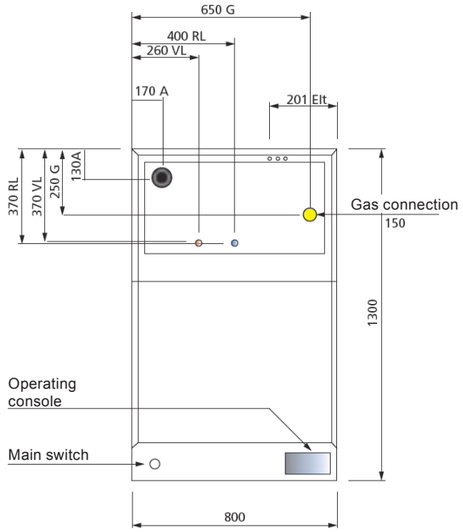
Exhaust gas silencer

Silencer type			(S-080)	(G-080)
Connection	DN	mm	80	80
Effective length	B	mm	500	500
Outside diameter		mm	250	250
Total length	C	mm	700	950
Nozzle length	E	mm	100	100
Total weight		kg	4.5	6.0
Drag coefficient	ζ		0.1	0.1

- Polymer version, material: PP black
- Filled with water-repellent mineral wool
- Standard EW connections
- Max. exhaust gas temperature 120°C
- Positive-pressure-tight up to 5000 Pa
- ¾" condensate drain
- Horizontal or vertical installation



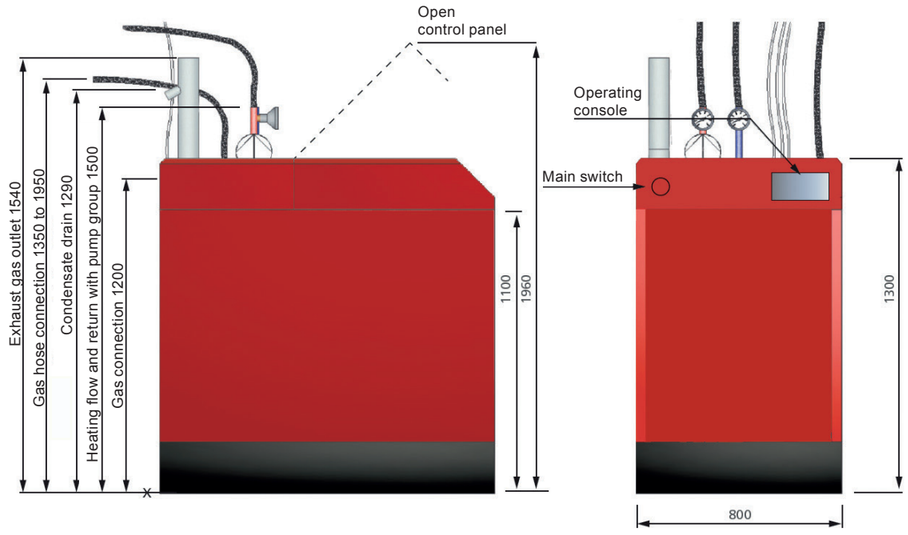
Space required (view from above)
(in mm)



Connection diagram (view from above)
(in mm)

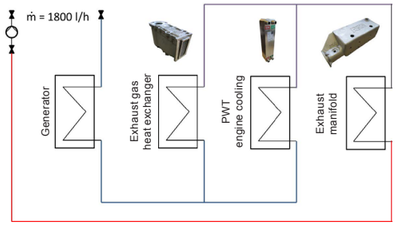
Legend:

RL DN 25 heating return incl. shut-off valve, pressure gauge and non-return valve (1" int. thread)
VL DN 25 heating flow incl. shut-off valve and pressure gauge (1" int. thread)
G DN 20 gas connection with ¾" connection hose, int. and ext. thread (shut-off valve on site)
A DN 80 exhaust gas connection
Elt Electrical connection, min. 16 mm² (flexible)
K DN 40 condensate drain



Connection diagram (view from side and above)
(in mm)

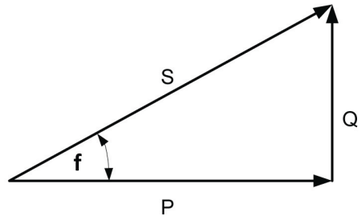
Structure: components



Heat exchanger system
The heat exchange system consists of several components that absorb heat which would normally be expelled and then usefully dissipate it elsewhere. The main components are the exhaust manifold heat exchanger, exhaust gas heat exchanger, plate heat exchanger, coolant heat exchanger as well as the internal engine coolant system.

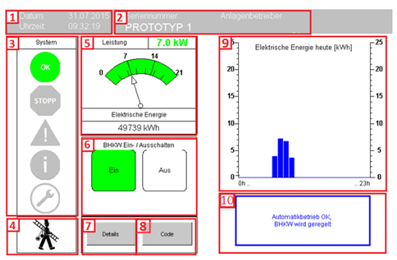
The exhaust manifold collects the exhaust gasses from the multiple cylinders and brings them together into one single outlet directing them to the catalytic convertor. Approximately 6kW of thermal energy is recovered from the exhaust manifold that would normally be rejected into the CHP casing, this is the reason the thermal output of this model is particularly high. The exhaust gas heat exchanger has been specifically designed for transferring thermal energy from the exhaust gasses produced by the engine into the heating system. The exhaust gasses coming from the catalytic convertor then flow through the heat exchanger surfaces of the cast aluminium heat exchanger to the plate heat exchanger. The oversized plate heat exchanger transfers the heat from the engine circuit out to the heating circuit.

The hydraulic schematic aside shows how the individual components all corellate with one another in the overall system. The generator is also part of the thermal recovery system but using the heating water to cool the copper stator windings.



Power factor correction
For the CHP to generate electricity, reacticve energy and the necessary reactive current that is associated with this is required. As these items are produced and then dissipated continuously during operation the energy continously fluctuates between generator and consumer. This energy cannot be used, it is converted into another form of energy (losses), puts strain on the supply system and ultimately may be charged by DNO.

By using an output capacitor that is installed directly on the CHP it is possible to reduce the load on power transmission systems because the necessary reactive power is no longer produced by the plant but corrected by the installed capacitor instead. In electrical engineering terms, as can be seen in the diagram, angle f is reduced and the cosine of the angle (power factor) approaches 1. Our unit corrects approximately to a power factor of 0.95 at an output of 20 kW. The amount of reactive power on the electrical system is reduced.



PowerBloc controller
The controller fitted to the CHP is responsible for the correct function of the plant and carries out all important functions such as controlling all of the devices installed within the casing. This includes items such as the gas contol, ignition system, modulation, auxillary systems and G59/3 requirements.

This control adjusts to ensure the CHP is operating in its most efficient way possible. Visible to the user the controls have a 7 inch touch screen interface that allows the user to intuitevly navigate through the options and menus.

The main display provides a quick overview of information giving a status of the machine complete with energy values produced and a history of performance. Furthermore the controller is the simple way to access settings for personal customisation.

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Plant structure: engine

- 4-cylinder, 4-stroke VW industrial engine, grey cast iron
- Optimised camshaft
- Optimised control times
- Optimised engine management
- Lambda probe upstream and downstream of catalytic converter for optimum mixture adjustment
- Compression: 1:14
- Twin Knock control for optimised ignition point
- Water-cooled exhaust manifold made from aluminium casting
- Condensing heat exchanger with integrated 3-way catalytic converter
- Oversized plate heat exchanger for engine coolant

Plant structure: heat extraction

- Flow directly through generator / exhaust manifold / condensing heat exchanger
- Engine connected in parallel via plate heat exchanger
- Flow rate from 0.5 to 5 m³/h
- Inlet temperature 0 to 75°C
- Outlet temperature up to 95°C
- Sludge filter in inlet recommended

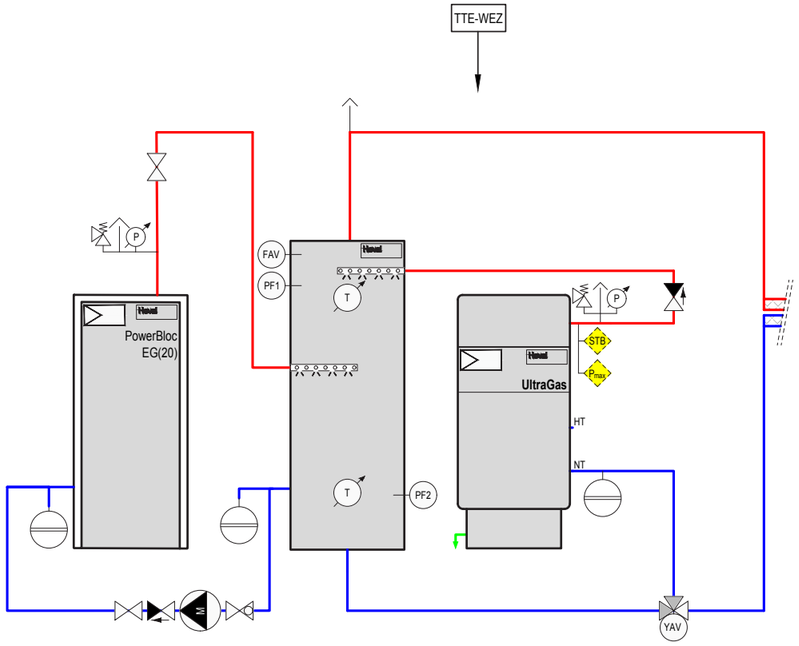
Plant structure: PowerBloc controller

- Freely programmable PLC with 7" touch panel
- Soft starter via star-delta starter (I < 60 A)
- Practical control panel structure – quick troubleshooting
- Incl. fixed compensation
- Incl. MID three-phase meter
- Incl. Modbus interface and Modbus output for BMS tasks
- 4 binary outputs for messages
- External output specifications / 0 - 20 mA / ripple control signal
- Plain text displays / menu navigation
- Can be folded up for servicing

Installation requirements

- 1" hose set for flow and return
- ¾" hose for gas connection
- PP Exhaust DN 80 pipe, preferably dependent on room air
- Condensate trap included
- Additional silencers available
- 3 phase + N + Electrical connection
- LAN connection or GSM router for remote monitoring system
- Internal network and system protection
  (for cascades, centralised network and system protection necessary)
- Equipotential bonding
- Combustion supply air / no housing ventilation

Hydraulics



The buffer storage tank is heated by the CHP plant. If the required temperature cannot be reached in the buffer storage tank, the boiler will be put into operation.

Using a plant flow sensor (FAV in the buffer storage tank) and mixer (YAV in the return), the boiler is used to heat up to the required temperature in the buffer storage tank.

Although it is controlled downstream of the system flow sensor, the system return temperature is what counts. If this value approaches the buffer storage tank temperature, additional heat will be required from the gas boiler.

The system flow control ensures the boiler receives the low system flow temperatures and not the buffer storage tank temperatures, while ensuring High utilisation of the buffer energy and optimum exploitation of the CHP energy.

Calorifier with higher charging temperatures
In systems with higher DHW charging temperatures, direct charging from the boiler (the YAV mixing valve is then closed via a relay during DHW charging) is recommended.

Output of heat generators with additional heating
With this type of hydraulic integration, both heat generators need to deliver their own output (parallel operation), which means that the gas boiler has to be designed in such a way that it can produce the entire output.

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Part numbers

	Description	Part no.	
	Natural gas CHP unit PowerBloc EG (20) - for single CHP installs • Modulating combined heat and power plant • With condensing technology • Network and system protection installed	8005 758	
	Natural gas CHP unit PowerBloc EG (20) - for multiple installs • Modulating combined heat and power plant • With condensing technology • Network and system protection not installed	8005 757	
	Network and system protection box (see below)		
	Flexible connections for PowerBloc EG (20) Vibration and solid-borne noise decoupling 2x heat extraction hoses 1x fuel hose (delivery, installation by the customer)	7013 861	
	Low-frequency silencer (S-080) PowerBloc EG (20) (PP) Silencer for the further reduction of the exhaust gas sound pressure level. Residual sound pressure level: approx. 45 dB(A) at a distance of 10 m from the exhaust gas outlet (free field).	7013 913	
	Low-frequency silencer (G-080) PowerBloc EG (20) (PP) Silencer for the further reduction of the exhaust gas sound pressure level. Residual sound pressure level: approx. 40 dB(A) at a distance of 10 m from the exhaust gas outlet (free field).	7013 916	
	Emergency cooling PowerBloc EG (20) For the emergency cooling circuit, the corresponding components (table cooler, pump, heat exchanger, three-way valve + actuator (AK, MAG, SV, TI, PI)) are provided. On-site installation incl. pipes, insulation and cabling is completed by the customer according to the hydraulic and electrical diagrams provided.	7013 918	
	Grid box for PowerBloc EG (20) Communication modem with operating system for remote maintenance and cyclic data acquisition via WebUI incl. data notification via e-mail and SMS as well as integrated firewall.	2064 855	
	Network and system protection box, 2x PowerBloc EG (20) up to 44 kVA	2064 797	
	Network and system protection box, 3x PowerBloc EG (20) up to 66 kVA	2065 276	
	Network and system protection box, 4x PowerBloc EG (20) up to 88 kVA	2065 275	
	Commissioning PowerBloc EG (20)	4505 443	
	Commissioning further PowerBloc EG (20)	xx	

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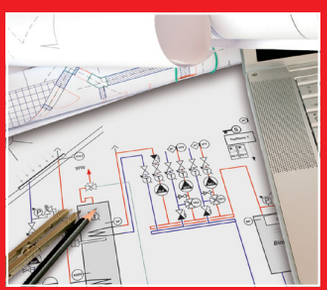

Technical advice

We are happy to assist you and your planning partners in developing intelligent systems, allowing you to take advantage of our expertise and the experience of our specialists.

After sales

For specialist commissioning and maintenance of your Hoval equipment, contact our service and spares department.

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OCtober 2016

Responsibility for energy and environment

Hoval follows a policy of continued improvement and reserves the right to change specifications without notice.

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