

Technical specification

patruus 140 EG | as80-0

Ultra low NO_x emission levels

- < 45 mg/Nm³ (5% O₂)
- < 59 mg/Nm³ (0% O₂)
- < 46 mg/kWh (0% O₂) *



Design:

140 kW el.
400 V / 50 Hz
natural gas
Hi = 10,25 kWh/Nm³
NO_x < 45 mg/Nm³
Exhaust cooling to 100 °C

* Based on the energy input of the gas (calculated by higher heating value).

1 Genset	3
1.1 Engine	3
1.2 Generator (utility planning data)	4
2 Mixture composition	4
2.1 Combustion air	4
2.2 Fuel	5
3 Integrated heat extraction	5
3.1 Heating circuit	5
3.2 Engine circuit	5
4. Exhaust system	6
5 Ventilation	6
6 Operating fluids	6
7 Electronics and software	6
8 Interfaces	7
8.1 Dimensions and weights	7
8.2 Water / gas transfer points	8
8.3 Electrical connections / utility interface	8
8.4 Data interfaces	8
9 Technical boundary conditions	9

Subject to technical changes!

Note: Figure on cover page may differ

1 Genset

	50 %	75 %	100 %	Load
Electrical power	70	105	140	kW ⁽⁵⁾
Recoverable thermal output	131	169	207	kW ⁽²⁾
Energy input	226	306	384	kW ⁽¹⁾
Efficiencies electrical	31,0	34,3	36,5	% ⁽¹⁾
Efficiencies thermal	58,0	55,3	53,9	% ^{(1), (2)}
Efficiencies total (el. + th.)	89,0	89,6	90,4	% ^{(1), (2)}
CHP coefficient	0,53	0,62	0,68	^{(1), (2)}

	NOx	CO	HCHO	
Exhaust emissions without catalytic converter	< 4500	< 4500	not specified	mg/Nm ³ ^{(4), (6)}
Exhaust emissions with catalytic converter *	< 45	< 300	< 20	mg/Nm ³ ^{(4), (6)}

Engine surface noise **	103,4	dB(A) ⁽⁷⁾
Engine surface noise with sound reducing encapsulation (optional) ***	70	dB(A) ⁽⁷⁾

1.1 Engine

Engine manufacturer	MAN	
Engine type	E 2876 E 312	
Type	row	
No. of cylinders	6	
Operating method	4-stroke	
Combustion process	$\lambda > 1$	
Engine displacement	12820	ccm
Bore	128	mm
Stroke	166	mm
RPM	1500	1/min
ISO standard power (mech.)	150	kW
compression ratio	12 : 1	
average effective pressure	9,4	bar
average piston speed	8,3	m/s
body of balance wheel	SAE 1	
Direction of rotation (based on balance wheel)	left	
tooth rim with number of teeth	160	
Engine dead weight	830	kg

* With appropriate catalyst configuration! NOx emission based on catalyst in new condition.

** Total sound power level at full engine load in accordance with DIN EN ISO 3746

*** Average sound pressure level under open area conditions at distance of 1 m in accordance with DIN 45635
An increased noise load must be taken into account with fresh air intake from the installation room.

1.2 Generator (utility planning data)

Manufacturer	Leroy Somer	
Type	LSA 46.3 S4 / 4P	
Generator type	Synchronous, directly coupled	
Voltage regulator (AVR)	D510C	
Rated speed	1500	1/min
Frequency	50	Hz
mechanical fuel shutoff	147	kW
Effective electrical power	140	kW
Apparent electrical power (cos ϕ 1.0 / cos ϕ 0.9)	140 / 156	kVA
Rated generator current (cos ϕ 1.0 / cos ϕ 0.9)	202 / 225	A
Rated generator voltage ($\pm 10\%$)	400	V
Subtransient reactance X"d	10,5	%
Short-circuit current I _k "3	2,67	kA
Power factor cos ϕ (inductive / capacitive)	0,9 / 0,9	
Generator circuit breaker	400	A
Additional section switch (VDE-AR-N 4105)	400	A
Efficiency (full load) at Cos ϕ = 1	95,2	%
Mass moment of inertia	2,81	kg · m ²
Ambient air temperature	40	°C
Stator circuit	star	
Protection class	IP 23	
Generator weight	674	kg
Compensation	not available	
Engine startup	not available	

2 Mixture composition

2.1 Combustion air

Combustion air mass flow	475	kg/h
Combustion air volume flow (25 °C, 1013 mbar)	401	m ³ /h

2.2 Fuel

Fuel requirements in accordance with 'TA-004 Gas'

Reference methane number - minimum methane number	80 / 80	
Combustible mass flow	30,1	kg/h ⁽¹⁾
Combustible volume flow	37,5	Nm ³ /h ^{(6), (1)}
Gas pressure at rated load min. *	30	mbar
Gas flow pressure at rated load max. *	70	mbar
Gas regulation line safety pressure	360	mbar

* At the inlet to the gas regulation line

3 Integrated heat extraction

3.1 Heating circuit

Heating water requirements in accordance with 'TA-002 Heating circuit'

Heating water volume flow ($\Delta t = 15 \text{ K}$)	11,9	m ³ /h
Internal pressure loss in heating circuit (approx.) *	300	mbar
Pressure reserve ca. *	450	mbar
Heating water return temperature (max)	70	°C
Heating water flow temperature (max) **	90	°C
Safety valve	6	bar

3.2 Engine circuit

Coolant requirements in accordance with 'TA-001 Coolant'

Coolant heat	127	kW ⁽²⁾
Exhaust gas heat up to 100 °C	80	kW ⁽²⁾
Engine inflow temperature (min.)	80	°C
Engine exit temperature (max.)	88	°C
Balance inflow / exit (max.)	6	K
Recirculated coolant quantity (min.)	21,1	m ³ /h
Total cooling water circulation volume	21,1	m ³ /h
Operating pressure (max.)	2,0	bar
Safety valve	3	bar

* Up to / from module interface

** Heating water supply temperature max. in partial load operation < 90 °C

4. Exhaust system

Exhaust gas temperature downstream of engine	582	°C ⁽³⁾
Exhaust temperature after exhaust heat exchanger	100	°C ⁽³⁾
exhaust gas volume flow wet	402	Nm ³ /h ⁽⁶⁾
exhaust gas volume flow dry	331	Nm ³ /h ⁽⁶⁾
exhaust gas mass flow wet	505	kg/h
exhaust gas mass flow dry	445	kg/h
Exhaust back pressure downstream of engine	50	mbar
Pressure reserve approx. *	27	mbar
Exhaust outlet noise **	140	dB ⁽⁷⁾

5 Ventilation

radiant heat of module (approx.)	32	kW
Supply air volume flow min. (at $\Delta t = 15$ K)	6867	m ³ /h

6 Operating fluids

Lubricating oil approvals, see 'TA-003 Lubricating oil'		
Lubrication oil consumption (max.)	0,89	g/kWh
Filling capacity lubricant (max.)	70	l
Lubricating oil filling tank fill capacity ***	35	l
Lubricating oil volume auxiliary tank (optional)	60	l
Motor circuit coolant fill quantity approx. (module)	104	l
Mixture cooling circuit LT coolant fill quantity approx. (module)	-	l
Coolant approvals, see 'TA-001 Coolant'		

7 Electronics and software

Grid protection device	Deif GPC 2G	
Grid protection software status	> 13414	
Touchscreen display	10	"
Approval (depending on version)	BDEW / VDE-AR-N 4105	
Protection class Control cabinet	IP 54	
Protection class Power switch cabinet	IP 54	
Switch cabinet environmental temperature	0 - 35	°C
Switch cabinet relative air humidity (max.)	65	%

* From module interface (exhaust heat exchanger / catalytic converter in standard version and new condition)

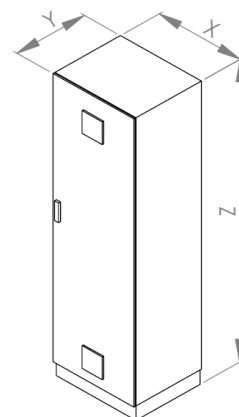
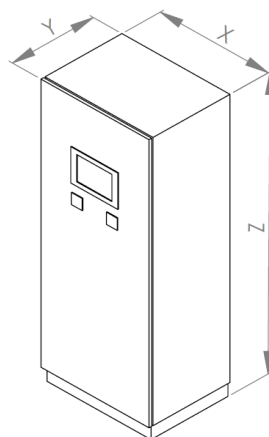
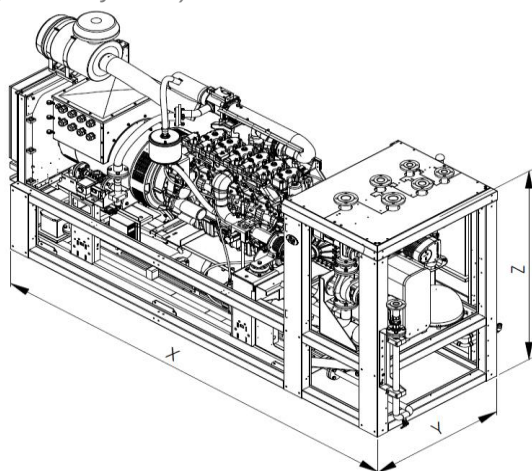
** Total sound power level at full engine load in accordance with DIN 45635-11 Annex A

*** Filling tank omitted with installation of a lubricating oil volume auxiliary tank

8 Interfaces

8.1 Dimensions and weights

(Figures may differ)



Length Module	X	3400	mm
Width Module	Y	1170	mm
Height Module	Z	1900	mm
Weight Module (without operating fluids)		3500	kg
Weight Module with sound reducing encapsulation (optional)		4150	kg
Powder-coated CHP frame		RAL 6002	
Width Control cabinet	X	800	mm
Depth Control cabinet	Y	600	mm
Height Control cabinet	Z	2000	mm
Weight Control cabinet		200	kg
Control cabinet powder coated		RAL 7035	
Width Power switch cabinet	X	600	mm
Depth Power switch cabinet	Y	500	mm
Height Power switch cabinet	Z	2000	mm
Weight Power switch cabinet		150	kg
Power switch cabinet powder coated		RAL 7035	

8.2 Water / gas transfer points

Interfaces Gas	40 / 10	DN / PN
Interfaces Exhaust	100 / 10	DN / PN
Interfaces Heating circuit	50 / 16	DN / PN
Interfaces Emergency cooling circuit	65 / 16	DN / PN

8.3 Electrical connections / utility interface

Grid connection with pre-fuse (customer-provided)	400 V / 50 Hz	
Grid system	TN-S	
Short-circuit proof Icc (max.)	50	kA

8.4 Data interfaces

Remote maintenance access (optional) *	DSL / UMTS (SIM)
Interfaces / Data interfaces (optional):	- Profibus DP - Profinet IO - Modbus RTU - Modbus TCP - Ethernet IP - Hardware signals
Access virtual power plant (optional)	Possible after technical clarification (bus or hardware signals)

* Access for remote maintenance must be provided by the customer

9 Technical boundary conditions

Unless otherwise specified, all data is based on full engine load with the respective indicated media temperatures and subject to technical improvements. The generator output measured at the generator terminals serves as the basis for the delivered electrical power. All power and efficiency specifications are gross specifications. The fuel gas quality must conform to the specifications of 'TA-004 Gas'. The operating fluids and plant system layout must conform to the 'Technical instructions' of 2G.

- (1) Performance conditions in accordance with DIN ISO 3046. Tolerance for specific fuel use amounts to + 5% of nominal performance. Efficiency specifications are based on an engine in new condition. An abatement in efficiency over the service life is reduced with observance of the maintenance requirements.
- (2) The tolerance for usable heat output is +/- 8 % under normal load.
- (3) The tolerance for the exhaust temperature is +/- 8 %.
- (4) Corresponding to a residual oxygen concentration in the exhaust of 5 %
- (5) Electrical generator terminal power at $\cos \varphi = 1$.
- (6) Volume specifications for normal status:

Pressure	1013 mbar
Temperature	0 °C
- (7) Standard deviation of reproducibility 4 dB in accordance with DIN EN ISO 3746

Power specifications in this document relate to standard reference conditions.

Standard reference conditions in accordance with DIN ISO 3046-1:

Air pressure	1000 mbar
Air temperature	25 °C
Relative air humidity	30 %

Power reduction

Power reduction due to installation at altitude > 100m a.s.l. and/or air suction temperature > 25°C shall be determined specifically for each project according "TI-049 Load reduction".