



PRODUCT CATALOGUE



OUR PRODUCTS

Enerblu designs and directly manufactures a range of cogenerators that fix new standards of reference in terms of performances and reliability, in order to guarantee energetic saving and sustainability. Our cogenerator production line ranges from the 20 kWe unit up to the 4 MWe one, fuelled with natural gas (methane), biogas or syngas.

All the cogenerators can be coupled to absorption chiller units, in order to meet and satisfy trigeneration needs. Enerblu designs and manufactures all the heat exchangers that equip the cogeneration units, thus creating a product that meets in full the Customer's requirements.



OUR SERVICES



ENERGY
AUDITS



FINANCIAL
SOLUTIONS



AFTER
SALES
SERVICE



EXECUTIVE
PLANNING



PRODUCTION



START UP
OPERATION

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> BIOGAS 50-1000 kWe	page 32



SYMBOLS KEY



Air



Hot water,
overheated
water



Trigeneration



Steam and
diathermic oil



MICRO
20-100 kWe



MICRO GPL
65-200 kWe



MIDDLE
100-500 kWe



BIG
600-4000 kWe



BIOGAS
60-999 kWe



New data
acquisition
system Enerblu

All the solutions



INDOOR AND OUTDOOR MICRO COGENERATION

Small size high efficiency cogeneration is suitable for many user applications in various sectors: service industry, small-sized enterprises and environment; promoted by the European Union in order to spread the culture of the energy saving and the environmental protection.

MOD.	kWe	kWt	EFF. %
REC2 20G	20	45	94,5
REC2 30G	30	60	92,5
REC2 40G	43	90	93,7
REC2 50G	50	78	86,0
REC2 65G	65	114	86,0
REC2 80G	80	121	87,0
REC2 100 TDM	103	166	89,0
REC2 100 DW	105	168	90,0

MIDDLE COGENERATION

The cogeneration with middle power units (from 130 kWe up to 500 kWe) is suitable for service industry important complexes, manufacturing and process companies, district heating services. Important economic benefits are combined with the savings achieved in primary energy.

MOD.	kWe	kWt	EFF. %
REC2 130G	130	179	86,5
REC2 200G M	200	281	86,6
REC2 200G DW	200	330	87,4
REC2 260G	260	351	88,1
REC2 300G DW	309	420	84,4
REC2 350G	340	426	84,5
REC2 370G	372	565	79,9
REC2 400G	425	528	87,1
REC2 480G	480	693	88,5
REC2 500G	520	666	88,1

INDOOR MIDDLE COGENERATION

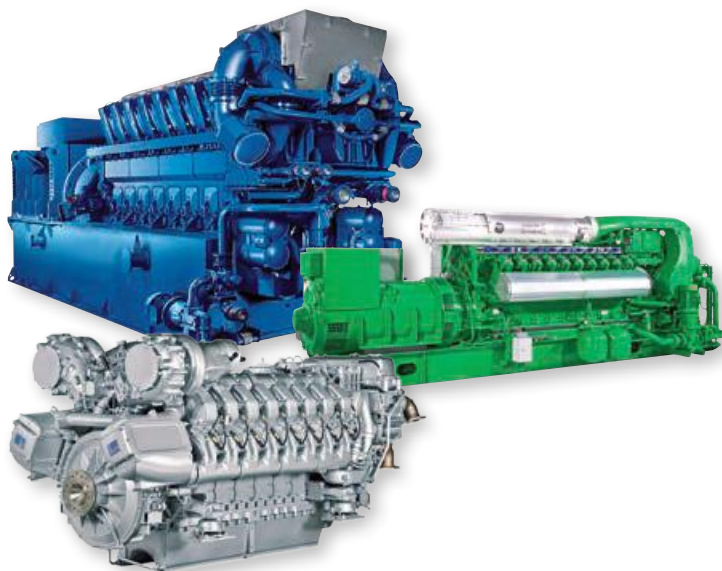
Enerblu Cogeneration has implemented its own range of middle cogeneration units with an indoor arrangement that reduce considerably the clearances so they can be placed inside technical premises.

MOD.	Engine	Weight kg
REC2 120* IG	TEDOM	3700
REC2 130 IG	MAN	3700
REC2 160* IG	TEDOM	4200
REC2 180* IG	TEDOM	4250
REC2 200 IG	MAN	3700
REC2 260 IG	MAN	5300
REC2 300 IG	DOOSAN	5350
REC2 350 IG	MAN	6400
REC2 400 IG	MAN	6450
REC2 500 IG	MAN	8200

* Ask the company for the data sheet. For the entire range REC2 that does not have *, the data sheet are those related to the outdoor units.

GPL COGENERATION

MOD.	kWe	kWt	EFF. %
REC2 65GPL	65	118	78,0
REC2 100GPL	103	167	77,0
REC2 200GPL	201	282	90,0



BIG COGENERATION

The cogeneration with units electrical power production over 600 kWe, appropriate for structures that demand a continuous use for thermal and electric power. This solution is suitable for process companies which need to lower the production costs of the final product and for big complexes and industrial consortia interested in management savings.

MOD.	kWe	kWt	EFF. %
REC2 600	600	652	87,7
REC2 800	800	860	87,9
REC2 1000 J	1063	1249	86,5
REC2 1000 M	1013	1009	84,4
REC2 1200	1200	1245	87,0
REC2 1500	1560	1650	87,0
REC2 2000	2000	2066	87,0
REC2 3300	3300	2080	86,7
REC2 4300	4300	3750	86,8

BIOGAS

The fuel supply of biogas co-generators for sewage depuration plants, waste treatment and zootechnical waste achieved through anaerobic fermentation processes, it is an excellent solution in order to involve economic benefits arising from the use of renewable source in environmental enhancement services.

MOD.	kWe	kWt	EFF. %
REC2 50 BIOG	50	68	91
REC2 60 BIOG	60	80	78
REC2 80 BIOG	80	117,4	83
REC2 100 BIOG	100	77	61
REC2 200 BIOG	200	261	86
REC2 250 BIOG	250	346	85
REC2 300 BIOG	300	320	83
REC2 350 BIOG	350	449	87
REC2 400 BIOG	420	514	85
REC2 600 BIOG	600	598	85
REC2 800 BIOG	800	795	85
REC2 1000 BIOG	1000	1032	84

MICRO GAS

THE PLUS:

- > Full range 20-100 kW_e
- > Minimum space needs
- > Very high efficiency
- > Low fuel consumption
- > Silent operation



Hot water,
overheated
water



Trigeneration



New data
acquisition
system Enerblu



REC2 is a range of high efficiency microcogenerators, fuelled with natural gas.

The units are suitable for the production of thermal and electric power. Their configuration heavy duty /low speed (1500 rpm) guarantees a particularly long life operation for the equipment. The cogenerators are constituted from an endothermic motor coupled to an alternator and fixed to the metallic base through antivibrating joints.

Taking advantage of the produced mechanical energy of the motor, the alternator produces electric power fit for the grid. From the cooling system of the engine and from the exhaust circuit, thermal energy is duly recovered for civil and industrial uses. The constructive characteristics of the exchangers and the engines allow the operation of the units within a range of temperatures for incoming water. A programmable electronic system surveys the operation, the regulation, the emergency devices and the remote control connection.



1. THERMAL LOAD FOLLOWING LOGIC

Controlling the incoming water temperature from the user's circuit, the equipment will modulate the generated power in order to maintain the outcoming water temperature at a prefixed value.

2. ELECTRICAL LOAD FOLLOWING LOGIC

Measuring the electrical absorption of the user from the grid, the unit will modulate the produced power, matching the user's electrical load. For this logic of operation it is necessary to install an amperometric transformer accessory TA, in order to control the amount of electric power to be produced, and the accessory "dissipator of thermal energy" in order to dissipate, in case of need, the extra thermal energy (hot water) produced from the cogenerator and not used by the user's system.

3. FIXED POINT LOGIC

Setting up a target value of temperature to be attained, the cogenerator will work at full load and, when the target value results attained, it stops. When the temperature lowers at a level under a preset second target value, the control system of the cogenerator automatically restarts the unit at full load operation. If the fixed point is related to the electrical load following logic it is necessary to include in the order the "dissipator of thermal energy". If the fixed point is related to the thermal load following logic no other accessories are needed.

4. HYBRID LOGIC

The unit follows the electrical load until reaching the target value of temperature. Once the target value results attained, the unit modulates the power in order to keep the temperature unchanged complying, however, with the power consumption demanded regularly by the process.

EXAMPLE OF ONE-LINE DIAGRAM

SYMBOLS KEY

	Meter
	Cut-Off fuse switch
	Automatic switch
	Magnetothermal switch
	Contactor
	Interface protection system
	Differential circuit breaker
DG	General device
DDI	An interface device
DDG	Device Builder
DGL	General Line device, tucked to DDI

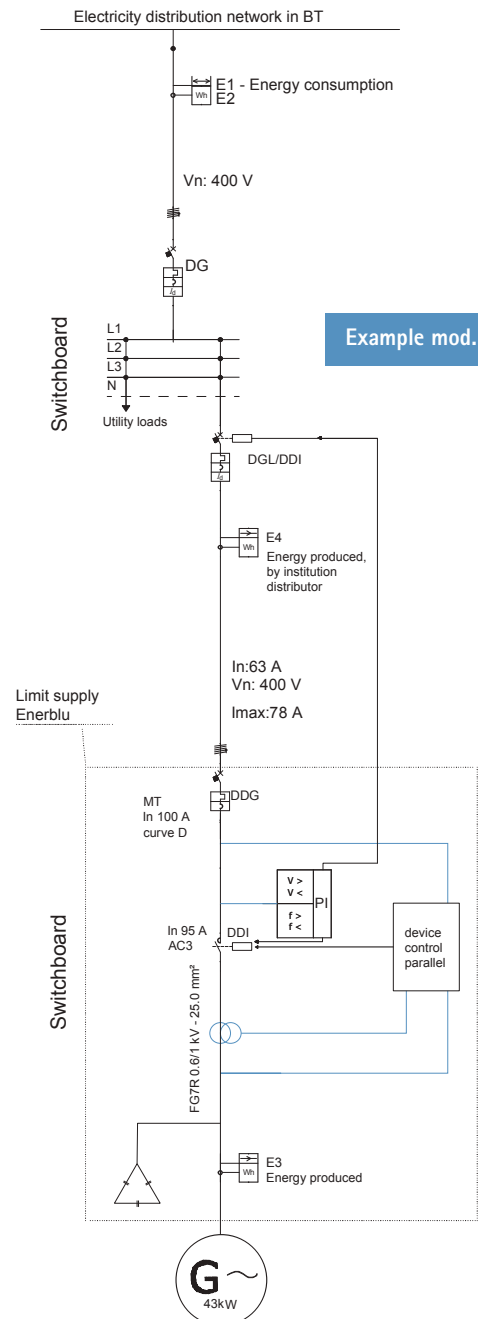
The operation is allowed both in manual way, through a start/stop command, and in automatic way through a remote contact controlled from the customer.

In the switchboard are placed the command circuits, the control card for the cogenerator operation, the power section for the connection in parallel with the grid, the recharging section for the batteries necessary for the starting ignition motor and the section for the system rephasing capacitors.

The unit is supplied in a soundproof enclosure fit for outdoor installation.

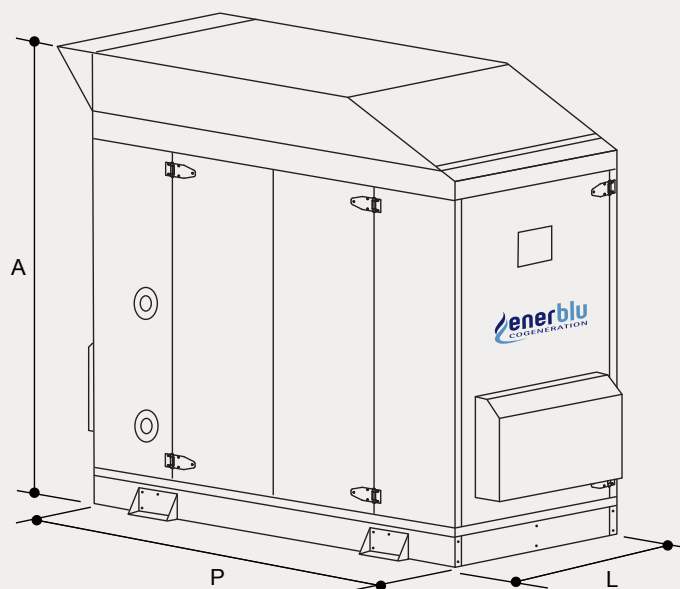
The base of the cogenerator is provided with lifting points, fit for an easy positioning by means of a fork-lift truck.

All the hydraulic pipe and flange fittings are preset for a very easy connection.



Example mod. 40G

DIMENSIONS



REC2		L width	P depth	A height
20G	mm	790	2100	2150
30G	mm	900	2400	2180
40G	mm	1200	2850	2330
50G	mm	1415	3304	2470
65G	mm	1415	3304	2470 PSI 2680 DAEWOO
80G	mm	1700	4700	3520
100G Light	mm	1700	4700	3520

Dimensions can be changed for specific applications or for technical reasons.

MICRO GAS

A series of specific accessories allows the fittest configuration for the necessary installation.

Each microcogeneration unit is supplied after passing a full test in the factory, and released with a test certificate, that also refers to the conformity to the operation parameters and features. All units are supplied with a CE certification and mark, in compliance with the European norms. The control of the generated power can be set accordingly to the thermal load (thermal load following logic), as a standard configuration, or to the electrical load (electric load following logic), upon request.

The selection of the operation logic must be carried out at the moment of the order, indicating the relevant needed accessories, mentioned in the dedicated list.

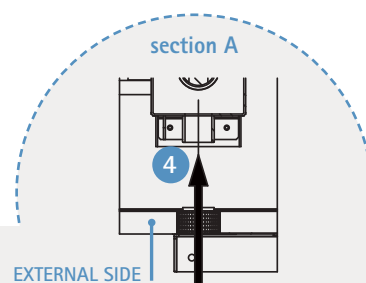
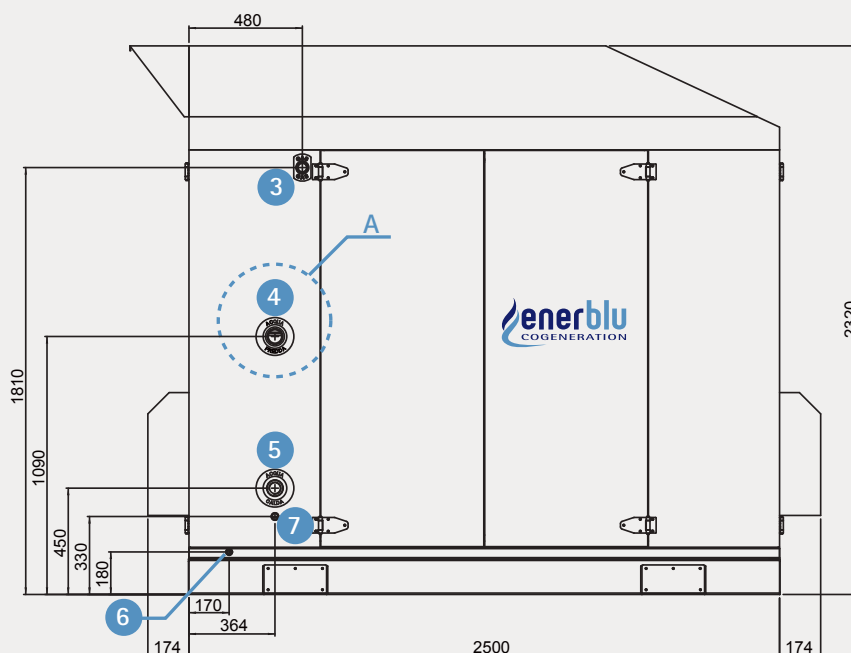
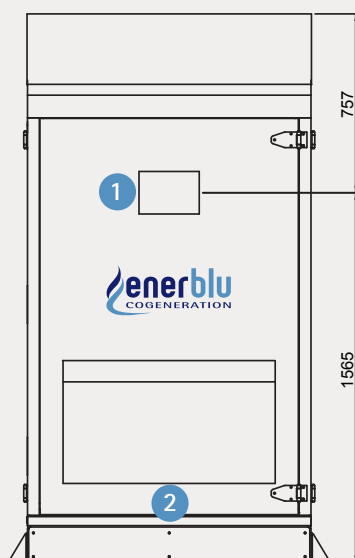
STANDARD SUPPLY

- > Endothermic Motor, fuelled with natural gas, starting through battery (in compliance with norm CEI 0-21)
- > Asynchronous Alternator
- > Rephasing capacitors
- > Thermal Module constituted from water-water plate type heat exchanger and water/exhaust shell and tubing heat exchanger
- > Residential Noise suppressor
- > Automatic refilling system for the lubricating oil
- > Catalyst system (three-valent) for lowering emissions levels into the atmosphere according to national regulations (D.L.152/06 in Italy)
- > Lambda probe
- > Container for outdoor installation, including ATEX fan
- > Pressure gauges group (INAIL regulations), expansion vessel not included
- > Switchboard with power terminals block for the connection to the electrical grid
- > Interface protection relay, in compliance with CEI 0-21 and annexe A70
- > Ethernet and RS485 ports in Modbus
- > Software of supervision
- > UTF

ACCESSORIES

- > Super catalyst low NOx
- > Dissipator of thermal energy
- > TA measuring device for electric load following logic
- > Gas leakage detector
- > Antivibration floor extra dampers for enclosure

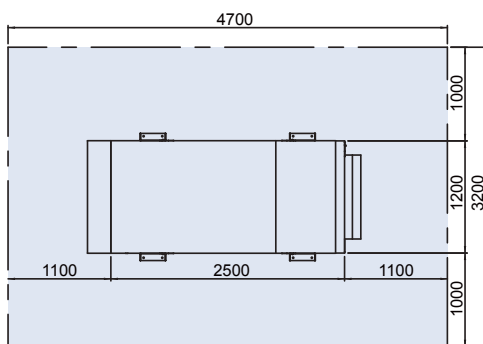
LAYOUT





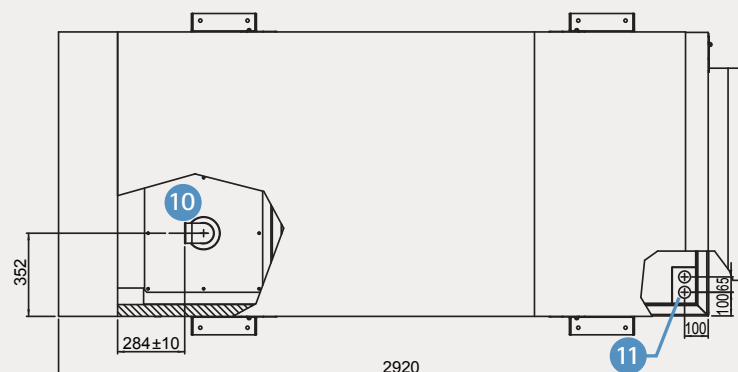
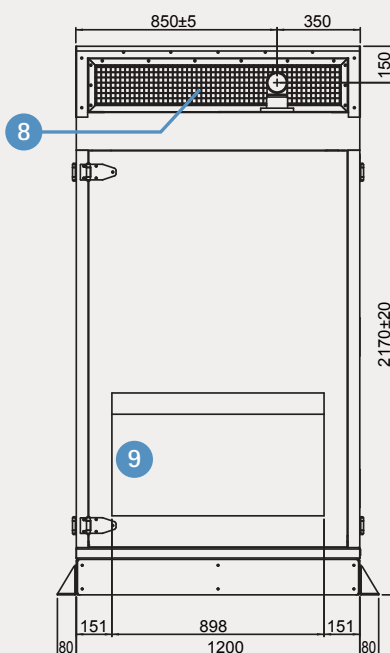
SERVICE AREA

For a correct service operation, it is necessary that the area around the CHP units accmplies with the following table.

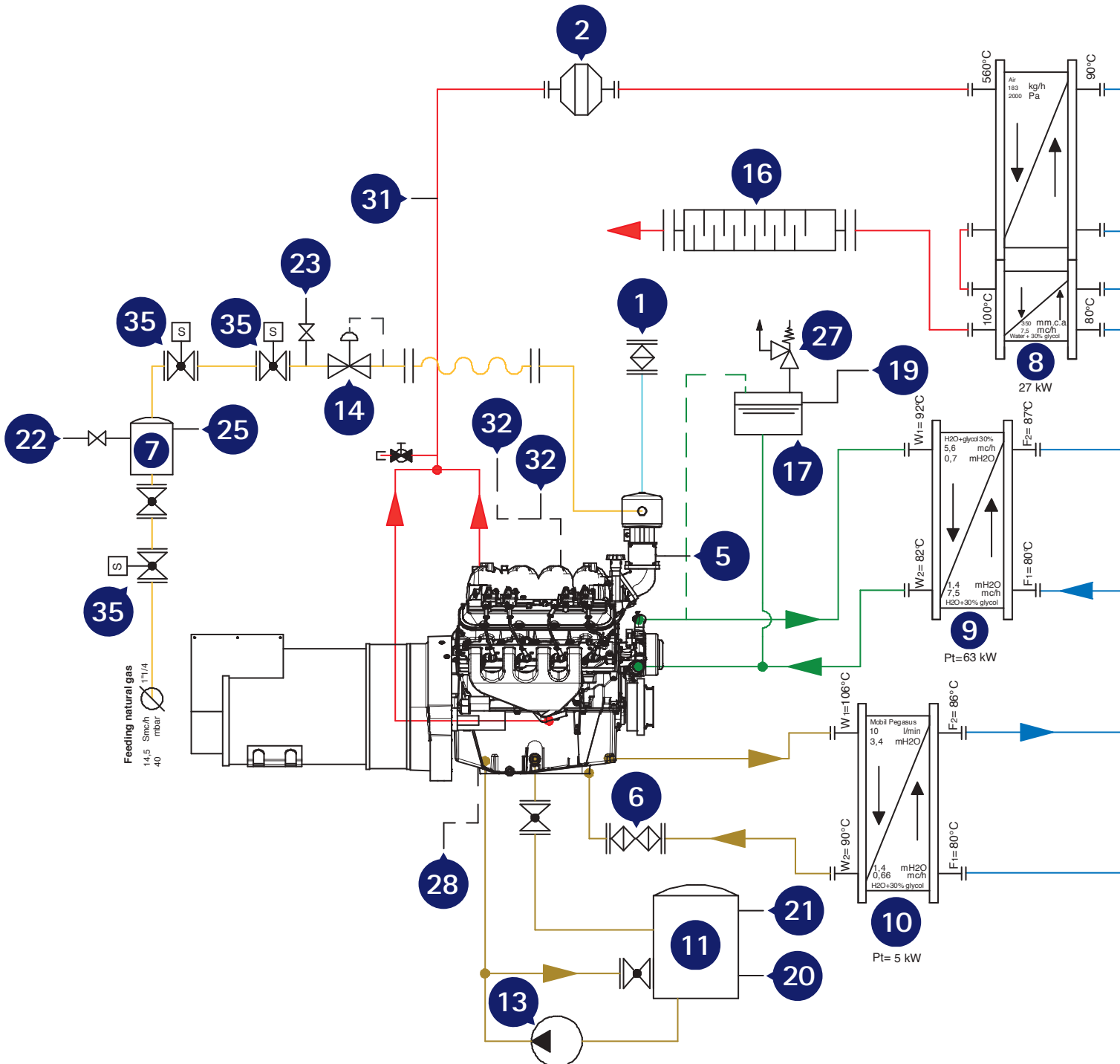
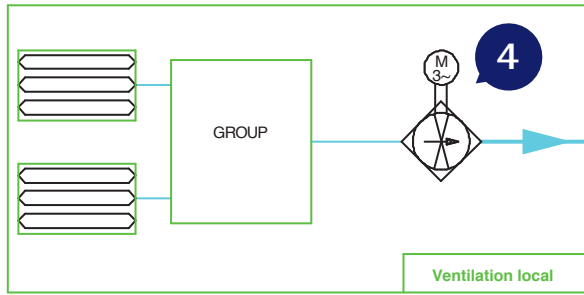


REC2	DX - SX	Front - Rear	Height
20G	mm	800	800
30G	mm	800	800
40G	mm	800	1000
50G	mm	1000	1000
65G	mm	1000	1000
75G	mm	1000	1000
80G	mm	1000	1000
100G Light	mm	1000	1000

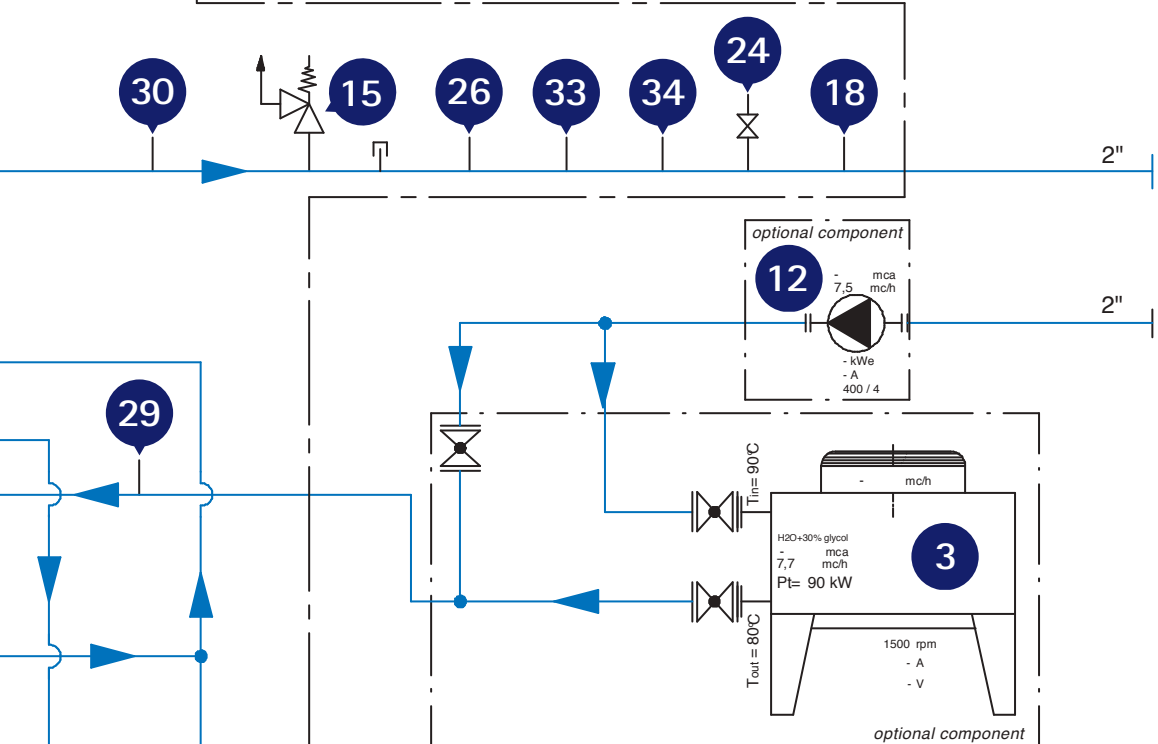
Example mod. 40G



- 1 Monitor and Electronic Control Board for Micro
- 2 Silencers for air intake
- 3 Input gas fuel in the enclosure 1" 1/4 G-F
- 4 Input cold water 2" G-F
- 5 Output hot water 2" G-F
- 6 Condensated water output 1/2" G-F (inox)
to be drained
- 7 Safety outlet 3/4" G-F to be conveyed
- 8 Hot air from the enclosure
V = 92 mc/min
- 9 Silencers for air intake
- 10 Exhaust output 3" G-F to be conveyed
- 11 Duct holes for signal and power cables



MICRO GAS PIPING INSTRUMENTS DIAGRAM



Example mod. 40G

- | | |
|---|--|
| 1 Air intake filter (engine orig.) | 20 Switch low level oil in the sump |
| 2 Exhaust catalyzer | 21 Switch very low level oil in the tank |
| 3 Dry-cooler dissipation for the user's circuit | 22 Pressure gauge for gas fuel 0-160 mbar |
| 4 Electrofan ATEX rules | 23 Pressure gauge for gas fuel 0-160 mbar |
| 5 Butterfly valve for mix intake (engine orig.) | 24 Pressure gauge 0-4 bar with glycerine |
| 6 Double oil filter | 25 Switch very low pressure in gas fuel input |
| 7 Compensation fuel intake tank | 26 Safety switch (INAIL recommended) minimum pressure, hand resettable |
| 8 Pipe Type heat exchanger for exhaust/user's water system | 27 Overpressure valve |
| 9 Plate type heat exchanger for engine coolant/ user's system | 28 Oil pressure meter sensor |
| 10 Plate type heat exchanger for oil circuit/ user's water system | 29 Thermometer - full scale 120°C |
| 11 Tank for oil storage and recirculation | 30 Thermometric switch, hand resettable |
| 12 Electropump for user's circuit (not in standard supply) | 31 Thermocouple TCK output engine temperature |
| 13 Mechanical gear type pump /engine orig.) | 32 Temperature meter for output water (engine orig.) |
| 14 Pressure regulator | 33 Thermoresistor PT100 for user's input temperature |
| 15 Over pressure valve for the user's circuit | 34 Thermoresistor PT100 for user's output temperature |
| 16 Exhaust gases silencer | 35 Electrovalve 24 V for input gas fuel |
| 17 Expansion vessel, closed type, without membrane V = 5 l | |
| 18 Fluxostate user's water | |
| 19 Switch low level foe engine water | |

MICRO COGENERATION RANGE from 20 kW_e to 100 kW_e

GAS COGENERATING SET		REC2 20G	REC2 30G	REC2 40G	REC2 50G	REC2 50G
General features at 100% load		PSI	PSI	PSI	PSI	MAN
Net electrical base load power	kW	20	30	43	53	50
Total heating capacity (water 70°C/80°C - 80°C/90°C)	kW	45	60	90	102	78
Fuel power	kW	69	97	142	182	148
Gas consumption	Sm³/h	7,2	10,2	14,8	19,0	15,4
Electrical efficiency	%	29	31	30	29,1	33,8
Thermal efficiency	%	66	62	63	56,0	52,7
Global efficiency	%	94,5	92,5	93,7	85,2	86
General features at 75% load						
Net electrical base load power	kW	15	23	32	40	38
Total heating capacity (water 70°C/80°C - 80°C/90°C)	kW	36	47	71	80	61
Fuel power	kW	57	80	117	150	122
Gas consumption	Sm³/h	5,9	8,4	12,2	15,7	12,7
Electrical efficiency	%	26	28	28	26	31
Thermal efficiency	%	63	59	61	54	50
Global efficiency	%	88,9	86,9	88,1	80,0	81
Engine technical data						
Cycle	type	4 stroke				
Running speed	rpm	1500				
Number of cylinders and total displacement	n°/dm³	4L/3,0	6V/4,3	8V/5,7	8V/8,1	4L/4,6
Bore and stroke	mm	101,6/91,4	101,6/88,39	101,6/91,4	108/111	108/125
Ignition	type	electronic				
Air intake system	type	natural				
Mechanical power	kW	22,0	33,0	45	53	54
Speed stability at constant load	%	0,25				
Lub oil consumption	kg/h	0,02	0,03	0,03	0,03	0,03
Oil filling system and tank capacity	type/l	auto/22	auto/22	auto/22	auto/38	auto/38
Combustion air flow (25°C)	m³/h	71	105	142	165	226
NOx emissions at 5% O2 without catalizer (*)	mg/Nm³	< 500				
CO emissions at 5% O2 (*)	mg/Nm³	< 650				
PPM emissions	ppm/Nm³	< 20				
(*) You can, on request, to have emissions that meet the more restrictive limits: < 50mg/Nm³ for both NOx that for CO						
Alternator technical data						
Alternator type		asynchronous				
Generator rated power in continuous duty	kW / kVA	23 / -	37 / -	45 / -	55 / -	55 / -
Power factor	cos(φ)	0,76	0,84	0,83	0,85	0,82
Rated voltage	V	400				
Pole number	P	4				
Frequency	Hz	50				
Subtransitory reactance X"d	%	nd	nd	nd	nd	nd
In	A	44,5	68,3	83,9	99,8	97
Is/In		8,0	7,4	7,4	7,3	7,6
Ip	A	503	715	878	1030	1045
Full load generator efficiency	%	91	93,0	93,2	93,5	93,5
Isolation class	cl.	F				
Thermal recovery plant data						
Thermal power recovery from water and lub oil	kW	30	40	63	63	46
Thermal power recovery from exhaust	kW	15	20	27	39	32
Exhaust gas flow (water 70°C/80°C)	kg/h	95	141	188	220	192
Maximum exhaust gas temperature	°C	< 680	< 680	< 680	< 680	< 650
Max exhaust back pressure after silencer	Pa	1200	1200	1200	1200	600
Maximum water flow user	l/h	7.774	10.320	15.480	17.544	11.180
Minimum water flow user (*)	l/h	2.591	3.440	5.160	4.386	3.354
Water flow rate user to obtain thermal jump of 10°C (*)	l/h	3.900	5.200	7.800	8.800	6.800
Water pressure drop (delta T 10°C)	kPa	< 60				
(*) Flow refers to water glycol						
Load, connections and noise						
Shipping weight	kg	1100	1500	2000	3200	3200
Operation weight	kg	1200	1600	2140	3300	3300
Degree of machine protection	IP	43				
Exhaust connection	INCH/DN	G 2	G 2	G 3	G 3	G 3
External water circuit connection	INCH/DN	G 1	G 1	G 2	G 2	G 2
External connection condensation drain	INCH/DN	G 1/2	G 1/2	G 1/2	G 1/2	G 1/2
Gas pipeline connection	INCH/DN	G 1	G 1	G 1 1/4	G 1 1/2	G 1 1/2
Noise level at 1 m engine with canopy and silencer	dB(A)	< 58				
Noise level at 7 m engine with canopy and silencer	dB(A)	< 53				
Natural gas						
Minimum dinamic gas supply pressure	bar	0,024	0,026	0,028	0,030	0,030
Maximum oscillation of the gas pressure	mbar	± 5				
Maximum speed of the transient pressure gas	mbar/min	3				
Minimum gas supply pressure and temperature	°C	15				

GAS COGENERATING SET		REC2 65G	REC2 65G	REC2 80G	REC2 100G Light	REC2 100G Light
General features at 100% load		PSI	DAEWOO	TEDOM	DAEWOO	TEDOM
Net electrical base load power	kW	65	65	80	105	103
Total heating capacity (water 70°C/80°C - 80°C/90°C)	kW	120	122	121	175	175
Fuel power	kW	202	207	232	302	301
Gas consumption	Sm³/h	21,1	21,6	24,2	31,5	31,4
Electrical efficiency	%	32	31	34	35	34
Thermal efficiency	%	59	59	52	58	58
Global efficiency	%	91,6	90,3	87	92,7	92,3
General features at 75% load						
Net electrical base load power	kW	49	49	60	79	77
Total heating capacity (water 70°C/80°C - 80°C/90°C)	kW	95	96	95	138	138
Fuel power	kW	167	171	183	249	246
Gas consumption	Sm³/h	17,4	17,8	20,0	26,0	25,7
Electrical efficiency	%	29	29	33	32	31
Thermal efficiency	%	57	56	52	55	56
Global efficiency	%	86,0	84,8	85	87,0	87,4
Engine technical data						
Cycle	type	4 stroke				
Running speed	rpm	1500				
Number of cylinders and total displacement	n°/dm³	8V/8,1	6V/8,0	6V/12	6V/8,1	6L/12
Bore and stroke	mm	108/111	111/138	130/150	111/139	130/150
Ignition	type	electronic				
Air intake system	type	natural	natural	natural	forced	forced
Mechanical power	kW	71	72	86	113	110
Speed stability at constant load	%	0,25				
Lub oil consumption	kg/h	0,03	0,03	0,04	0,03	0,04
Oil filling system and tank capacity	type/l	auto/38	auto/30	auto/250	auto/250	auto/250
Combustion air flow (25°C)	m³/h	225	229	248	238	326
NOx emissions at 5% O₂ without catalizer (*)	mg/Nm³	< 500				
CO emissions at 5% O₂ (*)	mg/Nm³	< 650				
PPM emissions	ppm/Nm³	< 20				
(*) You can, on request, to have emissions that meet the more restrictive limits: < 50mg/Nm³ for both NOx that for CO						
Alternator technical data						
Alternator type		asynchronous	asynchronous	asynchronous	asynchronous	asynchronous
Generator rated power in continuous duty	kW / kVA	75 / -	84 / 105	100 / 125	120 / 150	120 / 150
Power factor	cos(φ)	0,85	0,8	0,8	0,8	0,8
Rated voltage	V	400				
Pole number	P	4				
Frequency	Hz	50				
Subtransitory reactance X"d	%	nd	5,7	-	6,2	6,2
In	A	135	152,2	218	218,0	218,0
Is/In		6,9	-	-	-	-
Ip	A	1317	-	-	-	-
Full load generator efficiency	%	94,2	92,5	93,5	93,4	93,4
Isolation class	cl.	F	H	H	H	H
Thermal recovery plant data						
Thermal power recovery from water and lub oil	kW	72	73	55	123	102
Thermal power recovery from exhaust	kW	48	49	66	52	73
Exhaust gas flow (water 70°C/80°C)	kg/h	300	300	488	450	427
Maximum exhaust gas temperature	°C	< 680	< 550	< 570	< 550	< 630
Max exhaust back pressure after silencer	Pa	1200	560	344	1200	450
Maximum water flow user	l/h	20.640	20.984	20.812	30.100	30.100
Minimum water flow user (*)	l/h	5.160	5.246	5.203	7.525	7.525
Water flow rate user to obtain thermal jump of 10°C (*)	l/h	10.400	10.500	16.500	16.500	16.500
Water pressure drop (delta T 10°C)	kPa	< 60				
(*) Flow refers to water glycol						
Load, connections and noise						
Shipping weight	kg	3200	3500	6500	6200	6500
Operation weight	kg	3300	3650	6800	6500	6800
Degree of machine protection	IP	43				
Exhaust connection	INCH/DN	G 3	G 3	DN 100	DN 100	DN 100
External water circuit connection	INCH/DN	G 2	G 2	DN 50	DN 50	DN 50
External connection condensation drain	INCH/DN	G 1/2	G 1/2	G 1/2	G 1/2	G 1/2
Gas pipeline connection	INCH/DN	G 1 1/2	G 1 1/2	DN 40	DN 40	DN 40
Noise level at 1 m engine with canopy and silencer	dB(A)	< 58				
Noise level at 7 m engine with canopy and silencer	dB(A)	< 53	< 65	< 65	< 65	< 65
Natural gas						
Minimum dinamic gas supply pressure	bar	0,030	0,030	0,040	0,040	0,040
Maximum oscillation of the gas pressure	mbar	± 5				
Maximum speed of the transient pressure gas	mbar/min	3				
Minimum gas supply pressure and temperature	°C	15				

MICRO GPL

THE PLUS:

- > Full range 65–200 kW_e
- > Minimum space needs
- > Very low environmental impact
- > Silent operation



Hot water,
overheated
water



Trigeneration



New data
acquisition
system Enerblu



LPG COGENERATION

Where the natural gas distribution net isn't available, one is anyway allowed to take advantage from the cogeneration technology. As a matter of fact, within certain sizes, **a wide range of endothermal engines fuelled through LPG (Liquefied petroleum Gas) is available.** Such engines are fully complying with international rules and result to be very reliable and highly tested in field operation.

LPG is a mixture of Hydrocarbons low in their molecular weight. The mixture is mainly composed from propane and butane, with an occasional presence of ethane or other not saturated hydrocarbons, such as, e.g. ethylene and butylen. LPG is worth its name since its components, in standard conditions (Ambience temperature and atmospheric pressure) exist at the gaseous state.: they are liquefied through compression at relatively low pressure rates, namely between 2 and 8 bar, so to reduce their volume and maintain their transportation costs at a cheap level.

WHY TO USE LPG

The main advantage consists in attaining the mixture density to be 250 times higher than the gaseous state, then reducing its volume at the same mass and so allowing the storage into vessels limited in size and pressure requirements.

Thanks to its reduced content in sulphur and to a complete combustion, with very low residuals, the use of LPG gives a good contribution in lowering the environmental impact, promoting a better quality of the air and a reduction of the green-house emissions.

The LPG density, that is its weight per litre, is different according to its composition and the environment conditions, also considering the weather seasons. Generally an average density equal to 0.51 kg/litre is assumed, together with a LHV (Lower Heating Value) value of 5,500 kcal/litre, in standard conditions, that is 15 °C temperature at the sea level. In the gaseous state, LPG has a density higher than the air itself, and for such reason it is not allowed to diffuse into the atmosphere. For safety reasons a special rule is to be applied (in Italy from the Ministry of Interiors, Fire Brigade Recommendations).



MICRO GPL RANGE from 65 kWe to 200 kWe

LPG COGENERATING SET		REC2 65 GPL	REC2 100 GPL	REC2 100 GPL	REC2 200
General features at 100% load		DW GE08	TEDOM TG 110 G5V NX88	DW GE08TIC	DAEW00GV158 TIC
Net electrical base load power	kW	65	103	105	201
Total heating capacity (water 70°C/80°C - 80°C/90°C)	kW	118	167	166	282
Fuel power	kW	235,8	349	351	538
LPG consumption (Rif. 5.500 kcal/l in CN=15°C slm, density 0,51 kg/l) - tab. HD 5	l/h	36,9	47,1	47,2	74,4
Electrical efficiency	%	28	30	30	37
Thermal efficiency	%	50	48	47	52
Global efficiency	%	78	77	77	90
Engine technical data					
Cycle	type	4 stroke			
Running speed	rpm	1500			
Number of cylinders and total displacement	n°/dm³	6V/8,0	6V/8,1	6V/8,1	8V/14,62
Bore and stroke	mm	111/138	111/139	111/139	128/142
Ignition	type	electronic			
Air intake system	type	natural	forced		
Mechanical power	kW	72	125	110	214
Speed stability at constant load	%	0,25			
Lub oil consumption	kg/h	0,03	0,03		0,1
Oil filling system and tank capacity	type/l	auto/30	auto/21		auto/120
Combustion air flow	m³/h	229	238		763
NOx emissions at 5% O2 without catalizer (*)	mg/Nm³	< 500			500
CO emissions at 5% O2 (*)	mg/Nm³	< 650			650
PPM emissions	ppm/Nm³	< 20			
(*) You can, on request, to have emissions that meet the more restrictive limits: < 50mg/Nm³ for both NOx that for CO					
Alternator technical data					
Alternator type		synchronous			
Generator rated power in continuous duty	kW / kVA	84 / 105	120 / 150	120 / 150	300 / 300
Power factor	cos(φ)	0,8	0,8	0,8	-
Rated voltage	V	400			
Frequency	Hz	50			
In	A	135	218	218	0000
Full load generator efficiency	%	92,5	93,4	93,4	93,7
Isolation class	cl.	F	H	H	H
Thermal recovery plant data					
Thermal power recovery from water and lub oil	kW	72	123	126	219
Thermal power recovery from exhaust	kW	46	44	40	63
Exhaust gas flow (water 70°C/80°C)	kg/h	300	450	355	805
Maximum exhaust gas temperature	°C	< 550	< 550	< 550	495
Max exhaust back pressure after silencer	Pa	560	1200		
Maximum water flow user	l/h	20.296	28.724	28.552	0000
Minimum water flow user	l/h	5.074	7.181	7.138	0000
Water flow rate user to obtain thermal jump of 10°C	l/h	4.400	14.400	14.300	28,4
Water pressure drop (delta T 10°C) (70°/80°)	kPa	< 60			< 70
Total external water circuit capacity	l	60	75	75	000
Dimensions, load, connections and noise					
Width	mm	1415	4700	4700	2438
Depth	mm	3304	1700	1700	6058
Height	mm	2680	3520	3520	2591
Shipping weight	kg	6200	6200	6200	8450
Operation weight	kg	6500	6500	6500	8650
Degree of machine protection	IP	43	44	44	44
Exhaust connection	INCH/DN	G 3	DN 100	DN 100	DN 150
External water circuit connection	INCH/DN	G 2	DN 50	DN 50	DN 65
External connection condensation drain	INCH/DN	G 1/2	G 1/2	G 1/2	G 1
Gas pipeline connection	INCH/DN	G 1 1/2	DN 40	DN 40	DN 50
Noise level at 7 m engine with canopy and silencer	dB(A)	< 65			
Space for maintenance					
Width right and left side	mm	1000			
Depth right and left side	mm	1000			
Height	mm	800			
LPG					
Minimum dinamic supply pressure	bar	0,030	0,040	0,040	0,060
Minimum temperature supply	°C	15			
Conditions and tolerance					
Max operating outdoor air temperature without derating	°C	25			
Max operating altitude without derating	m.s.l.m.	100			
Maximum RH	%	30			
Maximum temperature water outlet	°C	92			90
Minimum water inlet temperature	°C	35			70
Maximum users water delta T°	°C	20			15
Minimum users water delta T°	°C	5			10
Lower calorific value of supply gas	kJ/Sm³	12,78			
Electrical power tolerance	%±	5			
Thermal power tolerance	%±	10			
Tolerance fuel consumption data	%±	8			
Sound pressure level tolerance	%+	3			

N.B. - Data refer to the environmental conditions of pressure at sea level height 15° humidity 30% and the calorific value stated in the table.
THE COMPANY RESERVES THE RIGHT TO MAKE CHANGES EVEN WITHOUT NOTIFICATION.

MIDDLE GAS

THE PLUS:

- > Full range 100–500 kWe
- > Tailor made solutions, in modules or single engines
- > Very high efficiency
- > Telecontrol
- > Silent operation



Hot water,
overheated water



Trigeneration



Steam and
diathermic oil



Air



New data
acquisition
system Enerblu

Enerblu boasts a line range of natural gas units in modular solutions or related to a single motor.

The range from 100 kWe to 500 kWe has been developed for solutions standardized in container, both in cogeneration and tri-generation versions.

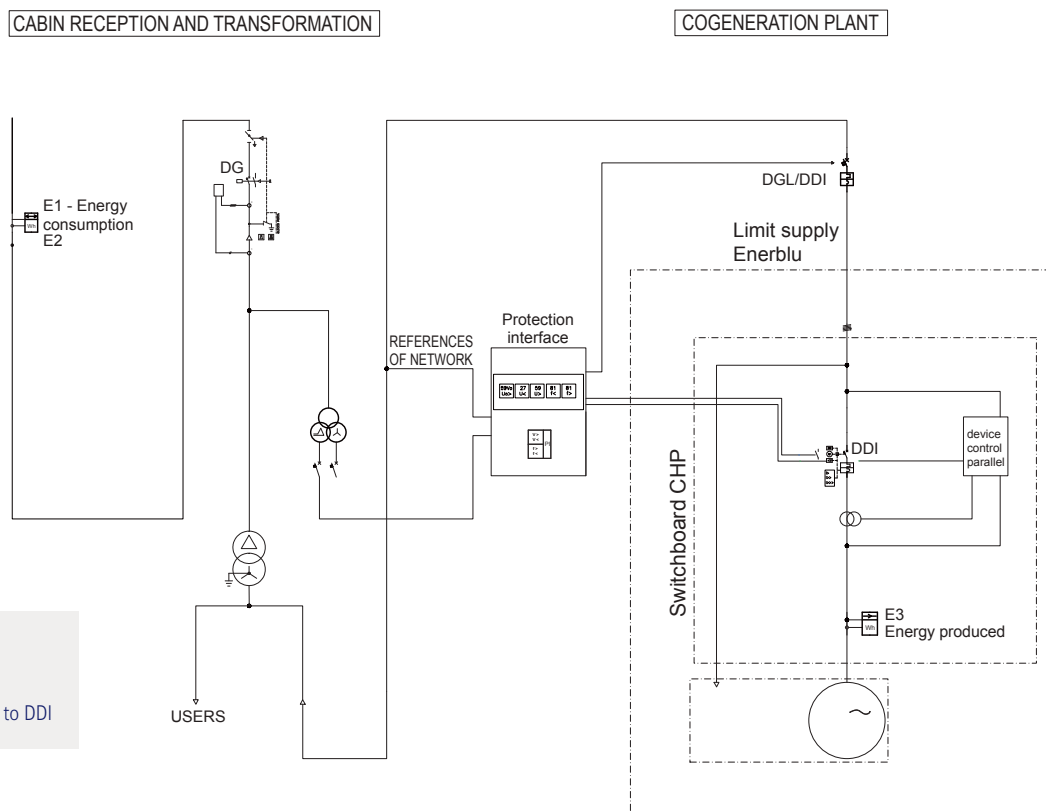
All the Enerblu Co-generation range is conceived so that all the thermal exchangers and dry cooler units are entirely planned and manufactured inside Enerblu itself, thus obtaining constructive and original solutions that make our groups extremely efficient and compact. Close to such characteristics, that make our cogenerators very special, a lot of attention has been placed into the control system. Remote operation of the entire cogeneration plant is enabled from a far location. Thanks to the particular control system, also the remote regulation of the operation parameters of the cogenerator engine is enabled.



EXAMPLE OF ONE-LINE DIAGRAM

Example mod. 260

DG General device
DDI An interface device
DDG Device Builder
DGL General Line device, tucked to DDI



Enerblu is in a position to supply tailor made solutions that take into account the application of the system in already existing technical premises, beyond the standard solution in container, and makes available the arrangement of the soundproofing system in a special customer version.

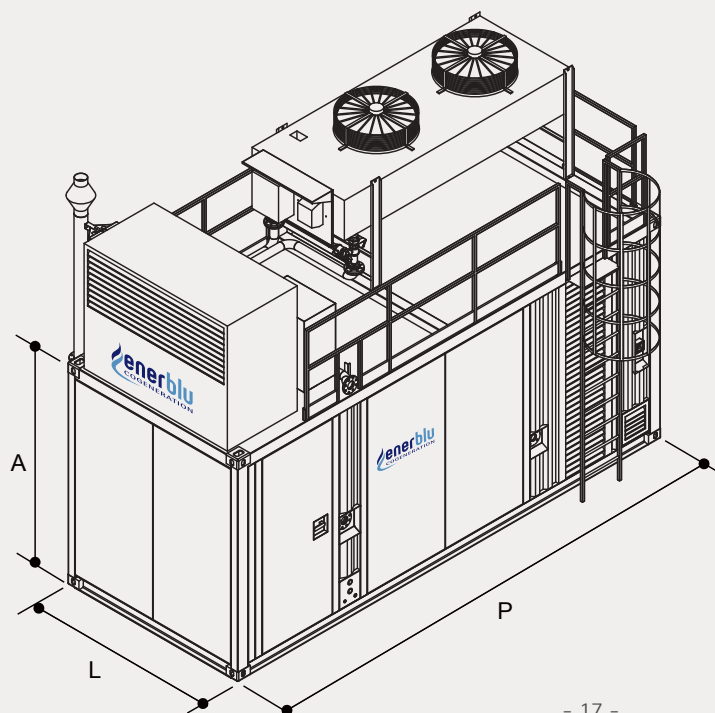
The cogenerators in the range REC2 100 kWe - 500 kWe, in the aim to satisfy the various energy requirements of the customer, can be connected to other specific equipment, in order to optimize the overall efficiency of the systems.

From the same primary source various forms of energy can be produced: in particular way thermal energy, as hot water or steam (at different operating pressures) or diathermic oil, refrigeration energy as cooled water and hot air.

SYMBOLS KEY

	Meter
	Cut-Off fuse switch
	Automatic switch
	Magnetothermal switch
	Contactor
	Interface protection system
	Differential circuit breaker

DIMENSIONS



REC2		L width	P depth	A height*
130	mm	2438	6058	2591
200	mm	2438	6058	2591
260	mm	2438	6058	2591
300	mm	2438	9125	2700
350	mm	2438	9125	2700
400	mm	2438	9125	2700
500	mm	2438	9125	2700

* The height value doesn't take into account the possible installation of the dry cooler units on the roof of the container
Dimensions can be changed for specific applications or for technical reasons.

MIDDLE GAS

STANDARD SUPPLY IN CONTAINER

- > Gas fuelled endothermic engine
- > Synchronous generator
- > Thermal Module constituted from water-water plate type heat exchanger and water/exhaust shell and tubing heat exchanger
- > Dry cooler for eventual dissipation of heat in emergency
- > Residential Noise suppressor in stainless steel
- > Automatic refilling system for the lubricating oil; forced circulation of lubricating oil, high capacity sump
- > Catalyst system (bi- or three-valent) for lowering emissions levels into the atmosphere according to national regulations (D.L.152/06 in Italy)
- > Container for outdoor installation, including ATEX fan
- > Pressure gauges group (INAIL regulations), expansion vessel not included
- > Control Switchboard (auxiliary)
- > LV Power Switchboard
- > Certified Production meter for electricity (MID type)
- > Interface protection relay, in compliance with CEI 0-16 and annexe A70
- > Supervision software

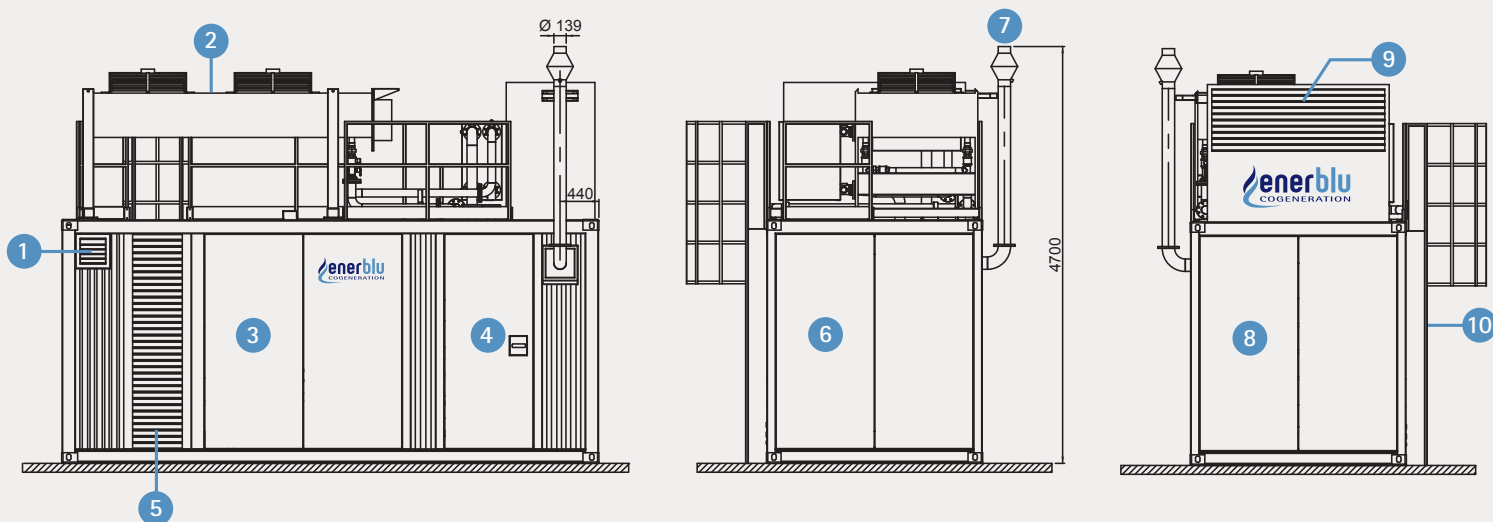


> Trigeneration plant REC3 500



> Plant REC2 130 G

LAYOUT

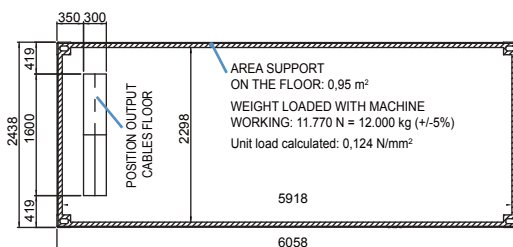
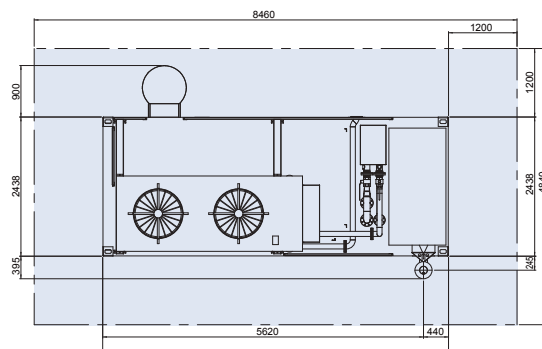




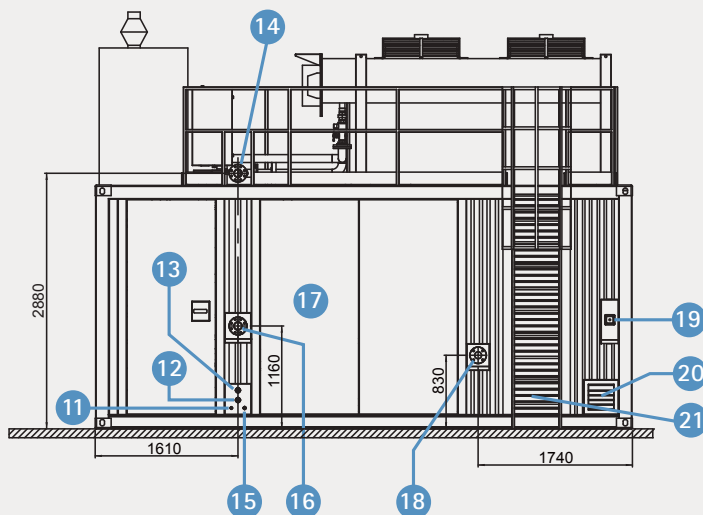
SERVICE AREA

For a correct service operation, it is necessary that the area around the CHP units accomplies with the following table.

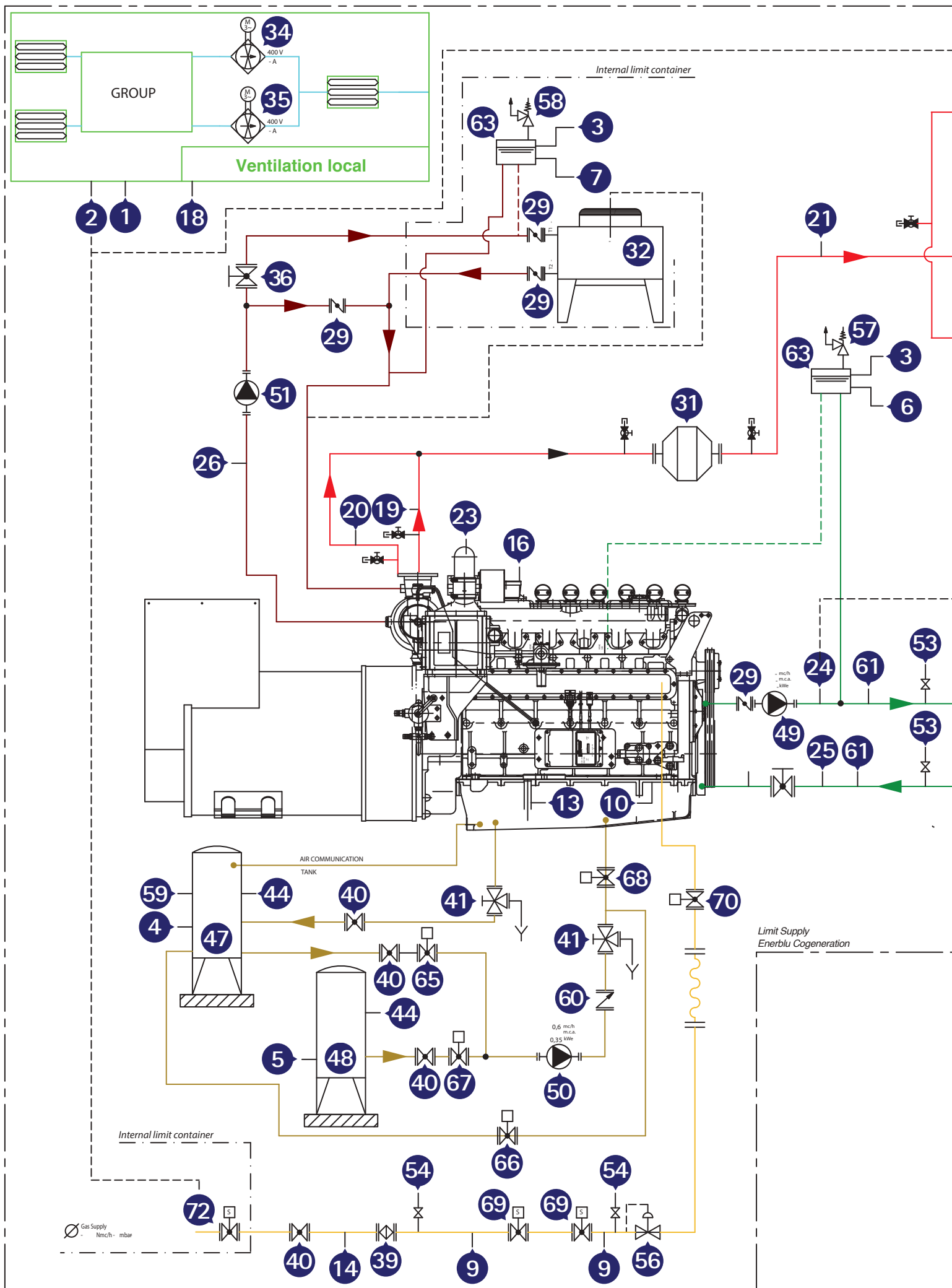
DX - SX	Front - Rear	Height
800	800	800



Example mod. 260

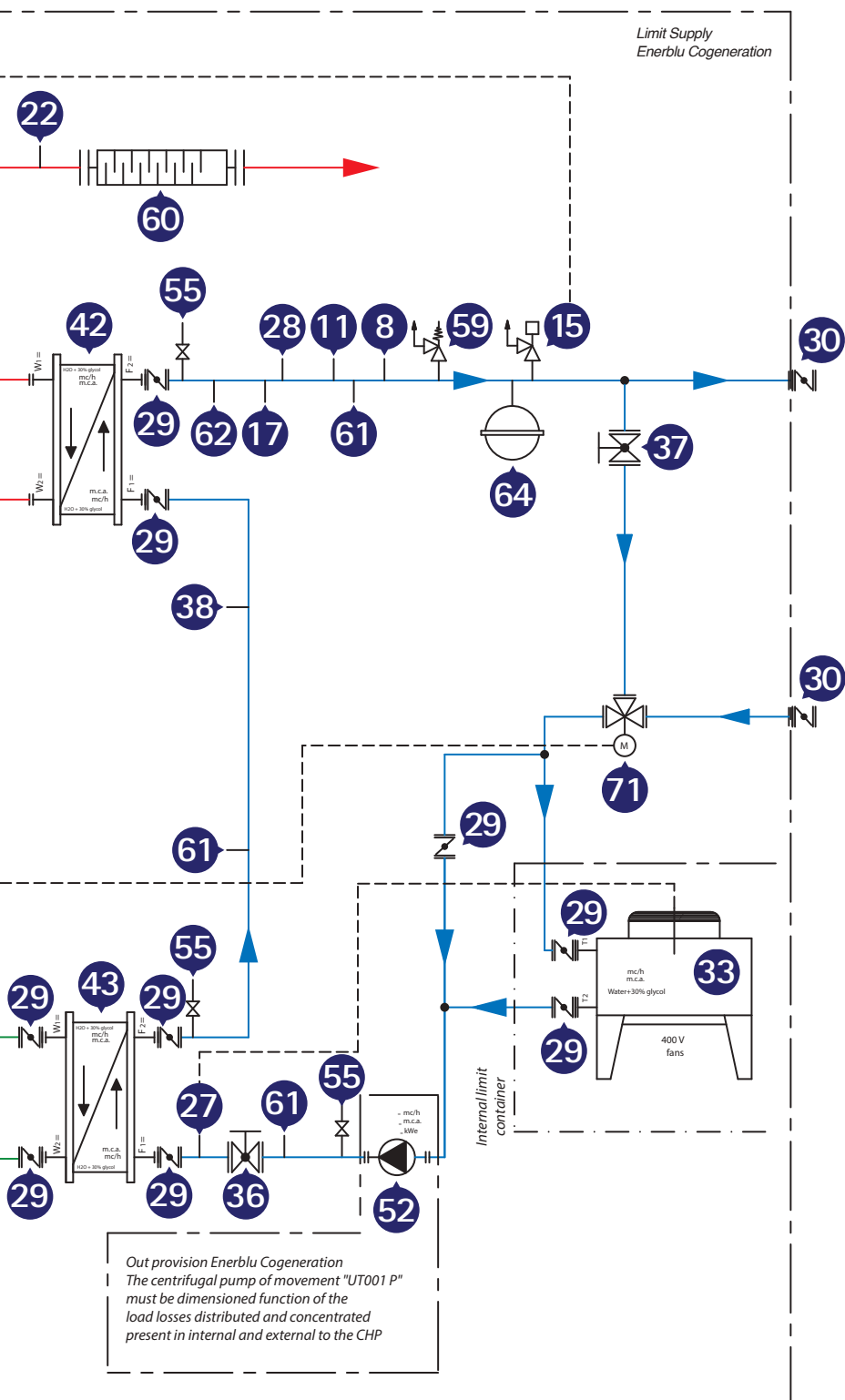


- 1 Air extraction grid from the electric control board compartment
- 2 Dry cooler for the user's system water Pmax=214 kWt
- 3 Engine enclosure twin door
- 4 Safety door and access to the "Thermal Module Zone"
- 5 Silencer for air intake
- 6 Thermal module compartment, twin door
- 7 Exhaust chimney
- 8 Electric control board compartment, twin door
- 9 Silencer for the expulsion of the cooling air
- 10 Dedicated ladder
- 11 Condensated water output from the exhaust (Stainless steel union to be soldered) 1/2"G
- 12 Ancillary drain (1" 1/2G union to be soldered)
- 13 Ancillary drain (1" 1/2G union to be soldered)
- 14 Flange for hot water (input to CHP unit from the user's return) DN80 PN16 UNI EN 1092-1
- 15 Ancillary discharge for the expansion vessel (INAIL) (union to be soldered 3/4"G)
- 16 Flange for hot water (output from CHP unit to the user's inlet) DN80 PN16 UNI EN 1092-1
- 17 Engine enclosure, twin door
- 18 Flange - Input natural gas to CHP unit (4 Holes) DN65 PN16 UNI EN 1092-1
- 19 Emergency pushbutton (with glass)
- 20 Air intake grid to the electric control board compartment
- 21 Silencer for air in intake



MIDDLE GAS PIPING INSTRUMENTS DIAGRAM

Example mod. 260



- 1 Gas leakage detector - alarm threshold
- 2 Gas leakage detector - failure threshold
- 3 Switch low level for engine water
- 4 Switch low level oil in the additional sump
- 5 Switch low level oil in the tank
- 6 Switch very low level for engine water
- 7 Switch very low level for the intercooler water
- 8 Switch low level for engine water in the user's system
- 9 Pressure switches for very low or very high gas pressure
- 10 Pressure switch for very low pressure in the engine oil system
- 11 Switch for very low level for engine water in the user's system
- 12 Pressure transducer for water jackets
- 13 Pressure transducer for engine oil
- 14 Pressure transducer for fuel gas
- 15 Safety thermal discharge valve (INAIL rules)
- 16 Thermal switch very high temperature for engine water
- 17 Thermal switch very high temperature for the user's water system
- 18 Thermoresistor PT100 for ambient temperature
- 19 Thermocouple TCK output engine temperature (DX)
- 20 Thermocouple TCK output engine temperature (SX)
- 21 Thermocouple TCK catalyzer output temperature (SX)
- 22 Thermocouple TCK exhaust heat exchanger output temperature (SX)
- 23 Thermoresistor PT100 for the temperature mixture intake to the turbine
- 24 Thermoresistor PT100 for the output intake mixture to the engine
- 25 Thermoresistor PT100 for input temperature to the engine
- 26 Thermoresistor PT100 for output temp. from the intercooler
- 27 Thermoresistor PT100 for input temp. from the user's system
- 28 Thermoresistor PT100 for output temp. to the user's system
- 29 Butterfly valve
- 30 Butterfly valve (to be installed by the user)
- 31 Catalytic depurator
- 32 Dry-cooler for the dry cooler circuit
- 33 Dry-cooler for the user's system
- 34 Electrofan ATEX rules
- 35 Electrofan
- 36 Flow rate regulation valve
- 37 Flow rate regulation valve
- 38 Flow rate switch for the user's circuit
- 39 Filter for natural gas
- 40 Two ways valve, hand operated, spherical type
- 41 Three ways valve, hand operated, spherical type
- 42 Pipe type heat exchanger
- 43 Plate type heat exchanger for engine coolant circuit
- 44 Level indicator (visual)
- 45 Transducer for the oil level in the additional sump/tank
- 46 Retain valve
- 47 Additional oil tank sump 55 litres
- 48 Oil storage tank 150 litres
- 49 Centrifugal pump
- 50 Gear type pump
- 51 Circulation pump
- 52 Centrifugal pump
- 53 Pressure gauge 0-4 bar with glycerine
- 54 Pressure gauge for gas fuel 0-160 mbar
- 55 Pressure gauge 0-4 bar with glycerine
- 56 Zero pressure regulator
- 57 Overpressure valve for engine coolant 0,7 bar
- 58 Overpressure valve for intercooler 0,7 bar
- 59 Safety valve
- 60 Exhaust gas silencer
- 61 Analogical thermometer - full scale 120°C
- 62 Inspection pit (INAIL)
- 63 Expansion vessel - closed type without membrane
- 64 Expansion vessel - closed type with membrane
- 65 Electrovalve 24V - recirculation for oil
- 66 Electrovalve 24V
- 67 Electrovalve 24V - refilling for oil sump
- 68 Electrovalve 24V - input to engine oil sump
- 69 Electrovalve 24V for gas fuel
- 70 Butterfly valve
- 71 Three-way valve
- 72 Fuel cut-off valve, manually resettable

MIDDLE COGENERATION RANGE from 130 kWe to 500 kWe

GAS COGENERATING SET		REC2 130	REC2 200	REC2 200	REC2 260	REC2 300
General features at 100% load		MAN	MAN – 1/2 TA-Luft	DAEWOO	MAN	DAEWOO
Net electrical base load power	kW	130	200	200	260	309
Total heating capacity	kW	193	263	330	375	420
Fuel power	kW	357	555	606	699	828
Gas consumption	Sm³/h	37,3	57,9	63,3	72,9	86,4
Electrical efficiency	%	36,3	36,0	33,0	37,2	37,3
Thermal efficiency	%	54,0	47,4	54,4	53,7	50,7
Global efficiency	%	90,3	83,4	87,4	90,9	88,0
General features at 75% load						
Net electrical base load power	kW	98	150	150	195	232
Total heating capacity	kW	166	213	253	306	346
Fuel power	kW	284	424	472	546	664
Gas consumption	Sm³/h	29,6	44,2	49,2	57,0	69,3
Electrical efficiency	%	34,4	35,4	31,8	35,7	34,9
Thermal efficiency	%	58,5	50,2	53,6	56,0	52,1
Global efficiency	%	92,8	85,6	85,4	91,8	87,1
Engine technical data						
Cycle	type	4 stroke				
Running speed	rpm	1500				
Number of cylinders and total displacement	n°/dm³	6L/12.42	6L/12,4	8V/14.62	12V/25.78	12V/21.9
Bore and stroke	mm	126/166	126/166	128/142	132/157	128/142
Ignition	type	electronic				
Air intake system	type	aspirated	forced with intercooler	forced with intercooler	aspirated	forced with intercooler
Mechanical power	kW	140	220	230	275	329
Speed stability at constant load	%	0,25				
Lub oil consumption	kg/h	0,04	0,15	0,10	0,06	0,11
Oil filling system and tank capacity	type/l	AUTO 120				
Combustion air flow	kg/h	435	1106	763	852	1150
NOx emissions at 5% O₂ without catalizer (*)	mg/Nm³	500	250	500	500	500
CO emissions at 5% O₂ (*)	mg/Nm³	650	300	650	650	650
(*) You can, on request, to have emissions that meet the more restrictive limits: < 100mg/Nm³ for both NOx that for CO						
Alternator technical data						
Alternator type		synchronous				
Generator rated power in continuous duty	kVA	200	300	300	400	450
Cos(φ) nominal		0,8				
Rated voltage	V	400				
Pole number	P	4				
Frequency	Hz	50				
Subtransitory reactance X"d	%	5,9	8,1	8,1	14,2	12,1
Full load generator efficiency and Cos(φ) nominal	%	93,0	94,1	94,1	94,2	94,0
Isolation class	cl.	H				
Thermal recovery plant data						
Thermal power recovery from water and lub oil	kW	107	133	230	218	267
Thermal power recovery from exhaust	kW	86	130	100	157	153
Exhaust gas flow	kg/h	461	1147	805	879	1319
Maximum exhaust gas temperature	°C	635	490	495	570	483
Max exhaust back pressure after silencer	Pa	1500	1200	1200	1200	1400
Water flow rate (thermal jump 10°C)	m³/h	17,1	22,6	28,4	32,3	36,1
Water pressure drop	kPa	< 70	< 70	< 70	< 100	< 100
Load, connections and noise						
Operation weight - Weight is estimated	kg	7200	8650	8650	8650	13000
Shipping weight - Weight is estimated	kg	7000	8450	8450	8450	12500
Degree of machine protection	IP	44				
Electrical connection	DN	125	150	150	150	150
Exhaust connection	DN	50	65	65	65	65
External water circuit connection	INCH	1/2"	1"	1"	1"	1"
Gas pipeline connection	DN	40	50	50	50	50
Noise level at 7 m engine with canopy and silencer (*)	dB(A)	< 65				
(*) Upon request, can be obtained more performing soundproofing						
Natural gas						
Minimum dinamic gas supply pressure	mbar	60				80
Minimum gas supply pressure and temperature	°C	15				
Maximum speed of gas pressure variation	mbar/min	5				

GAS COGENERATING SET		REC2 350	REC2 370	REC2 400	REC2 480	REC2 500
General features at 100% load		MAN	MAN	MAN	MAN	MAN
Net electrical base load power	kW	350	372	425	480	520
Total heating capacity	kW	446	447	516	651	672
Fuel power	kW	907	999	1094	1325	1346
Gas consumption	Sm³/h	94,6	104,2	114,2	138,3	140,5
Electrical efficiency	%	38,6	37,2	38,8	36,2	38,6
Thermal efficiency	%	49,2	44,7	47,2	49,1	49,9
Global efficiency	%	87,8	82,0	86,0	85,3	88,5
General features at 75% load						
Net electrical base load power	kW	263	284	319	360	390
Total heating capacity	kW	335	335	409	485	501
Fuel power	kW	690	772	838	1010	1025
Gas consumption	Sm³/h	72,0	80,6	87,5	105,4	107,0
Electrical efficiency	%	38,0	36,8	38,0	35,6	38,0
Thermal efficiency	%	48,6	43,4	48,8	48,0	48,9
Global efficiency	%	86,6	80,2	86,8	83,7	86,9
Engine technical data						
Cycle	type	4 stroke				
Running speed	rpm	1500				
Number of cylinders and total displacement	n°/dm³	8V/17.2	12V/25.78	12V/25.78	12V/25.8	12V/25.8
Bore and stroke	mm	132/157	132/157	132/157	132/157	132/157
Ignition	type	electronic				
Air intake system	type	forced with intercooler				
Mechanical power	kW	370	450	450	550	550
Speed stability at constant load	%	0,25				
Lub oil consumption	kg/h	0,18	0,08	0,08	0,18	0,18
Oil filling system and tank capacity	type/l	AUTO 120				
Combustion air flow	kg/h	1879	2280	2280	2825	2775
NOx emissions at 5% O₂ without catalizer (*)	mg/Nm³	500				
CO emissions at 5% O₂ (*)	mg/Nm³	650				
(*) You can, on request, to have emissions that meet the more restrictive limits: < 100mg/Nm³ for both NOx that for CO						
Alternator technical data						
Alternator type		synchronous				
Generator rated power in continuous duty	kVA	500	550	625	750	750
Cos(φ) nominal		0,8				
Rated voltage	V	400				
Pole number	P	4				
Frequency	Hz	50				
Subtransitory reactance X"d	%	11,4	10,2	9,8	8,7	8,7
Full load generator efficiency and Cos(φ) nominal	%	94,6	94,8	95,0	95,1	95,2
Isolation class	cl.	H				
Thermal recovery plant data						
Thermal power recovery from water and lub oil	kW	225	190	263	252	336
Thermal power recovery from exhaust	kW	221	220	253	315	336
Exhaust gas flow	kg/h	1945	2320	2364	2924	2872
Maximum exhaust gas temperature	°C	435	440	448	463	458
Max exhaust back pressure after silencer	Pa	1200	1200	1200	1000	1000
Water flow rate (thermal jump 10°C)	m³/h	36,6	38,4	44,4	56,0	57,8
Water pressure drop	kPa	< 100	< 100	< 130	< 130	< 130
Load, connections and noise						
Operation weight - Weight is estimated	kg	14100	14500	14500	17082	17082
Shipping weight - Weight is estimated	kg	13300	14000	14000	16493	16493
Degree of machine protection	IP	44				
Electrical connection	DN	150	200	200	300	300
Exhaust connection	DN	80	80	80	100	80
External water circuit connection	INCH	1"				
Gas pipeline connection	DN	50	50	50	65	65
Noise level at 7 m engine with canopy and silencer (*)	dB(A)	< 65				
(*) Upon request, can be obtained more performing soundproofing						
Natural gas						
Minimum dinamic gas supply pressure	mbar	80				
Minimum gas supply pressure and temperature	°C	15				
Maximum speed of gas pressure variation	mbar/min	5				

For values of stricter emissions are available ad-hoc solutions.
Valid only when attached to a detailed offer with the trade expressed.
THE COMPANY RESERVES THE RIGHT TO MAKE CHANGES EVEN WITHOUT NOTIFICATION.

BIG GAS

THE PLUS:

- > Full range 600 kWe - 4 MWe
- > Tailor made solutions, in modules or single engines
- > Very high efficiency
- > Telecontrol
- > Silent operation



Hot water,
overheated water



Trigeneration



Steam and
diathermic oil



Air



New data
acquisition
system Enerblu

Enerblu boasts a line range of natural gas units in modular solutions or related to a single motor.

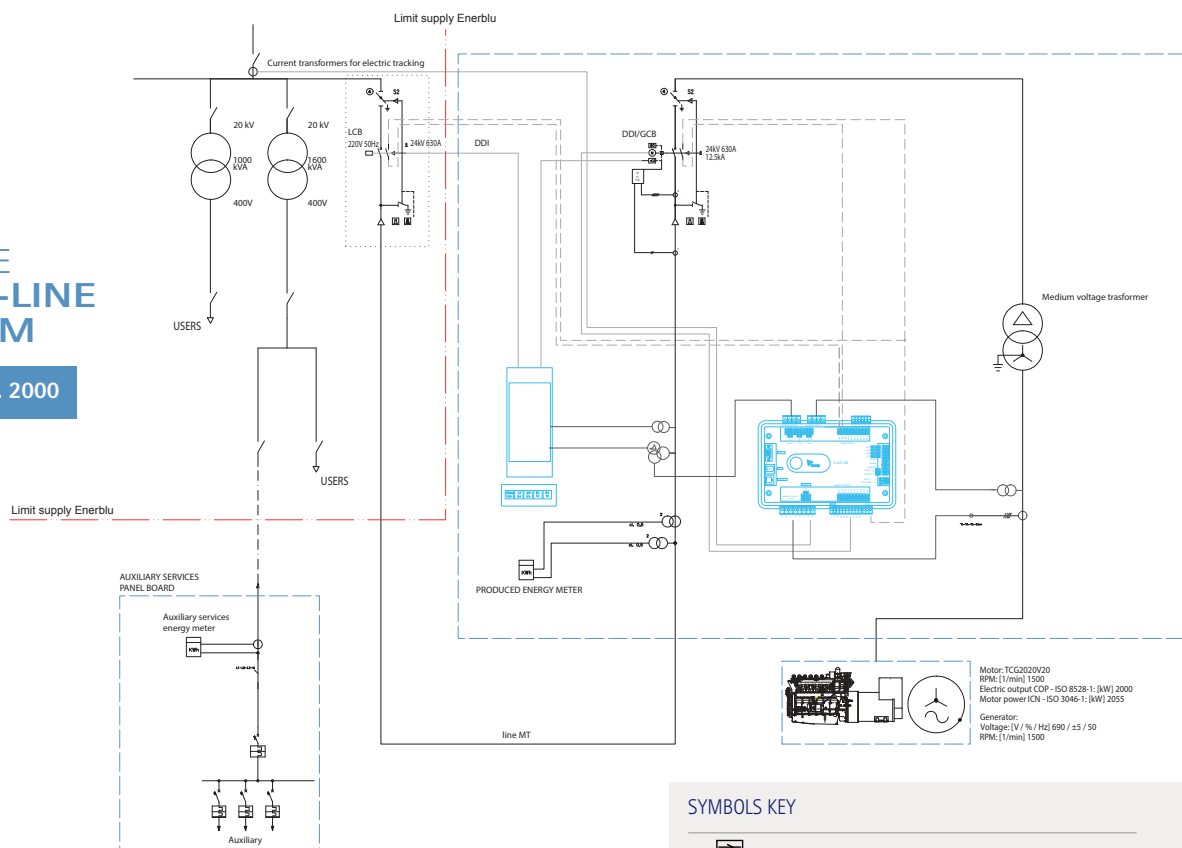
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All the Enerblu Co-generation range is conceived so that all the thermal exchangers and dry cooler units are entirely planned and manufactured inside Enerblu itself, thus obtaining constructive and original solutions that make our groups extremely efficient and compact. Close to such characteristics, that make our cogenerators very special, a lot of attention has been placed into the control system. Remote operation of the entire cogeneration plant is enabled from a far location. Thanks to the particular control system, also the remote regulation of the operation parameters of the cogenerator engine is enabled.



EXAMPLE OF ONE-LINE DIAGRAM

Example mod. 2000

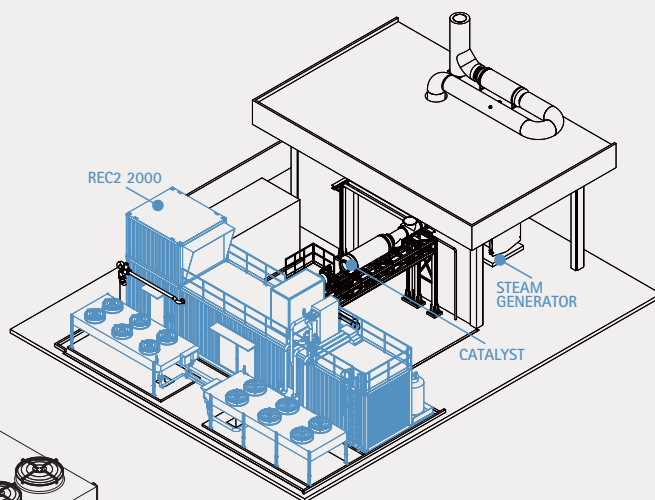
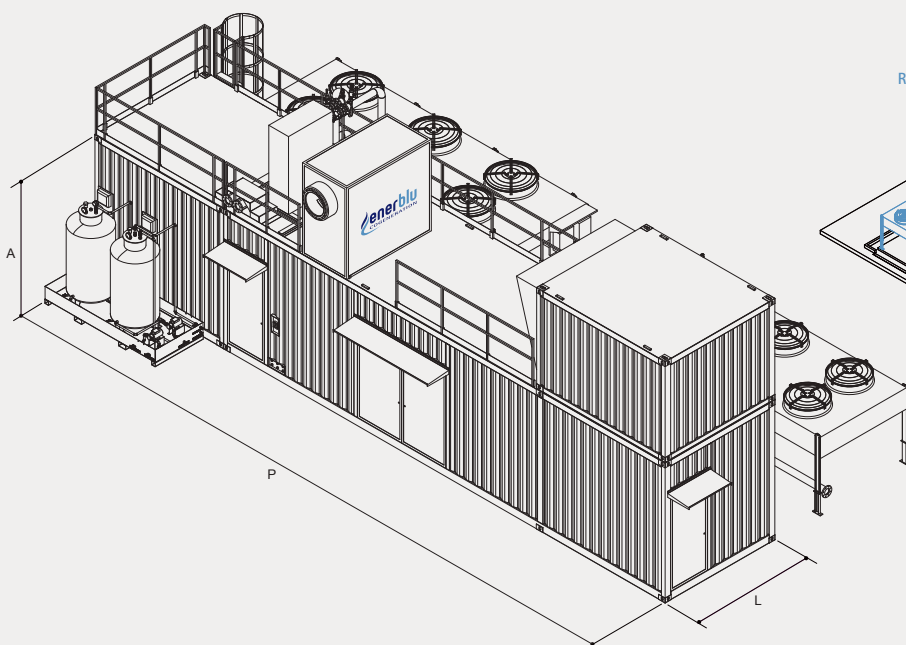


SYMBOLS KEY

	Meter
	Cut-Off fuse switch
	Automatic switch
	Magnetothermal switch
	Contactor
	Interface protection system
	Differential circuit breaker

DG General device
DDI An interface device
DDG Device Builder
DGL General Line device, tucked to DDI

DIMENSIONS



REC2	L width	P depth	A height*
600	mm	3000	12200
800	mm	3000	12200
1000	mm	3000	12200
1200	mm	3000	12200
1500	mm	3000	13500
2000	mm	3000	13500

* The height value doesn't take into account the possible installation of the dry cooler units on the roof of the container

Dimensions can be changed for specific applications or for technical reasons.

BIG GAS

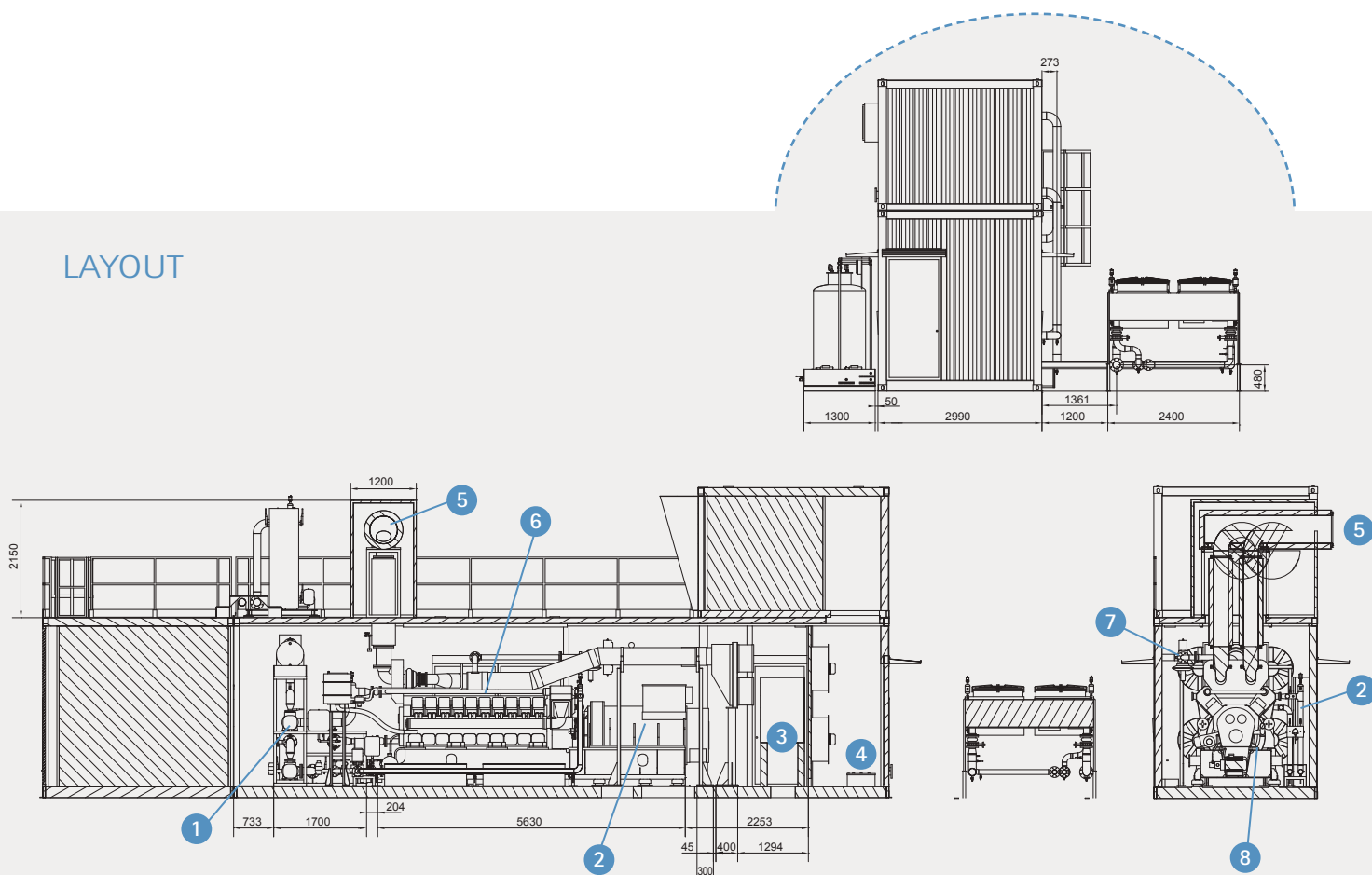
STANDARD SUPPLY IN CONTAINER

- > Gas fuelled endothermic engine
- > Synchronous generator
- > Thermal Module constituted from water-water plate type heat exchanger and water/exhaust shell and tubing heat exchanger, made in AISI 316L steel
- > Dry cooler for eventual dissipation of heat in emergency
- > Residential Noise suppressor in stainless steel
- > Automatic refilling system for the lubricating oil
- > Catalyst system (bi-or three-valent) for lowering emissions levels into the atmosphere according to national regulations (D.L.152/06 in Italy)
- > Container for outdoor installation, including ATEX fan
- > Pressure gauges group (INAIL regulations), expansion vessel not included
- > Control Switchboard (auxiliary)
- > LV Power Switchboard
- > Certified Production meter for electricity (MID type)
- > Interface protection relay, in compliance with CEI 0-16 and annexe A70
- > Supervision Software



> Inside view of a REC 2000 unit

LAYOUT





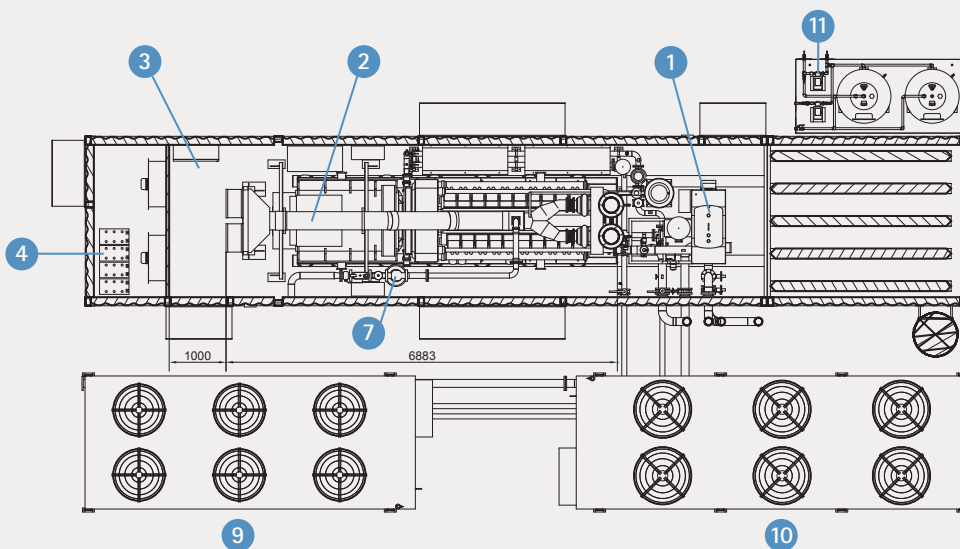
SERVICE AREA

For a correct service operation, it is necessary that the area around the CHP units accmplies with the following table.

DX - SX	Front - Rear	Height
1000	1000	1000



Example mod. 2000



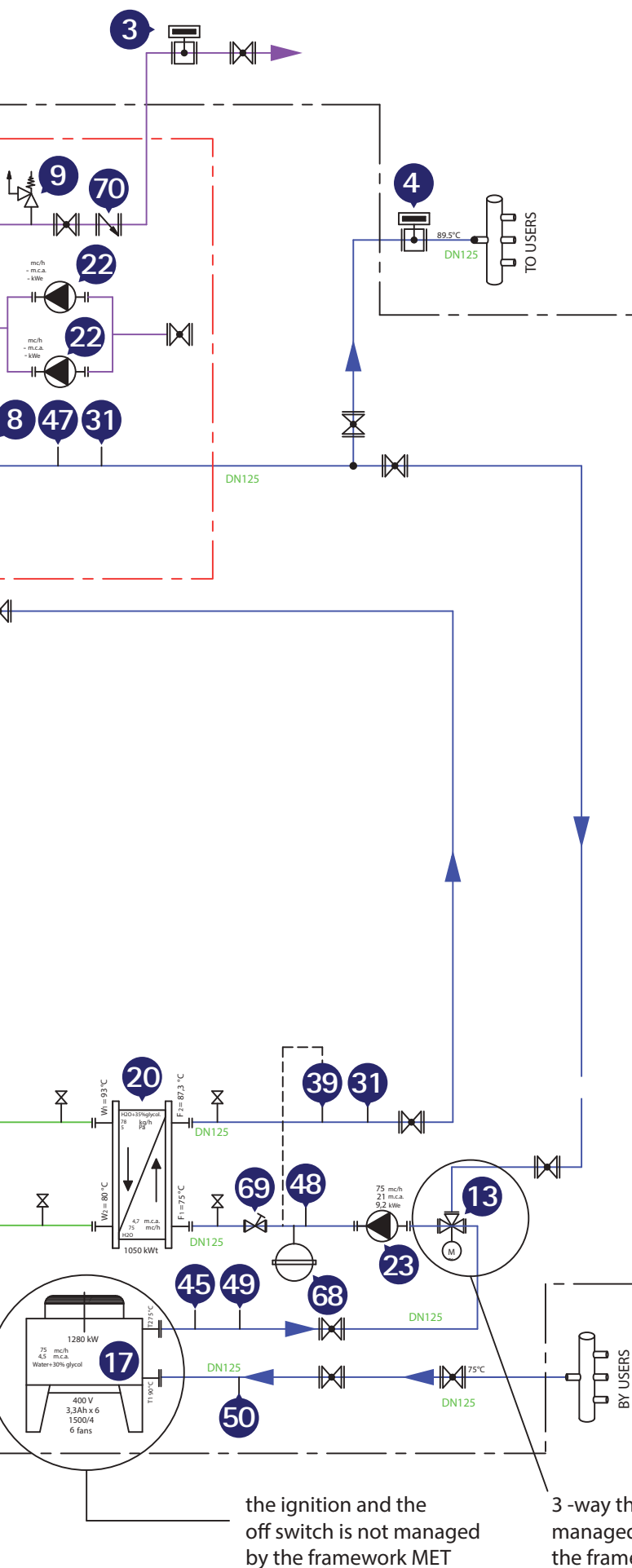
- 1 Internal thermal module
- 2 Alternator
- 3 TEM Control Board
- 4 Starter Batteries 12 V 220 Ah
- 5 Thermal recovery circuit from the exhaust gases
- 6 GENSET MWM
- 7 Feed line for the natural gas fuel
- 8 Silent proof container
- 9 Dry cooler LT (intercooler)
- 10 Dry cooler UT (user's system)
- 11 Module for the lubrication oil tanks

The diagram illustrates a local ventilation system with four parallel branches. Each branch contains a motor (M) and a fan. The motor is labeled '21' and '400 V 1 A'. The fan is labeled '60' and '59'. The entire system is labeled 'GROUP'.



BIG GAS PIPING INSTRUMENTS DIAGRAM

Example mod. 2000



- 1 Oxidizing catalyzer
- 2 Flow rate meter for natural gas fuel
- 3 Flow rate meter for steam
- 4 Thermal power meter for UTH
- 5 Electrovalve for charging the steam generator
- 6 Natural gas electrovalve
- 7 Natural gas electrovalve, manually resettable
- 8 Valve for thermal discharge UTH
- 9 Safety valve for the steam circuit
- 10 Safety valve for the UTH circuit
- 11 Safety valve for the LT circuit
- 12 Safety valve for the HT circuit
- 13 Three-way valve for the UTH circuit control
- 14 Three-way valve for the steam generator circuit control
- 15 Three-way valve for the LT circuit control
- 16 Heater device for the engine coolant
- 17 Dry cooler for the UTH cooling circuit
- 18 Post recuperator from exhaust gases
- 19 Steam generator
- 20 Heat exchanger for HT/UTH circuits
- 21 Electrofan for room ventilation
- 22 Electropump for ST circuit
- 23 Electropump for UHT circuit
- 24 Electropump for prelubrication and oil discharge
- 25 Electropump LT circuit
- 26 Electropump HT circuit
- 27 Gas leakage alarm
- 28 Gas leakage failure signal
- 29 Level switch max – Generator HE EG001
- 30 Level switch min – Generator HE EG001
- 31 Level switch min – UTH circuit
- 32 Level switch min – LT circuit
- 33 Level switch min – HT circuit
- 34 Transducer for steam generator level
- 35 Transducer for minimum gas pressure
- 36 Gas filter
- 37 Transducer for max exhaust pressure
- 38 Transducer for minimum pressure – UTH circuit
- 39 Differential pressure transducer for UTH circuit
- 40 Differential pressure transducer for LT circuit
- 41 Differential pressure transducer for HT circuit
- 42 Steam output pressure gauge
- 43 Pressure gauge for LT circuit
- 44 Pressure gauge for HT circuit
- 45 Pressure gauge for user's circuit
- 46 Pit for INAIL temperature gauge
- 47 Temperature gauge for the user's circuit
- 48 Temperature gauge for the user's circuit, downstream the three-way valve
- 49 Temperature gauge for the user's circuit, downstream the dry-cooler
- 50 Temperature input gauge for the user's circuit
- 51 Temperature gauge for the exhaust chimney
- 52 Temp. gauge for the exhaust, after the post-recuperator
- 53 Temp. gauge for the exhaust, in output from the steam gen.
- 54 Temp. gauge for the exhaust, in input to the steam gen.
- 55 Temp. gauge for the exhaust, in output from the catalyzer
- 56 Temp. gauge for the exhaust, turbine output, B block side
- 57 Temp. gauge for the exhaust, turbine output, A block side
- 58 Temp. gauge for the fuel mixture, after the compressor
- 59 Temperature gauge for the air intake – engine mixer
- 60 Temperature gauge for the air intake – engine filters
- 61 Temperature gauge for the dry- cooler LT output circuit
- 62 Temperature gauge for the intercooler output circuit
- 63 Temperature gauge for the intercooler input circuit
- 64 Temperature gauge for the engine output circuit
- 65 Temperature gauge for the engine input circuit
- 66 Gas pressure regulator
- 67 Cut-off valve
- 68 Expansion vessel
- 69 Flow rate regulation valve
- 70 No-return valve
- 71 Three-way valve, manually operated
- 72 Exhaust gases silencer

BIG COGENERATION RANGE from 600 kWe to 4000 kWe

GAS COGENERATING SET		REC2 600	REC2 800	REC2 1000	REC2 1000
General features at 100% load		MWM TCG3016 V12 1/2 TA - Luft	MWM TCG3016 V16 1/2 TA - Luft	JENBACHER J 320 GS-C02 1/2 TA - Luft	MTU 8V 4000 GS 1/2 TA - Luft
Net electrical base load power (cos ϕ =1)	kW	600	800	1063	1013
Rated thermal power (no Intercooler LT)	kW	652	860	1249	1009
gross of heat exchange efficiency					
Fuel power	kW	1427	1888	2673	2396
Gas consumption	Sm ³ /h	149,0	197,1	279,0	250,1
Electrical efficiency	%	42,0	42,4	39,8	42,3
Thermal efficiency	%	45,7	45,6	46,7	42,1
Global efficiency	%	87,7	87,9	86,5	84,4
General features at 75% load					
Net electrical base load power	kW	450	600	796	760
Rated thermal power (no Intercooler LT)	kW	513	680	935	789
gross of heat exchange efficiency					
Fuel power	kW	1099	1455	2060	1818
Gas consumption	Sm ³ /h	114,7	151,9	215,0	189,8
Electrical efficiency	%	40,9	41,2	38,6	41,8
Thermal efficiency	%	46,7	46,7	45,4	43,4
Global efficiency	%	87,6	88,0	84,0	85,2
General features at 50% load					
Net electrical base load power	kW	300	400	529	507
Rated thermal power (no Intercooler LT)	kW	376	499	647	575
gross of heat exchange efficiency					
Fuel power	kW	777	1028	1446	1277
Gas consumption	Sm ³ /h	81,1	107,3	150,9	133,3
Electrical efficiency	%	38,6	38,9	36,6	39,7
Thermal efficiency	%	48,4	48,5	44,7	45,0
Global efficiency	%	87,0	87,5	81,3	84,7
Engine technical data					
Cycle	type	4 stroke			
Running speed	rpm	1500			
Number of cylinders and total displacement	n°/dm ³	12V / 26,0	16V / 35,0	20V/48,67	8 V /38,1
Bore and stroke	mm	132 / 160	132 / 160	135/170	170/210
Ignition	type	electronic			
Air intake system	type	forced with intercooler			
Engine jacket water flow (min / max)	m ³ /h	22 / 37	29 / 50	32,2	39,2
Mechanical power	kW	632	842	1107	1040
Speed stability at constant load	%	0,25			
Medium lub oil consumption	kg/h	0,160	0,160	0,330	0,160
Oil filling system and tank capacity	type/l	AUTO 1000			
Combustion air flow	kg/h	3.310	4.382	5.768	5.251
Exhaust mass flow	kg/h	3.421	4.529	5.960	5.432
NOx emissions at 5% O ₂ without catalizer	mg/Nm ³	250	250	250	250
CO emissions at 5% O ₂ without catalizer	mg/Nm ³	300	300	300	300
Thermal recovery plant data					
Thermal power recovery from water and lub oil	kW	354	439	669	505
Thermal power recovery from intercooler	kW	38	49	83	73
Thermal power recovery from exhaust	kW	298	421	580	504
Exhaust gas flow	kg/h	3.421	4.529	5.960	5.432
Maximum exhaust gas temperature	°C	407	425	433	423
Max exhaust back pressure after silencer	Pa	5000	5000	6000	6000
Water flow rate (70°/80°C)	m ³ /h	56,15	74,07	107,57	86,90
Water pressure drop (70°/80°C)	kPa	< 70			
Load, connections and noise					
Operation weight	kg	nd			
Shipping weight	kg	9000	10000	15000	15000
Degree of machine protection	IP	44			
Exhaust connection	DN	300			
External water circuit connection	DN	125			
External connection condensation drain	INCH	1"			
Gas pipeline connection	DN	65	65	80	80
Noise level at 7 m engine with canopy and silencer	dB(A)	< 65			
Natural gas					
Minimum dinamic gas supply pressure	mbar	80	80	80-200	120-250
Minimum gas supply pressure and temperature	°C	15			
Maximum speed of gas pressure variation	mbar/min	5			

GAS COGENERATING SET		REC2 1200	REC2 1500	REC2 2000
General features at 100% load		MWM TCG 2020 V12 1/2 TA – Luft	MWM TCG2020 V16 1/2 TA – Luft	MWM TCG2020 V20 1/2 TA – Luft
Net electrical base load power (cos ϕ =1)	kW	1200	1560	2000
Rated thermal power (no Intercooler LT)	kW	1245	1650	2066
gross of heat exchange efficiency				
Fuel power	kW	2818	3696	4690
Gas consumption	Sm ³ /h	294,2	385,4	489,6
Electrical efficiency	%	42,6	42,2	42,6
Thermal efficiency	%	44,2	44,6	44,1
Global efficiency	%	86,8	86,9	86,7
General features at 75% load				
Net electrical base load power	kW	900	1170	1500
Rated thermal power (no Intercooler LT)	kW	992	1304	1644
gross of heat exchange efficiency				
Fuel power	kW	2175	2846	3628
Gas consumption	Sm ³ /h	227,0	296,8	378,7
Electrical efficiency	%	41,4	41,1	41,3
Thermal efficiency	%	45,6	45,8	45,3
Global efficiency	%	87,0	86,9	86,7
General features at 50% load				
Net electrical base load power	kW	600	780	1000
Rated thermal power (no Intercooler LT)	kW	731	963	1211
gross of heat exchange efficiency				
Fuel power	kW	1529	1999	2556
Gas consumption	Sm ³ /h	159,6	208,7	266,8
Electrical efficiency	%	39,2	39,0	39,1
Thermal efficiency	%	47,8	48,2	47,4
Global efficiency	%	87,1	87,2	86,5
Engine technical data				
Cycle	tipo	4 stroke		
Running speed	rpm	1500		
Number of cylinders and total displacement	n°/dm ³	12V / 53,0	16V / 71,0	20V / 89,0
Bore and stroke	mm	170 / 195	170 / 195	170 / 195
Ignition	tipo	electronic		
Air intake system	tipo	forced with intercooler		
Engine jacket water flow (min / max)	m ³ /h	36 / 56	50 / 65	60 / 85
Mechanical power	kW	1263	1642	2105
Speed stability at constant load	%	0,25		
Medium lub oil consumption	kg/h	0,240	0,240	0,240
Oil filling system and tank capacity	tipo/l	AUTO 1000		
Combustion air flow	kg/h	6.609	8.687	11.059
Exhaust mass flow	kg/h	6.829	8.975	11.425
NOx emissions at 5% O ₂ without catalizer	mg/Nm ³	250	250	250
CO emissions at 5% O ₂ without catalizer	mg/Nm ³	300	300	300
Thermal recovery plant data				
Thermal power recovery from water and lub oil	kW	632	827	1.042
Thermal power recovery from intercooler	kW	110	138	185
Thermal power recovery from exhaust	kW	613	823	1.024
Exhaust gas flow	kg/h	6.829	8.975	11.425
Maximum exhaust gas temperature	°C	415	421	415
Max exhaust back pressure after silencer	Pa	5000	5000	5000
Water flow rate (70°/80°C)	m ³ /h	107,22	142,11	177,93
Water pressure drop (70°/80°C)	kPa	< 70		
Load, connections and noise				
Operation weight	kg	nd		
Shipping weight	kg	15000	18000	27000
Degree of machine protection	IP	44		
Exhaust connection	DN	350	450	500
External water circuit connection	DN	125	150	200
External connection condensation drain	POLLICI	1"		
Gas pipeline connection	DN	80	80	80
Noise level at 7 m engine with canopy and silencer	dB(A)	< 65		
Natural gas				
Minimum dinamic gas supply pressure	mbar	80	80	80
Minimum gas supply pressure and temperature	°C	15		
Maximum speed of gas pressure variation	mbar/min	5		

(*) For values of stricter emissions will be studied ad-hoc solutions.
The performances of the cogenerator refer to the values of: ambient temperature, relative humidity and gas supply pressure, with the relative tolerances and efficiencies indicated on the card.
With gas supply pressures lower than those reported, hourly engine consumption is NOT guaranteed.
THE COMPANY RESERVES THE RIGHT TO MAKE CHANGES EVEN WITHOUT NOTIFICATION.

BIOGAS

THE PLUS:

- > Full range 60 – 999 kWe
- > Tailor made solutions
- > Very high efficiency
- > Open (naked) version
- > Silent operation through canopy or container



Hot water,
overheated water



Trigeneration



Enerblu has available a complete range of biogas cogeneration units apt to satisfy all the requests coming from the world of the zootechny, from sewage depuration plants and from waste landfills plants.

The range covers the electrical power production from 50 kWe until 999 kWe, with the possibility, on specific demand, to arrive up to 2 MWe.

Enerblu is in a position to tailor suit the supply on specific demand for the customer and to issue a project that in every case is aimed at the maximum energetic efficiency of the system.

All the biogas cogenerators are supplied with sound-proof cabin or container. Upon request they can be supplied also in the so-called "naked" version, ready for installation on existing technical premises.

EXAMPLE

Biogas plant 100 kWe

Potential size for cattle breeding farm
350 adult cattle
> 6.000 tons per year of manure



production of 200,000 m³ of biogas per year
330,000 kWh/year of electricity








Energy saving for the country = 62 tep/year (tons of oil equivalent)

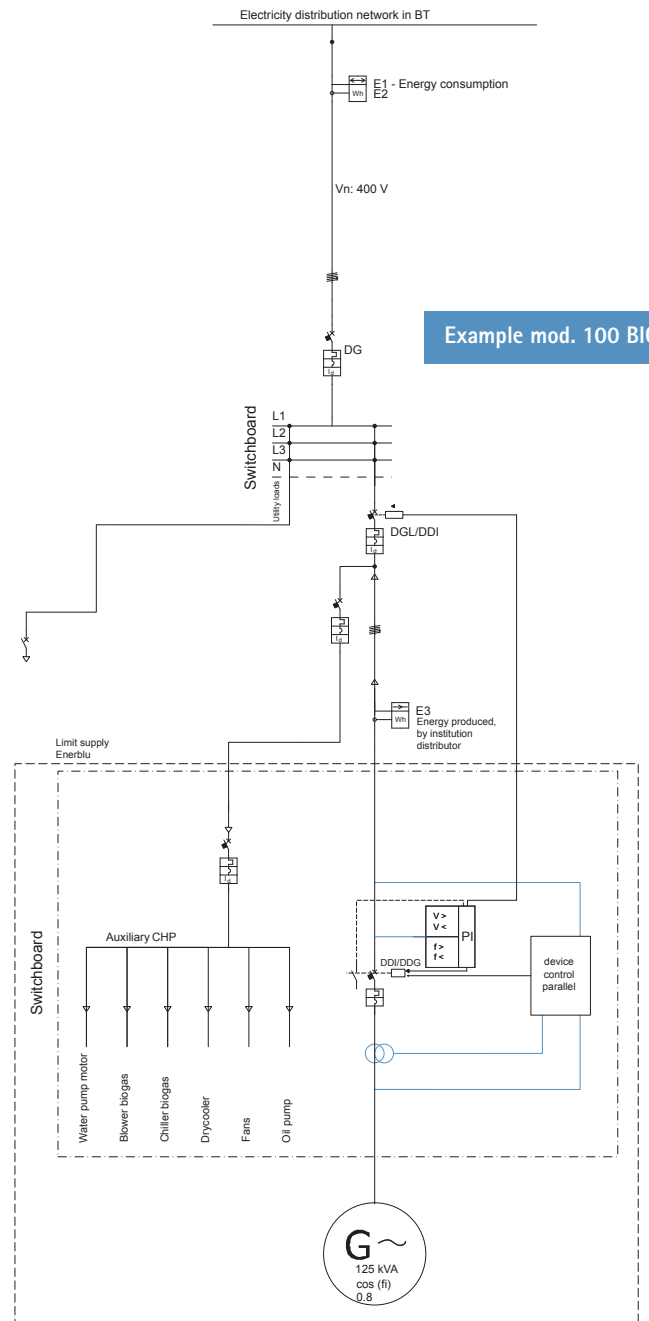
Reduction of emissions in to the atmosphere = 180 tons/year of CO₂ (carbon dioxide)



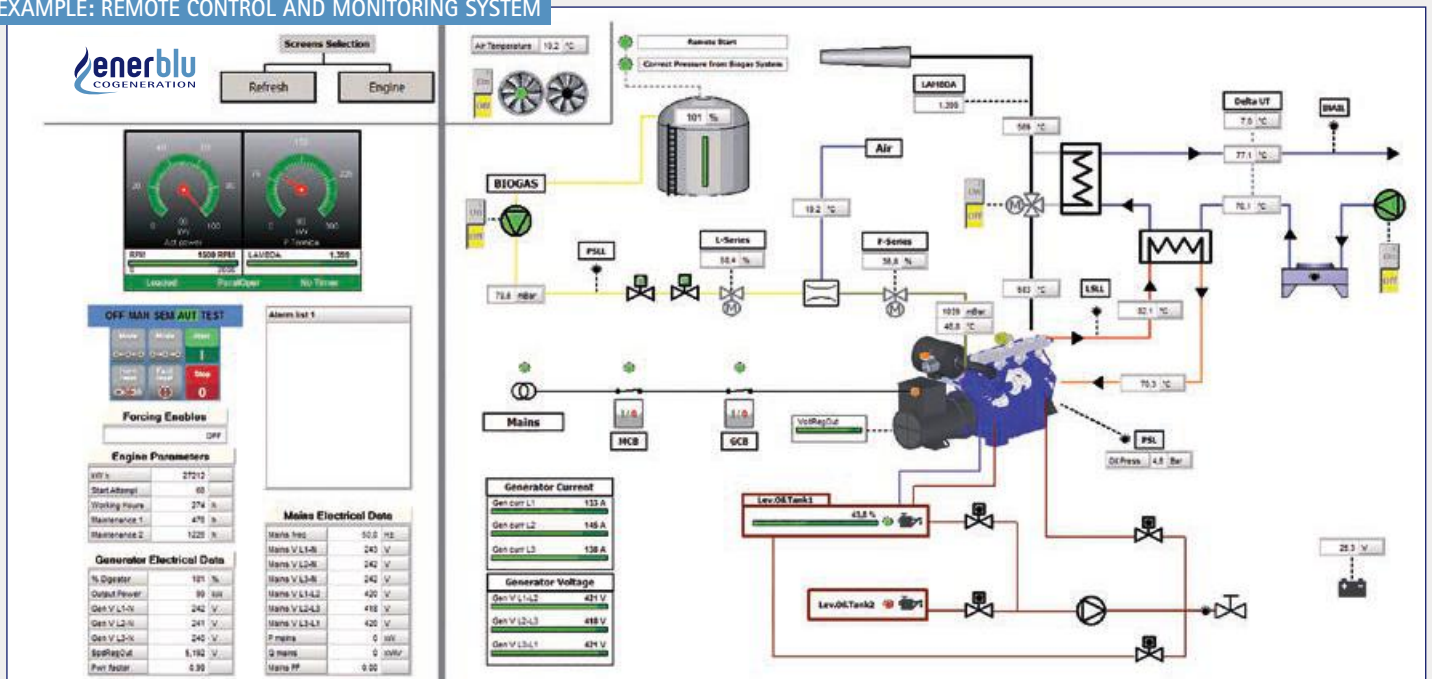
EXAMPLE OF ONE-LINE DIAGRAM

SYMBOLS KEY

	Meter
	Cut-Off fuse switch
	Automatic switch
	Magnetothermal switch
	Contactor
	Interface protection system
	Differential circuit breaker
DG	General device
DDI	An interface device
DDG	Device Builder
DGL	General Line device, tucked to DDI



EXAMPLE: REMOTE CONTROL AND MONITORING SYSTEM



BIOGAS

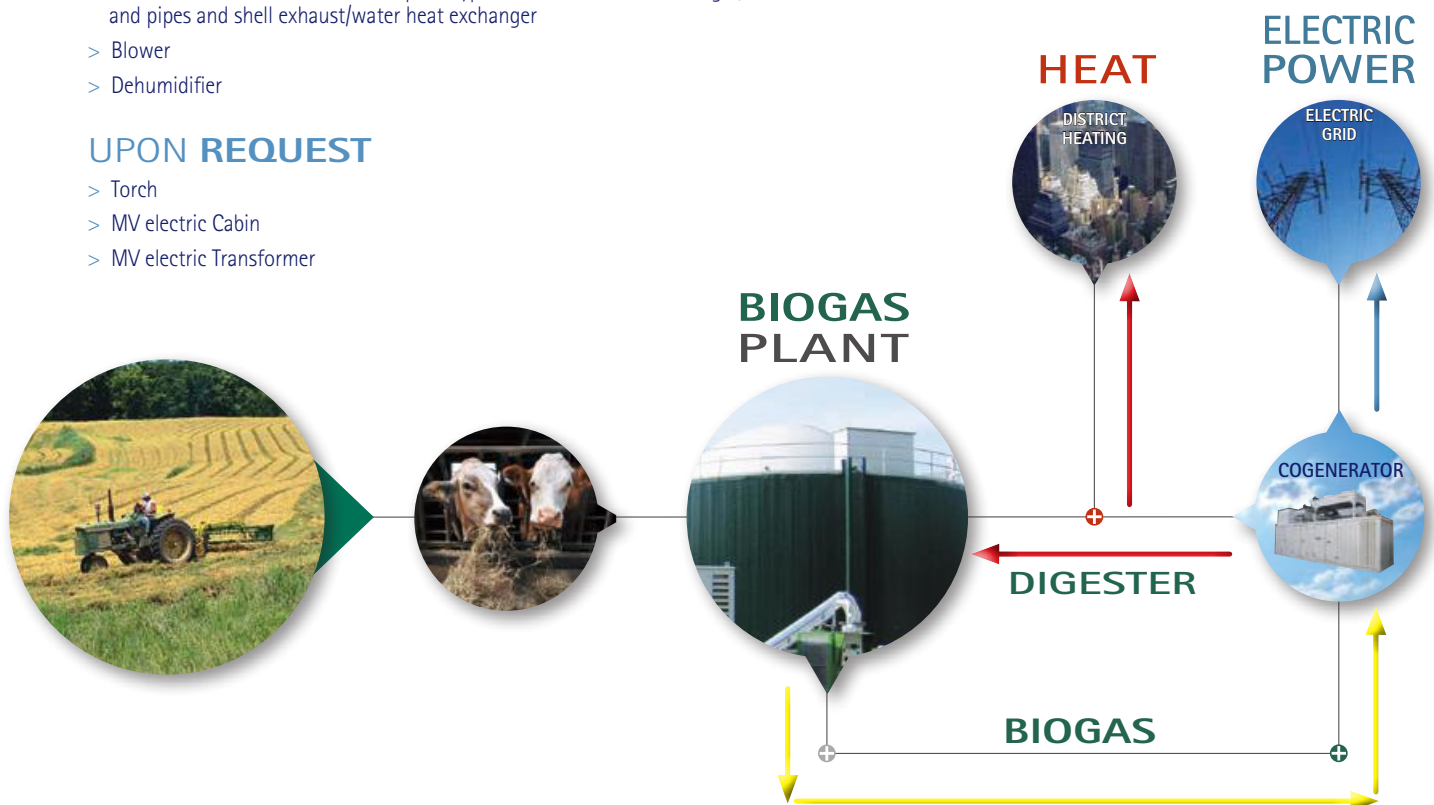
All the BIOGAS product line cogenerators are conceived with the aim to keep to the minimum the self-consumption in the energy needed for operating the CHP plant.

STANDARD SUPPLY

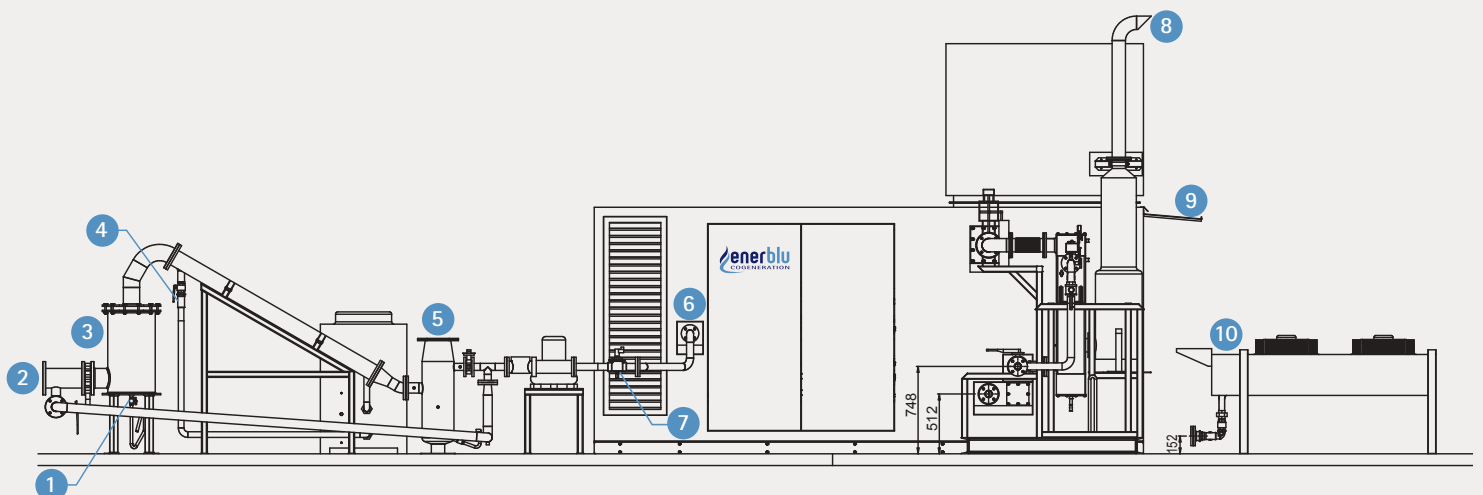
- > Thermal Module constituted from plate type water-water heat exchanger, and pipes and shell exhaust/water heat exchanger
- > Blower
- > Dehumidifier

UPON REQUEST

- > Torch
- > MV electric Cabin
- > MV electric Transformer



LAYOUT





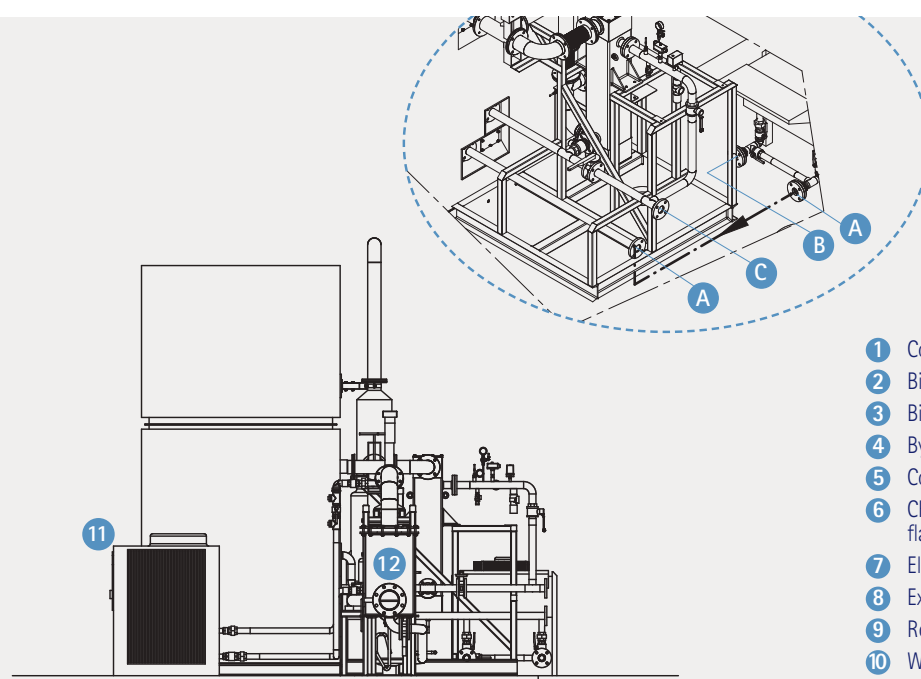
SERVICE AREA

For a correct service operation, it is necessary that the **area around the CHP units be a free walk area, plane, around each component of the group itself and its shown accessories.**



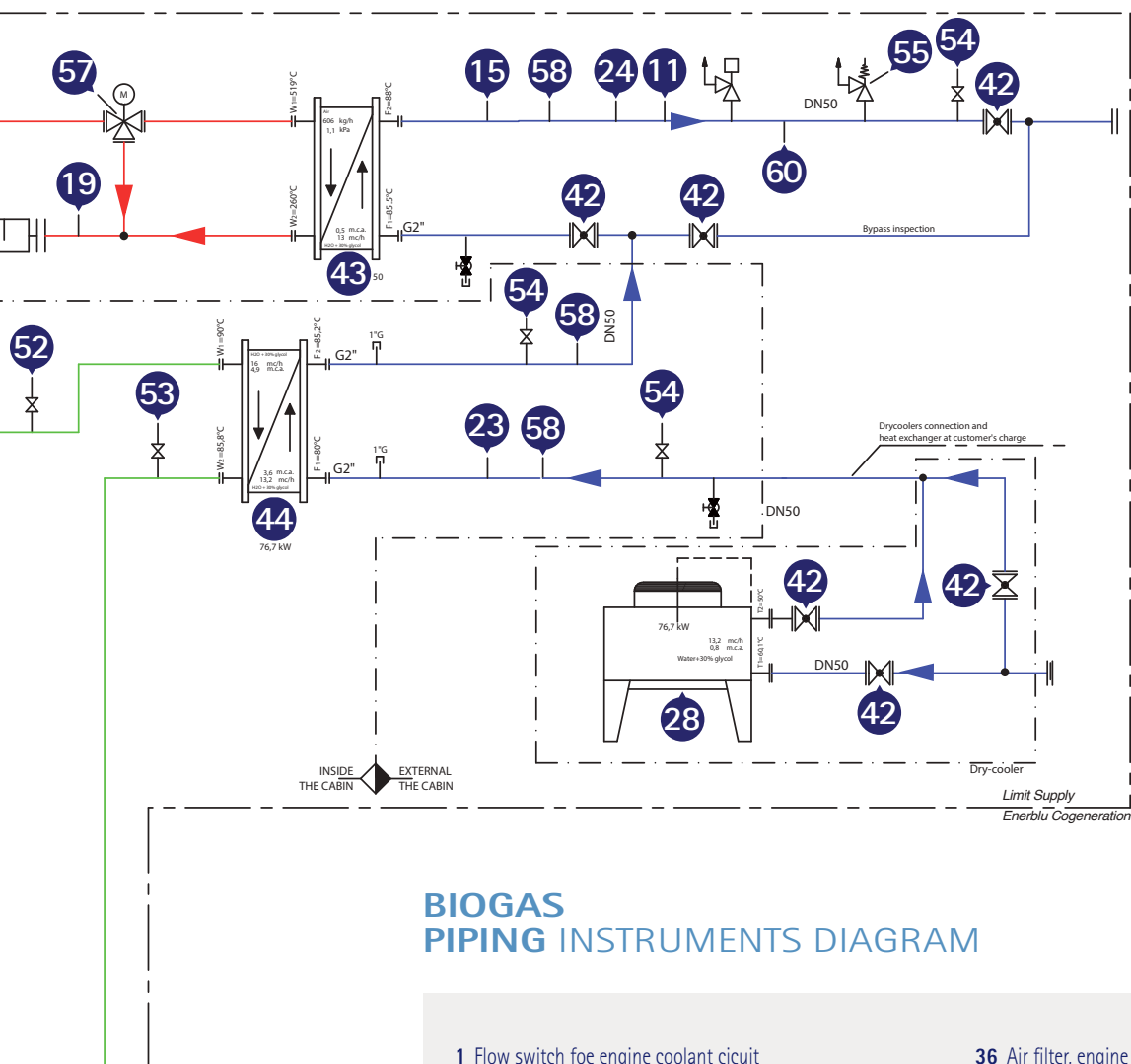
> REC2 60 BIO

Example mod. 100 BIO



- A Flange DN50 PN16 UNI EN 1092-1
- B Input cold water (from UT circuit) DN50 PN16
- C Output hot water (from the CHP unit) DN50 PN16

- 1 Condensate drainage
- 2 Biogas input, stainless steel flange DN150 PN10 UNI EN 1092-1
- 3 Biogas filter in input
- 4 By-pass device for further installation of a chiller
- 5 Condensate separator
- 6 CHP Input for biogas after filtering and dehumidification, flange DN40 PN16 UNI EN 1092-1 – Stainless steel
- 7 Electrovalve DN50 M16
- 8 Exhaust gases output
- 9 Roofing canopy for rain protection, electric control board side
- 10 WH1263BD 2VQS – body
- 11 Refrigerator
- 12 Input for biogas to filtering and dehumidification, flange DN150 PN10 UNI EN 1092-1 – Stainless steel



BIOGAS PIPING INSTRUMENTS DIAGRAM

Example mod. 100 BIO

- 1 Flow switch for engine coolant circuit
- 2 Biogas leakage detector
- 3 Biogas leakage detector
- 4 Level switch – low water level in the engine
- 5 Level switch – low oil level in the engine ancillary sump
- 6 Level switch – low oil level in the engine oil tank
- 7 Meter for oil level in the oil tank
- 8 Pressure switch – high pressure for BIOGAS input
- 9 Pressure switch – very low press. for BIOGAS input
- 10 Pressure switch – minimum pressure for engine oil
- 11 Pressure switch – very low press. for user's water circuit
- 12 Pressure transducer for biogas
- 13 Pressure transducer for the fuel mixture
- 14 Pressure transducer for the engine oil
- 15 Thermal switch – very high temp. in the user's circuit
- 16 Thermoresistor PT100 – environment temperature
- 17 Thermocouple TCK – Output temperature n°6 Cyl.
- 18 Thermocouple TCK – Output temp. for the turbine
- 19 Thermocouple TCK – Input temp. to the silencer
- 20 Thermoresistor PT100 – mixture temp. in output from the turbine
- 21 Thermoresistor PT100 – coolant temp. in output from the engine
- 22 Thermoresistor PT100 – coolant temp. in input to the engine
- 23 Thermoresistor PT100 – water temp. in input to the user's circuit
- 24 Thermoresistor PT100 – water temp. in output from the user's circuit
- 25 Electrovalve, manually resettable
- 26 Butterfly valve for BIOGAS cut-off – stainless steel
- 27 Condensate separator
- 28 Dry cooler Thermokey, inverter controlled
- 29 Chiller for BIOGAS dehumidification
- 30 Electrofan ATEX complying
- 31 Electrofan, standard
- 32 Butterfly valve for BIOGAS mixture control
- 33 Butterfly valve for power control
- 34 Biogas filter, cartridge type
- 35 Biogas filter, on the gas feeding line
- 36 Air filter, engine orig.
- 37 Spherical type valve for biogas cut-off
- 38 Two way spherical valve – bypass closing
- 39 Two way spherical valve
- 40 Three-way manually operated valve – oil tank discharge
- 41 Venturi mixer
- 42 Two way spherical valve
- 43 Heat exchanger for BIOGAS cooling
- 44 Pipe and shell type heat exchanger for the exhaust gases AISI 316 L
- 45 Plate type heat exchanger for engine coolant/user's water circuits – TP202-52, Pt=76,7 kW
- 46 Retaining valve – input oil sump
- 47 Oil tank 50 litres
- 48 Oil tank 150 litres
- 49 Blower for biogas feeding
- 50 Mechanical pump – coolant for the engine jackets
- 51 Charging and circulation pump for engine oil, Pel=250W
- 52 Pressure meter for gas, 0-160mbar
- 53 Pressure meter, 0-4 bar, with glycerine
- 54 Zero pressure regulator for biogas
- 55 Safety valve 3 bar, to be checked with the pressure in the plant SILENCER !!!!!
- 56 Over pressure valve – engine water 0,7 bar
- 57 Three-way valve exhaust bypass, automatic return in a safe position
- 58 Thermometer – Full scale 120°C
- 59 Thermostatic valve, engine orig.
- 60 Inspection cavity INAIL
- 61 Expansion vessel, closed type, without membrane V=6.7 litre engine coolant
- 62 Electrovalve 24V BIOGAS
- 63 Electrovalve for lubrication oil circuit
- 64 Lambda probe

BIOGAS RANGE from 50 kWe to 1000 kWe

BIOGAS COGENERATING SET		REC2 50 BIOG	REC2 60 BIOG	REC2 80 BIOG	REC2 100 BIOG	REC 200 BIOG	REC2 250 BIOG
General features at 100% load		MAN E0834 LE302	MAN E0834 LE302	TEDOM TB 90 G5V NX 86	TEDOM / DOOSAN	DOOSAN GV180 TIC	DOOSAN GV 222 TIC
Net electrical base load power (Cosφ 1,00)	kW	50	60	80	100	200	250
Total heating capacity (**)	kW	68	80	117,4	77	261	346
Fuel power	kW	130	179	239	292	533	702
Biogas consumption	Sm³/h	22,6	31,1	41,6	50,8	92,7	122,1
Electrical efficiency	%	38	34	33,5	34,2	37,5	35,6
Thermal efficiency (with water - exhaust heat exchanger)	%	52	45	49,1	26,4	49,0	49,3
Global efficiency	%	91	78	83	61	86	85
Engine technical data							
Cycle	type	4 stroke					
Running speed	rpm	1500					
Number of cylinders and total displacement	n°/dm³	4 - 4,6	4 - 4,6	6 - 11,9	6 - 11,9	10 - 18,3	12 - 21,9
Ignition	type	electronic					
Air intake system	type	forced with intercooler		aspirated		forced with intercooler	
Engine jacket water flow	m³/h	8	8,5	15	15	35	38
Mechanical power	kW	55	65	85	112,5	210	263
Speed stability at constant load	%	0,25					
Lub oil consumption up to	kg/h	0,1	0,1	0,04	0,04	0,15	0,15
Oil filling system and tank capacity	type/l	automatic / 30		automatic / 50			
Combustion air flow	kg/h	271	334	413	561	922	1140
Exhaust mass flow	kg/h	301	370	450	606	1028	1228
Engine exit exhaust temperature	°C	413	430	580	519	500	470
NOx emissions at 5% O2 without catalizer (*)	mg/Nm³	< 500					
CO emissions at 5% O2 without catalizer (*)	mg/Nm³	< 1000	< 1000	< 650	< 650	< 650	< 650
Alternator technical data							
Alternator type		synchronous					
Generator rated power in continuous duty	kVA	63	75	100	125	250	312,5
Cos(φ) nominal		0,8					
Rated voltage	V	400					
Pole number	P	4					
Frequency	Hz	50					
Subtransitory reactance	%	7,28	7,54	5,7	4,53	5,8	7,18
Full load generator efficiency	%	91	92	94	95	95,4	95
Voltage precision	%	± 5%					
Isolation class	cl.	H					
Thermal recovery plant data							
Thermal power recovery from water and lub oil	kW	47	52	63,4	77	162	240
Thermal power recovery from intercooler	kW	0	0	0	0	13	19
Thermal power recovery from exhaust	kW	21	28	54	50 (***)	99	106
Natural gas							
Minimum dinamic gas supply pressure	mbar	50					60
Maximum gas supply pressure and temperature	°C	15					15
Conditions and tollerance							
Max operating outdoor air temperature without derating	°C	25	25	25	25	25	25
Max operating altitude without derating	m.s.l.m.	100	100	100	100	100	100
Maximum RH	%	30	30	30	30	30	30
Maximum temperature water inlet	°C	82	82	82	82	82	82
Maximum temperature water outlet	°C	88	88	88	88	88	88
Maximum users water Δt	°C	10	10	15	15	10	10
Characteristics biogas	kJ/Sm³	21600	21600	21600	21600	21600	21600
Electrical power tolerance	% ±	5	5	5	5	5	5
Thermal power tolerance	% ±	10	10	10	10	10	10

BIOGAS COGENERATING SET		REC2 300 BIOG	REC2 350 BIOG	REC2 400 BIOG	REC2 600 BIOG	REC2 800 BIOG	REC2 1000 BIOG
General features at 100% load		MAN E3268 LE232	MAN	MAN	MWM	MWM	MWM
Net electrical base load power (Cosφ 1,00)	kW	300	350	420	600	800	1000
Total heating capacity (**)	kW	320	449	514	598	795	1032
Fuel power	kW	748	923	1095	1411	1880	2433
Biogas consumption	Sm³/h	130,1	160,6	190,5	245,5	327,1	423,3
Electrical efficiency	%	40,1	37,9	38,4	42,5	42,6	41,1
Thermal efficiency (with water - exhaust heat exchanger)	%	42,8	48,6	46,9	42,4	42,3	42,4
Global efficiency	%	83	87	85	85	85	84
Engine technical data							
Cycle	type	4 stroke					
Running speed	rpm	1500					
Number of cylinders and total displacement	n°/dm³	8 - 17,2	8 - 17,2	12 - 25,78	12V - 26,3	16V / 35,0	12V / 53,1
Ignition	type	electronic					
Air intake system	type	forced with intercooler					
Engine jacket water flow	m³/h	29	39	44	51	68	89
Mechanical power	kW	312	370	450	620	826	1026
Speed stability at constant load	%	0,25					
Lub oil consumption up to	kg/h	0,15	0,15	0,08	0,120	0,160	0,200
Oil filling system and tank capacity	type/l	automatic / 50			automatic n.d		
Combustion air flow	kg/h	1456	1662	2095	2967	3954	4926
Exhaust mass flow	kg/h	1619	1851	2320	3219	4290	5496
Engine exit exhaust temperature	°C	480	490	455	454	449	466
NOx emissions at 5% O₂ without catalizer (*)	mg/Nm³	< 500					
CO emissions at 5% O₂ without catalizer (*)	mg/Nm³	< 700	< 700	< 750	<1000	<1000	<1000
Alternator technical data							
Alternator type		synchronous					
Generator rated power in continuous duty	kVA	375	437,5	525	750	1000	1250
Cos(φ) nominal		0,8					
Rated voltage	V	400					
Pole number	P	4					
Frequency	Hz	50					
Subtransitory reactance	%	11,44	11,4	18,7	7,81	8,4	12,9
Full load generator efficiency	%	96,2	95,2	95	96,5	96,8	97,4
Voltage precision	%	± 5%					
Isolation class	cl.	H					
Thermal recovery plant data							
Thermal power recovery from water and lub oil	kW	174	229	274	306	411	554
Thermal power recovery from intercooler	kW	32	20	30	39	56	76
Thermal power recovery from exhaust	kW	146	220	240	292	384	478
Natural gas							
Minimum dinamic gas supply pressure	mbar	60			20/200		
Maximum gas supply pressure and temperature	°C	15			15		
Conditions and tollerance							
Max operating outdoor air temperature without derating	°C	25	25	20/25	20 / 25	20 / 25	20 / 25
Max operating altitude without derating	m.s.l.m.	100	100	100	100	100	100
Maximum RH	%	30	30	30	30	30	30
Maximum temperature water inlet	°C	82	82	84	84	84	84
Maximum temperature water outlet	°C	88	88	92	92	92	92
Maximum users water Δt	°C	10	10	10	12	12	12
Characteristics biogas	kJ/Sm³	21.600	21.600	21.600	21.600	21.600	21.600
Electrical power tolerance	% ±	5	5	5	5	5	5
Thermal power tolerance	% ±	10	10	10	10	10	10

(*) Values lower emissions are achieved with the catalyst bivalent for CO and with SCR systems for NOx.
 (**) On request of the customer is possible to increase the thermal power recovered for the following package REC2 62 BIO MAN, REC2 80 BIO TD and REC2 100 BIO TD and DW. (***) Flue gas outlet temperature 200°C.
 The data refer to the percentage of methane by 60 % up to 360 kWt and 55 % from 400 to 999 kWt.
 THE COMPANY RESERVES THE RIGHT TO MAKE CHANGES EVEN WITHOUT NOTIFICATION.



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