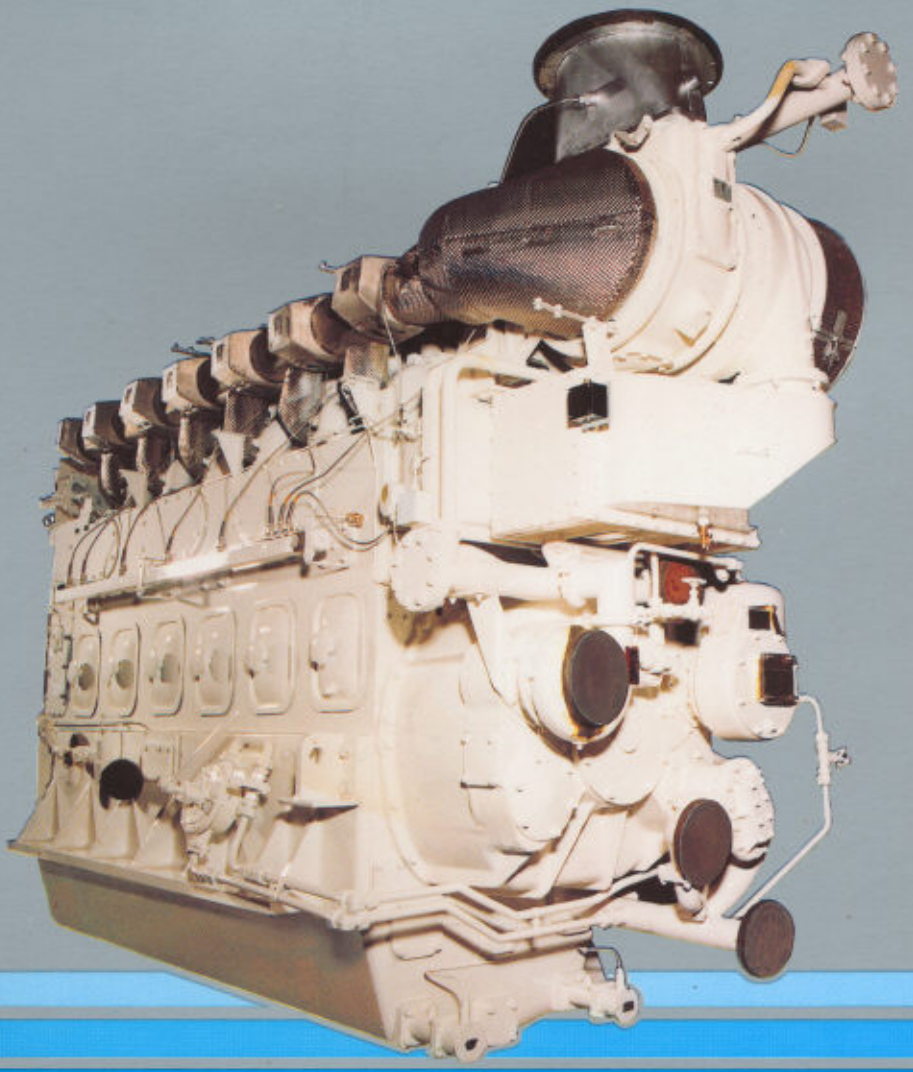
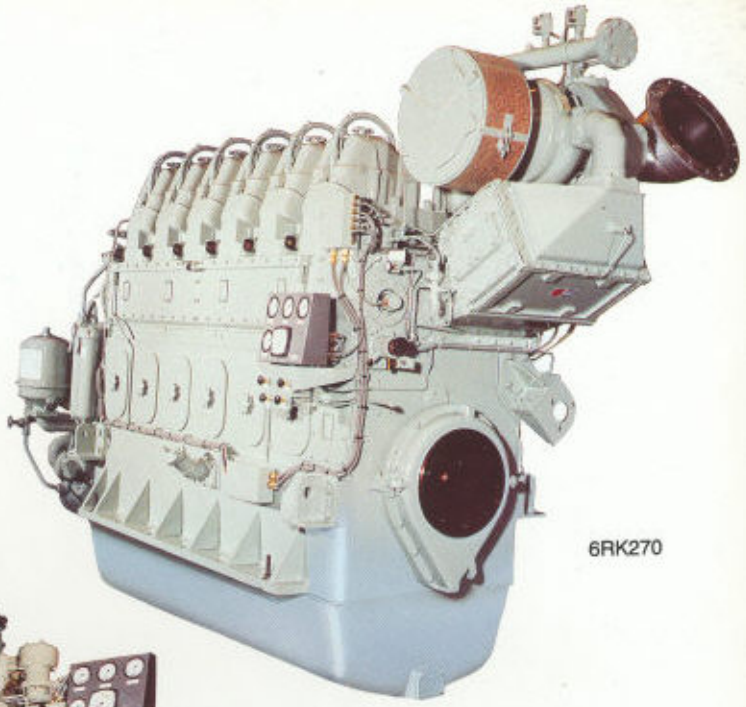
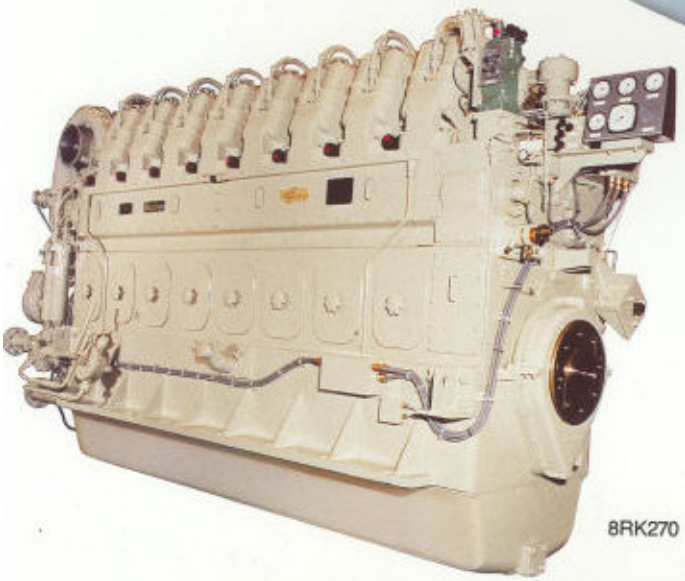
RUSTON
RK 270
DIESEL ENGINES

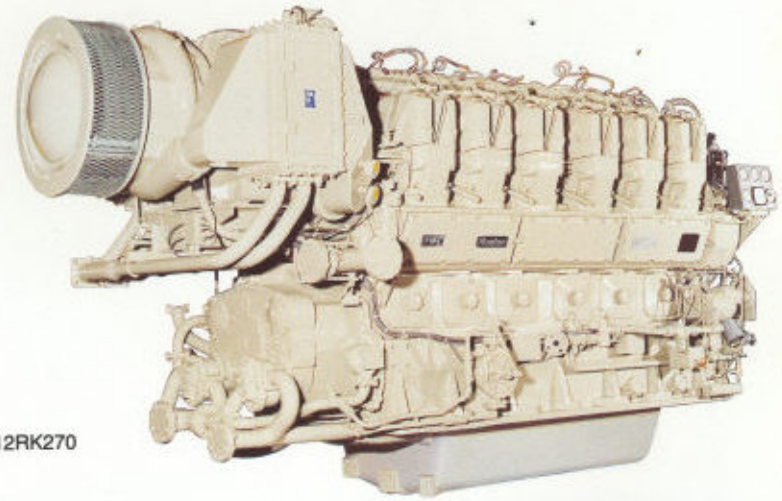




6RK270



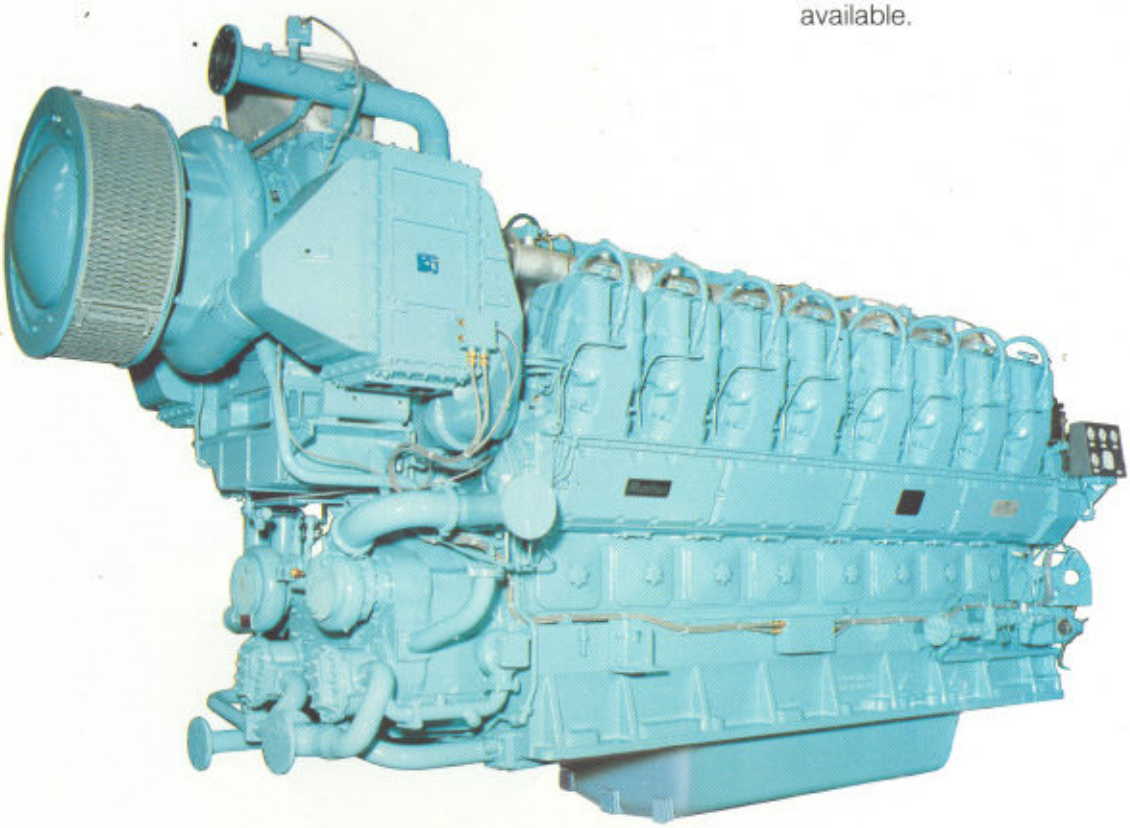
8RK270



12RK270

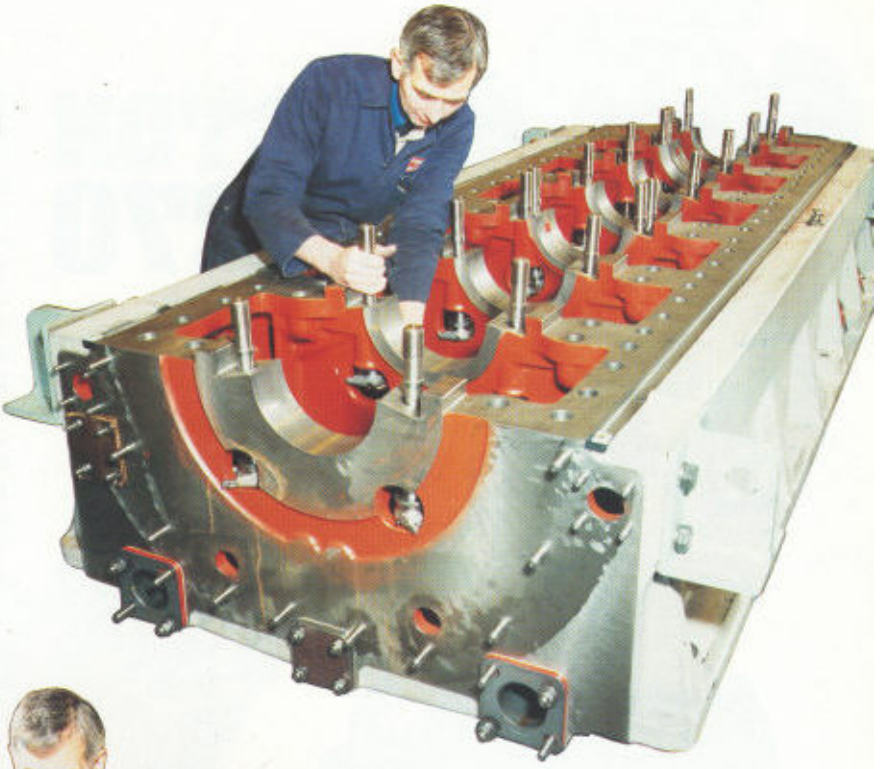
RUSTON RK 270

The Ruston RK 270 is a development of the successful RK engine with an increased bore providing an output of 1200 to 6000 bhp at speeds from 720 to 1000 rev/min, from a range of 6, 8, 12 and 16 cylinder engines. The RK 270 is suitable for a wide variety of applications including industrial power generation, marine propulsion, marine auxiliary power generation and rail traction duties.
With appropriate de-rating the engine can operate on residual fuels, and a spark-ignited industrial version is also available.



16RK270

Bedplate
The RK 270 follows the proven design features of the renowned RK range of engines with the bedplate manufactured from a high grade meehanite iron casting. Robust construction with transverse diaphragms for each main bearing provides rigid support for the crankshaft. Angled joint faces ensure positive locking of the main bearing caps in the bedplate.

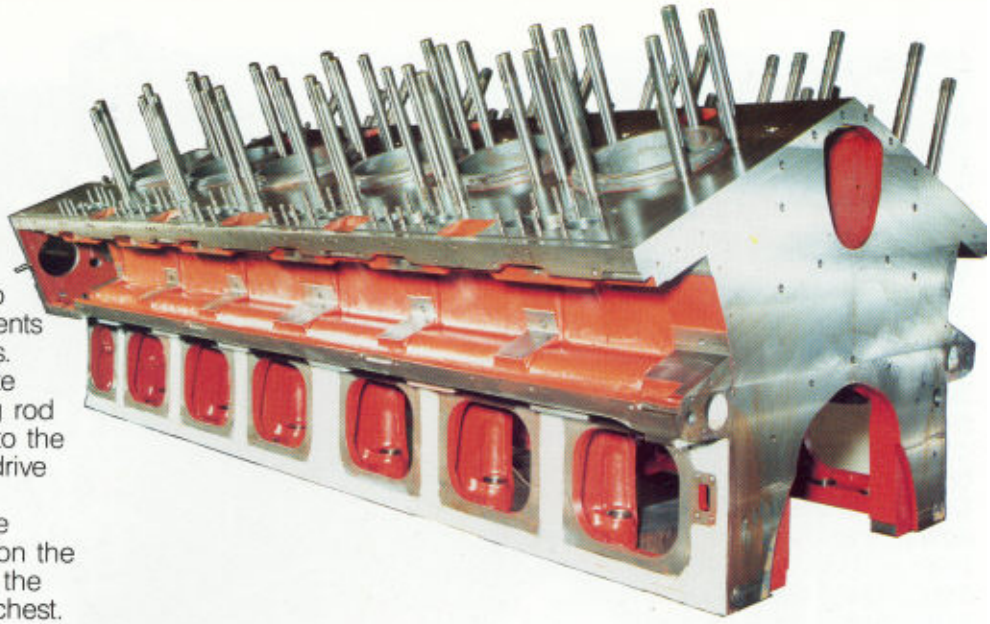


Crankshaft
The crankshaft is machined from a single piece alloy steel forging produced by the continuous grain flow method with bolted on balance weights and an integrally forged coupling flange to which the flywheel is registered and bolted. The camshaft drive gear is split to facilitate replacement.

Bearings
The main bearings are pre-finished, steel backed shells lined with high grade bearing material having a lead-tin surface flashing to facilitate running-in. The bearings are retained in the housings by caps drilled to direct oil to the bearings. These caps are located transversely in large registers in the bedplate and held in position by studs and nuts. The bearings are easily removable through the crankcase doors.

Crankcase

The cylinder housing with integral air chest is machined from a rigid grey iron casting having transverse diaphragms between each cylinder to provide water compartments around the cylinder liners. Detachable doors facilitate access to the connecting rod and main bearings and to the camshaft and governor drive gear train.
Explosion relief valves are appropriately positioned on the crankcase doors and on the integrally cast charge airchest.



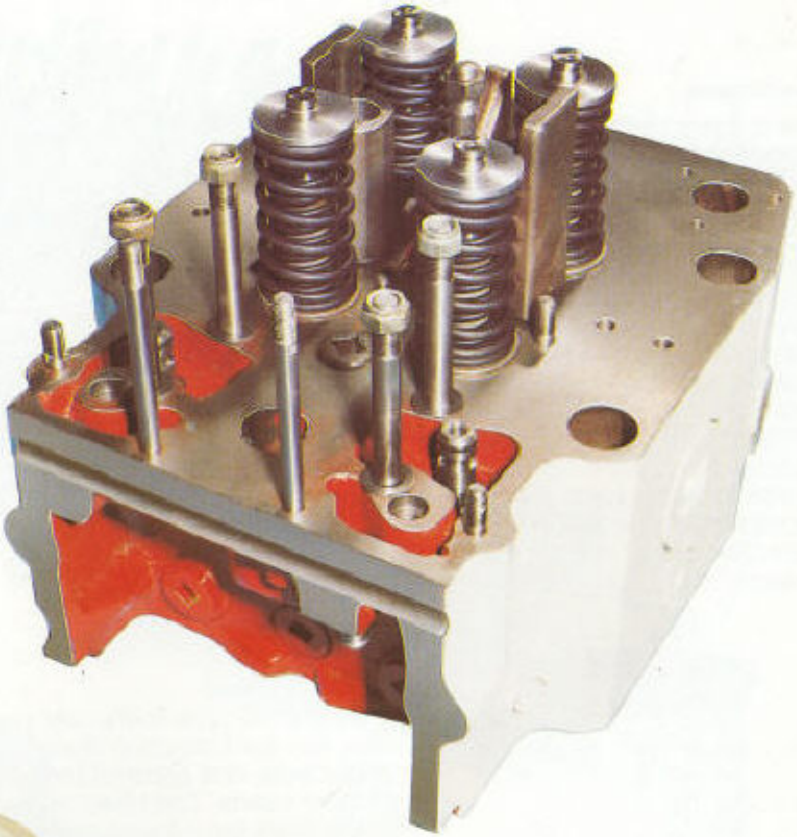
Cylinder liners

Separate wet type liners cast in alloy iron are flanged at their upper ends and secured by the cylinder heads. The lower ends of the liners are located in the crankcase and sealed by synthetic rubber rings. The liners are machined all over and the bore is hone finished to provide good piston liner compatibility for long service life.

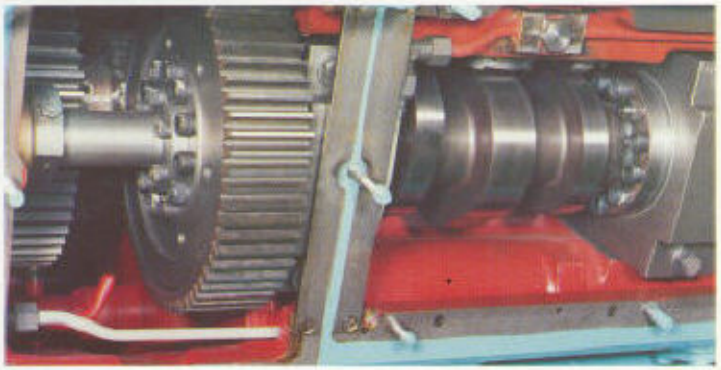
Connecting rods

A feature of the connecting rods is an oblique split large end with the cap located by serrations on the joint face, optimised to reduce bending and shear loads across the joint. As a result, distortion of the large end housing is minimised.
The small end features a stepped configuration large diameter pin to distribute the load evenly between piston and connecting rod, allowing operation at very high firing pressures.

Cylinder Head
Individual cylinder heads are manufactured from iron castings. Each cylinder head carries two inlet and two exhaust valves and a side entry air inlet port which is connected to the crankcase air manifold.



Piston
The standard piston is of single piece aluminium alloy construction with a combustion bowl of the Hesselman design. Cooling oil is fed from the connecting rod, through the small end bush and drillings in the gudgeon pin and piston body to the cast-in cooling gallery.
For some duties, including heavy fuel operation, a steel crown, aluminium skirt, 2 piece piston is used.



Valve Gear and Camshaft
Each pair of valves is operated via short stiff pushrods and conventional rockers. The pushrods are driven from the side entry camshafts, one per bank of cylinders via roller cam followers. Hardened steel cams are used throughout.

Camshaft
A single shaft for each cylinder has few component parts and removal and replacement of cam clusters is simple and straightforward. The camshafts are side mounted in the crankcase and can be easily inserted or removed from the side of the engine.

Camshaft drive
The camshafts and auxiliary drive are driven through a train of hardened and ground steel spur gears from the crankshaft split gear.

Flywheel
The mild steel flywheel, suitable for mounting flexible couplings when required, is fitted with a ring gear for starting and hand barring and is statically balanced before bolting to the integrally forged crankshaft flange.

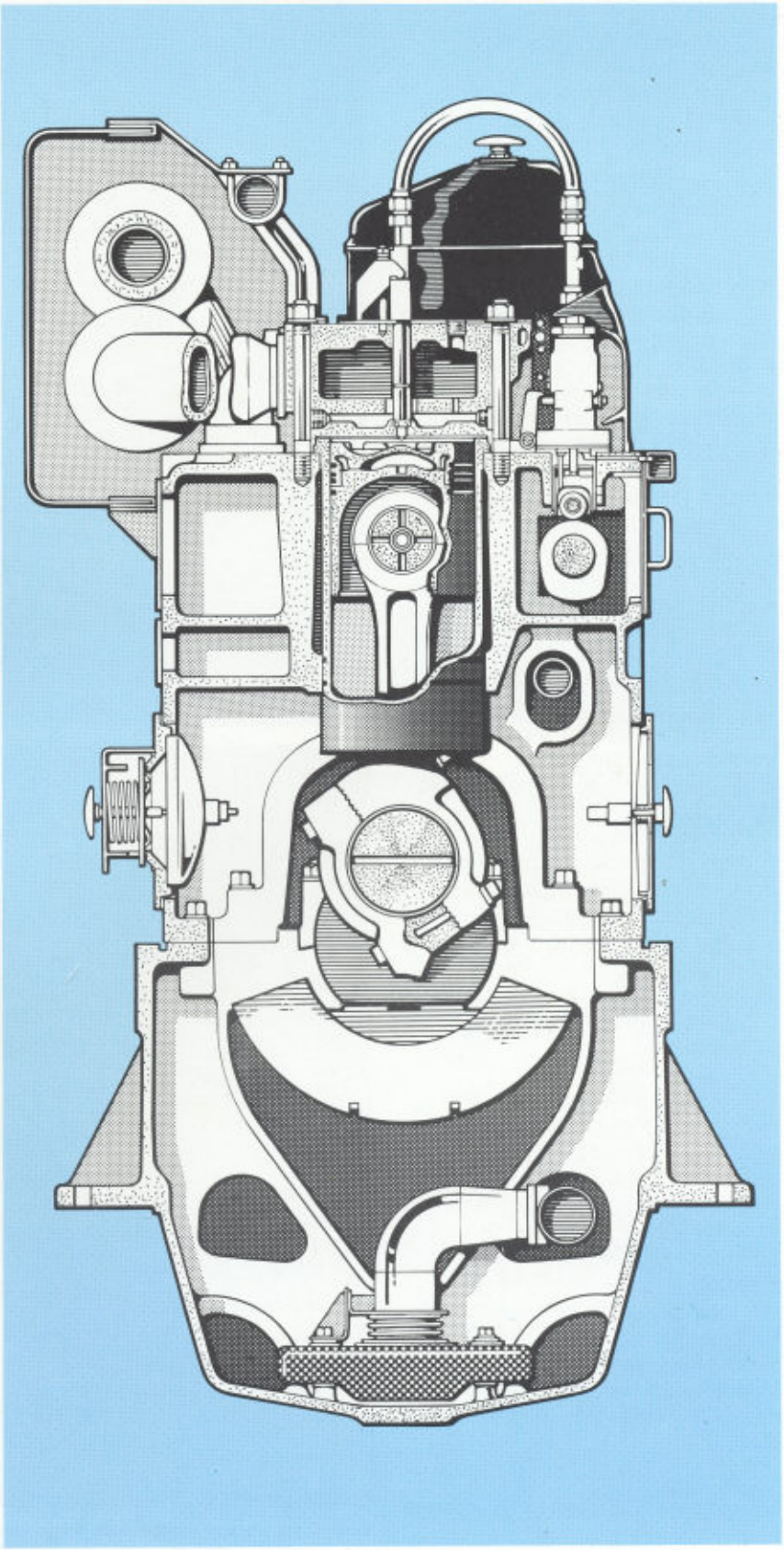
Governor
A sensitive hydraulic governor is bevel gear driven from the camshaft.

Overspeeding is prevented by a separate safety trip mechanism which returns the control shaft to the "NO-FUEL" position.

For Generator drive applications an electric load-sensing governor is employed.

Auxiliary drives
Auxiliaries are driven from the free end of the engine through a spring drive and spur gears. The standard arrangement includes one water pump for the jacket water, one water pump for the charge air cooler and lubricating oil cooler circuits and a gear type lubricating oil pump.

An extension shaft may be fitted to allow power to be taken from the free end of the engine.



Cross section through in-line RK270

Instrumentation

An engine mounted instrument panel is provided to indicate:

Engine speed

Lube oil pressure and temperature

Jacket water pressure

Air chest pressure

Engines are fitted with thermocouples for indicating cylinder exhaust outlet, turbine inlet and outlet temperatures. A multi-point indicator with compensating multi core cabling is supplied for off engine mountings.

Turbochargers

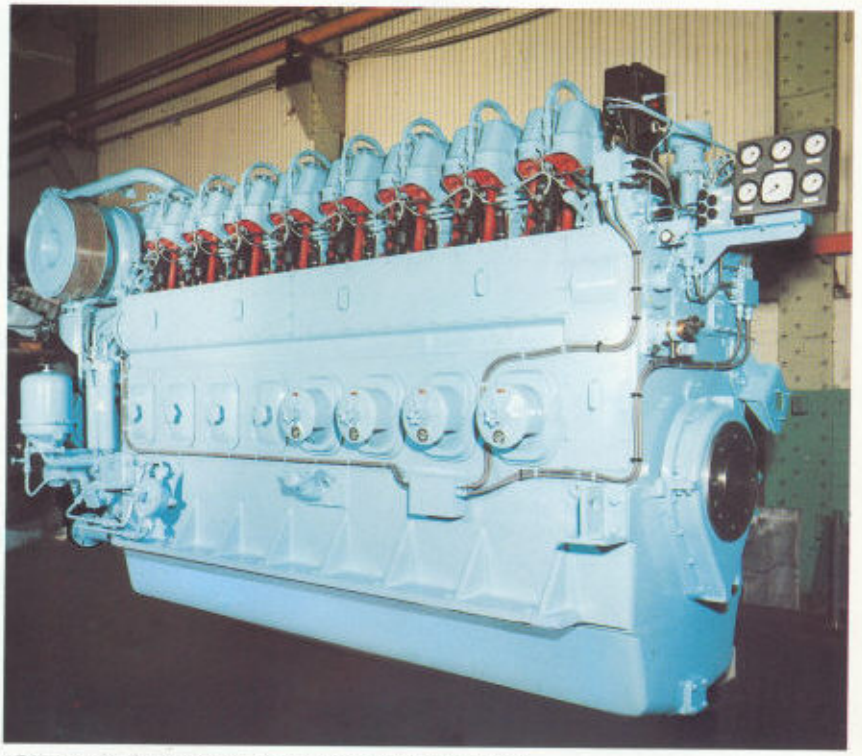
Turbochargers and charge air coolers are fitted as standard equipment. The standard location of the single turbocharger is at the free end of the engine. However, a flywheel end mounted turbocharger may be offered at customer's request. For rail traction applications the turbocharger is mounted above the alternator.

A high efficiency compressor is driven by an axial flow exhaust gas turbine and delivers air to the air-chest through a charge air cooler. Lube oil to the plain bearings and cooling water is provided from the engine systems.

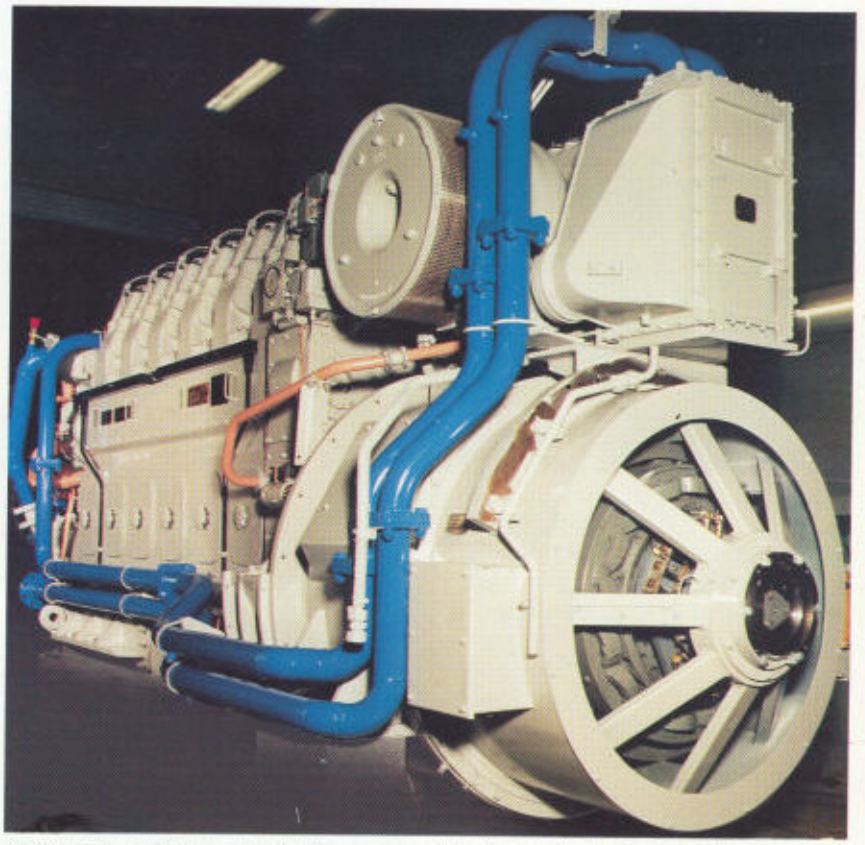
By careful turbocharger matching, engine output is achieved with a favourable air/fuel ratio resulting in low thermal loading.

Exhaust manifold

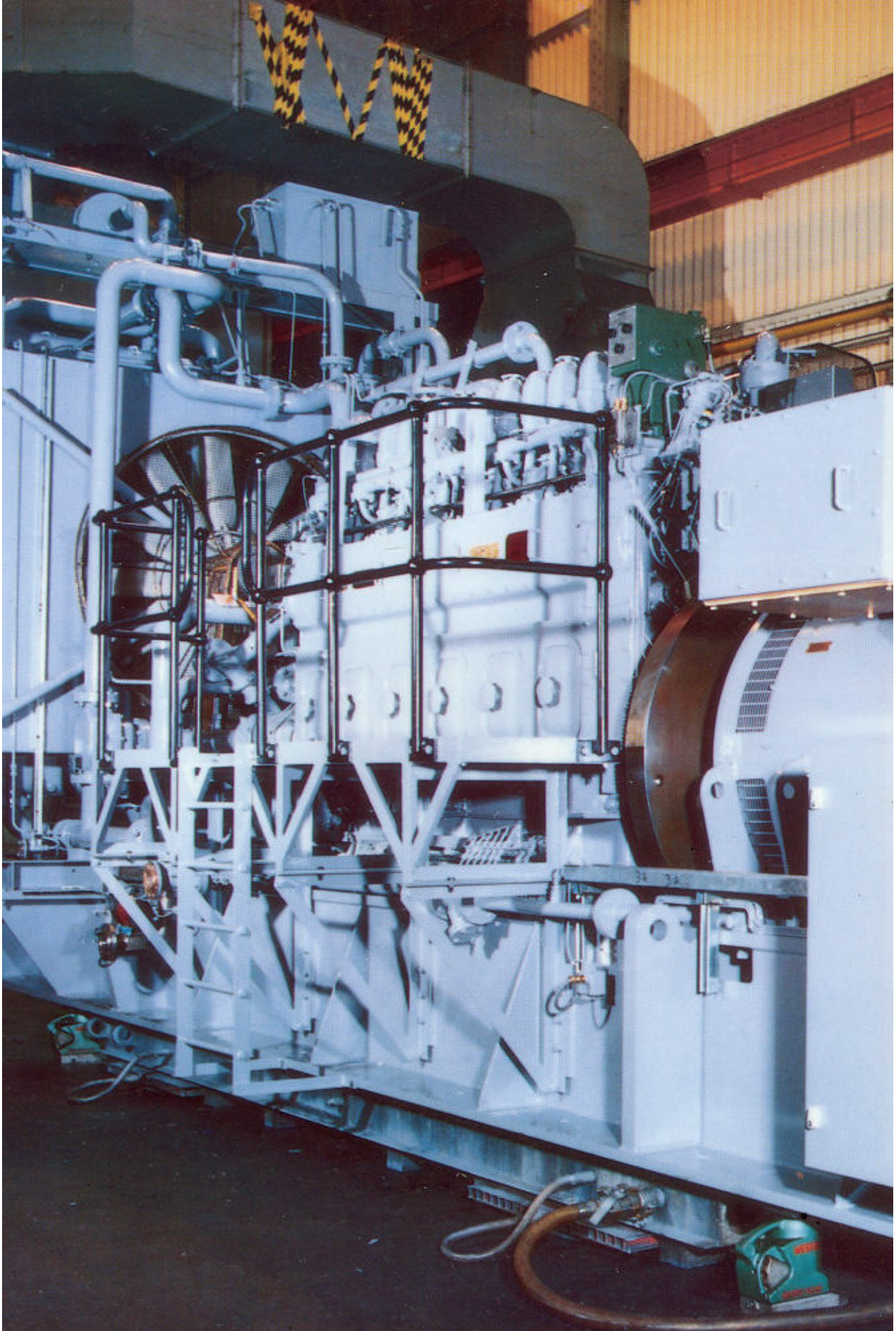
Exhaust manifolds, of cast iron construction, feature bolted flanges with heavy duty joints. Where required these are lagged with non-asbestos material, protected by a metallic skin.



8RK270 with front covers removed to show fuel pumps.



6RK270 rail traction version with flange mounted alternator for B.R. Class 37 locomotive.



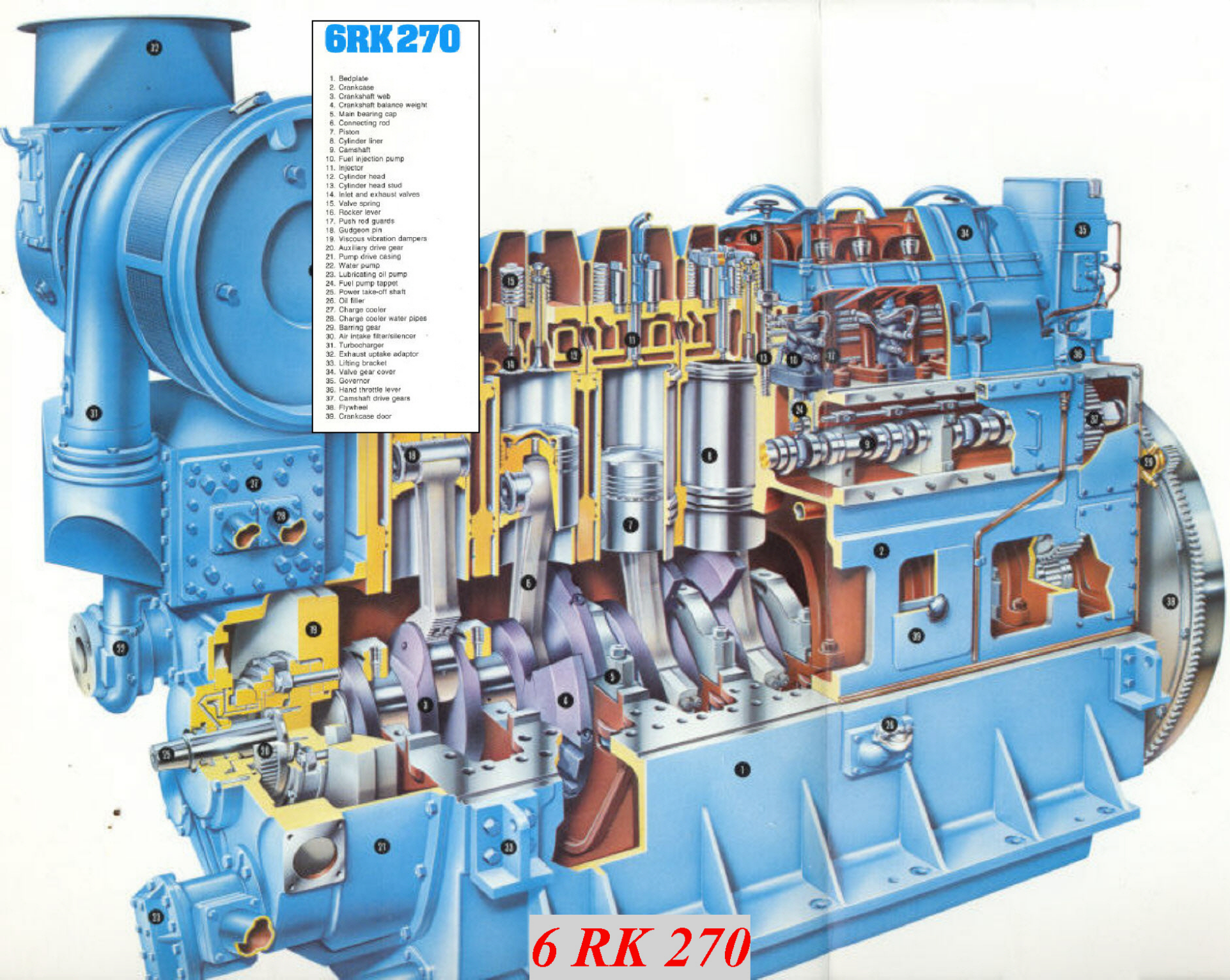
(Left)
6RK270 gas engine powered generating set, producing 844kW brake, for Shell UK Ltd, North Sea installation at Bacton, Norfolk.

(Right)
Two 8RK270M engines, each developing 2300 bhp at 750 rev/min, power Seaman, a coastal and harbour tug, built by Cochrane Shipbuilders Ltd. for Humber Tugs.

(Below)
Built by McTay Marine for Cory Ship Towage Ltd, the tug Oakgarth is powered by two 6RK270M engines, each developing 2000 bhp at 900 rev/min.

6RK270

1. Bedplate
2. Crankcase
3. Crankshaft web
4. Crankshaft balance weight
5. Main bearing cap
6. Connecting rod
7. Piston
8. Cylinder liner
9. Camshaft
10. Fuel injection pump
11. Injector
12. Cylinder head
13. Cylinder head stud
14. Inlet and exhaust valves
15. Valve spring
16. Rocker lever
17. Push rod guards
18. Gudgeon pin
19. Viscous vibration dampers
20. Auxiliary drive gear
21. Pump drive casing
22. Water pump
23. Lubricating oil pump
24. Fuel pump tappet
25. Power take-off shaft
26. Oil filler
27. Charge cooler
28. Charge cooler water pipes
29. Barring gear
30. Air intake filter/silencer
31. Turbocharger
32. Exhaust uptake adaptor
33. Lifting bracket
34. Valve gear cover
35. Governor
36. Hand throttle lever
37. Camshaft drive gears
38. Flywheel
39. Crankcase door



6 RK 270

RUSTON RK270

Marine propulsion & auxiliary

Technical Data

Engine Type RK270

Description Turbocharged and charge cooled diesel

Cycle 4-stroke

Bore 270mm (10.63 in)

Stroke 305mm (12.00 in)

Compression ratio 12.8

Mean piston speed 10.16 m/s (2000 ft/min) at 1000 rev/min

Standard rotation Counter clockwise looking on the drive end of the crankshaft

Standard Equipment

Flywheel
Air filter/silencer mounted on turbocharger
Air motor starting
Crankcase explosion relief valves
Water to air charge air coolers
Jacket water cooler
Lubricating oil cooler
Speed governor-type 1100
Lubricating oil pressure relief valve
Lubricating oil filter —
simplex type for gen. sets
duplex type for propulsion
Lubricating oil pressure pump engine driven
Fuel oil filter — duplex type
Pre-start lubricating oil priming pump
Engine cooling water pump — engine driven
Electric tachometer
Engine-mounted instrument panel
Remote exhaust temperature indicator
Charge air temperature alarm
Jacket water temperature alarm and shut down
Lubricating oil pressure alarm and shut down
Hand barring gear
Lagged exhaust manifold
Cylinder pressure relief valve/compression release valve and indicator (o kill type)
Exhaust silencer — non-spark arrester type
Exhaust uptake adaptor and bellous
Tools for routine maintenance

Optional Equipment

Auto starting
Reverse direction of rotation
Alternative type of speed governor
Power take off from free end of crankshaft
Sea water/secondary water pump — engine driven
Overload switch
Fuel limiter
Residual fuel build
Centrifugal bypass lubricating oil filter
Alternative exhaust silencer — eg spark arrester/improved attenuation
Turbocharger mounted at drive end (6, 8 & 12 cylinder)
Handed engine control
Tools for engine overhaul

Number of cylinders		**6**	**8**	**12**	**16**
Cylinder configuration		In line	In line	45° vee	45° vee
Dry weight (with flywheel)	kg lb	12800 28200	17200 37900	21230 46800	25820 56900
Oil sump capacity	l gal	340 75	410 90	570 125	750 160
Length	mm in	4020 158	4750 187	4785 189	5600 221
Width	mm in	1325 52	1325 52	1830 72	1830 72
Height	mm in	2490 98	2490 98	2400 94	2400 94
Turbocharger no. Position		One Free end	One Free end	One Free end	Two Free end & drive end
Charge cooler no. Position		One Free end	One Free end	Two Free end	Two Free end & drive end

Marine unrestricted service power

Engine	**Speed**	**DISTILLATE**		
	rev/min	Brakepower kW	hp	Electrical kW
6RK270	720 750 900 1000	1410 1440 1620 1720	1890 1930 2170 2305	1350 1380 1550 1650
8RK270	720 750 900 1000	1880 1920 2160 2300	2520 2575 2895 3080	1800 1840 2070 2200
12RK270	750 750 900 1000	2820 2880 3240 3440	3780 3860 4340 4610	2700 2760 3100 3300
16RK270	720 750 900 1000	3760 3840 4320 4600	5040 5150 5790 6160	3600 3680 4140 4400

*Electrical power output will depend on actual generator efficiency.

Specific fuel consumption

Percent full load		**110**	**100**	**75**	**50**	**25**	**110**	**100**	**75**	**50**	**25**
	rev/min	kg/kW-h (brake)					lb/bhp-h				
All **RK270**	720/750 900 1000	.204 .210 .211	.202 .207 .208	.201 .207 .209	.209 .212 .220	.228 .225 .239	.335 .345 .347	.332 .340 .342	.330 .340 .343	.343 .348 .361	.375 .370 .393
Tolerance		+5%					+5%				
L.C.V. of fuel		42000 kJ/kg					18060 Btu/lb				

Fuel specification
Distillate. BSMA100. Class M1, M2 or equivalent specification.

Residual. BSMA, 100 Class M4-M7 or equivalent specification having viscosities of 15, 25, 45, 75 cst at 80°C (300, 600, 1500, 3500 Redwood No. 1 at 100°F).

General performance data*

ENGINE TYPE		6RK270				8RK270				12RK270				16RK270			
Engine speed	rev/min	720	750	900	1000	720	750	900	1000	720	750	900	1000	720	750	900	1000
BMEP	bar	22.40	22.03	20.64	19.72	22.40	22.03	20.64	19.75	22.40	22.03	20.64	19.72	22.40	22.03	20.64	19.75
	lbf/in²	324.8	319.4	299.3	285.9	324.8	319.4	299.3	286.4	324.8	319.4	299.3	285.9	324.8	319.4	299.3	286.4
Mechanical efficiency	%	91.7	91.4	89.8	88.8	91.7	91.4	89.8	88.8	91.7	91.4	89.9	88.8	91.7	91.4	89.9	88.8
Brake thermal efficiency	%	42.52	42.52	41.47	41.27	42.52	42.52	41.47	41.27	42.52	42.52	41.47	41.27	42.52	42.52	41.47	41.27
Maximum cylinder pressure	bar	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
	lbf/in²	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Compression pressure	bar	100	98.5	97	97	100	98.5	97	97	100	98.5	97	97	100	98.5	97	97
	lbf/in²	1450	1428	1407	1407	1450	1428	1407	1407	1450	1428	1407	1407	1450	1428	1407	1407
Charge air pressure	bar	2.2	2.15	2.1	2.1	2.2	2.15	2.1	2.1	2.2	2.15	2.1	2.1	2.2	2.15	2.1	2.1
	lbf/in²	31.9	31.2	30.5	30.5	31.9	31.2	30.5	30.5	31.9	31.2	30.5	30.5	31.9	31.2	30.5	30.5
Air flow rate	kg/s	2.98	3.08	3.51	3.72	3.97	4.11	4.67	4.98	5.96	6.16	7.01	7.44	7.94	8.21	9.35	9.95
	lb/s	6.56	6.79	7.73	8.20	8.75	9.06	10.30	10.96	13.12	13.58	15.15	16.40	17.50	17.73	20.61	21.93
Exhaust gas flow rate	kg/s	3.06	3.10	3.60	3.82	4.08	4.21	4.79	5.11	6.12	6.32	7.20	7.64	8.15	8.43	9.60	10.22
	lb/s	6.74	6.83	7.94	8.42	8.98	9.10	10.57	11.27	13.48	13.65	15.86	16.84	17.96	18.09	20.31	22.52
Charge air temperature	°C	66	65	65	65	66	65	65	65	66	65	65	65	66	65	65	65
	°F	151	149	149	149	151	149	149	149	151	149	149	149	151	149	149	149
Turbine inlet temperature	°C	540	540	580	580	540	540	580	580	540	540	580	580	540	540	580	580
	°F	1005	1005	1075	1075	1005	1005	1075	1075	1005	1005	1075	1075	1005	1005	1075	1075
Turbine outlet temperature	°C	390	380	390	390	390	380	390	390	390	380	390	390	390	380	390	390
	°F	735	715	735	735	735	715	735	735	735	715	735	735	735	715	735	735
Fuel injection pressure	bar	1040	1055	1035	1120	1040	1055	1035	1120	1040	1055	1035	1120	1040	1055	1035	1120
	lbf/in²	15100	15300	15000	16200	15100	15300	15000	16200	15100	15300	15000	16200	15100	15300	15000	16200
Lubricating oil consumption	l/hr	2.15	2.15	2.4	2.55	2.85	2.85	3.2	3.4	4.25	4.25	4.8	5.1	5.7	5.7	6.4	6.8
	pint/h	3.75	3.75	4.25	4.45	5.0	5.0	5.65	6.0	7.5	7.5	8.45	9.0	10.0	10.0	11.3	12.0

Heat dissipation and flow data*

ENGINE TYPE		6RK270				8RK270				12RK270				16RK270			
Engine speed	rev/min	720	750	900	1000	720	750	900	1000	720	750	900	1000	720	750	900	1000
Heat dissipation to charge cooler	kW	525	542	600	636	699	723	799	851	1050	1084	1198	1272	1398	1445	1598	1702
	Btu/h×10³	1792	1849	2049	2171	2387	2967	2724	2905	3582	3699	4091	4341	4773	4630	5455	5805
Sec. water flow through charge cooler(s) — total**	m³/h	40.9	40.9	40.9	40.9	45.5	47.7	57.3	63.6	81.8	81.8	81.8	81.8	91.0	95.4	114.6	127.2
	gal/h	9000	9000	9000	9000	10000	10500	12600	14000	18000	18000	18000	18000	20000	21000	25200	28000
Heat dissipation to jacket water	kW	372	398	464	506	497	532	624	676	739	800	931	1012	992	1062	1240	1351
	Btu/h×10³	1268	1360	1584	1728	1696	1814	2129	2305	2522	2731	3178	3451	3386	3624	4230	4610
Jacket water flow rate	m³/h	45.5	47.7	57.3	63.6	45.5	47.7	57.3	63.6	91.0	95.4	114.6	127.2	91.0	95.4	114.6	127.2
	gal/h	10000	10500	12600	14000	10000	10500	12600	14000	20000	21000	25200	28000	20000	21000	25200	28000
Jacket water temperature into cooler	°C	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82
	°F	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
Heat dissipation to lubricating oil	kW	178	191	219	231	239	255	292	310	354	384	436	464	475	509	582	619
	Btu/h×10³	608	653	747	789	814	871	996	1058	1207	1310	1488	1584	1621	1738	1986	2113
Lubricating oil flow through cooler	m³/h	32.7	32.7	32.7	32.7	37.0	37.0	37.0	37.0	50.9	50.9	50.9	50.9	61.4	61.4	61.4	61.4
	gal/h	7200	7200	7200	7200	8150	8150	8150	8150	11200	11200	11200	11200	13500	13500	13500	13500
Lubricating oil into cooler†	°C	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82	82
	°F	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
Heat to radiation (lagged exhaust manifold)	kcw	39	40	45	48	52	54	60	64	79	80	90	96	105	107	120	128
	Btu/h×10³	134	137	154	163	178	182	205	218	268	273	307	326	357	364	410	436

* At marine unrestricted service conditions of 45°C air intake and 32°C charge cooler water temperature.
† Cooler design temperature — nominal setting of thermostatic valve is 77°C (170°F).
** Based on clean deep-sea water and Al-brass tubes.

RUSTON DIESELS

Ruston Diesels Limited
Vulcan Works
Newton-le-Willows
Merseyside WA12 8RU
England
Telephone: 0925 225151
Fax: 0925 222055
Telex: 627131

Publication No. RD084S

2M0889
Printed in England

RUSTON
DIESELS

RUSTON
DIESELS

Ruston Diesels Limited
Vulcan Works, Newton-le-Willows,
Merseyside, WA12 8RU, England
Tel: 0925 225151 Telex: 627131
Telefax: 0925 222055

Publication No. RD101

Printed in England

1M0788