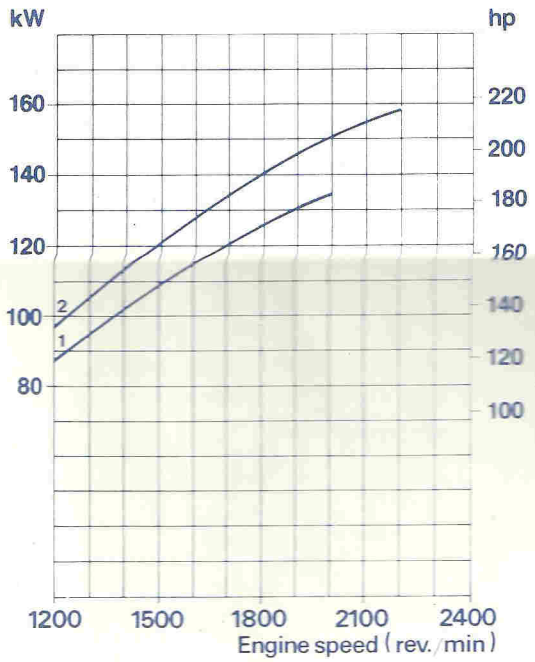
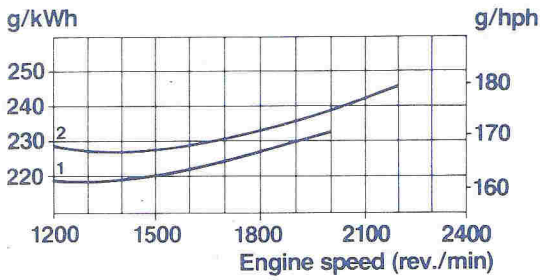
158 (215) MARINE ENGINE

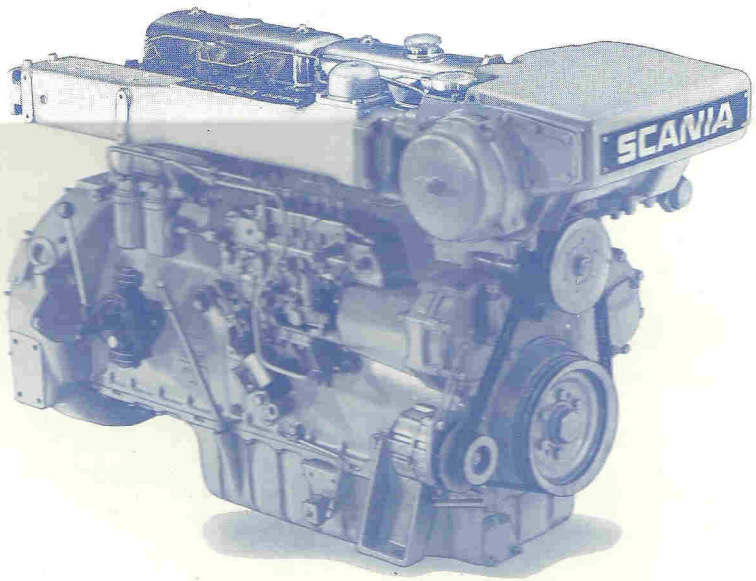
SCANIA DN11

Power



Specific fuel consumption



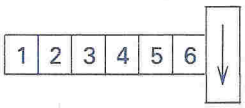


Basic data

DN 11 engine is a naturally aspirated, 6 cylinder, water-cooled, 4 stroke, direct injected diesel engine.

Number of cylinders		6 in line
Displacement	dm^3	11.02
Bore	mm	127
Stroke	mm	145
Number of main bearings		7
Compression ratio		16:1
Direction of rotation, viewed from flywheel end: counter clockwise		
Moment of inertia, with industrial flywheel	kgm^2	2.83
Cyclic irregularity at full load, curve 1		1:300
Speed variation when taking off, or applying 100% load:		
All speed engine.	%	6-12
Lube oil capacity, standard sump.	dm^3	21
Time between lube oil changes, standard sump	h	200
Specific lube oil consumption at 100% load, curve 1, approx g/kWh (g/hph)		1.4 (1.0)
Cooling water temperature,		
Normal	°C	75-85
Max permitted, without pressure cap,	°C	90
Max permitted, with pressure cap,	°C	100
Weight (excl.oil and water)	kg	1085

Firing order 1-5-3-6-2-4



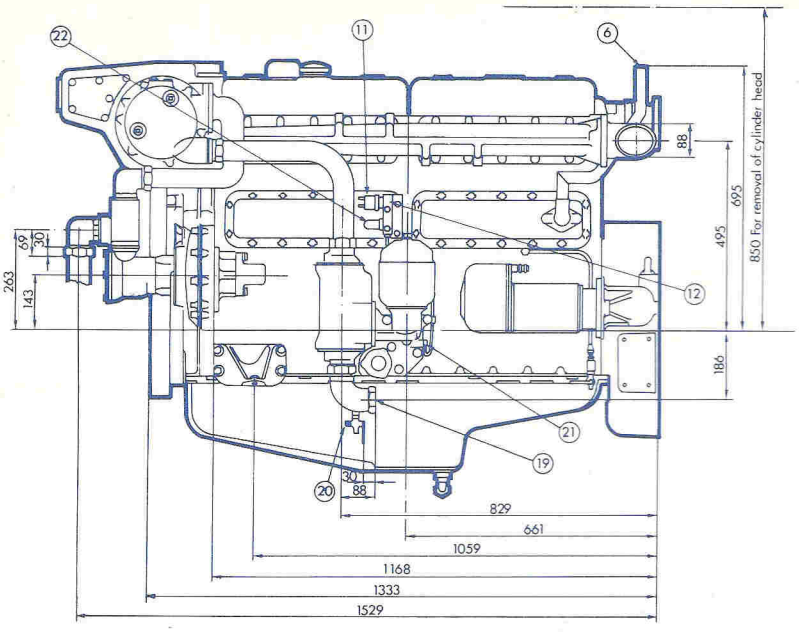
Test conditions

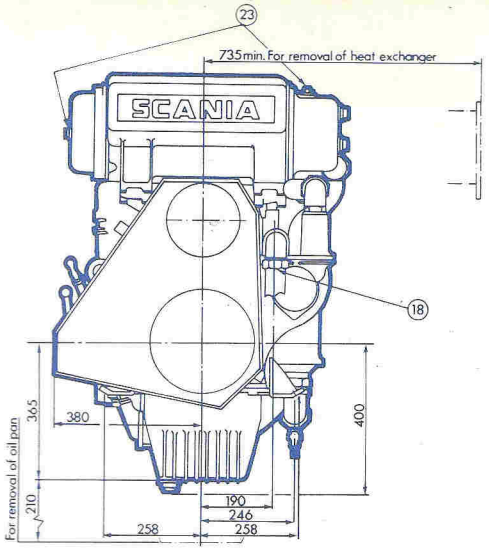
Ambient temperature	+ 27°C
Barometric pressure	100 kPa (750 mm Hg)
Humidity	60%
Power test codes, main:	ISO 3046
supplementary:	ISO 2534
	DIN 6270
	SAE J 1349
	B.S. 5514

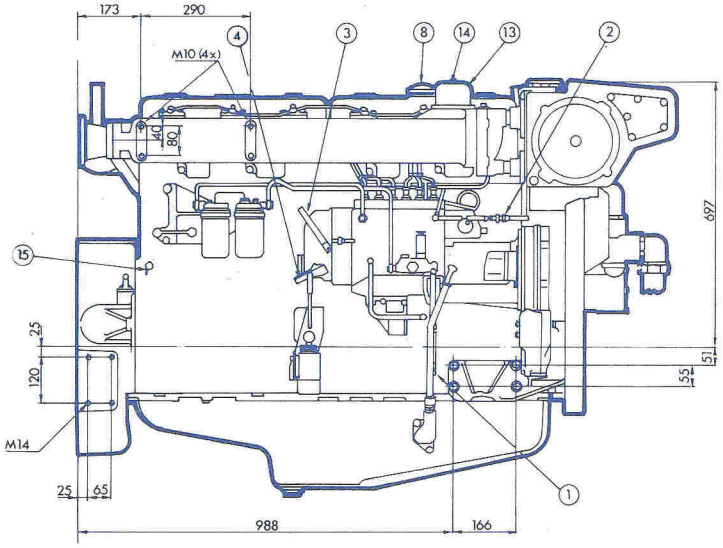
Power rating codes
Curve 1 Continuous un interrupted
Curve 2 Light duty commercial

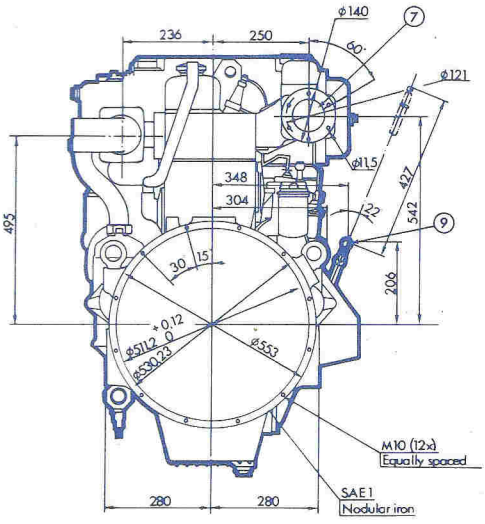
Diesel fuel according to	SIS 155432, or DIN 51601, ASTM-D975-No.2
Density of fuel	0,83 kg/dm^3
Calorific value of fuel	42700 kJ/kg (10200 kcal/kg)
Temperature of fuel	35°C

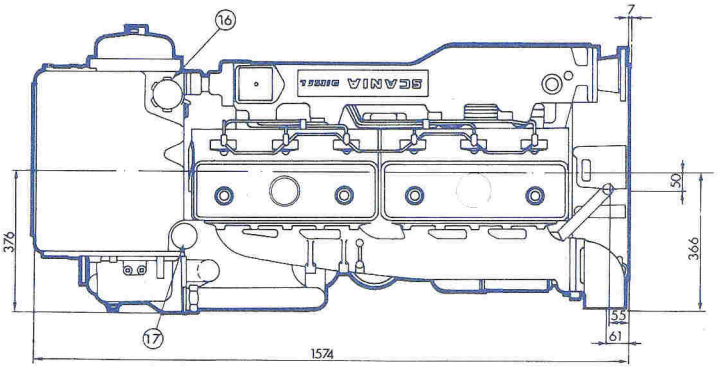
A new engine gives up to 3% lower power











1. Fuel inlet (Pipe 10×1).
2. Fuel outlet (Pipe 10×1).
3. Speed control lever.
4. Stop lever.
5. Air inlet.
6. Crankcase ventilation (Tube Ø 28).
7. Exhaust flange.
8. Oil filling cap.
9. Oil dipstick.
10. Plug for oil draining.
11. Connection for oil pressure sending unit (M14×1,5)(2×).
12. Oil pressure gauge connection (M14×1,5).
13. Water temperature switch connection (½ – 14 NPSF)(2×).
14. Water temperature gauge connection (M14×1,5)(2×).
15. Drain tap for fresh water.
16. Fresh water filling cap.
17. Coolant level switch connection.
18. Sea water inlet (Ø 54).
19. Sea water outlet (Ø 54).
20. Draintap for sea water.
21. Oil pressure switch.
22. Connection oil pressure switch (M14×1,5)(2×).
23. Protection anode (3×).

Scale 1:20

GENERAL DESCRIPTION

Cylinder block

The cylinder block is integral with the upper half of the crankcase and is made in one piece of alloy cast iron. The main bearing caps are made of forged steel. The exchangeable wet-type cylinder liners (in direct contact with the coolant) are centrifugally cast of special cast-iron, and are flanged at the top for fitting into the cylinder block. Sealing between the coolant jacket and the crankcase is provided by rings of oil- and heat-resistant rubber.

Cylinder heads

The cylinder heads are made of alloy cast-iron, each covering three cylinders. Valves and injectors are mounted in the cylinder head. The gas sealing between block and cylinder head is executed by a steel plate gasket. The sealing around cooling water and lube oil canals, between block and cylinder head is carried out with heavy duty rubber rings. Each unit is easily removable. All valve seat inserts are made of a special alloy. The inlet ports in the cylinder head are specially shaped to give the incoming air a swirl which improves engine function. This results in optimal combustion of the injected fuel, which to a large extent contributes to the low fuel consumption.

Valves and valve mechanism

Both inlet and exhaust valves are made of heat-resistant steel and are stellite-faced. The valve stems are chromium-plated and have exchangeable steel caps, against which the hardened thrust surfaces of the rocker arms act. Double springs on every valve. The valve clearance is adjusted with a hardened ball stud on the rocker arm. The pushrods, which rise against the rocker arms, are of steel tubing and are carried in cup type valve lifters of chill-hardened cast iron. The valve mechanism is protected by a light-alloy cover.

Camshaft

The camshaft is drop-forged of alloy steel with cams and journals hardened, ground and polished. It runs in bushings in the cylinder block. The axial thrust is taken up by a flange at the front bearing. The camshaft is driven from the crankshaft through silent-running helical gears.

Pistons

The pistons are made of a light alloy. The shape of the piston crown ensures optimum combustion. For the top compression ring there is a cast-iron insert to reduce the wear of the ring groove to a minimum. Compression rings and oil control ring of alloy cast-iron. Top compression ring chromium-plated. The gudgeon pins are made of case-hardened chrome steel.
Piston cooled from inside by lubricating oil, sprayed from a nozzle in the crank case.

Connecting rods

The connecting rods are I-section dropforgings of alloy steel. The small end of the connecting rod is wedge shaped so that combustion pressure is taken up by a much larger area than otherwise, both in piston and connecting rod.
There is a bronze bushing for the gudgeon pin. The gudgeon pin is lubricated by lubricating oil, sprayed from a nozzle in the crankcase. Exchangeable big end bearings of the same type as the main bearings.

Crankshaft

The crankshaft is made of drop-forged alloy steel. It is substantially dimensioned and is dynamically balanced and Magnaflux tested like many other forged engine parts. It is mounted in sturdy main bearings with exchangeable bearing shells consisting of a steel plate with lead-bronze lining covered with lead-indium.
The bearing surfaces of the crankshaft are extra deep induction hardened, ground and polished. The hardening allows, if required, regrinding to 6 undersizes for which standard bearings can be obtained. The axial forces are taken up by thrust washers at the rear main bearing.
The crankshaft has a patented viscous-type vibration damper at the frontend.

Oil sump

The oil sump is cast in aluminium alloy and provided with a magnetic drain plug. The standard oil sump has the oil drain plug in the bottom of the sump. Handpump for oil draining is delivered loose with the engine.

Lubricating system

From a gear pump located in the front of the sump the oil is forced to the main bearings, big-end bearings, camshaft bushings, the bearings of the timing gears and the piston cooling nozzles. The pump capacity at 2,200 engine rev/min is 120 dm^3/min. By a special device at the second and third camshaft bearings the oil is fed intermittently to the rocker mechanism, from which it runs off to lubricate the valve lifters.
The oil is regulated by a pressure relief valve. Maximum oil pressure is set to 4.5–6 bar.
The lubricating system has a sea-water cooled full flow oil cooler of the heat exchanging type.

Oil cleaner

The lubricating oil is cleaned prior to the oil pump by a strainer in the oil sump and after the oil pump by a patented cleaning arrangement consisting of a cyclone and a centrifugal type cleaner.

Crankcase ventilation

The interior of the crankcase is ventilated by a breather pipe on the block, provided with an oil trap and a protection filter.

Fuel system

The fuel is drawn from the fuel tank through a prefilter by a feed pump. It is then forced through two parallelly connected fine filters to the injection pump. The injection pump forces the fuel through pressure pipes to the injectors. The pump is driven from the crankshaft through helical gears and an adjustable coupling. It is provided with a centrifugal governor which regulates the fuel charge according to the load of the engine.
The camshaft of the injection pump has a special design which prevents reverse running. The injectors have multi-orifice nozzles and are furnished with edge-type filters. The opening pressure is set to 200 bar. Leak-off oil from the injectors is carried back to the tank. The cold-starting device facilitates starting at low temperatures. It gives additional fuel for starting and is then automatically cut out. The injection pump is lubricated from the engine lubricating system. The prefilter is a fine-mesh gauze filter. The fine filters have cartridges of specially impregnated paper.

Cooling system

The engine including exhaust manifold is fresh water cooled. The fresh water is cooled by a heat-exhanger mounted directly on the engine. The coolant is pumped by a powerful pump through a lengthwise passage in the cylinder block which communicates with the cooling jackets of the cylinder head. The coolant passages in the cylinder head are so directed that the injectors and exhaust valves receive maximum cooling. From the cylinder heads the coolant passes through dual two-way wax thermostats back to the heat-exchanger.
The thermostats do not open until the coolant has reached normal working temperature. In the meantime the coolant is led through a by-pass line straight back to the suction side of the coolant pump. Thus the coolant circulates only in the engine which quickly reaches working temperature.
The coolant pump is of centrifugal type. It is mounted on the front end of the cylinder block and is driven by two V-belts from the crankshaft. The pump has a self-adjusting carbon seal. The pump shaft is of stainless steel and runs in sealed ballbearings. The sea water pump is driven directly from the engine front and gears.

Air intake manifold

Standard intake manifold is shown in the main drawing.

Exhaust manifold

Standard watercooled exhaust manifold is shown in the main drawing.

Flywheel housing and flywheel

Standard flywheel housing is made of nodular iron and has a SAE 1 connection flange. The flywheel housing have the possibility to mount double starter motors.
Standard flywheel is for reverse gear or industrial clutch.

Electrical system

The electrical system has a nominal voltage of 24 V. 2-pole 35 A 28 V alternator with relay and sending unit for tachometer. 2-pole starter motor rated 5.5 kW (7.5 hp).

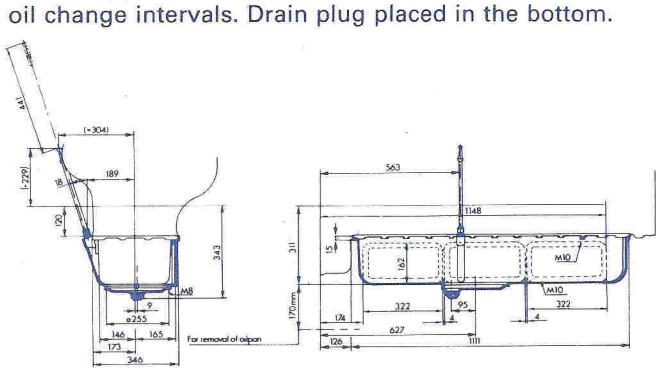
OPTIONAL EQUIPMENT

Crankshaft

For high output power take off from the crankshaft front end, a special crankshaft with polygon joint can be supplied.

Oil sump

This oil sump has inspection covers on the left hand side and a bigger oil capacity (30 litres), which allows longer oil change intervals. Drain plug placed in the bottom.



Flywheels

Flywheels are available for different types of industrial clutches, converters, reverse gears, flange mounted generators and for flexible couplings.

EXTRA EQUIPMENT

Engine mountings

Stiff and fixed suspensions are available in combinations with several different reverse gears.

Power take-offs

Several direct driven optionals can be connected to the crank shaft and the timing gear train. Air compressor, side or front mounted power take-offs, hydraulic pump etc.

Clutches, reverse gears and couplings

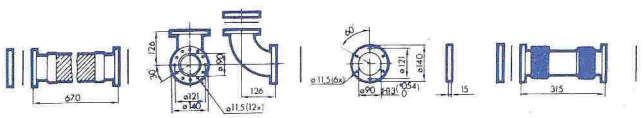
One 14" single plate Industrial clutch is available.
Different types of reverse gears and flexible couplings can be supplied.
Single or double flexible couplings, flywheel mounted or shaft mounted.

Silencer

Silencers can be delivered in different executions

Exhaust fittings

Flexible exhaust connection and 90° bend as shown fit water cooled exhaust manifold.



Air cleaner

Two dry types are available: One with metal net and one with paper insert.

Instrumentation

Panel 285102, for propulsion engines with 2-pole electrical system.
Includes: Electrical tachometer with
revolution counter,
engine oil pressure and
water temperature gauges,
warning lamps for charging voltage,
water temperature and oil pressure,
starter push-botton, stopping push-botton,
ON/OFF-switch,
rheostat for instrument lighting and jointing cable 5 meters.
Manual stop in event of fault

To the instrument panel 285102 is a connection box on the engine, with relays for starting, stopping and alarm. In the connection box is a terminal board to which the lines from all the measuring and monitoring points are run.
The couplings consist of divisible, multi-pole pin connectors with a splashproof locking arrangement.
All connection cables are ready-made upon delivery.

Panel 335850 for engine with 1-pole electrical system
Includes: Electrical tachometer with hourmeter, engine oil pressure and water temerature gauges, rheostat for instrument lighting, key switch, interlock push-button, stopping push-button with warning lamp for battery charging, buzzer, alarm lamp and automatic stop at high coolant temperature and/or low oil pressure (the automatic stop can be disconnected), jointing cable 6 meters.

The complete instrumentation consists of instrument panel, jointing cable, cable bundle and a junction box with relays for starting/stopping and a automatic fuse.

SERVICE INSTRUMENT PANEL

Panel 218719,
Instrument panel without instruments. Can be equipped with three ∅ 60 mm instruments as required.

Additional equipment and classification

Different devices for accurate speed adjustment, engine heater, emergency starting equipment, protection covers for V-belts and pump couplings, tool kit, spare parts set etc, can be supplied.
The engine can be delivered with certificate from most classification societies.

Technical data, all speed engine.

Gross power:		Curve No.	Engine speed, rev./min. 1200	1500	1800	2000	2200
1 h/6 h	kW (hp)	2	97 (132)	121 (164)	140 (190)	149 (203)	158 (215)
24 h/24 h	kW (hp)	1	87 (119)	108 (147)	125 (170)	134 (182)	–
Specific fuel consumption:							
4/4 load	g/kWh (g/hph)	2	228 (168)	227 (167)	233 (171)	239 (176)	246 (181)
3/4 load	g/kWh (g/hph)	2	219 (161)	220 (162)	227 (167)	235 (173)	246 (181)
1/2 load	g/kWh (g/hph)	2	228 (168)	234 (172)	242 (178)	260 (191)	268 (197)
4/4 load	g/kWh (g/hph)	1	218 (160)	220 (162)	227 (167)	233 (171)	–
3/4 load	g/kWh (g/hph)	1	219 (161)	223 (164)	233 (171)	242 (178)	–
1/2 load	g/kWh (g/hph)	1	235 (173)	243 (179)	256 (188)	267 (196)	–
Specific heat rejection:							
to cooling water	kJ/kWh	2	3015	2840	2800	2850	2910
to exhaust gas	kJ/kWh	2	2680	2685	3030	3230	3440
to surrounding air	kJ/kWh	2	490	535	530	545	560
Air consumption	m^3/min	2	6	8	9	10	11
Exhaust flow	m^3/min	2	19	25	30	34	38
Exhaust temperature	°C	2	490	540	560	570	600
Permitted exhaust back pressure	mm w.c.		500	500	500	500	500
Permitted pressure drop in air intake line	mm w.c.		500	500	500	500	500

Single speed engine for Generating sets etc.

Gross power, at rating for:		Engine speed, rev./min.**) 1500	1800
Prime duty	kW (hp)	106 (144)	123 (167)
Prime duty 10% overload	kW (hp)	117 (159)	135 (184)
Idle speed max.	rev./min.	1575	1890
Specific fuel consumption. Prime duty:			
4/4 load	g/kWh (g/hph)	220 (162)	227 (167)
3/4 load	g/kWh (g/hph)	223 (164)	233 (171)
1/2 load	g/kWh (g/hph)	243 (179)	256 (188)
Specific heat rejection. Prime duty:			
to cooling water	kJ/kWh	2730	2730
to exhaust gas	kJ/kWh	2645	2935
to surrounding air	kJ/kWh	425	425
Air consumption	m^3/min	7	8,5
Exhaust flow	m^3/min	18	24
Exhaust temperature	°C	480	490

**) Speed variation according to ISO 3046/IV, class A1

Power conditions.
Prime duty: Intended for prime power, back up or peak shaving units.

This specification may be rèviced without notice.

SCANIA
INDUSTRIAL & MARINE ENGINES, S-151 87 SÖDERTÄLJE, SWEDEN

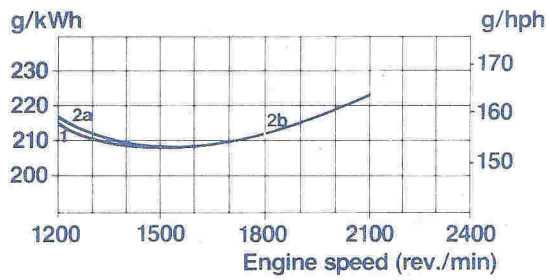
E1420 – 8305 Tofters tryckeri ab, Östervåla 1983

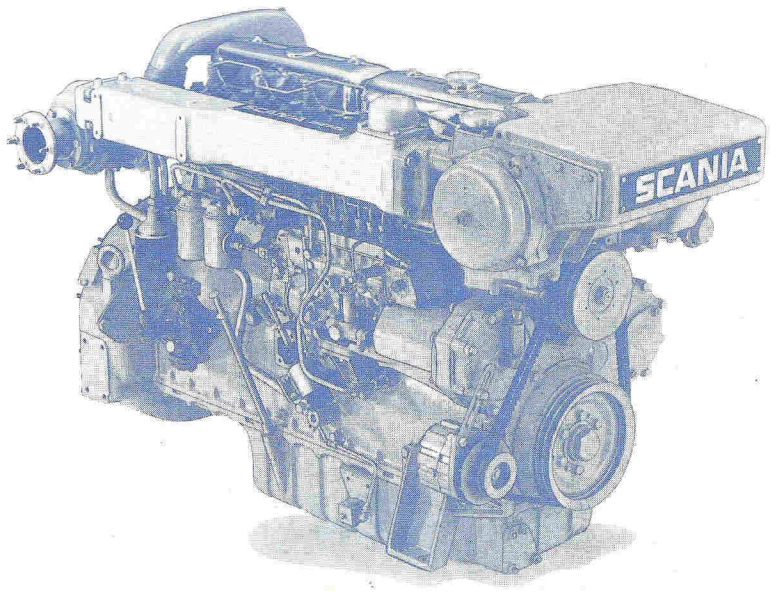
233 (317) MARINE ENGINE

SCANIA DS 11

Power

Specific fuel consumption



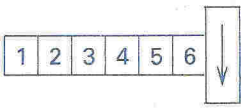


Basic data

DS 11 engine is a turbocharged, 6 cylinder, water-cooled, 4-stroke, direct injected diesel engine.

Number of cylinders		6 in line
Displacement	dm^3	11.02
Bore	mm	127
Stroke	mm	145
Number of main bearings		7
Compression ratio		15:1
Direction of rotation, viewed from flywheel end:		counter clockwise
Moment of inertia, with industrial flywheel	kgm^2	2.83
Cyclic irregularity at full load, curve 1		1:300
Speed variation when taking off, or applying 100% load:		
All speed engine.	%	6-12
Lube oil capacity, standard sump,	dm^3	21
Time between lube oil changes, standard sump	h	200
Specific lube oil consumption at 100% load, curve 1, approx g/kWh (g/hph)		0.7 (0.5)
Cooling water temperature:		
Normal	°C	75-85
Max permitted, without pressure cap,	°C	90
Max permitted, with pressure cap,	°C	100
Weight (excl.oil and water)	kg	1110

Firing order 1-5-3-6-2-4



Test conditions

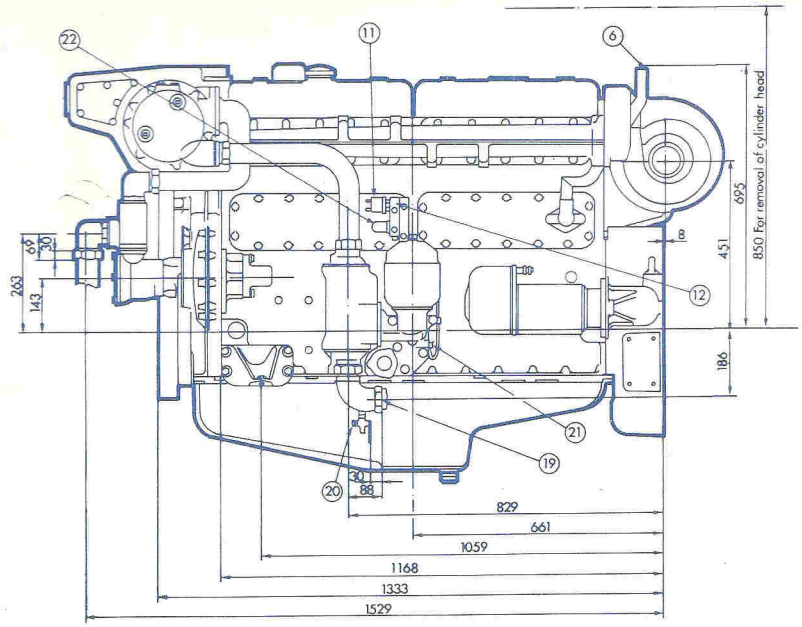
Ambient temperature		+ 27°C
Barometric pressure		100 kPa (750 mm Hg)
Humidity		60%
Power test codes,	main:	ISO 3046
	supplementary:	ISO 2534 DIN 6270 SAE J 1349 B.S. 5514

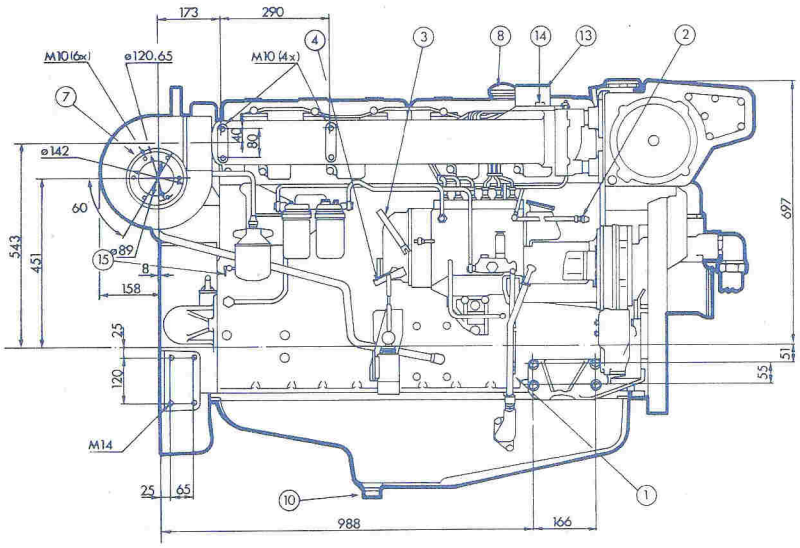
Power rating codes

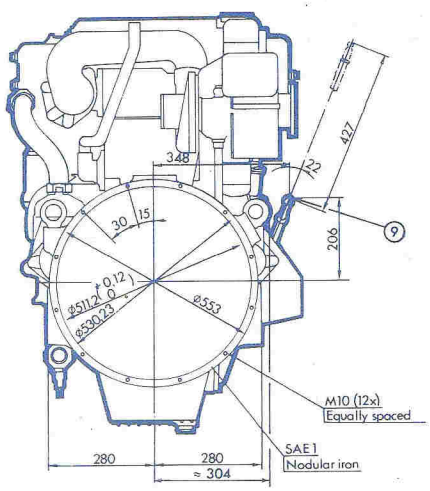
Curve 1 Continuous uninterrupted
Curve 2a Medium duty commercial
Curve 2b Light duty commercial

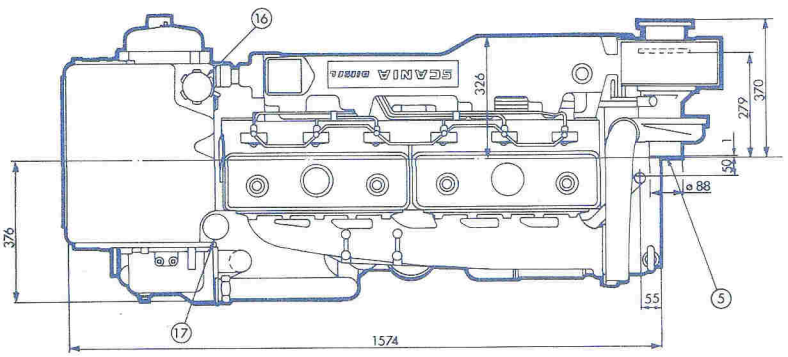
Diesel fuel according to	SIS 155432, or DIN 51601, ASTM-D975-No.2
Density of fuel	0,83 kg/dm^3
Calorific value of fuel	42700 kJ/kg (10200 kcal/kg)
Temperature of fuel	35°C

A new engine gives up to 3% lower power









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Scale 1:20

GENERAL DESCRIPTION

Cylinder block

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Camshaft

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Pistons

The pistons are made of a light alloy. The shape of the piston crown ensures optimum combustion. For the top compression ring there is a cast-iron insert to reduce the wear of the ring groove to a minimum. Compression rings and oil control ring of alloy cast-iron. Top compression ring of keystone type. The gudgeon pins are made of case-hardened chrome steel.
Piston cooled from inside by lubricating oil, sprayed from a nozzle in the crank case.

Connecting rods

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The crankshaft has a patented viscous-type vibration damper at the frontend.

Oil sump

The oil sump is cast in aluminium alloy and provided with a magnetic drain plug. The standard oil sump has the oil drain plug in the bottom of the sump. Handpump for oil draining is delivered loose with the engine.

Lubricating system

From a gear pump located in the front of the sump the oil is forced to the main bearings, big-end bearings, camshaft bushings, the bearings of the timing gears and the piston cooling nozzles. The pump capacity at 2,100 engine rev/min is 115 dm^3/min. By a special device at the second and third camshaft bearings the oil is fed intermittently to the rocker mechanism, from which it runs off to lubricate the valve lifters.
The oil is regulated by a pressure relief valve. Maximum oil pressure is set to 4.5–6 bar.
The lubricating system has a sea-water cooled full flow oil cooler of the heat exchanging type.

Oil cleaner

The lubricating oil is cleaned prior to the oil pump by a strainer in the oil sump and after the oil pump by a patented cleaning arrangement consisting of a cyclone and a centrifugal type cleaner. An extra spin on type oil filter is cleaning the oil, lubricating the floating type bushing of the turbocharger.

Crankcase ventilation

The interior of the crankcase is ventilated by a breather pipe on the block, provided with an oil trap and a protection filter.

Fuel system

The fuel is drawn from the fuel tank through a prefilter by a feed pump. It is then forced through two parallelly connected fine filters to the injection pump. The injection pump forces the fuel through pressure pipes to the injectors. The pump is driven from the crankshaft through helical gears and an adjustable coupling. It is provided with a centrifugal governor which regulates the fuel charge according to the load of the engine.
The camshaft of the injection pump has a special design which prevents reverse running. The injectors have multi-orifice nozzles and are furnished with edge-type filters. The opening pressure is set to 230 bar. Leak-off oil from the injectors is carried back to the tank. The cold-starting device facilitates starting at low temperatures. It gives additional fuel for starting and is then automatically cut out. The injection pump is lubricated from the engine lubricating system. The prefilter is a fine-mesh gauze filter. The fine filters have cartridges of specially impregnated paper.

Cooling system

The engine including exhaust manifold is fresh water cooled. The fresh water is cooled by a heat-exhanger mounted directly on the engine. The coolant is pumped by a powerful pump through a lengthwise passage in the cylinder block which communicates with the cooling jackets of the cylinder head. The coolant passages in the cylinder head are so directed that the injectors and exhaust valves receive maximum cooling. From the cylinder heads the coolant passes through dual two-way wax thermostats back to the heat-exchanger.

The thermostats do not open until the coolant has reached normal working temperature. In the meantime the coolant is led through a by-pass line straight back to the suction side of the coolant pump. Thus the coolant circulates only in the engine which quickly reaches working temperature.

The coolant pump is of centrifugal type. It is mounted on the front end of the cylinder block and is driven by two V-belts from the crankshaft. The pump has a self-adjusting carbon seal. The pump shaft is of stainless steel and runs in sealed ballbearings. The sea water pump is driven directly from the engine front and gears.

Air intake manifold

Standard intake manifold is shown in the main drawing.

Exhaust manifold

Standard watercooled exhaust manifold is shown in the main drawing.

Turbocharger

The turbocharger consists of a single stage radial turbine and a single stage centrifugal compressor. The turbine utilizes the energy of the exhaust gases and supplies the engine with extra air for optimum combustion and higher output. Turbine and compressor wheels are individually balanced and are fitted on one shaft, which runs in a floating type bearing. The turbine blades are made of special heat-resistant material. The turbocharger is cooled and lubricated from the engine lubricating system. The turbocharger is provided with an insulation cover.

Flywheel housing and flywheel

Standard flywheel housing is made of nodular iron and has a SAE 1 connection flange. The flywheel housing have the possibility to mount double starter motors.
Standard flywheel is for reverse gear or industrial clutch.

Electrical system

The electrical system has a nominal voltage of 24 V. 2-pole 35 A 28 V alternator with relay and sending unit for tachometer. 2-pole starter motor rated 5.5 kW (7.5 hp).

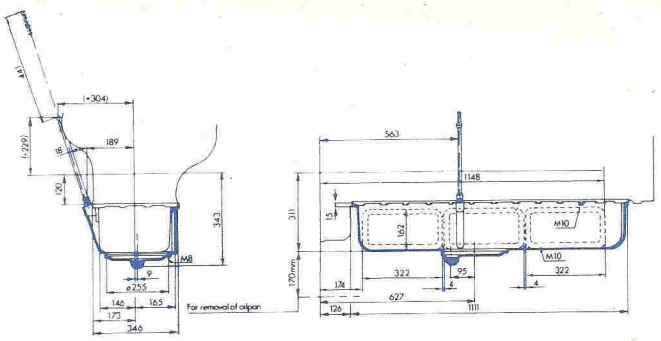
OPTIONAL EQUIPMENT

Crankshaft

For high output power take off from the crankshaft front end, a special crankshaft with polygon joint can be supplied.

Oil sump

This oil sump has inspection covers on the left hand side and a bigger oil capacity (30 litres), which allows longer oil change intervals. Drain plug placed in the bottom.



Flywheels

Flywheels are available for different types of industrial clutches, converters, reverse gears, flange mounted generators and for flexible couplings.

EXTRA EQUIPMENT

Engine mountings

Stiff and fixed suspensions are available in combinations with several different reverse gears.

Power take-offs

Several direct driven optionals can be connected to the crank shaft and the timing gear train. Air compressor, side or front mounted power take-offs, hydraulic pump etc.

Clutches, reverse gears and couplings

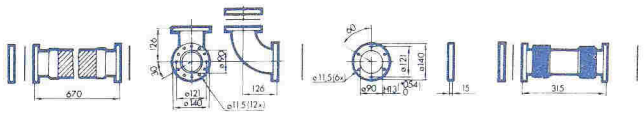
One 14" double plate Industrial clutch is available.
Different types of reverse gears and flexible couplings can be supplied.
Single or double flexible couplings, flywheel mounted or shaft mounted.

Silencer

Silencers can be delivered in different executions.

Exhaust fittings

Flexible exhaust connection and 90° bend as shown fit water cooled exhaust manifold.



Air cleaner

Two dry types are available: One with metal net and one with paper insert.

E1421 – 8305 Tofters tryckeri ab, Östervåla 1983

Instrumentation

Panel 285102, for propulsion engines with 2-pole electrical system.
Includes: Electrical tachometer with
revolution counter,
engine oil pressure and
water temperature gauges,
warning lamps for charging voltage,
water temperature and oil pressure,
starter push-botton, stopping push-botton,
ON/OFF-switch,
rheostat for instrument lighting and jointing cable 5 meters.
Manual stop in event of fault

To the instrument panel 285102 is a connection box on the engine, with relays for starting, stopping and alarm. In the connection box is a terminal board to which the lines from all the measuring and monitoring points are run.
The couplings consist of divisible, multi-pole pin connectors with a splashproof locking arrangement.
All connection cables are ready-made upon delivery.

Panel 335850 for engine with 1-pole electrical system
Includes: Electrical tachometer with hourmeter, engine oil pressure and water temerature gauges, rheostat for instrument lighting, key switch, interlock push-button, stopping push-button with warning lamp for battery charging, buzzer, alarm lamp and automatic stop at high coolant temperature and/or low oil pressure (the automatic stop can be disconnected), jointing cable 6 meters.

The complete instrumentation consists of instrument panel, jointing cable, cable bundle and a junction box with relays for starting/stopping and a automatic fuse.

SERVICE INSTRUMENT PANEL

Panel 218719,
Instrument panel without instruments. Can be equipped with three ∅ 60 mm instruments as required.

Additional equipment and classification

Different devices for accurate speed adjustment, engine heater, emergency starting equipment, protection covers for V-belts and pump couplings, tool kit, spare parts set etc, can be supplied.
The engine can be delivered with certificate from most classification societies.

Technical data, all speed engine.

Gross power:		Curve No.	Engine speed, rev./min. 1200	1500	1800	2100
1 h/2 h and max. 1,000 h/year	kW (hp)	2 b	–	–	218 (296)	233 (317)
8 h/24 h	kW (hp)	2 a	157 (213)	195 (265)	218 (296)	–
24 h/24 h	kW (hp)	1	137 (186)	166 (225)	188 (256)	–
Specific fuel consumption:						
4/4 load	g/kWh (g/hph)	2 a–2 b	217 (160)	208 (153)	212 (156)	223 (164)
3/4 load	g/kWh (g/hph)	2 a–2 b	214 (157)	207 (152)	214 (157)	226 (166)
1/2 load	g/kWh (g/hph)	2 a–2 b	217 (160)	208 (153)	226 (166)	241 (177)
4/4 load	g/kWh (g/hph)	1	215 (158)	208 (153)	212 (156)	–
3/4 load	g/kWh (g/hph)	1	213 (157)	207 (152)	216 (159)	–
1/2 load	g/kWh (g/hph)	1	223 (164)	212 (156)	234 (172)	–
Specific heat rejection:						
to cooling water	kJ/kWh	2 a–2 b	2800	2615	2570	2660
to exhaust gas	kJ/kWh	2 a–2 b	2800	2755	2800	3135
to surrounding air	kJ/kWh	2 a–2 b	365	275	275	290
Air consumption	m^3/min	2 a–2 b	9	11	15	18
Exhaust flow	m^3/min	2 a–2 b	26	34	41	51
Exhaust temperature	°C	2 a–2 b	600	540	490	500
Permitted exhaust back pressure	mm w.c.		500	500	500	500
Permitted pressure drop in air intake line	mm w.c.		500	500	500	500

Single speed engine for Generating sets etc.

Gross power, at rating for:		Engine speed, rev./min.**) 1500	1800	2100
Stand-by duty	kW (hp)	205 (279)	235 (320)	241 (328)
Stand-by duty 10% overload	kW (hp)	225 (306)	258 (351)	265 (360)
Prime duty	kW (hp)	181 (246)	213 (290)	–
Prime duty 10% overload	kW (hp)	199 (271)	234 (318)	–
Idle speed max.,	rev./min.	1575	1890	2205
Specific fuel consumption:				
4/4 load Stand-by duty	g/kWh (g/hph)	209 (154)	216 (159)	224 (165)
3/4 load Stand-by duty	g/kWh (g/hph)	207 (152)	213 (157)	225 (165)
1/2 load Stand-by duty	g/kWh (g/hph)	208 (153)	224 (165)	240 (177)
4/4 load Prime duty	g/kWh (g/hph)	208 (153)	213 (157)	–
3/4 load Prime duty	g/kWh (g/hph)	207 (152)	216 (159)	–
1/2 load Prime duty	g/kWh (g/hph)	208 (153)	228 (168)	–
Specific heat rejection. Stand-by duty:				
to cooling water	kJ/kWh	2630	2620	2670
to exhaust gas	kJ/kWh	2765	2900	3155
to surrounding air	kJ/kWh	270	280	290
Air consumption	m^3/min	12	15	18
Exhaust flow	m^3/min	37	45	51
Exhaust temperature	°C	550	510	500
Specific heat rejection. Prime duty:				
to cooling water	kJ/kWh	2615	2585	–
to exhaust gas	kJ/kWh	2660	2790	–
to surrounding air	kJ/kWh	265	275	–
Air consumption	m^3/min	10	13	–
Exhaust flow	m^3/min	31	36	–
Exhaust temperature	°C	510	480	–

**) Speed variation according to ISO 3046/IV, class A1

Power conditions.
Prime duty: Intended for prime power, back up or peak shaving units.
Stand-by duty: Intended for emergency or stand-by units with a maximum total operating time of 300 h/year.

This specification may be rèviced without notice.

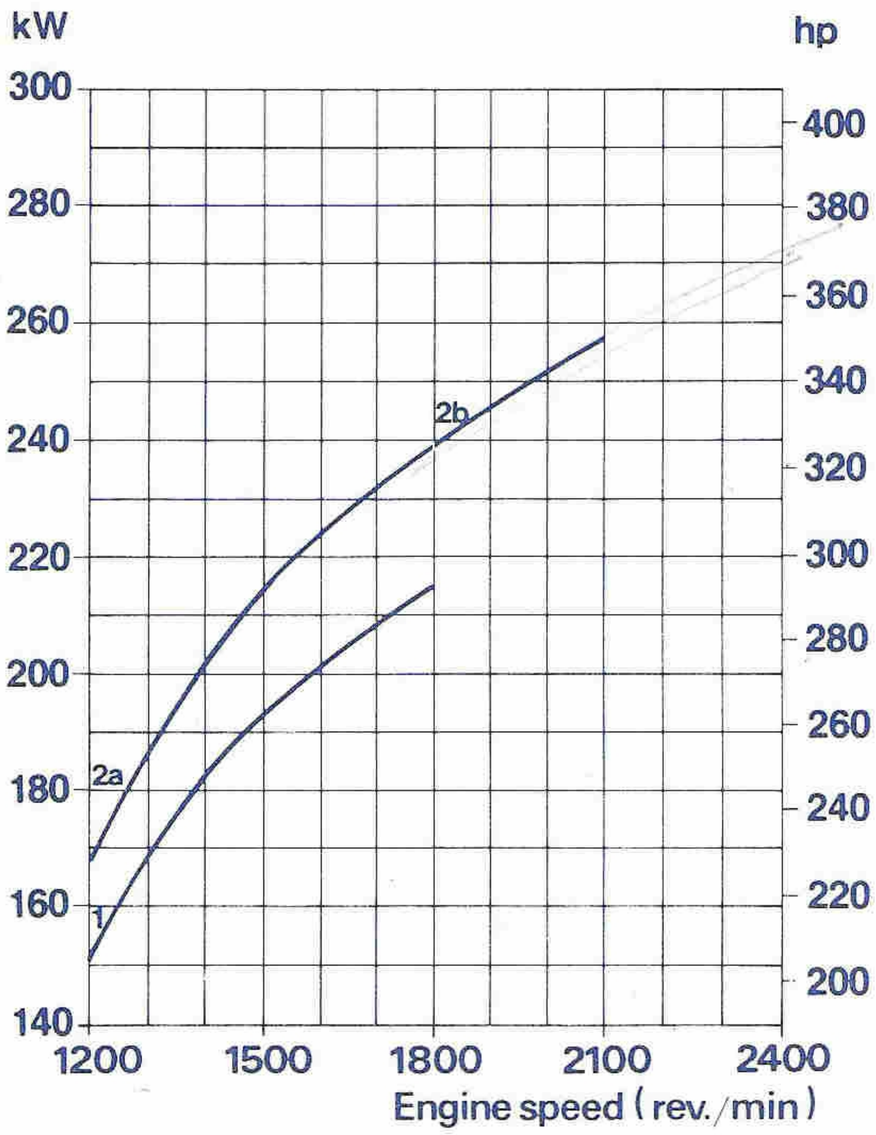
SCANIA
INDUSTRIAL & MARINE ENGINES, S-151 87 SÖDERTÄLJE, SWEDEN

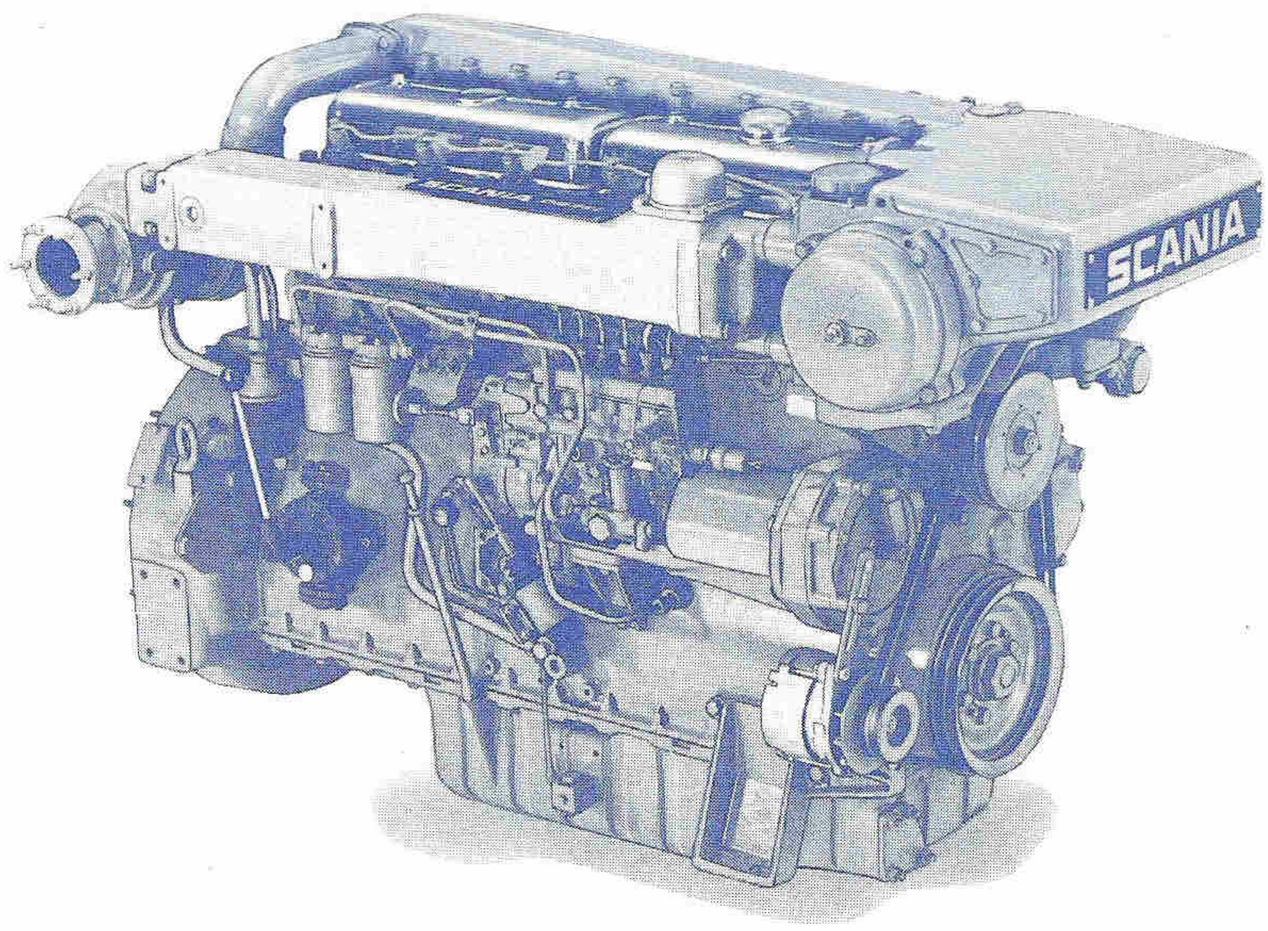
E1421 – 8305 Tofters tryckeri ab, Österåla 1983

257 (350) MARINE ENGINE

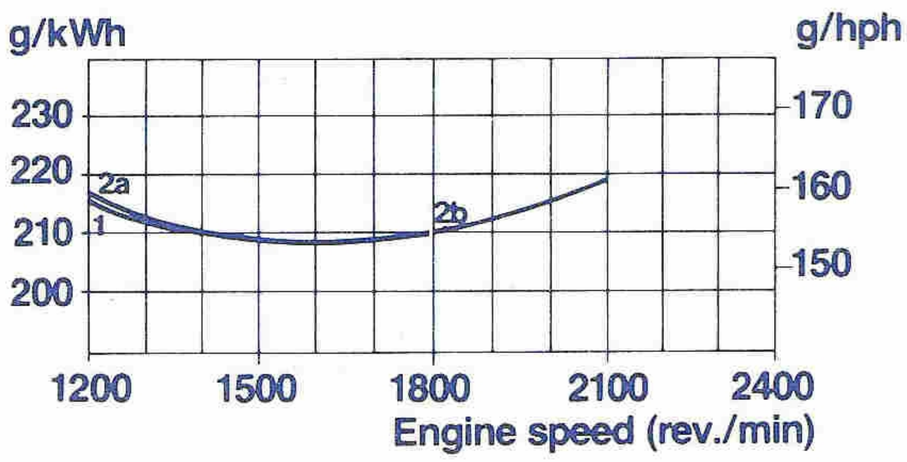
SCANIA DSI 11

Power





Specific fuel consumption



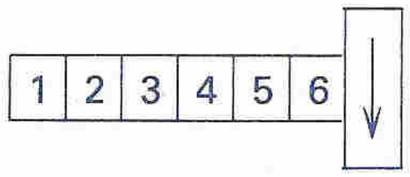
Demirhan Sadıkoğlu
2015

Basic data

DSI 11 engine is a turbocharged and charge-air cooled, 6 cylinder, water-cooled, 4-stroke, direct injected diesel engine.

Number of cylinders		6 in line
Displacement	dm^3	11.02
Bore	mm	127
Stroke	mm	145
Number of main bearings		7
Compression ratio		15:1
Direction of rotation, viewed from flywheel end:		counter clockwise
Moment of inertia, with industrial flywheel	kgm^2	2.83
Cyclic irregularity at full load, curve 1		1:300
Speed variation when taking off, or applying 100% load:		
All speed engine.	%	6-12
Lube oil capacity, standard sump,	dm^3	21
Time between lube oil changes, standard sump	h	200
Specific lube oil consumption at 100% load, curve 1, approx g/kWh (g/hph)		0.7 (0.5)
Cooling water temperature,		
Normal	°C	75-85
Max permitted, without pressure cap,	°C	90
Max permitted, with pressure cap,	°C	100
Weight (excl.oil and water)	kg	1135

Firing order 1-5-3-6-2-4



Test conditions

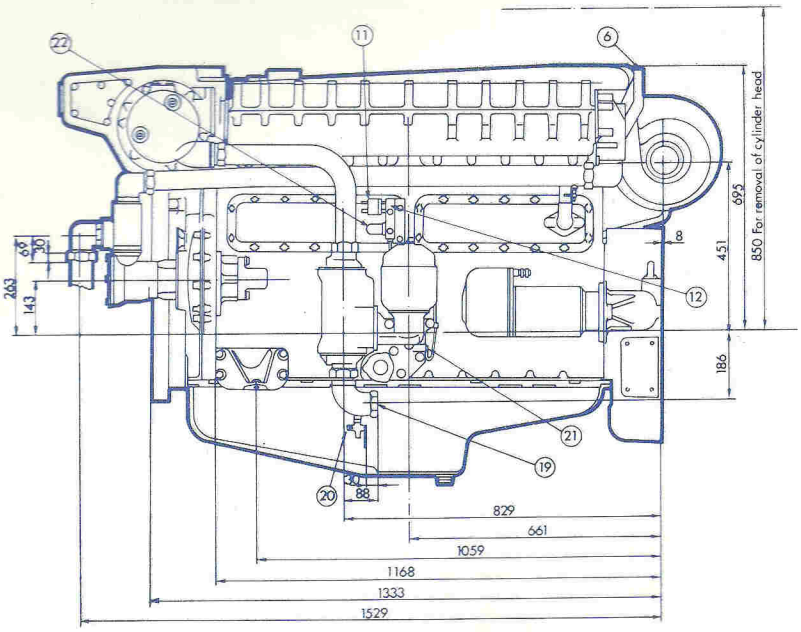
Ambient temperature	+ 27°C
Barometric pressure	100 kPa (750 mm Hg)
Humidity	60%
Power test codes, main:	ISO 3046
supplementary:	ISO 2534
	DIN 6270
	SAE J 1349
	B.S. 5514

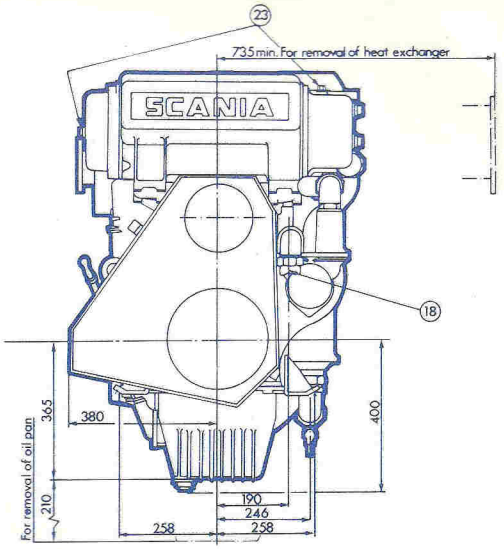
Power rating codes

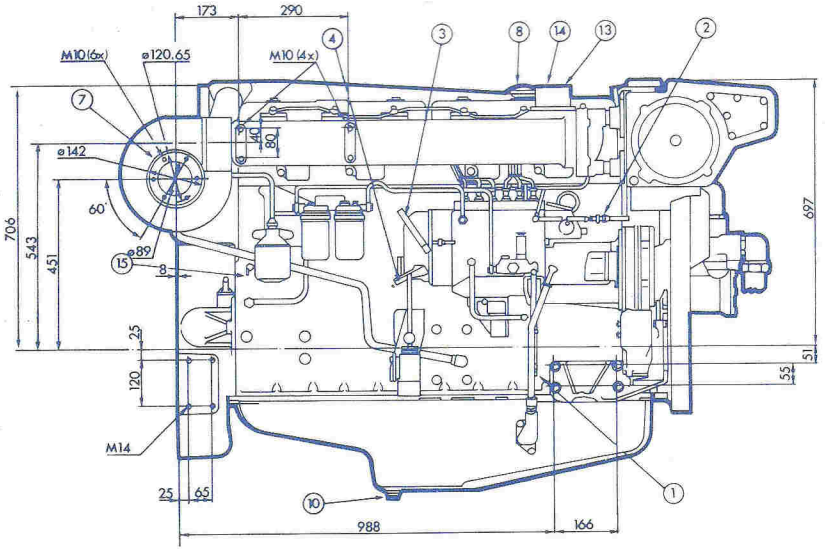
Curve 1 Continuous uninterrupted
Curve 2a Medium duty commercial
Curve 2b Light duty commercial

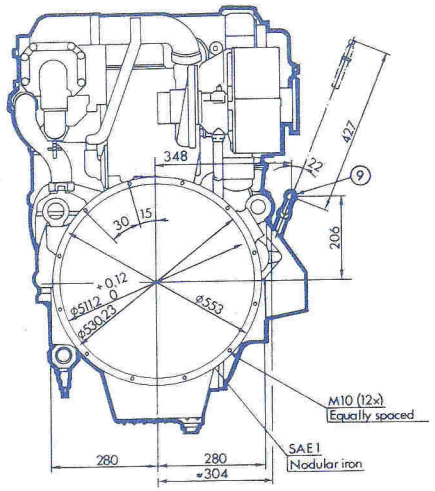
Diesel fuel according to	SIS 155432, or DIN 51601, ASTM-D975-No.2
Density of fuel	0,83 kg/dm^3
Calorific value of fuel	42700 kJ/kg (10200 kcal/kg)
Temperature of fuel	35°C

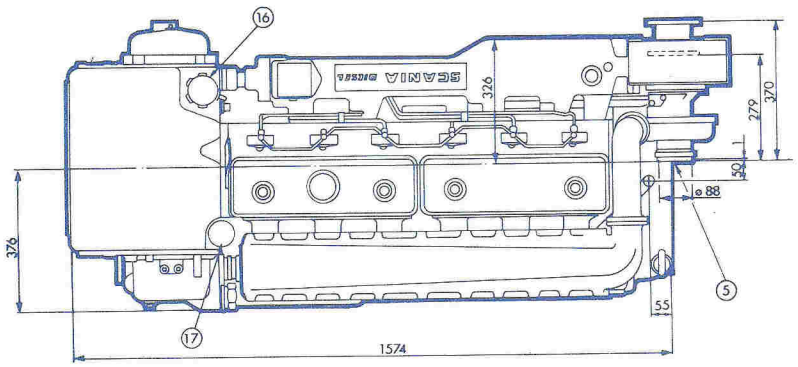
A new engine gives up to 3% lower power











1. Fuel inlet (Pipe 10×1).
2. Fuel outlet (Pipe 10×1).
3. Speed control lever.
4. Stop lever.
5. Air inlet.
6. Crankcase ventilation (Tube Ø 28).
7. Exhaust flange.
8. Oil filling cap.
9. Oil dipstick.
10. Plug for oil draining.
11. Connection for oil pressure sending unit (M14×1,5)(2×).
12. Oil pressure gauge connection (M14×1,5).
13. Water temperature switch connection (½ – 14 NPSF)(2×).
14. Water temperature gauge connection (M14×1,5)(2×).
15. Drain tap for fresh water.
16. Fresh water filling cap.
17. Coolant level switch connection.
18. Sea water inlet (Ø 54).
19. Sea water outlet (Ø 54).
20. Draintap for sea water.
21. Oil pressure switch.
22. Connection oil pressure switch (M14×1,5)(2×).
23. Protection anode (3×).

Scale 1:20

GENERAL DESCRIPTION

Cylinder block

The cylinder block is integral with the upper half of the crankcase and is made in one piece of alloy cast iron. The main bearing caps are made of forged steel. The exchangeable wet-type cylinder liners (in direct contact with the coolant) are centrifugally cast of special cast-iron, and are flanged at the top for fitting into the cylinder block. Sealing between the coolant jacket and the crankcase is provided by rings of oil- and heat-resistant rubber.

Cylinder heads

The cylinder heads are made of alloy cast-iron, each covering three cylinders. Valves and injectors are mounted in the cylinder head. The gas sealing between block and cylinder head is executed by a steel plate gasket. The sealing around cooling water and lube oil canals, between block and cylinder head is carried out with heavy duty rubber rings. Each unit is easily removable. All valve seat inserts are made of a special alloy. The inlet ports in the cylinder head are specially shaped to give the incoming air a swirl which improves engine function. This results in optimal combustion of the injected fuel, which to a large extent contributes to the low fuel consumption.

Valves and valve mechanism

Both inlet and exhaust valves are made of heat-resistant steel and are stellite-faced. The valve stems are chromium-plated and have exchangeable steel caps, against which the hardened thrust surfaces of the rocker arms act. Double springs on every valve. The valve clearance is adjusted with a hardened ball stud on the rocker arm. The pushrods, which rise against the rocker arms, are of steel tubing and are carried in cup type valve lifters of chill-hardened cast iron. The valve mechanism is protected by a light-alloy cover.

Camshaft

The camshaft is drop-forged of alloy steel with cams and journals hardened, ground and polished. It runs in bushings in the cylinder block. The axial thrust is taken up by a flange at the front bearing. The camshaft is driven from the crankshaft through silent-running helical gears.

Pistons

The pistons are made of a light alloy. The shape of the piston crown ensures optimum combustion. For the top compression ring there is a cast-iron insert to reduce the wear of the ring groove to a minimum. Compression rings and oil control ring of alloy cast-iron. Top compression ring of keystone type. The gudgeon pins are made of case-hardened chrome steel.
Piston cooled from inside by lubricating oil, sprayed from a nozzle in the crank case.

Connecting rods

The connecting rods are I-section dropforgings of alloy steel. The small end of the connecting rod is wedge shaped so that combustion pressure is taken up by a much larger area than otherwise, both in piston and connecting rod.
There is a bronze bushing for the gudgeon pin. The gudgeon pin is lubricated by lubricating oil, sprayed from a nozzle in the crankcase. Exchangeable big end bearings of the same type as the main bearings.

Crankshaft

The crankshaft is made of drop-forged alloy steel. It is substantially dimensioned and is dynamically balanced and Magnaflux tested like many other forged engine parts. It is mounted in sturdy main bearings with exchangeable bearing shells consisting of a steel plate with lead-bronze lining covered with lead-indium.
The bearing surfaces of the crankshaft are extra deep induction hardened, ground and polished. The hardening allows, if required, regrinding to 6 undersizes for which standard bearings can be obtained. The axial forces are taken up by thrust washers at the rear main bearing.
The crankshaft has a patented viscous-type vibration damper at the frontend.

Oil sump

The oil sump is cast in aluminium alloy and provided with a magnetic drain plug. The standard oil sump has the oil drain plug in the bottom of the sump. Handpump for oil draining is delivered loose with the engine.

Lubricating system

From a gear pump located in the front of the sump the oil is forced to the main bearings, big-end bearings, camshaft bushings, the bearings of the timing gears and the piston cooling nozzles. The pump capacity at 2,100 engine rev/min is 115 dm^3/min. By a special device at the second and third camshaft bearings the oil is fed intermittently to the rocker mechanism, from which it runs off to lubricate the valve lifters.
The oil is regulated by a pressure relief valve. Maximum oil pressure is set to 4.5–6 bar.
The lubricating system has a sea-water cooled full flow oil cooler of the heat exchanging type.

Oil cleaner

The lubricating oil is cleaned prior to the oil pump by a strainer in the oil sump and after the oil pump by a patented cleaning arrangement consisting of a cyclone and a centrifugal type cleaner. An extra spin on type oil filter is cleaning the oil, lubricating the floating type bushing of the turbocharger.

Crankcase ventilation

The interior of the crankcase is ventilated by a breather pipe on the block, provided with an oil trap and a protection filter.

Fuel system

The fuel is drawn from the fuel tank through a prefilter by a feed pump. It is then forced through two parallelly connected fine filters to the injection pump. The injection pump forces the fuel through pressure pipes to the injectors. The pump is driven from the crankshaft through helical gears and an adjustable coupling. It is provided with a centrifugal governor which regulates the fuel charge according to the load of the engine.
The camshaft of the injection pump has a special design which prevents reverse running. The injectors have multi-orifice nozzles and are furnished with edge-type filters. The opening pressure is set to 230 bar. Leak-off oil from the injectors is carried back to the tank. The cold-starting device facilitates starting at low temperatures. It gives additional fuel for starting and is then automatically cut out. The injection pump is lubricated from the engine lubricating system. The prefilter is a fine-mesh gauze filter. The fine filters have cartridges of specially impregnated paper.

Cooling system

The engine including exhaust manifold is fresh water cooled. The fresh water is cooled by a heat-exhanger mounted directly on the engine. The coolant is pumped by a powerful pump through a lengthwise passage in the cylinder block which communicates with the cooling jackets of the cylinder head. The coolant passages in the cylinder head are so directed that the injectors and exhaust valves receive maximum cooling. From the cylinder heads the coolant passes through dual two-way wax thermostats back to the heat-exchanger.

The thermostats do not open until the coolant has reached normal working temperature. In the meantime the coolant is led through a by-pass line straight back to the suction side of the coolant pump. Thus the coolant circulates only in the engine which quickly reaches working temperature.

The coolant pump is of centrifugal type. It is mounted on the front end of the cylinder block and is driven by two V-belts from the crankshaft. The pump has a self-adjusting carbon seal. The pump shaft is of stainless steel and runs in sealed ballbearings. The sea water pump is driven directly from the engine front and gears.

Charge-air cooler

The charge-air cooler is located inside the inlet manifold. Sea water cools the intake air. This means that more air can be forced into the cylinders as cold air needs less space than warm.

Exhaust manifold

Standard watercooled exhaust manifold is shown in the main drawing.

Turbocharger

The turbocharger consists of a single stage radial turbine and a single stage centrifugal compressor. The turbine utilizes the energy of the exhaust gases and supplies the engine with extra air for optimum combustion and higher output. Turbine and compressor wheels are individually balanced and are fitted on one shaft, which runs in a floating type bearing. The turbine blades are made of special heat-resistant material. The turbocharger is cooled and lubricated from the engine lubricating system. The turbocharger is provided with an insulation cover.

Flywheel housing and flywheel

Standard flywheel housing is made of nodular iron and has a SAE 1 connection flange. The flywheel housing have the possibility to mount double starter motors.
Standard flywheel is for reverse gear or industrial clutch.

Electrical system

The electrical system has a nominal voltage of 24 V. 2-pole 35 A 28 V alternator with relay and sending unit for tachometer. 2-pole starter motor rated 5.5 kW (7.5 hp).

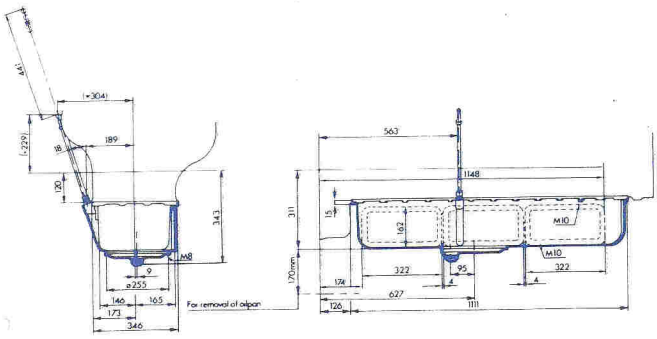
OPTIONAL EQUIPMENT

Crankshaft

For high output power take off from the crankshaft front end, a special crankshaft with polygon joint can be supplied.

Oil sump

This oil sump has inspection covers on the left hand side and a bigger oil capacity (30 litres), which allows longer oil change intervals. Drain plug placed in the bottom.



Flywheels

Flywheels are available for different types of industrial clutches, converters, reverse gears, flange mounted generators and for flexible couplings.

EXTRA EQUIPMENT

Engine mountings

Stiff and fixed suspensions are available in combinations with several different reverse gears.

Power take-offs

Several direct driven optionals can be connected to the crank shaft and the timing gear train. Air compressor, side or front mounted power take-offs, hydraulic pump etc.

Clutches, reverse gears and couplings

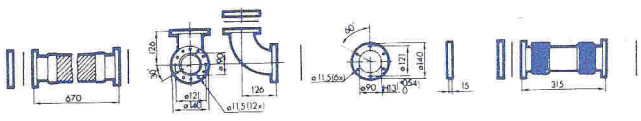
One 14" double plate Industrial clutch is available.
Different types of reverse gears and flexible couplings can be supplied.
Single or double flexible couplings, flywheel mounted or shaft mounted.

Silencer

Silencers can be delivered in different executions.

Exhaust fittings

Flexible exhaust connection and 90° bend as shown fit water cooled exhaust manifold.



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water temperature and oil pressure,
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ON/OFF-switch,
rheostat for instrument lighting and jointing cable 5 meters.
Manual stop in event of fault

To the instrument panel 285102 is a connection box on the engine, with relays for starting, stopping and alarm. In the connection box is a terminal board to which the lines from all the measuring and monitoring points are run.
The couplings consist of divisible, multi-pole pin connectors with a splashproof locking arrangement.
All connection cables are ready-made upon delivery.

Panel 335850 for engine with 1-pole electrical system
Includes: Electrical tachometer with hourmeter, engine oil pressure and water temerature gauges, rheostat for instrument lighting, key switch, interlock push-button, stopping push-button with warning lamp for battery charging, buzzer, alarm lamp and automatic stop at high coolant temperature and/or low oil pressure (the automatic stop can be disconnected), jointing cable 6 meters.

The complete instrumentation consists of instrument panel, jointing cable, cable bundle and a junction box with relays for starting/stopping and a automatic fuse.

SERVICE INSTRUMENT PANEL

Panel 218719,
Instrument panel without instruments. Can be equipped with three ∅ 60 mm instruments as required.

Additional equipment and classification

Different devices for accurate speed adjustment, engine heater, emergency starting equipment, protection covers for V-belts and pump couplings, tool kit, spare parts set etc, can be supplied.
The engine can be delivered with certificate from most classification societies.

Technical data, all speed engine.

		Curve No.	Engine speed, rev./min. 1200	1500	1800	2100
Gross power:						
1 h/2 h and max. 1,000 h/year	kW (hp)	2 b	–	–	238 (324)	257 (350)
8 h/24 h	kW (hp)	2 a	169 (230)	214 (291)	238 (324)	–
24 h/24 h	kW (hp)	1	152 (207)	193 (262)	214 (291)	–
Specific fuel consumption:						
4/4 load	g/kWh (g/hph)	2 a–2 b	217 (160)	209 (154)	210 (154)	219 (161)
3/4 load	g/kWh (g/hph)	2 a–2 b	216 (159)	209 (154)	211 (154)	220 (162)
1/2 load	g/kWh (g/hph)	2 a–2 b	217 (160)	211 (155)	226 (166)	235 (173)
4/4 load	g/kWh (g/hph)	1	216 (159)	209 (154)	210 (154)	–
3/4 load	g/kWh (g/hph)	1	216 (159)	210 (154)	214 (157)	–
1/2 load	g/kWh (g/hph)	1	219 (161)	212 (156)	235 (173)	–
Specific heat rejection:						
to cooling water	kJ/kWh	2 a–2 b	2550	2480	2550	2675
to exhaust gas	kJ/kWh	2 a–2 b	2725	2640	2700	2935
to surrounding air	kJ/kWh	2 a–2 b	350	160	170	270
Air consumption	m^3/min	2 a–2 b	11	15	19	23
Exhaust flow	m^3/min	2 a–2 b	38	49	58	68
Exhaust temperature	°C	2 a–2 b	575	530	475	460
Permitted exhaust back pressure	mm w.c.		500	500	500	500
Permitted pressure drop in air intake line	mm w.c.		500	500	500	500

Single speed engine for Generating sets etc.

		Engine speed, rev./min.**) 1500	1800
Gross power, at rating for:			
Prime duty	kW (hp)	195 (265)	216 (294)
Prime duty 10% overload	kW (hp)	214 (291)	238 (324)
Idle speed max,	rev./min.	1575	1890
Specific fuel consumption. Prime duty:			
4/4 load	g/kWh (g/hph)	209 (154)	210 (154)
3/4 load	g/kWh (g/hph)	210 (154)	213 (157)
1/2 load	g/kWh (g/hph)	212 (156)	233 (171)
Specific heat rejection. Prime duty:			
to cooling water	kJ/kWh	2425	2560
to exhaust gas	kJ/kWh	2660	2655
to surrounding air	kJ/kWh	215	170
Air consumption	m^3/min	14	17
Exhaust flow	m^3/min	45	50
Exhaust temperature	°C	505	450

**) Speed variation according to ISO 3046/IV, class A1

Power conditions.
Prime duty: Intended for prime power, back up or peak shaving units.

This specification may be rèviced without notice.

SCANIA
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