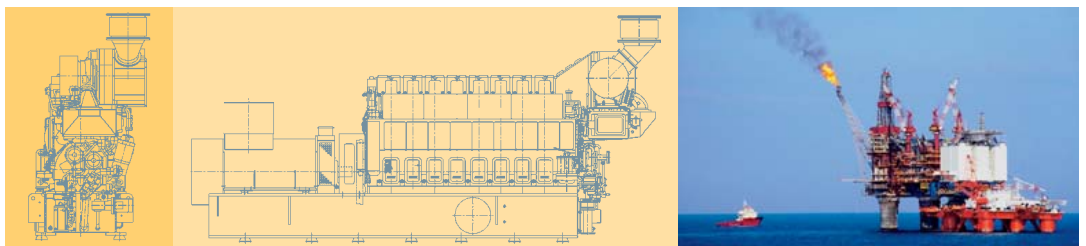


CM20

6, 8 + 9 Cylinder • Project Guide • Generator Set for Petroleum Applications



Information for the user of this project guide

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This certificate is valid until:

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The audit has been performed under the supervision of

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Place and date:

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1 | Engine description

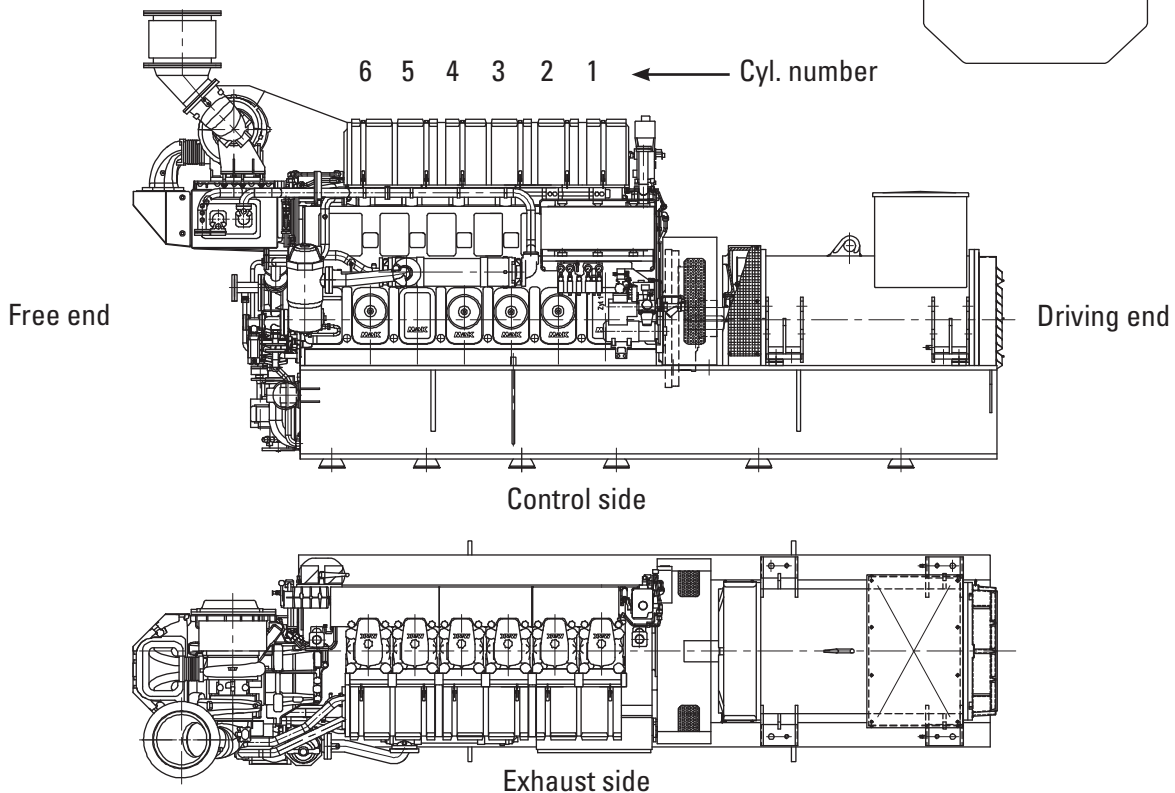
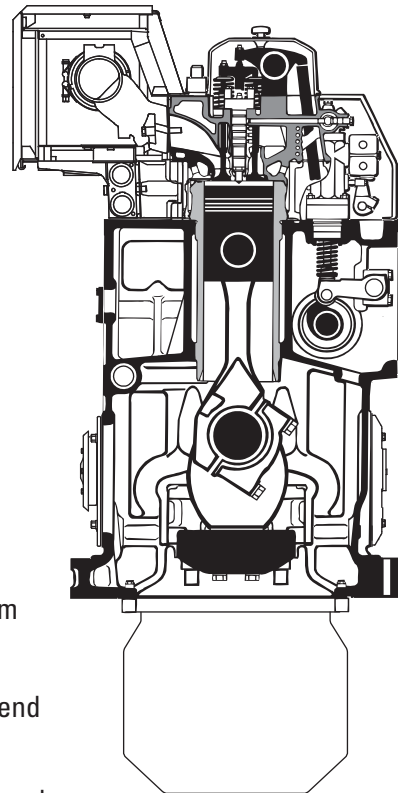


1.1 Engine description

The CM20C is a four-stroke diesel engine, non-reversible, turbocharged and inter-cooled with direct fuel injection.

In-line engine CM20C

Cylinder configuration:	6,8,9 in-line
Bore:	200 mm
Stroke:	300 mm
Stroke/bore ratio:	1.5
Swept volume:	9.4 l/Cyl.
Output/cyl.:	170/190 kW
BMEP:	24.1/24.2 bar
Revolutions:	900/1,000 rpm
Mean piston speed:	9.0/10.0 m/s
Turbocharging:	constant pressure system
Direction of rotation:	counter-clockwise, viewed from the driving end



1 | Engine description



1.2 Engine design features

- Designed for heavy fuel operation up to 700 cSt/50°C, fuel grade acc. to CIMAC H55 K55, ISO 8217, 2010 (E), ISO-F-RMH55 RMK55.
- 1-piece dry engine block made of nodular cast iron. It includes the crankshaft bearing, camshaft bearing, charge air duct, vibration damper housing and gear drive housing.
- Underslung crankshaft with corrosion resistant main and big end bearing shells.
- Natural hardened liners, centrifugally cast, with calibration insert.
- Composite type pistons with steel crown and aluminium alloy skirt.
- Piston ring set consisting of 2 chromium plated compression rings, first ring with chromium-ceramic layer and 1 chromium plated oil scraper ring. Two ring grooves are hardened and located in the steel crown.
- 2-piece connecting rod, fully machined, obliquely split with serrated joint.
- Cylinder head made of nodular cast iron with 2 inlet and 2 exhaust valves with valve rotators. Directly cooled exhaust valve seats.
- Camshaft consisting of individual cylinder sections allowing a removal of the pieces sideways.
- Turbocharger supplied with integrated plain bearings lubricated by engine lubricating oil.
- No water cooling for turbocharger.
- 2-circuit fresh water cooling system with single charge air cooler.
- Nozzle cooling for heavy fuel operation with engine lubricating oil.

2 | General data and operation of the engine



	900 rpm / 60 Hz		1,000 rpm / 50 Hz	
	Engine kW	Generator kWe	Engine kW	Generator kWe
6CM20C	1,020	979	1,140	1,094
8CM20C	1,360	1,305	1,520	1,459
9CM20C	1,530	1,469	1,710	1,641

Remark:

The generator outputs are based on 96% efficiency and a power factor of 0.8.

Engine output 180/200 kW/cyl. at 900/1,000 rpm ask for availability!

2.1 General data and outputs

2.1.1 Output definition

The maximum continuous rating stated by Caterpillar refers to the following reference conditions according to "IACS" (International Association of Classification Societies) for main and auxiliary engines:

Reference conditions according to IACS (tropical conditions):

Air pressure 100 kPa (1 bar)

Air temperature 318 K (45°C)

Relative humidity 60 %

Seawater temperature 305 K (32°C)

The permissible overload is 10 % for one hour every twelve hours. The maximum fuel rack position is limited to 110 % continuous rating.

2 | General data and operation of the engine



2.1.2 Fuel consumption

The fuel consumption data refer to the following reference conditions:

Intake temperature	298 K (25°C)
Charge air temperature	318 K (45°C)
Charge air coolant inlet temperature	298 K (25°C)
Net heating value of the diesel oil	42,700 kJ/kg
Tolerance	5 %

Specification of the fuel consumption data without engine driven pumps; for each fitted pump an additional consumption of 1 % has to be calculated.

2.1.3 Lube oil consumption

Actual data can be taken from the technical data page 5/6.

2.1.4 Nitrogen oxide emissions (NO_x values) IMO II

NO _x limit values according to MARPOL 73/78 Annex VI:	9.20 g/kWh (n = 900 rpm)
	9.00 g/kWh (n = 1,000 rpm)
Generator according to cycle D2:	8.80 g/kWh (n = 900 rpm)
	8.80 g/kWh (n = 1,000 rpm)

2 | General data and operation of the engine



2.1.5 Technical data

Performance Data		Cylinder	6		8		9	
Maximum continuous rating acc. ISO 3046/1		kW	1,020	1,140	1,360	1,520	1,530	1,710
Speed		1/min	900	1,000	900	1,000	900	1,000
Minimum speed		1/min	280	300	280	300	280	300
Brake mean effective pressure		bar	24.06	24.2	24.06	24.2	24.06	24.2
Charge air pressure		bar	3.3	3.4	3.3	3.4	3.3	3.4
Firing pressure		bar	185		185		185	
Combustion air demand (ta = 20°C)		m³/h	6,135	6,790	9,240	9,485	10,395	10,663
Specific fuel oil consumption								
n = const ¹⁾	100%	g/kWh	187	190	187	190	187	190
	85%	g/kWh	-/186	189/189	-/186	189/189	-/186	189/189
	75%	g/kWh	-/188	189/190	-/188	189/190	-/188	189/190
	50%	g/kWh	-/199	191/198	-/199	191/198	-/199	191/198
Lube oil consumption ²⁾		g/kWh	0.6		0.6		0.6	
NO _x -emission ⁶⁾		g/kWh	8.5		8.5		8.5	
Turbocharger type			KBB HPR4000		KBB HPR5000		KBB HPR5000	
Fuel								
Engine driven booster pump		m³/h/bar	1.2/5		1.2/5		1.2/5	
Stand-by booster pump		m³/h/bar	0.8/10		1.0/10		1.2/10	
Mesh size MDO fine filter		mm	0.025		0.025		0.025	
Mesh size HFO automatic filter		mm	0.010		0.010		0.010	
Mesh size HFO fine filter		mm	0.034		0.034		0.034	
Lubricating Oil								
Engine driven pump		m³/h/bar	52.5/10	58.8/10	52.5/10	58.8/10	52.5/10	58.8/10
Independent pump		m³/h/bar	35/10		45/10		45/10	
Working pressure at engine inlet		bar	4 - 5		4 - 5		4 - 5	
Independent suction pump		m³/h/bar	—		—		—	
Priming pump pressure/suction pump		m³/h/bar	5/5/8/3		8/5/10/3		8/5/10/3	
Sump tank content/dry sump content		m³	1.7/0.5		2.3/0.5		2.6/0.5	
Temperature at engine inlet		°C	55 - 65		55 - 65		55 - 65	
Temperature controller NB		mm	—		—		—	
Double filter NB		mm	65/65		65/65		65/65	
Mesh size double filter		mm	—		—		—	
Mesh size automatic filter		mm	0.03		0.03		0.03	

2 | General data and operation of the engine

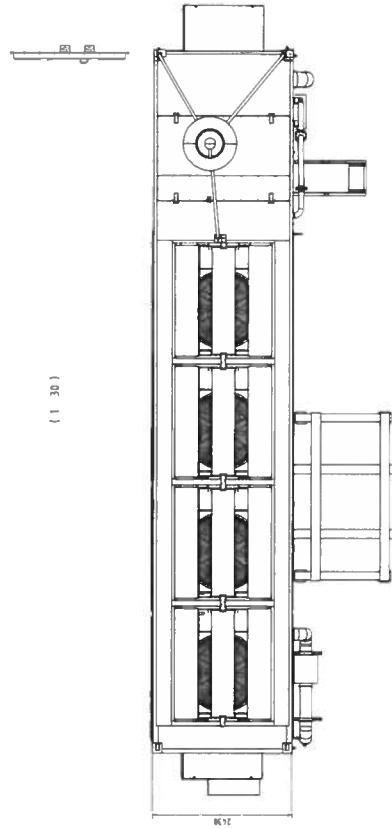
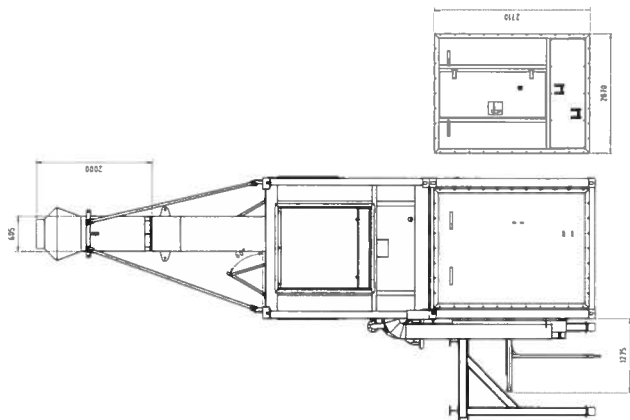
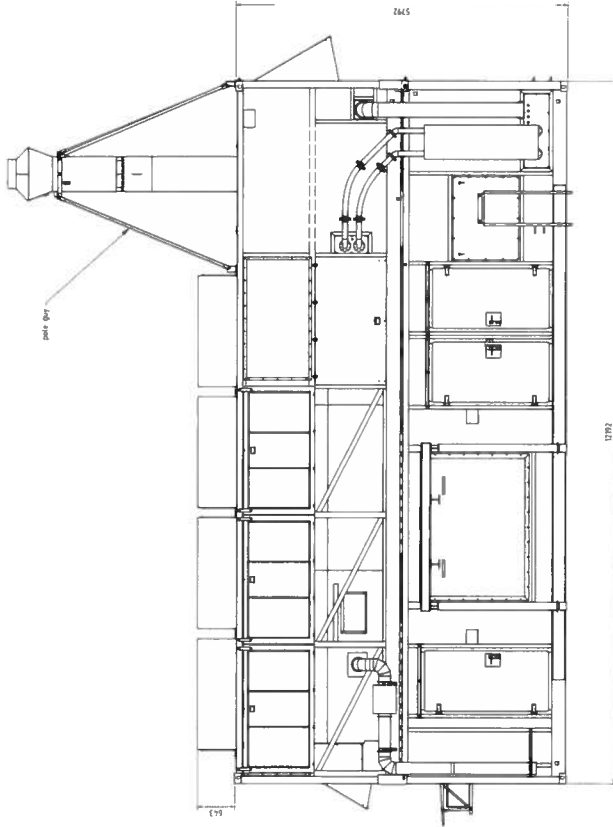
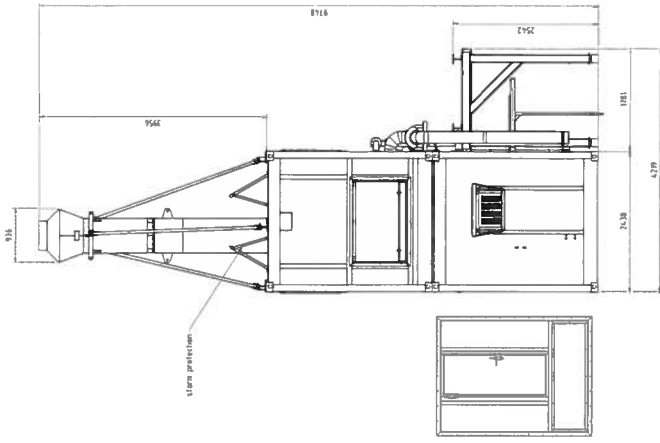


Fresh water cooling	Cylinder	6		8		9	
Engine content	m ³	0.12		0.16		0.18	
Pressure at engine inlet min/max	bar	2.5/6.0		2.5/6.0		2.5/6.0	
Header tank capacity	m ³	0.1		0.1		0.1	
Temperature at engine outlet	°C	80 - 90		80 - 90		80 - 90	
Two-circuit system							
Engine driven pump HT	m ³ /h/bar	25/3.4	30/4.2	30/3.4	35/4.2	35/3.4	40/4.2
Independent pump HT	m ³ /h/bar	30/4.0		40/4.0		45/4.0	
HT-controller NB	mm	50		65		65	
Water demand LT-charge air cooler	m ³ /h	40/3.2	45/4.0	40/3.2	45/4.0	40/3.2	45/4.0
Temperature at LT-charger air cooler inlet	°C	38		38		38	
Heat dissipation							
Specific jacket water heat	kJ/kW	550		550		550	
Specific lube oil heat	kJ/kW	500		500		500	
Lube oil cooler	kW	142	158	189	211	213	238
Jacket water	kW	156	174	208	232	234	261
Charge air cooler ³⁾	kW	406	464	613	648	690	728
Heat radiation engine	kW	52		69		78	
Exhaust gas							
Silencer/spark arrestor NB 25 dBA	mm	400/400		500/500		500/500	
Pipe diameter NB after turbine	mm	400		500		500	
Maximum exhaust gas pressure drop	bar	0.03		0.03		0.03	
Exhaust gas temp after turbine (25°C intake air) ⁵⁾	°C	340	345	290	330	300	337
Exhaust gas mass flow (25°C intake air) ⁵⁾	kg/h	7,580	8,395	11,420	11,723	10,395	13,180
Exhaust gas temp after turbine (45°C intake air) ⁵⁾	°C	362	366	309	350	320	357
Exhaust gas mass flow (45°C intake air) ⁵⁾	kg/h	7,150	7,920	10,775	11,060	12,120	12,435
Starting air							
Starting air pressure max.	bar	30		30		30	
Minimum starting air pressure	bar	7		7		7	
Air consumption per start ⁴⁾	Nm ³	0.5		0.5		0.5	
Max. crankcase pressure, nominal diameter ventilation pipe	mmWs/mm	25/50		25/50		25/50	

- ¹⁾ Reference conditions: LCV = 42,700 kJ/kg, ambient temperature 25 °C
charge air coolant temperature 25 °C, tolerance 5 %, + 1 % for engine driven pump
- ²⁾ Standard value, tolerance ± 0.3 g/kWh, related on full load
- ³⁾ Charge air heat based on 45 °C ambient temperature
- ⁴⁾ Preheated engine
- ⁵⁾ Tolerance 10 %, rel. humidity 60 %
- ⁶⁾ MARPOL 73/78 Annex VI, Cycle E2, E3, D2

SOENERGY
INTERNATIONAL
POWER MODULE
GENERAL DETAILS

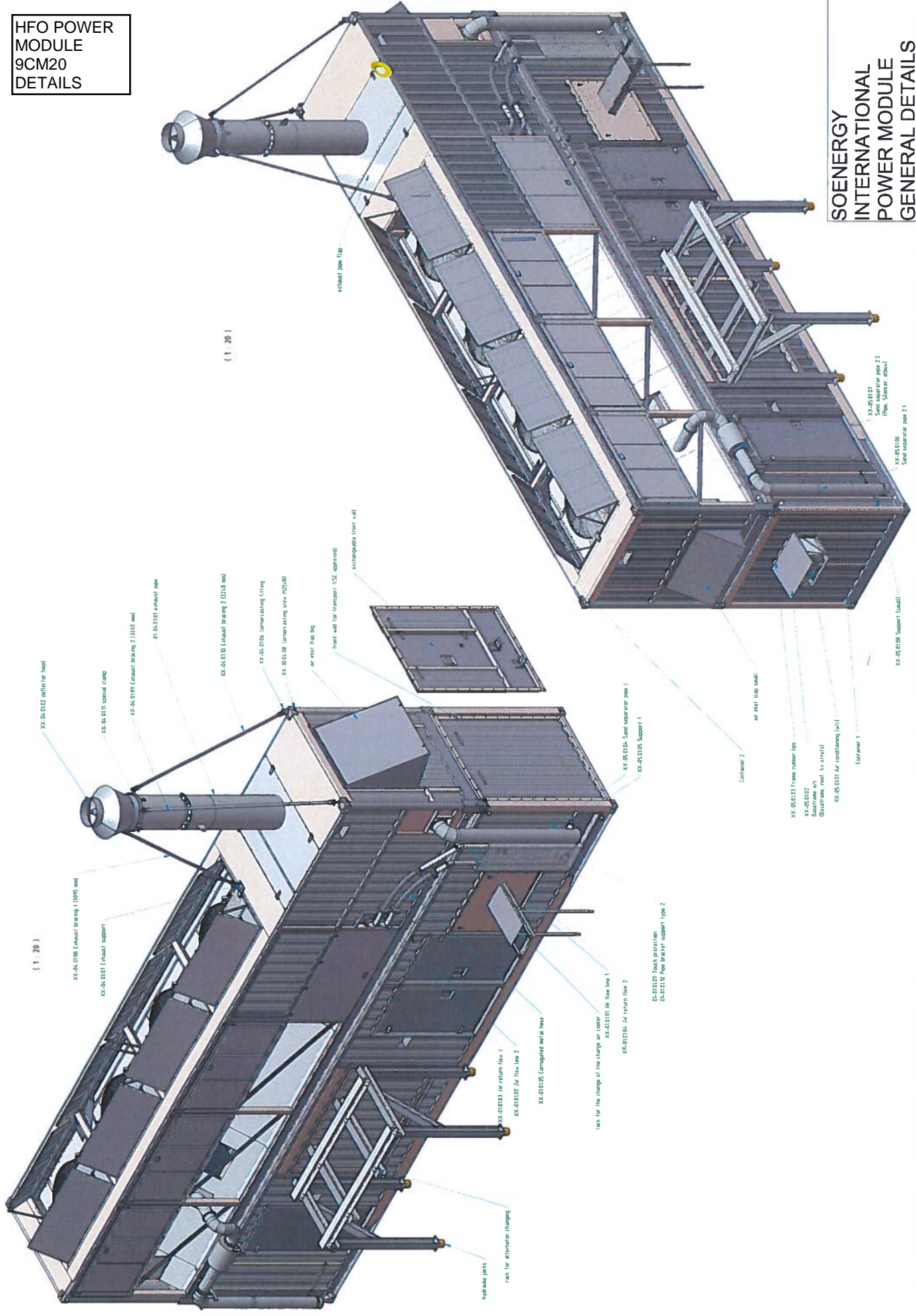
HFO POWER
MODULE 9CM20
DETAILS



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**HFO POWER
MODULE
9CM20
DETAILS**

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