



## Product range 2009

Natural gas – Combined Heat and Power Units,  
**50 kW to 958 kW** electrical power



Compact modules 50Hz Natural gas CHP Units

## Electrical Power 40 kW to 70 kW

Compact modules with MAN gas engines , Series 0830

<b>CHP-Type</b>	<b>Engine</b> (Gas-Otto-engine) (naturally aspirated: Lambda = 1) Cyl. / Mode <sup>1)</sup> / Manufacturer <sup>2)</sup>	<b>Electrical power<sup>3)</sup></b> /kW	<b>Electrical efficiency<sup>3)</sup></b> /%	<b>Thermal output<sup>4)</sup></b> /kW Exhaust temp. 120°C	<b>Fuel input<sup>5)</sup></b> /kW
<b>FMB-65- GSK</b>	6 / L – asp. / MAN	50	34,3	74	146
<b>FMB-85- GSK</b>	6 / L - turbo int / MAN	70	34,9	105	201

- Legend:
- 1) L = In line engine
  - 3) at pf=1, not over loadable
  - 4) +/- 8%; Methane number 80; Exhaust temp. 120°C.
  - 5) +/- 5%; Methane number 80%

## Electrical Power 122 kW to 400 kW

Compact modules with SCHMITT ENERTEC gas engines , based on Mercedes Benz Series SE-MB

CHP-Type	Engine (Gas-Otto-engine) (naturally aspirated: Lambda = 1) (Leanburn: Turbocharged) Cyl. / Mode <sup>1)</sup> / Manufacturer <sup>2)</sup>	Electrical power <sup>3)</sup> /kW	Electrical efficiency <sup>3)</sup> /%	Thermal output <sup>4)</sup> /kW Exhaust temp. 120°C	Fuel input <sup>5)</sup> /kW
<b>FMB-120-GSK</b>	6 / R – asp. / SE-MB	100	34,4	161	291
<b>FMB-155-GSK</b>	6 / R – asp. / SE-MB	122	35,1	196	348
<b>FMB-190-GSK</b>	8 / V – asp. / SE-MB	151	36,0	232	419
<b>FMB-215-GSMK</b>	6 / R - turbo int. / SE-MB	173	35,8	264	483
<b>FMB-230-GSMK</b>	6 / R - turbo ext. / SE-MB	185	36,5	239	508
<b>FMB-270-GSMK</b>	8 / V - turbo int. / SE-MB	220	37,3	308	590
<b>FMB-285-GSMK</b>	8 / V - turbo ext. / SE-MB	233	37,7	203	618
<b>FMB-410-GSMK</b>	12 / V - turbo int. / SE-MB	334	36,6	485	913
<b>FMB-430-GSMK</b>	12 / V - turbo ext. / SE-MB	350	38,1	413	919
<b>FMB-500-GSMK</b>	12 / V - turbo int / ext. / SE-MB	400	37,9	503	1.055

Legend:

- 1) L = In line engine  
V = V-Motor 90°  
int. = internal mixture cooling  
ext. = external mixture cooling
- 2) SE-MB = SCHMITT-ENERTEC based on Mercedes-Benz
- 3) at pf=1, not over loadable
- 4) +/- 8%; Methane number 80; Exhaust temp. 120°C.
- 5) +/- 5%; Methane number 80%

## Electrical Power 609 kW to 958 kW

Compact modules with Guascor gas engines , Series SFGLD

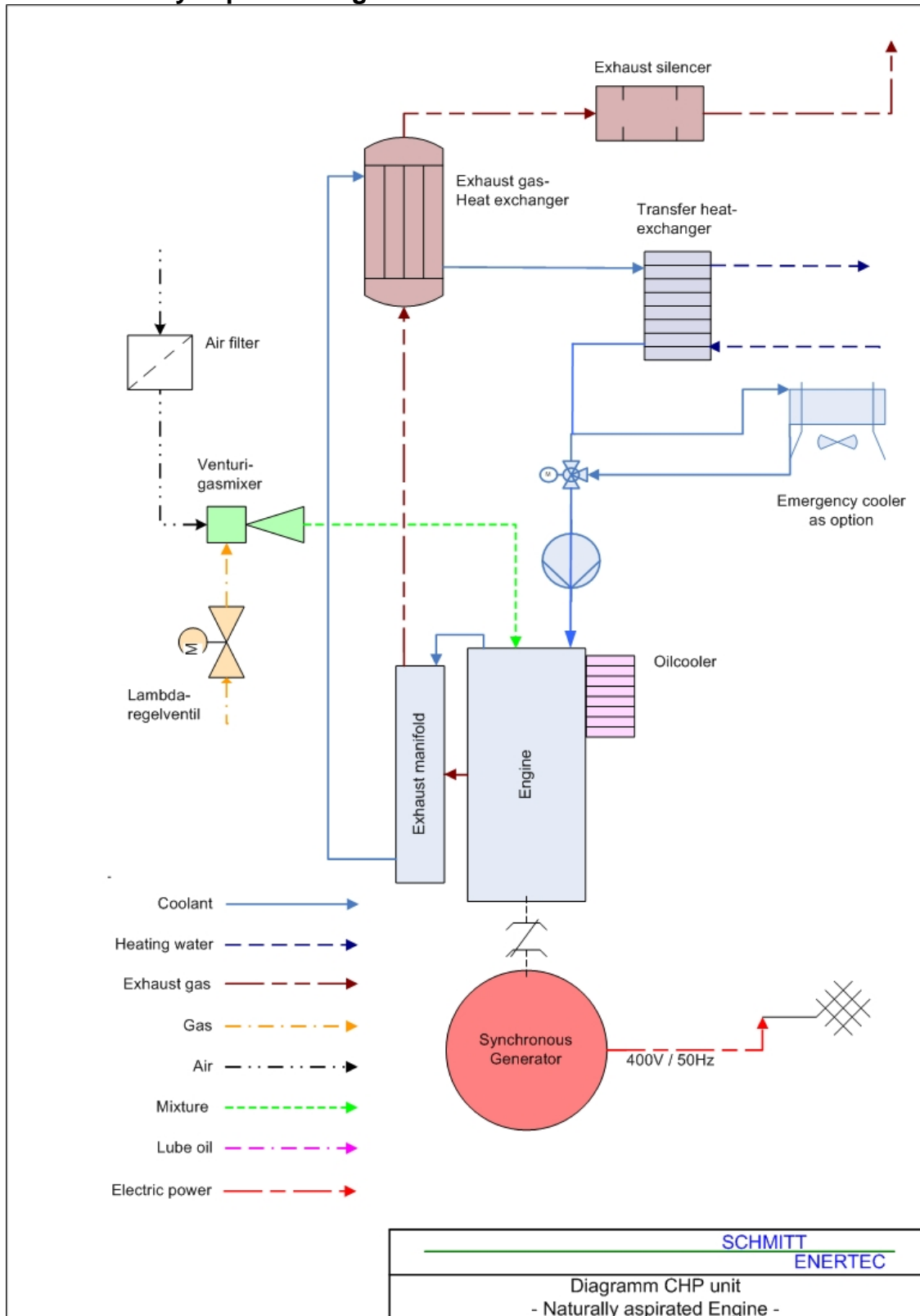
CHP-Type	Engine (Gas-Otto-engine) (naturally aspirated: Lambda = 1) (Leanburn: Turbocharged) Cyl. / Mode <sup>1)</sup> / Manufacturer <sup>2)</sup>	Electrical power <sup>3)</sup> /kW	Electrical efficiency <sup>3)</sup> /%	Thermal output <sup>4)</sup> /kW Exhaust temp. 120°C	Fuel input <sup>5)</sup> /kW
<b>FMB-750-GSMK</b>	12 / V - turbo ext. / GUASCOR	609	39,1	663	1.559
<b>FMB-970-GSMK</b>	16 / V - turbo ext. / GUASCOR <b>250 mg/Nm<sup>3</sup> NOx</b>	773	35,9	1.028	2.151
<b>FMB-1000-GSMK</b>	16 / V - turbo ext. / GUASCOR	809	39,3	945	2.057
<b>FMB-1130-GSMK</b>	16 / V - turbo ext. / GUASCOR <b>250 mg/Nm<sup>3</sup> NOx</b>	909	35,9	1.213	2.532
<b>FMB-1180-GSMK</b>	16 / V - turbo ext. / GUASCOR	958	39,1	1.126	2.449

Legend:

- 1) L = In line engine  
V = V-Motor 90°  
int. = internal mixture cooling  
ext. = external mixture cooling
- 2) SE-MB = SCHMITT-ENERTEC based on Mercedes-Benz
- 3) at pf=1, not over loadable
- 4) +/- 8%; Methane number 80; Exhaust temp. 120°C
- 5) +/- 5%; Methane number 80%

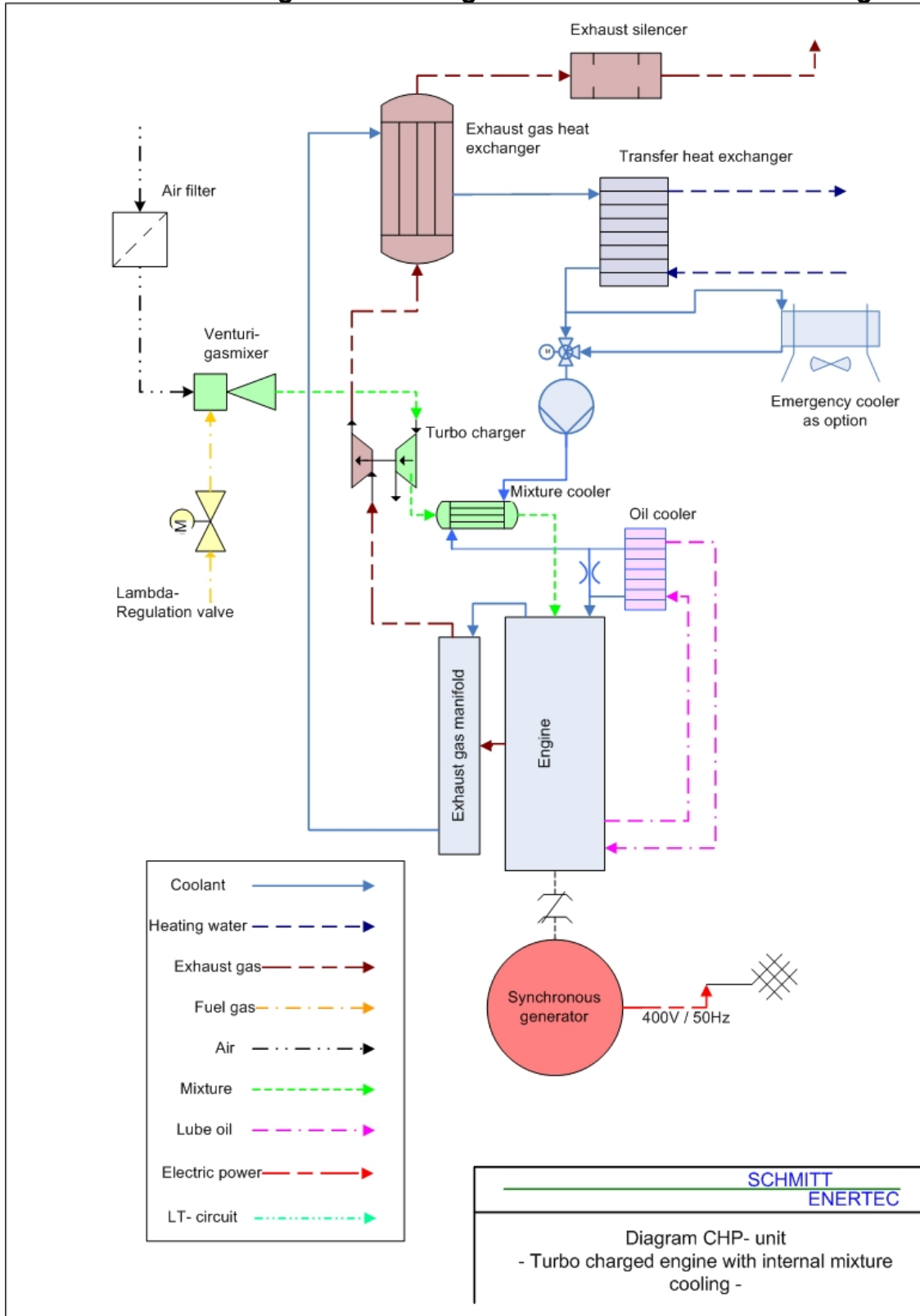


**Flow Chart: Naturally aspirated engine**



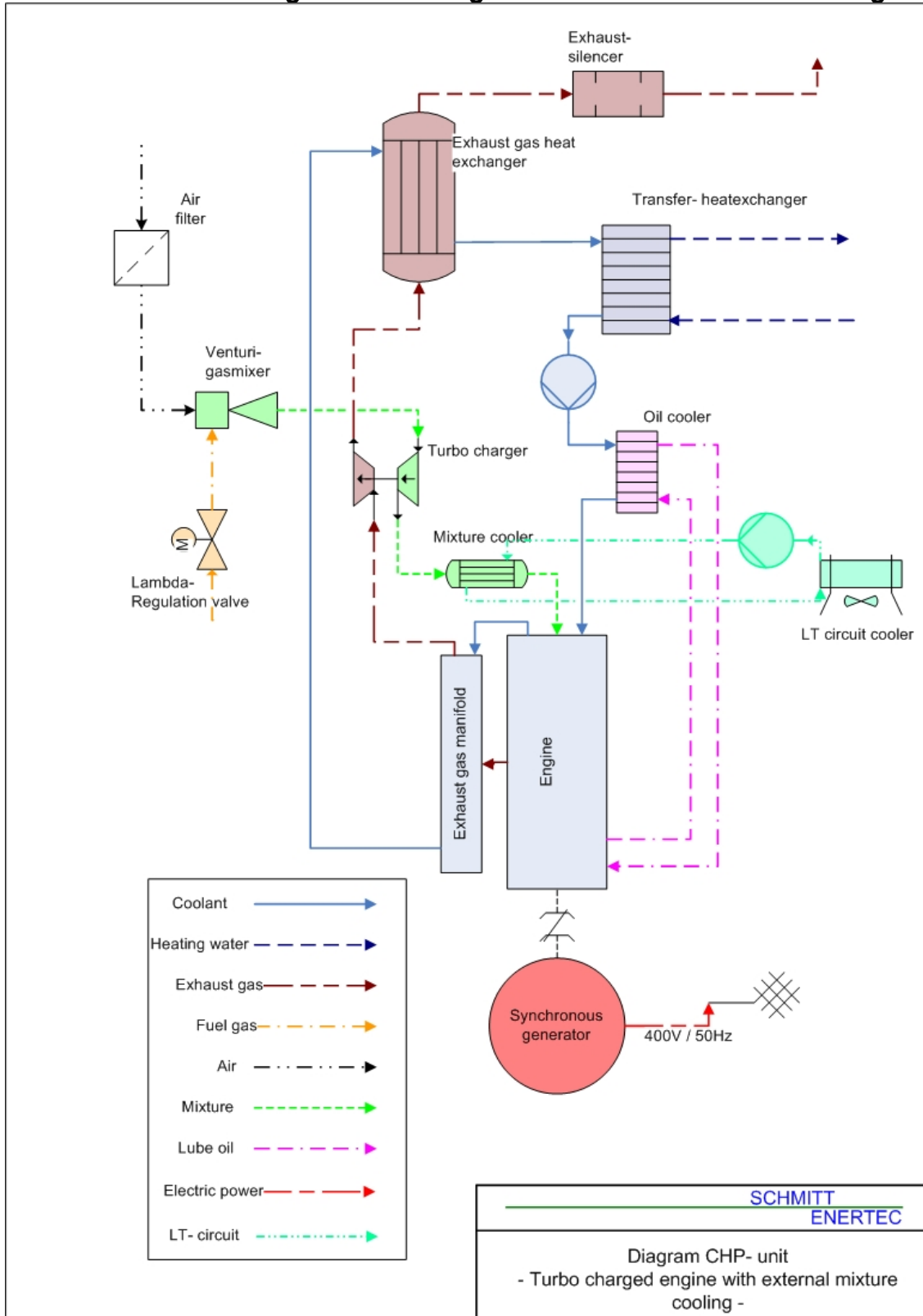


### Flow Chart: Lean burn engine turbocharged with internal mixture cooling



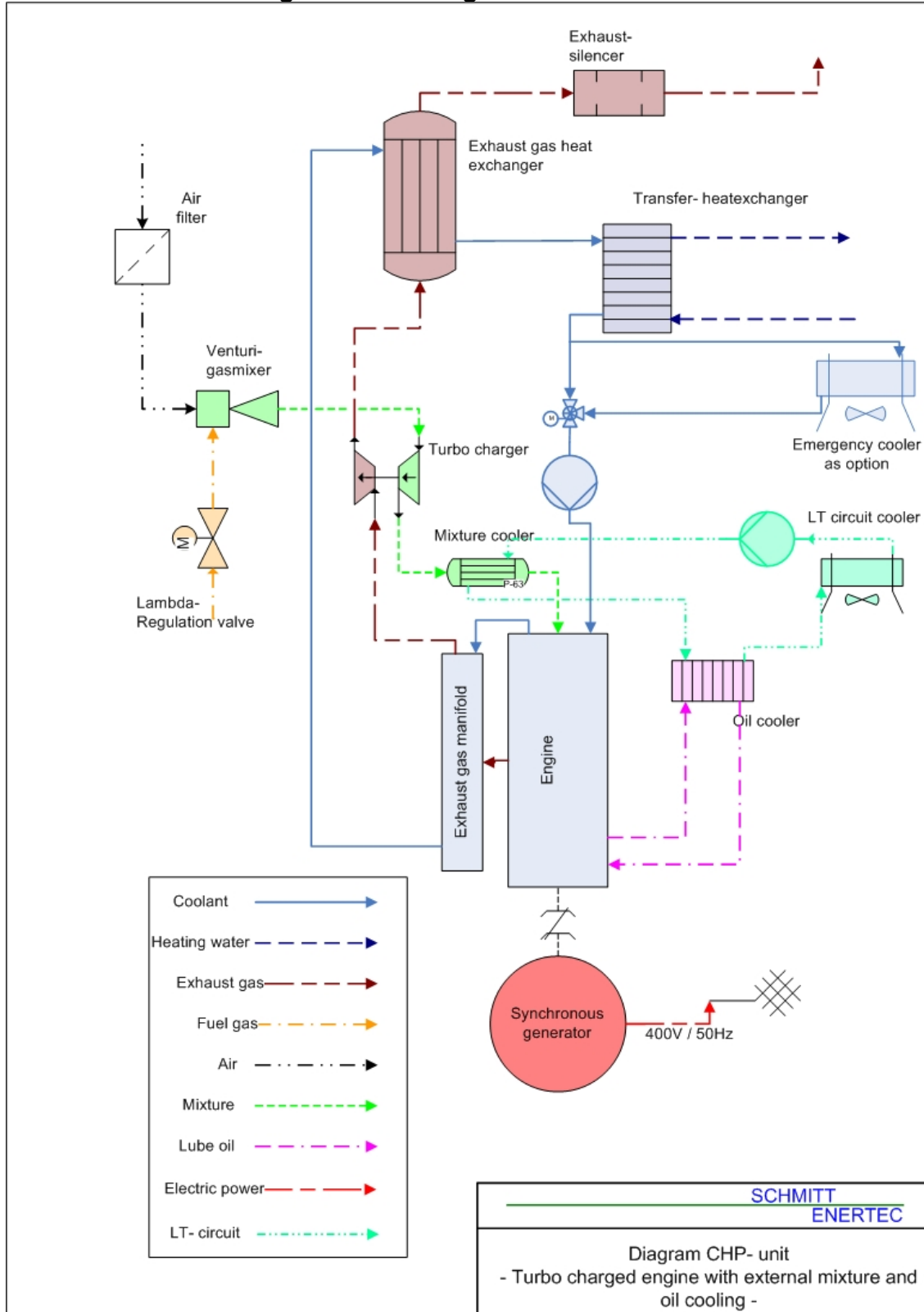


### Flow Chart: Lean burn engine turbocharged with external mixture cooling





### Flow Chart: Lean burn engine turbocharged with external mixture and oil cooling



## Standard scope

### Engine

- Industrial engine for continuous operation, speed 1500 1/min

### Ignition:

- processor controlled condenser ignition system, contact- less with electronic controller, dead centre sensor, sensor for cylinder No. 1 and each one ignition coil and spark plug per cylinder

### Gas train:

- to DVGW, ready piped on the set

### Gas mixer:

- Venturi gas- air- mixer

### Throttle:

- Throttle flap with actuator

### Turbo charging / Mixture cooling (only for turbo-engines)

- Mixture-turbocharger
- Guascor V-engine: One turbocharger per cylinder bank
- Internal mixture cooling: Mixture cooling will dissipated in the engine cooling circuit (Return water entering mixture cooler: 80 ° C)
- External mixture cooling: Mixture cooling will dissipated in an external LT cooler and to the ambient air. (Return water entering mixture cooler: 50 ° C)

### Transfer heat exchanger:

- for completion of the thermal performance of the CHP to an external heating water system
- soldered plate- type heat exchanger, stainless steel 1.4401
- primary circuit: approx. 95°C / 80°C
- secondary circuit: approx. 70°C / 90°C

### Mixture cooler (only for turbo-engines)

- shell and tube heat exchangers
- Internal mixture cooling: Mixture cooling will dissipated in the engine cooling circuit (Return water entering mixture cooler: 80 ° C)
- External mixture cooling: Mixture cooling will dissipated in an external LT cooler and to the ambient air. (Return water entering mixture cooler: 50 ° C)



**Emission control:**

- Naturally aspirated engine: Controlled 3-way catalytic converter in the exhaust stream
- Lean burn engine turbocharged: Oxidation catalyst in the exhaust stream

**Exhaust gas heat exchanger:**

- shell and tube type heat exchanger of stainless steel 1.4571

**Cooling water pump:**

- electric motor driven centrifugal pump set

**Temperature control:**

- electronically controlled three-way valve as flow divider to the transfer heat exchanger
- electronically controlled three-way mixing valve after emergency cooler (optional)

**LT cooler (only for Turbocharged engine with external mixture cooler):**

- External cooler for dissipation of surplus LT-heat to the ambient air

**Further components:**

- diaphragm expansion tank
- safety valve
- pressure gauge
- temperature sensors
- compensators

**Coolant:**

- Glycol- water- mixture with 40% Glycol

**Control**

The PLC based control unit of the set is integrated in the sheet steel switchboard elastically mounted on the base frame, ready wired. Moreover supervision and control of the CHP the control unit can also provide the control for a boiler or the load sharing for two or more generators running in parallel mode (master, optional)

**Synchronizing control**

The synchronizing control supervises the CHP switching to the utility grid.

**Hot water temperature control( as an option)**

- Continuous control of the hot water temperature by a control valve in the hot water circuit, at hot water inlet temperatures below 70 °C hot water outlet will be mixed to the inlet

### **Lambda control**

3-point-stepper-motor-control to run the mixture control valve to operate the engine with constant stoichiometric combustion effecting in best conversion rates in the 3-way catalyst

### **Base frame, noise protection housing, auxiliary equipment**

#### **Base frame:**

- Engine-/ generator unit elastically mounted on common torsion resistant welded steel base frame, with fitted hydraulic components, auxiliaries and control-/ switchboard
- Leak oil pan under the engine to receive the total oil volume of the engine , with level sensor
- Elastic mounting pads under the base frame for erection of the set on site foundation or clean, plain and rigid surface

#### **Noise protection housing:**

- Housing fitted on the base frame
- Steel frame with sheet steel cladding panels, side cladding easily removable for easy maintenance, partially with windows
- Electric motor drive fan for housing ventilation
- Air intake from the bottom of the set, with filter
- Flow sensor for ventilation supervision

#### **Exhaust gas silencer:**

- Exhaust gas silencer fitted in the base frame
- Stainless steel 1.4571
- Noise pressure level at exhaust gas outlet: 75 dB(A)

#### **Auxiliary equipment:**

- Battery 24 V DC for starting and control power supply
- Battery charger 24 V DC
- Lube oil topping up tank fitted in the housing
- Topping up control by level sensors in the oil pan
- Tank capacity dimensioned for operating time in between the maintenance intervals
- Electric motor driven lube oil priming pump
- The priming pump can be used for draining the oil pan by switching over of the ball valve fitted in the lube oil pipe