

8RTA68-D

Standard Tuning

25040.0 kW 100.0% R1
95.0 rpm 100.0% R1

IMO Tier II compliant

Project:
Yard / Plant:
Owner:
Created: 2014-04-07
Printed: 2014-04-07

Summary (FW cooled / single-stage SAC / separate HT)

Bore	680	mm
Stroke	2720	mm
MEP	20.0	bar
Piston speed	8.6	m/s
Length	11765	mm
Weight dry	593	t
Weight water/oil	6.29	t
Lift vertical (standard)	12545	mm
Lift tilted (special)	11570	mm
E/R crane capacity	6.0	t
System oil consumption	8.0	kg/cyl per day
Cylinder oil consumption	0.9 - 1.3	g/kWh
Turbocharger	ABB	2 x TPL77B12
Scavenge air cooler		2 x SAC233F
Governor type (electronic)	KM	DGS C20
	NABCO	MG-800
	Lyngso	EGS2000
	STN	ESG 40M
	ABB	DEGO-III system
Aux. blower: min. installed electric motor power (shaft)	2 x 80	kW (400/440 V / 50/60 Hz)
Turning gear capacity	5.5	kW (400/440 V / 50/60 Hz)
Fuel oil booster P/P	11.3	m³/h
Fuel oil feed P/P	6.3	m³/h
High temperature water circuit P/P	203	m³/h
Low temperature water circuit P/P	523	m³/h
Main lubricating oil P/P	318	m³/h
Crosshead lubricating oil P/P	56	m³/h
Sea water P/P	809	m³/h
SAC (LT), heat dissipation	11003	kW
SAC (LT), fresh water flow	338	m³/h
Lub. oil cooler, heat dissipation	2133	kW
Lub. oil cooler, oil flow	318	m³/h
Lub. oil cooler, fresh water flow	185	m³/h
Cylinder cooler, heat dissipation	3458	kW
Cylinder cooler, fresh water flow	203	m³/h
Central cooler, heat dissipation	16594	kW
Exhaust gas, mass flow	183.7	t/h
Exhaust gas, temperature	301.2	°C
Air consumption	185.4	t/h
Engine radiation	215	kW
Main lub. oil drain tank	32	m³
Fresh water expansion tank	0.75	m³
Air compressor (30 bar)	2 x 225	m³/h
Air receiver (30 bar)	2 x 7.5	m³
HFO separator	5320	l/h
LO separator	3510	l/h
FO endheater	216	kW

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Selection Overview
Engine Data

Power Rx :	25040.0	=	100.0% R1	Power R1 :	25040.0 kW	
Speed Rx :	95.0	=	100.0% R1	Speed R1 :	95.0 rpm	
Turbocharger (ABB type) :				2 x TPL77B12	Bore :	680 mm
Scavenge air cooler :				2 x SAC233F	Stroke :	2720 mm

Brake specific fuel consumption (ISO 3046-1:2002)

Air temperature before blower 25.0 °C
 Coolant temperature before SAC 25.0 °C
 Barometric pressure 1000.0 mbar
 Relative humidity 30.0 %

Power [%]	110.0	100.0	90.0	85.0	80.0	75.0	70.0	65.0	60.0	50.0	40.0	30.0	25.0
BSFC [g/kWh]	174.8	173.8	171.6	170.9	170.7	170.8	171.1	171.5	172.0	173.8	176.4	178.6	180.8

Ancillary Systems

Cooling system : Fresh water cooled / single-stage SAC / separate HT
 Cylinder cooling water inlet temperature : 70.0 °C
 Cylinder cooling water outlet temperature : 85.0 °C

Lub. oil system : Lubricating oil system incl. TC
 Oil temperature before engine : 45.0 °C
 Oil pressure before engine: 4.3 bar
 Viscosity: 84.3 mm²/s

Exhaust gas back pressure at rated power (Rx) : 300.0 mm WG

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Engine Performance Data

Conditions	Reference	Design	Specified
Air temperature before blower	25.0 °C	45.0 °C	10.0 °C
Engine room ambient air temp.	25.0 °C	45.0 °C	10.0 °C
Coolant temperature before SAC	29.0 °C	36.0 °C	25.0 °C
Barometric pressure	1000.0 mbar	1000.0 mbar	1000.0 mbar
Cylinder water outlet temperature	85.0 °C	85.0 °C	85.0 °C
Oil temperature before engine	45.0 °C	45.0 °C	45.0 °C
Exhaust gas back pressure	300.0 mm WG	300.0 mm WG	300.0 mm WG
Relative humidity	30.0 %	60.0 %	30.0 %

Fresh water cooled / single-stage SAC / separate HT - 2 x TPL77B12 / 2 x SAC233F

Performance				Reference			Design			Specified		
Power %	Power kW	Speed rpm	mep bar	BSFC g/kWh	BSEF kg/kWh	tEaT °C	BSFC g/kWh	BSEF kg/kWh	tEaT °C	BSFC g/kWh	BSEF kg/kWh	tEaT °C
110.0	27544.0	98.1	21.3	175.0	7.60	278.0	178.0	7.14	316.4	172.8	7.90	258.0
100.0	25040.0	95.0	20.0	174.0	7.84	262.0	177.0	7.33	301.2	171.8	8.19	241.3
90.0	22536.0	91.7	18.7	171.8	8.08	250.2	174.8	7.52	290.3	169.6	8.47	228.6
85.0	21284.0	90.0	18.0	171.1	8.21	246.0	174.1	7.63	286.6	168.9	8.62	223.9
80.0	20032.0	88.2	17.2	170.9	8.37	242.8	173.9	7.76	283.9	168.7	8.80	220.2
75.0	18780.0	86.3	16.5	171.0	8.53	241.0	174.0	7.89	282.8	168.8	8.99	217.7
70.0	17528.0	84.4	15.8	171.3	8.71	240.6	174.3	8.04	283.1	169.1	9.20	216.7
65.0	16276.0	82.3	15.0	171.7	8.87	242.0	174.7	8.16	285.4	169.5	9.39	217.2
60.0	15024.0	80.1	14.2	172.2	9.00	244.7	175.2	8.26	289.3	170.0	9.56	218.7
50.0	12520.0	75.4	12.6	174.0	9.11	258.0	177.0	8.30	306.5	171.8	9.75	228.7
40.0	10016.0	70.0	10.9	176.6	8.81	289.0	179.6	8.03	337.9	174.4	9.48	257.0
30.0	7512.0	63.6	9.0	178.8	9.55	277.0	181.8	8.85	315.3	176.6	10.16	251.1
25.0	6260.0	59.8	7.9	181.0	9.60	282.0	184.0	8.96	316.6	178.8	10.17	258.3

Abbreviations

BSFC : Brake specific fuel consumption with lower calorific value 42707 kJ/kg
 BSEF : Brake specific exhaust gas flow
 tEaT : Exhaust gas temperature after turbine
 mep : Mean effective pressure

Tolerances

BSFC : + 5 % (+ 7 %)
 BSEF : ± 5 % (± 10 %)
 tEaT : ± 15 °C (± 30 °C)

Tolerances in brackets refer to an engine power of less than or equal to 40%.

The above performance values correspond to the lower calorific value of 42707 kJ/kg (MDO). Based on experience during seatrials with HFO, exhaust gas temperature increases by 15°C compared to MDO figures according winGTD.

An increase of BSEF by 5 % corresponds to a decrease of the tEaT by 15 °C

Effective values and shape of curves up to 40% load will depend on final settings of auxiliary blower.

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Yard / Plant:

95.0 rpm 100.0% R1

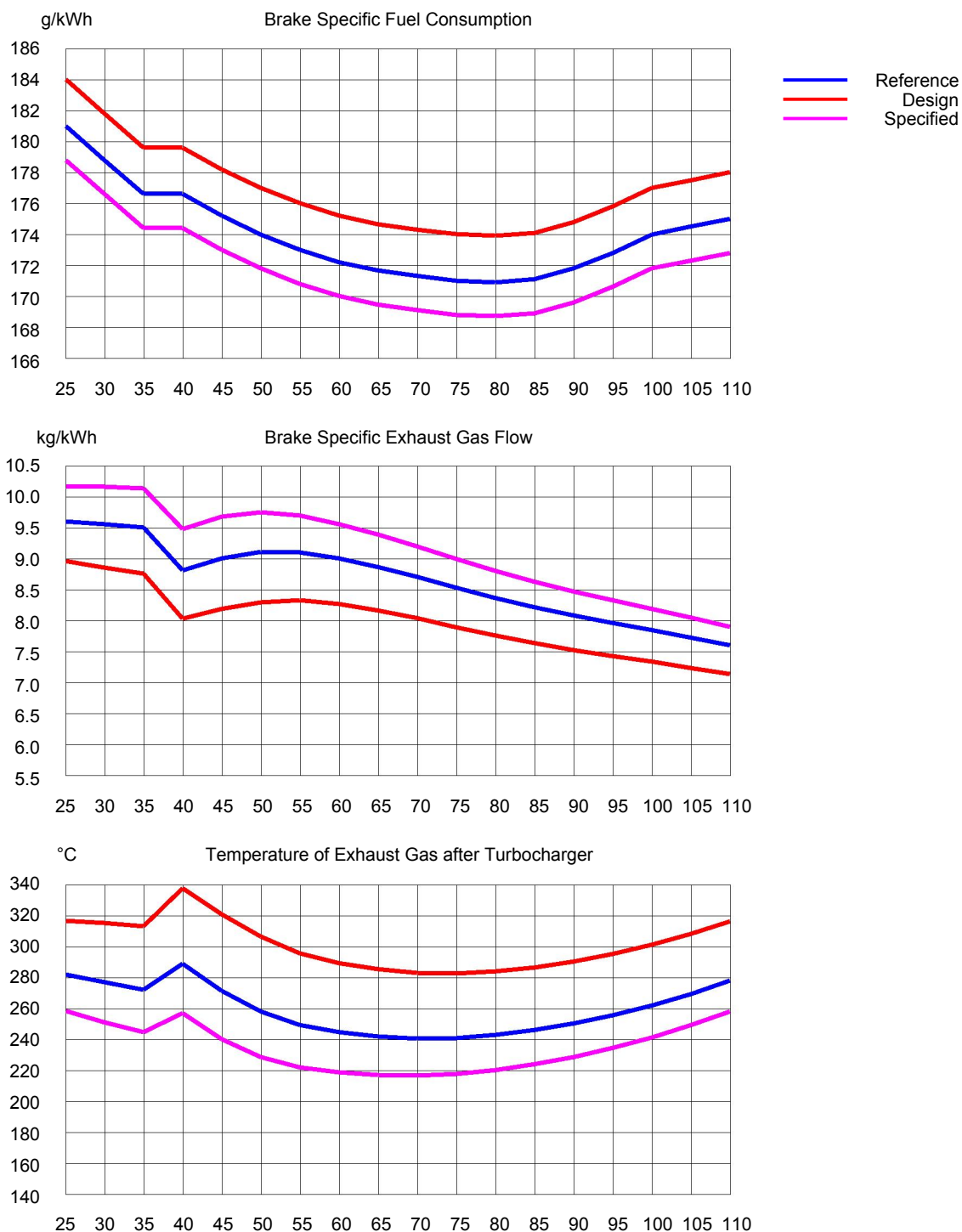
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Engine Performance Data - Diagrams



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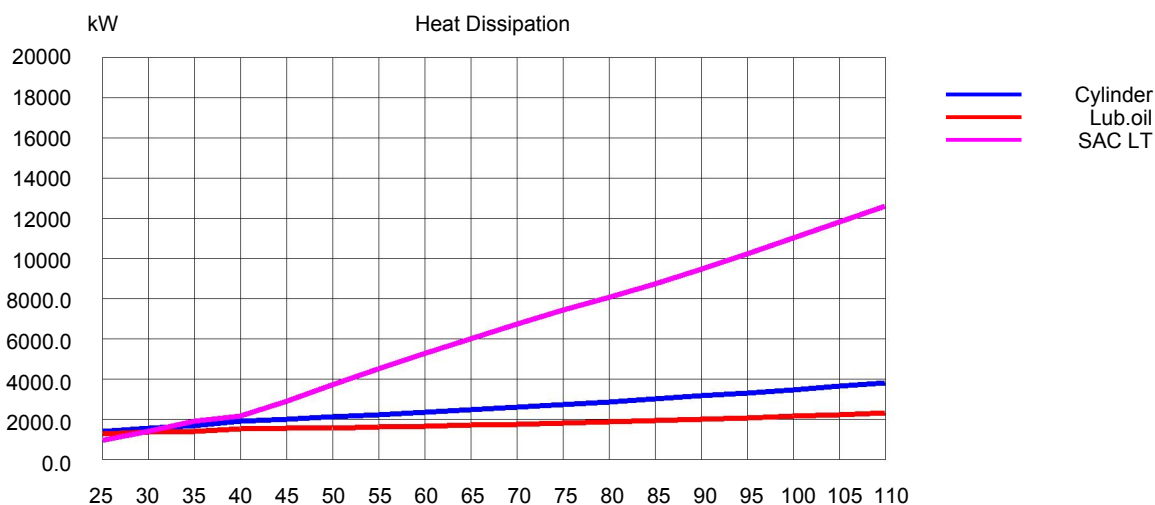
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Heat Dissipation

Design Conditions

Air temperature before blower	45.0 °C	Turbocharger (ABB type) :	2 x TPL77B12
Engine room ambient air temp.	45.0 °C	Scavenge air cooler :	2 x SAC233F
Coolant temperature before SAC	36.0 °C		
Barometric pressure	1000.0 mbar	Fresh water cooled / single-stage SAC / separate HT	
Relative humidity	60.0 %		

Power %	Power kW	SAC LT kW	Cylinder kW	Lub. oil kW	Radiation kW	SPP *1) kW
110.0	27544.0	12592	3801	2316	215	8760
100.0	25040.0	11003	3458	2133	215	7323
90.0	22536.0	9443	3143	1974	215	6191
85.0	21284.0	8718	2990	1910	215	5744
80.0	20032.0	8061	2841	1845	215	5369
75.0	18780.0	7405	2705	1782	215	5066
70.0	17528.0	6720	2583	1725	215	4831
65.0	16276.0	5998	2463	1683	215	4652
60.0	15024.0	5259	2339	1635	215	4496
50.0	12520.0	3688	2101	1548	215	4311
40.0	10016.0	2141	1888	1497	215	4118
30.0	7512.0	1385	1538	1347	215	2941
25.0	6260.0	941	1366	1265	215	2503



*1) Steam Production Power (± 7%) for a constant temperature after economizer of 170°C.

Effective values and shape of curves up to 40% load will depend on final settings of auxiliary blower.

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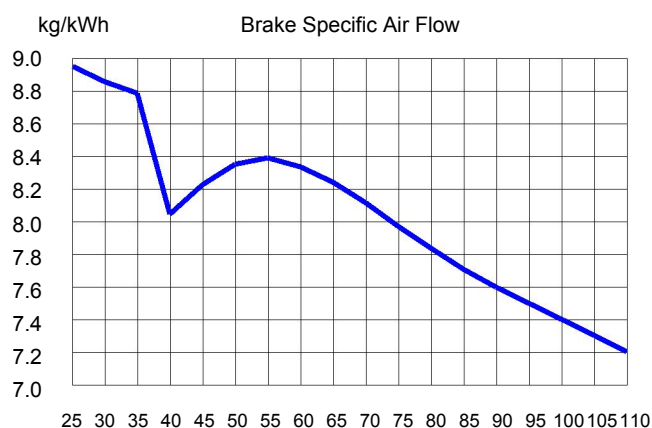
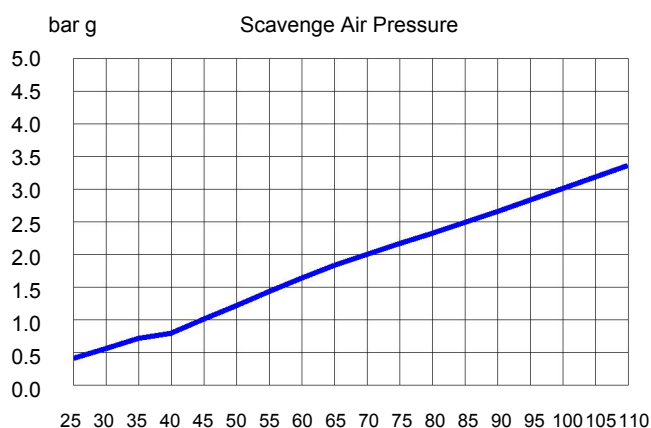
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Scavenge Air System

Design Conditions

Air temperature before blower	45.0 °C	Turbocharger (ABB type) :	2 x TPL77B12
Engine room ambient air temp.	45.0 °C	Scavenge air cooler :	2 x SAC233F
Coolant temperature before SAC	36.0 °C		
Barometric pressure	1000.0 mbar	Fresh water cooled / single-stage SAC / separate HT	
Relative humidity	60.0 %		

Power %	Power kW	after TC °C	after SAC °C	Mass flow kg/h	Pressure bar g	Cond. water kg/h
110.0	27544.0	242.4	50.4	198334	3.36	3821
100.0	25040.0	226.8	49.1	185392	3.00	3494
90.0	22536.0	211.1	47.8	171241	2.65	3132
85.0	21284.0	203.8	47.2	164062	2.48	2945
80.0	20032.0	197.4	46.7	156958	2.32	2760
75.0	18780.0	190.8	46.1	149666	2.16	2570
70.0	17528.0	182.9	45.5	142228	2.00	2374
65.0	16276.0	174.2	44.8	134123	1.83	2160
60.0	15024.0	165.0	44.1	125238	1.63	1922
50.0	12520.0	143.2	42.5	104543	1.21	1379
40.0	10016.0	116.0	40.7	80590	0.79	812
30.0	7512.0	98.6	39.5	66541	0.56	518
25.0	6260.0	86.9	38.6	56040	0.40	334



Effective values and shape of curves up to 40% load will depend on final settings of auxiliary blower.

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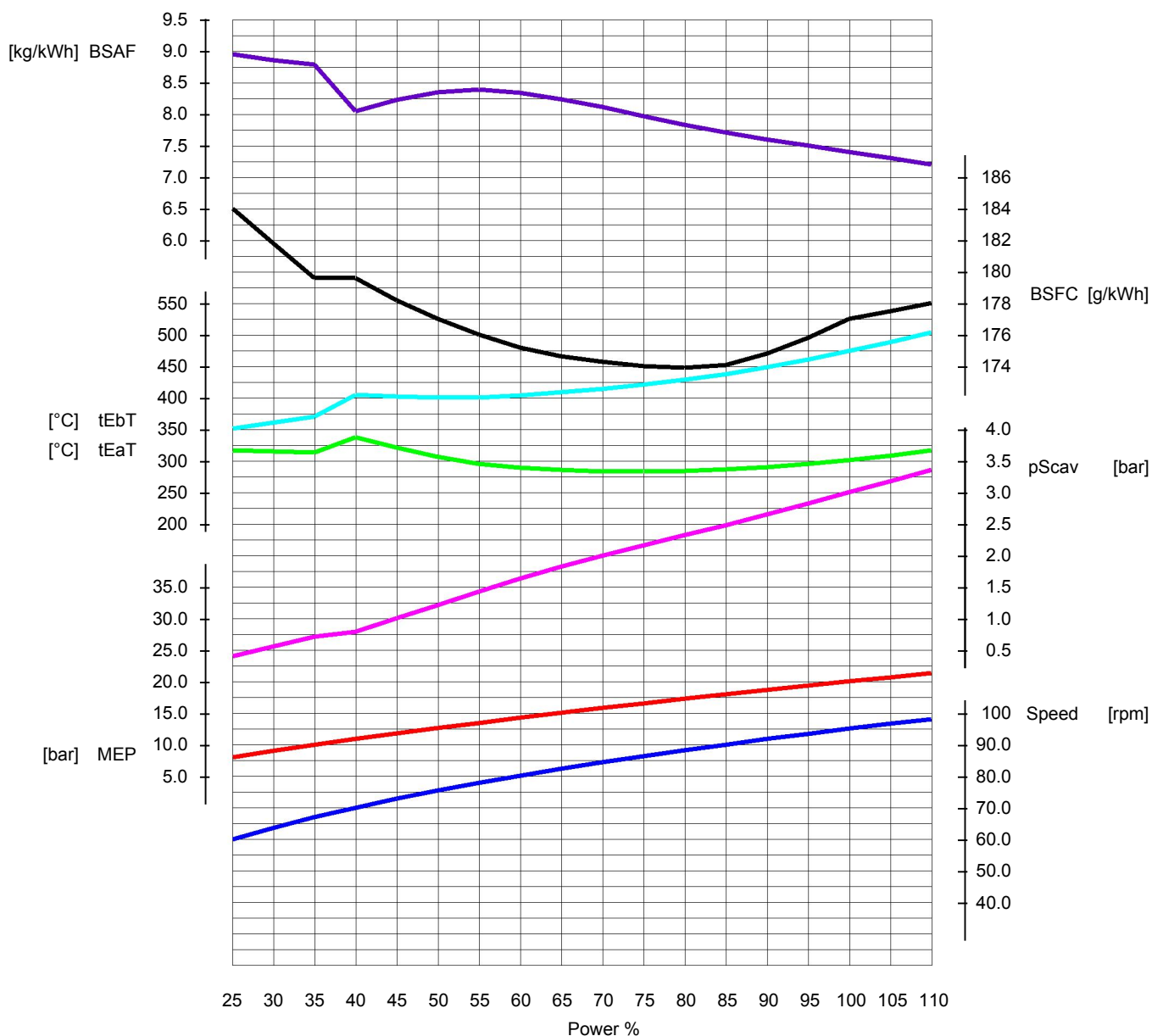
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Performance Summary - Diagrams

Design Conditions


Abbreviations

BSAF	Brake specific air flow	BSFC	Brake specific fuel consumption
tEbT	Exhaust gas temperature before turbine	pScav	Scavenge air pressure
tEaT	Exhaust gas temperature after turbine	Speed	Rotation speed
MEP	Mean effective pressure		

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Turbocharging Data

Reference Conditions

Air temperature before blower	25.0 °C	Turbocharger (ABB type) :	2 x TPL77B12
Engine room ambient air temp.	25.0 °C	Scavenge air cooler :	2 x SAC233F
Coolant temperature before SAC	29.0 °C		
Barometric pressure	1000.0 mbar	Fresh water cooled / single-stage SAC / separate HT	
Relative humidity	30.0 %		

Back pressure after turbine : 300.0 mm WG

SAC differential pressure (max.) : 300.0 mm WG

Performance
Scavenge air
Exhaust gas

Power %	Power kW	Speed rpm	pScav bar	tAac °C	tScav °C	Comp flow kg/s	pExh bar	tEbT °C	tEaT °C	Turb flow kg/s	eta %
110.0	27544.0	98.1	4.50	215.1	36.1	57.61	4.12	456.0	278.0	58.15	66.2
100.0	25040.0	95.0	4.15	200.8	35.0	54.11	3.78	427.0	262.0	54.55	68.0
90.0	22536.0	91.7	3.80	186.5	33.9	50.23	3.44	401.6	250.2	50.59	69.3
85.0	21284.0	90.0	3.63	179.8	33.4	48.24	3.28	391.0	246.0	48.56	69.8
80.0	20032.0	88.2	3.47	174.0	32.9	46.27	3.13	382.4	242.8	46.56	70.2
75.0	18780.0	86.3	3.31	168.0	32.5	44.24	2.98	375.0	241.0	44.50	70.4
70.0	17528.0	84.4	3.15	160.9	32.0	42.15	2.83	368.0	240.6	42.39	70.6
65.0	16276.0	82.3	2.97	152.9	31.6	39.88	2.67	362.0	242.0	40.09	70.6
60.0	15024.0	80.1	2.78	144.5	31.1	37.37	2.50	357.0	244.7	37.56	70.5
50.0	12520.0	75.4	2.35	124.8	30.3	31.51	2.11	352.0	258.0	31.67	69.8
40.0	10016.0	70.0	1.88	97.7	29.5	24.37	1.69	357.0	289.0	24.52	68.2

Abbreviations

pScav	Scavenge air pressure	pExh	Exhaust receiver pressure
tAaC	Air temperature after compressor	tEbT	Exhaust gas temperature before turbine
tScav	Scavenge air temperature	tEaT	Exhaust gas temperature after turbine
		etaTC	Turbocharger overall efficiency acc. to CIMAC 2007

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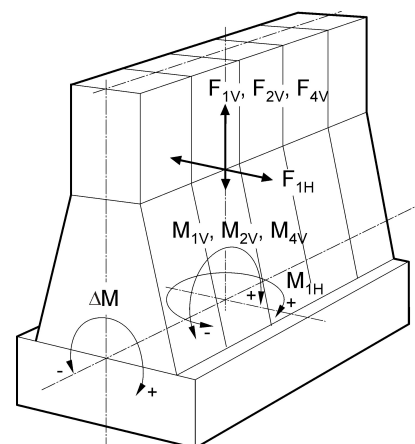
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Dynamic Characteristics
Massmoments and Forces

External moments	[±kNm]	Free forces	[±kN]
M_{1V} standard counterweights	497	F_{1V}	0
M_{1H} standard counterweights	521	F_{1H}	0
M_{2V}	0	F_{2V}	0
M_{4V}	175	F_{4V}	0

External couples and forces


Countermeasures for Dynamic Effects

External couples (2nd order balancer) :	Balancing countermeasure is not relevant
Torsional vibration :	Detailed calculations have to be carried out for every installation
Axial vibration :	An integrated axial damper is fitted as standard
Lateral rocking (side-stays) :	The countermeasure indicated is needed
Lateral rocking (longitudinal-stays) :	The countermeasure indicated is not needed

Rating R1 : 3130 kW/Cyl. / 95 rpm

Lateral H-Moments

Orders	[±kNm]	Orders	[±kNm]
Ord. 1	0	Ord. 7	0
Ord. 2	0	Ord. 8	723
Ord. 3	0	Ord. 9	0
Ord. 4	0	Ord. 10	0
Ord. 5	0	Ord. 11	0
Ord. 6	0	Ord. 12	0

Lateral X-Moments

Orders	[±kNm]	Orders	[±kNm]
Ord. 1	432	Ord. 7	40
Ord. 2	0	Ord. 8	0
Ord. 3	558	Ord. 9	12
Ord. 4	632	Ord. 10	0
Ord. 5	1469	Ord. 11	32
Ord. 6	0	Ord. 12	2

Torque variation ΔM 731 [±kNm]

The value of lateral forces and moments of other engine ratings and orders are available on request.

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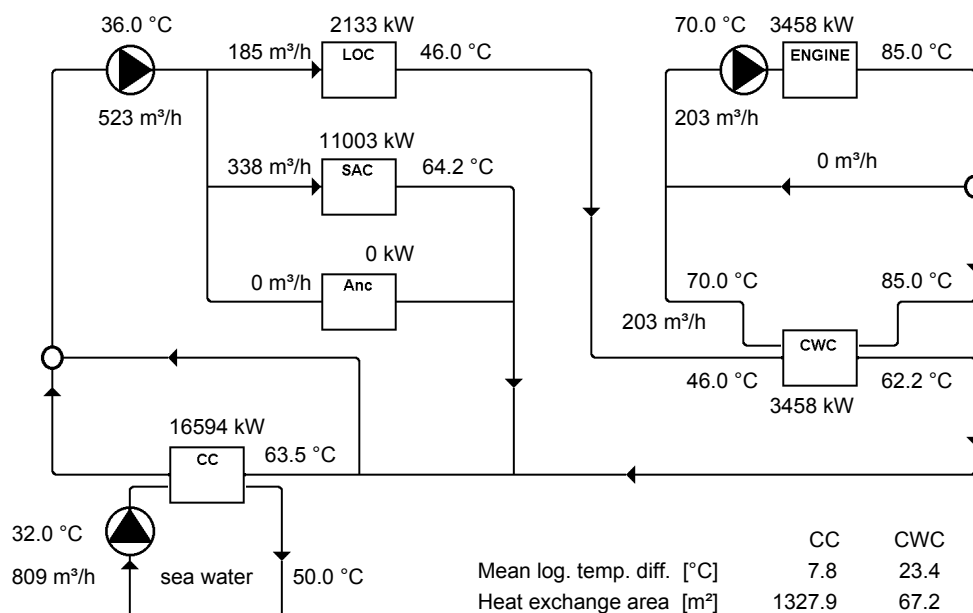
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Cooling System

Design Conditions

Air temperature before blower	45.0 °C	Turbocharger (ABB type) :	2 x TPL77B12
Engine room ambient air temp.	45.0 °C	Scavenge air cooler :	2 x SAC233F
Coolant temperature before SAC	36.0 °C		
Barometric pressure	1000.0 mbar	Fresh water cooled / single-stage SAC / separate HT	
Relative humidity	60.0 %		

FW Cooled / Single-Stage SAC / Sep. HT


System data at 100 %Rx (25040.0 kW)

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95.0 rpm 100.0% R1

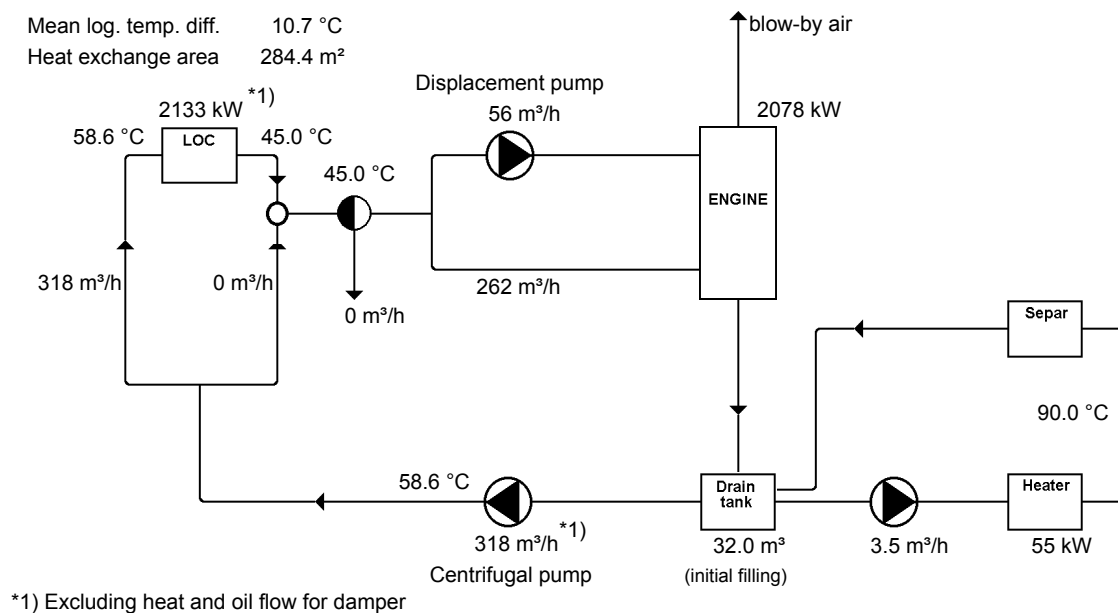
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Lubricating Oil System

Design Conditions

Air temperature before blower	45.0 °C	Turbocharger (ABB type) :	2 x TPL77B12
Engine room ambient air temp.	45.0 °C	Scavenge air cooler :	2 x SAC233F
Coolant temperature before SAC	36.0 °C		
Barometric pressure	1000.0 mbar	Fresh water cooled / single-stage SAC / separate HT	
Relative humidity	60.0 %		

Main Lub. Oil System incl. TC


System data at 100 %Rx (25040.0 kW)

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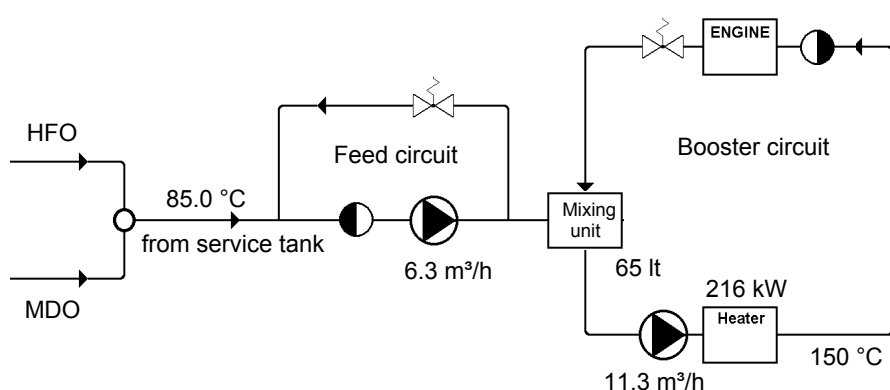
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Fuel Oil System

Tank System Data and HFO Treatment

Feed circuit	HFO setting tank	40 m ³	8 h operation at MCR
	HFO service tank	40 m ³	8 h operation at MCR
	MDO service tank	40 m ³	8 h operation at MCR
	Feed pump	6.3 m ³ /h	
Booster circuit	Booster pump	11.3 m ³ /h	
	HFO endheater	216 kW	
	Mixing unit	65 lt	
Treatment	Separator throughput	5.3 m ³ /h	
	HFO preheater	63 kW	

Pressurized Fuel Oil System



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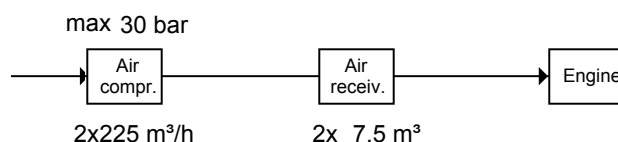
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Starting Air System

Air temperature before blower	45.0 °C	Turbocharger (ABB type) :	2 x TPL77B12
Engine room ambient air temp.	45.0 °C	Scavenge air cooler :	2 x SAC233F
Coolant temperature before SAC	36.0 °C		
Barometric pressure	1000.0 mbar	Fresh water cooled / single-stage SAC / separate HT	
Relative humidity	60.0 %		

Number of starts : 12 ^{*2)}
Propeller pitch control : FPP

Relative shaft inertia J_{Tot} / J_{Eng} : 2.00000
Engine inertia J_{Eng} : 164700 kgm² ^{*3)}

**For 30 bar design**

Air receiver : 2 x 7.5 m³
Air compressor : 2 x 225 m³/h

The above capacities are for the engine only. If additional consumers for board purposes must be supplied with air, then additional capacity must be provided.

*2) 12 consecutive starts of the main engine, alternating between ahead and astern

*3) Data given for engine without damper and front disc on crankshaft but included smallest flywheel

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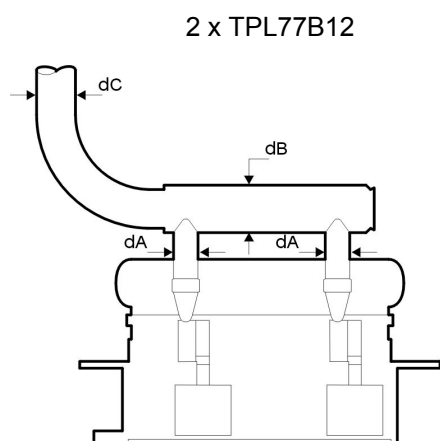
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Exhaust Gas System

Design Conditions


Exhaust gas

Mass flow 183657 kg/h
 Temperature after TC 301.2 °C
 Density 0.624 kg/m³
 Backpressure 300 mmWG

Pipes	Gas velocity m/s	Volume flow m³/h	Diameter mm
Pipe A	40	147156	dA = 1200
Pipe B	25	294312	dB = 2100
Pipe C	35	294312	dC = 1800

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Air temperature before blower	45.0 °C	Turbocharger (ABB type) :	2 x TPL77B12
Engine room ambient air temp.	45.0 °C	Scavenge air cooler :	2 x SAC233F
Coolant temperature before SAC	36.0 °C		
Barometric pressure	1000.0 mbar	Fresh water cooled / single-stage SAC / separate HT	
Relative humidity	60.0 %		

Pumps	Minimum capacities m³/h	Delivery head *3) bar
Lubricating oil *2)	318	6.2
Crosshead lubricating oil	56	7.5
High temperature water circuit	203	3.0
Low temperature water circuit	523	2.7
Fuel oil booster	11.3	6.5
Fuel oil feed	6.3	5.0
Sea-water	809	2.2

*2) Excluding oil flow for damper

*3) Pressure difference across pump (final delivery head) must be according to the actual piping layout

8RTA68-D

Standard Tuning

25040.0 kW 100.0% R1
95.0 rpm 100.0% R1

IMO Tier II compliant

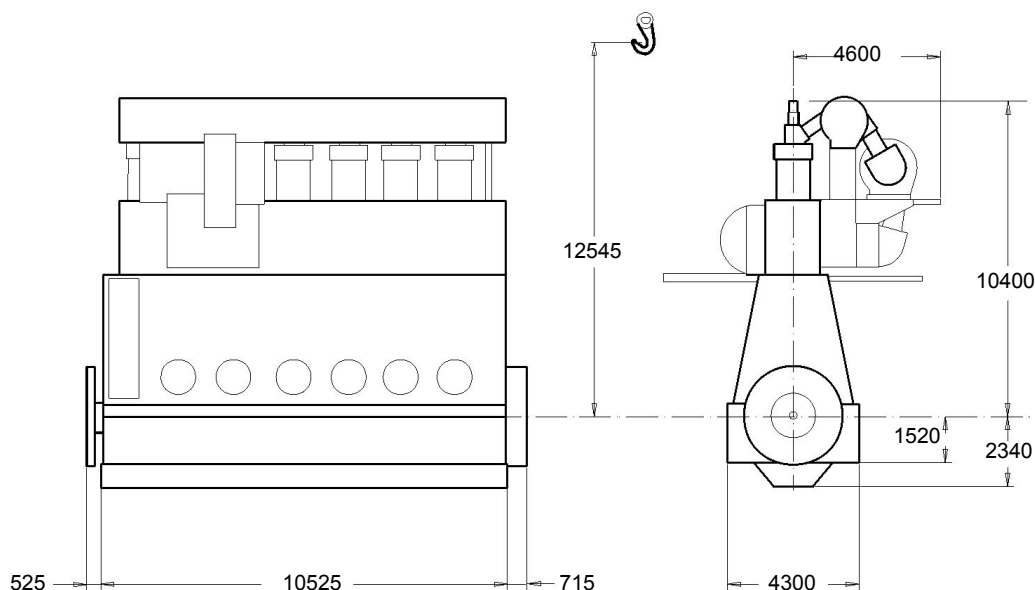
Project:

Yard / Plant:

Owner:

Created: 2014-04-07

Printed: 2014-04-07

Installation Data


Net engine mass: 593 t

Minimum crane capacity: 6.0 t

Engine mass is calculated according to nominal dimensions of drawings, incl. turbochargers and scavenge air coolers (specified for R1), piping and platforms but without oil / water. The dimensions are in mm across R1-rated engines without Efficiency-Booster System with a tolerance of approx. +/- 10 mm.

The standard piston dismantling height as shown in the sketch can be reduced by using special tools and / or tilted lift of the piston. (Min. height to ceiling for tilted piston removal is 11570 mm)

8RTA68-D

Standard Tuning

Project:

Yard / Plant:

Owner:

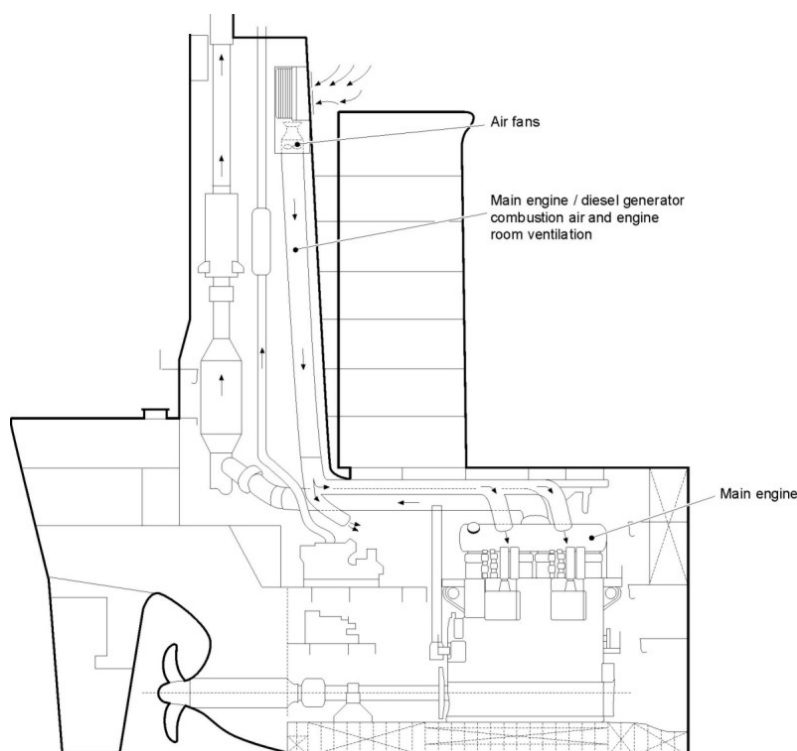
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25040.0 kW 100.0% R1

95.0 rpm 100.0% R1

IMO Tier II compliant

Engine Room Ventilation


Combustion air required	Power / Heat kW	Air flow m³/h
Main engine	25040	164209
Auxiliary engines	4006	25547
Boiler	5000	7661
Ventilation air required		
Radiated heat	1175	
Ventilator	692	423731

Based on : air outdoor temperature : 35°C
 delivery head of the ventilation air blower : 30 mbar