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SERTIFIKATER - Nogva kontrakt 8225.
Merk: RS24424

Vedlagt følger:

SCANIA

2 stk. EIAPP- sertifikat for Scania DI16 43M, nr.: EIAPP-F-065001-0025 & 0026.

Søvik den 15.06.2018

Med vennelig hilsen
NOGVA MOTORFABRIKK AS


Elsebet Malena Eide Bjørnøy

DNV·GL

Certificate no.:
EIAPP-F-065001-0025

ENGINE INTERNATIONAL AIR POLLUTION PREVENTION CERTIFICATE

Issued under the provisions of the Protocol of 1997, as amended by resolution MEPC.176(58) in 2008, to amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified of the Protocol of 1978 related thereto (hereinafter referred to as "the Convention")
under the authority of the Government of

NORWAY

by **DNV GL**

Particulars of the engine:

Engine manufacturer:	Scania CV AB
Model number:	DI1643M
Serial number:	6508100
Test cycle(s):	C1 / E3
Rated power [kW] and speed [rpm]:	515 @ 2100
Engine approval number:	EIAPP-F-065001-0025

This is to certify:

1. That the above-mentioned marine diesel engine has been surveyed for pre-certification in accordance with the requirements of the Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines 2008 made mandatory by Annex VI of the Convention; and
2. That the pre-certification survey shows that the engine, its components, adjustable features, and technical file, prior to the engine's installation and/or service on board a ship, fully comply with the applicable regulation 13 of Annex VI of the Convention.

This certificate is valid for the life of the engine, subject to surveys in accordance with regulation 5 of Annex VI of the Convention, installed in ships under the authority of this Government.

Issued at **Hamburg** on **2018-05-03**



Stine Mundal
Stine Mundal
Head of Section Environmental Certification

A. Hoard

**SUPPLEMENT TO ENGINE INTERNATIONAL AIR POLLUTION PREVENTION
CERTIFICATE**
RECORD OF CONSTRUCTION, TECHNICAL FILE AND MEANS OF VERIFICATION

Notes:

- 1 This Record and its attachments shall be permanently attached to the EIAPP Certificate. The EIAPP Certificate shall accompany the engine throughout its life and shall be available on board the ship at all times.
- 2 The Record shall be at least in English, French or Spanish. If an official language of the issuing country is also used, this shall prevail in case of a dispute or discrepancy.
- 3 Unless otherwise stated, regulations mentioned in this Record refer to regulations of Annex VI of the Convention and the requirements for an engine's technical file and means of verifications refer to mandatory requirements from the NOx Technical Code 2008.

1. Particulars of the engine

- | | | |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| 1.1 | Name and address of manufacturer | Scania CV AB
Vagnmakarvägen 1
Södertälje, Sweden |
| 1.2 | Place of engine build | Södertälje, Sweden |
| 1.3 | Date of engine build | 2003 |
| 1.4 | Place of pre-certification survey | Södertälje, Sweden |
| 1.5 | Date of pre-certification survey | 2003 |
| 1.6 | Engine type and model number | DI1643M |
| 1.7 | Engine serial number | 6508100 |
| 1.8 | If applicable, the engine is a parent engine <input type="checkbox"/> or a member engine <input checked="" type="checkbox"/>
of the following engine family <input checked="" type="checkbox"/> or engine group <input type="checkbox"/> | DI16M |
| | As approved with approval no. | 65001-06 HH |
| 1.9 | Individual engine or engine family/engine group details: | |
| 1.9.1 | Approval reference | EIAPP-F-065001-0025 |
| 1.9.2 | Rated power (kW) and rated speed (rpm) values or range | 515 @ 2100 |
| 1.9.3 | Test cycle(s) | C1 / E3 |
| 1.9.4 | Parent engine(s) test fuel oil specification | ISO-F-DMA |
| 1.9.5 | Applicable NOx emission limit (g/kWh),
regulation 13.3 | 9.8 /
9.8 |
| 1.9.6 | Parent engine(s) emission value (g/kWh) | 9.4 /
9.1 |

2. Particulars of the technical file

The technical file, as required by chapter 2 of the NOx Technical Code 2008, is an essential part of the EIAPP Certificate and must always accompany an engine throughout its life and always be available on board a ship.

- 2.1 Technical file identification/approval number **EIAPP-F-065001-0025**
- 2.2 Technical file approval date **2018-05-03**

3. Specifications for the onboard NOx verification procedures

The specifications for the on board NOx verification procedures, as required by Ch. 6 of the NOx Technical Code 2008, are an essential part of the EIAPP Certificate and must always accompany an engine through its life and always be available on board a ship.

- 3.1 Engine parameter check method:
 - 3.1.1 Identification/approval number **EIAPP-F-065001-0025**
 - 3.1.2 Approval date **2018-05-03**
- 3.2 Direct measurement and monitoring method:
 - 3.2.1 Identification/approval number -
 - 3.2.2 Approval date -

Alternatively the simplified measurement method in accordance with 6.3 of the NOx Technical Code 2008 may be utilized.

Issued at **Hamburg** on **2018-05-03**



Stine Mundal

Stine Mundal
Head of Section Environmental Certification

Stine Mundal



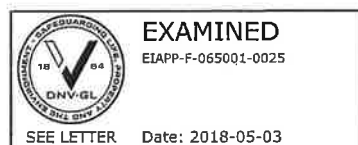
SCANIA

TECHNICAL DOCUMENTS

According to
Revised MARPOL Annex VI and NOx Technical Code 2008

Applies for:

Engine type	DI1643M
Engine number	6508100
Power (kW)	515
Rated speed (rpm)	2100
Engine built	2003
Engine family	DI16M
Approval number	GL 65001-06 HH



A. Hadzi

TECHNICAL FILE NO: 1 754 950-7 2018-03-13

 According to MARPOL 73/78 Annex VI and NO_x technical code

For the engine family: DI16M

Date for original application: 2006-02-01

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1. Record of engine performance and emission relevant components and settings
Allowable adjustment of components

Allowable adjustment of components and settings is described in the "On board verification procedure".

Diesel fuel

The engine exhaust emissions and power output are dependent on the fuel quality.

The composition of the diesel fuel is also vitally important to the operation and life of the engine.

The diesel fuel shall comply with standard: EN 590 (European standard).

The table below shows the requirements for the most important properties:

Viscosity at 40°C	2.0 - 4.5 mm ² /s (cSt)
Density at 15°C	0.82 - 0.86 kg/dm ³
Sulphur (concentration by mass)	max. 0.2%
Ignitability (CET rating)	min. 49
Flashpoint, min	56°C



Emission relevant components and settings

Selection criteria for parent engine = Max NOx emission, g/kWh

Engine type	DI16 43M			DI16 42M			DI16 50M		DI16 45M
Application	C1/E3			E3			C1/E3	C1/D2	E3
No. of cylinders	8								
Rated power, kW	386 - 441	423 - 550	588	386 - 441	423 - 550	588	550	441	625, 662
D:o max per cyl, kW	55	69	74	55	69	74	69	55	83
Rated speed, r/min	1 800	2 100	2 200	1 800	2 100	2 200	2 100	1 800	2 300
Bore/Stroke, mm	127 x 154								
Selected parent	X/X								
Emission relevant components									
Cylinder head	1 448 282 1 526 482 1 743 122 1 750 995 1 846 123 2 609 859								
Classified	1 727 907 1 727 908								
Cyl head gasket	1 403 260 1 444 941 1 403 608 1 468 555 1 743 553 1 893 055 1 893 054								
Piston	1 528 397 1 499 635 1 734 585 1 791 501								
Connecting rod	1 444 153 1 423 481								
Classified	1 727 910 1 727 911								
Camshaft, left	1 441 247 1 534 557 1 724 850 1 503 529								1 503 529
Camshaft, right	1 441 248 1 534 558 1 724 851 1 503 530								1 503 530
Turbo charger	1 395 478						1 529 418		
Charge air cooler	1 421 456								
Classified	1 727 920 1 727 921								
Test plan number**	1 738 416 1 738 417	1 738 418 to 1 738 421	1 738 422	1 549 965 to 1 549 966	1 549 967 to 1 549 970	1 549 971	1 762 351	1 784 058	1 869 844 1 859 814
Injector	1 487 472 1 942 702								
Emission relevant settings									
Valve clearance*	Cold engine: Intake 0.45 mm, outlet 0.70 mm								

Engine type	DI16 49M		DI16 44M		DI16 51M
Application	D2/E2				
No. of cylinders	8				
Rated power, kW	450	500	366 - 426	405 - 469	500
D:o max per cyl, kW	56	63	53	59	63
Rated speed, r/min	1 500	1 800	1 500	1 800	1 800
Bore/Stroke, mm	127 x 154				
Selected parent	X/X				
Emission relevant components					
Cylinder head	1 448 282 1 526 482 1 743 122 1 750 995 1 846 123 2 609 859				
Classified	1 727 907 1 727 908				
Cyl head gasket	1 403 260 1 444 941 1 403 608 1 468 555 1 743 553 1 893 055 1 893 054				
Piston	1 528 397 1 499 635 1 734 585 1 791 501				
Connecting rod	1 444 153 1 423 481				
Classified	1 727 910 1 727 911				
Camshaft, left	1 441 247 1 534 557 1 724 850 1 503 529				
Camshaft, right	1 441 248 1 534 558 1 724 851 1 503 530				
Turbo charger	1 395 478				
Charge air cooler	1 421 456				
Classified	1 727 920 1 727 921				
Test plan number**	1 761 985	1 755 320	1 549 972 1 549 973	1 549 974 1 549 975	1 794 771
Injector	1 487 472 1 942 702				
Emission relevant settings					
Valve clearance*	Cold engine: Intake 0.45 mm, outlet 0.70 mm				

* Also see label on rocker cover

** See note on next page



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Emission relevant components and settings

Selection criteria for parent engine = Max NOx emission, g/kWh

Engine type	DI16 52M				DI16 54M		DI16 55M	
	D2/E2		C1/E3		C1/E3	D2/E2	D2/E2	
No. of cylinders	8							
Rated power, kW	334 - 365	351 - 450	386 - 469	515 - 535	441	401 - 441	366 - 450	405 - 532
D:o max per cyl, kW	46	56	59	67	55	55	53	67
Rated speed, r/min	1 500	1 800	1 800	2 100	1 800		1 500	1 800
Bore/Stroke, mm	127 x 154							
Selected parent								
Emission relevant components								
Cylinder head	1 444 282 1 743 122 1 750 995 1 846 123 2 609 859							
Classified	1 727 907 1 727 908							
Cyl head gasket	1 444 941 1 468 555 1 743 553 1 893 055 1 893 054							
Piston	1 528 397 1 499 635 1 734 585 1 791 501							
Connecting rod	1 444 153							
Classified	1 727 910 1 727 911							
Camshaft, left	1 503 529							
Camshaft, right	1 503 530							
Turbo charger	1 395 478				1 529 418		1 395 478	
Charge air cooler	1 421 456							
Classified	1 727 920 1 727 921							
Test plan number**	1 851 153 to 1 851 157		1 851 153 to 1 851 155		1 851 156 to 1 851 157		1 853 037 to 1 856 226 to 1 856 232 to 1 856 232	
Injector	1 487 472 1 942 702							
Emission relevant settings								
Valve clearance*	Cold engine: Intake 0.45 mm, outlet 0.70 mm							

* Also see label on rocker cover

** Engines manufactured 2005 and earlier have an ECU label including only the ECU Cpl. No according to the table below.

Engine type	DI16 42M	DI16 43M	DI16 44M	DI16 45M	DI16 49M	DI16 50M	DI16 51M
ECU Cpl. No.	1 722 273	1 722 273	1 520 257	1 546 280	1 755 317	1 762 338	1 794 764
	1 730 184	1 730 184	1 722 275	1 722 276	1 774 343	1 774 344	1 797 741
	1 739 952	1 739 952	1 730 186	1 730 187	1 797 739	1 797 740	
	1 754 844	1 754 844	1 739 954	1 739 955			
	1 774 339	1 774 339	1 754 846	1 754 847			
	1 797 734	1 797 734	1 774 341	1 774 342			
		1 774 340	1 797 736	1 797 737			
		1 797 735					



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2. On board verification procedure

The method to verify the on board NOx emissions is the engine parameter check method

Components and settings to check

Turbo charger	These components/settings can be checked without dismantling. Location of part numbers, see sketches below.	No adjustment are allowed
Test plan number, see below		See "Important information" below
Valve clearance		See chapter 1, page 3
Cylinder head	These components can only be checked after dismantling and should only be checked during maintenance or if there is doubt about the correctness of the components.	No adjustment are allowed
Cylinder head gasket		No adjustment are allowed
Piston		No adjustment are allowed
Connecting rod		No adjustment are allowed
Cam shaft		No adjustment are allowed
Charge air cooler		No adjustment are allowed
Injector		No adjustment are allowed
	Location of part numbers, see sketches below.	

Important information

The injection advance timing of the Engine Control Unit (ECU) is the same for all engines within an engine type. Different ratings, within an engine type, are obtained by variation of the fuel delivery. A test plan number, labeled on the ECU, is introduced for individual combinations of power and speed within an engine type.

Modifications and verification of the software and ECU can only be carried out by Scania service organisation and all program modifications are electronically monitored. Unauthorized access to the ECU, the related settings and software will result in immediate suspension of the certificates and breach of the warranties.

2018-05-03

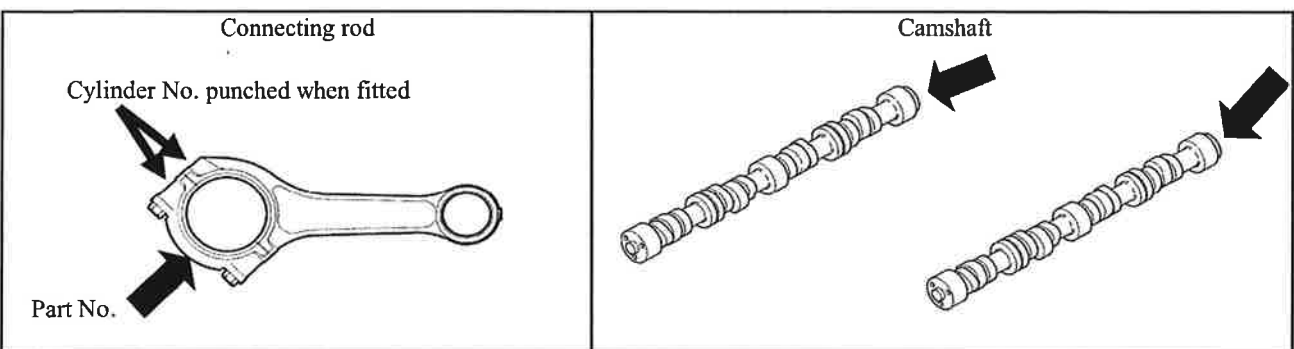
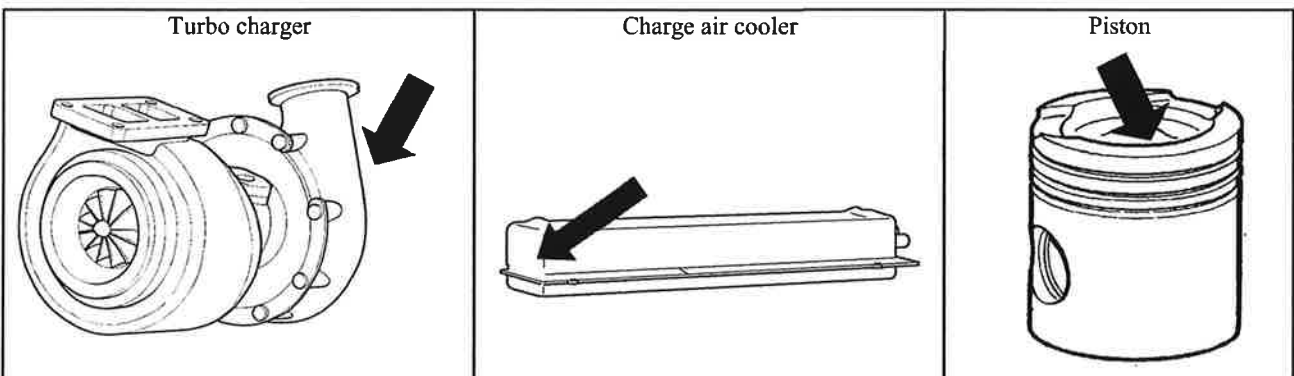
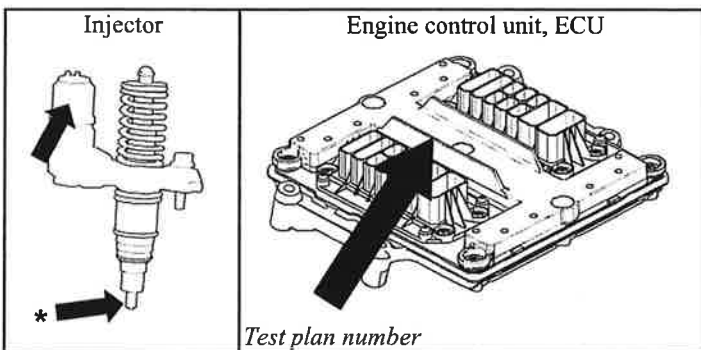
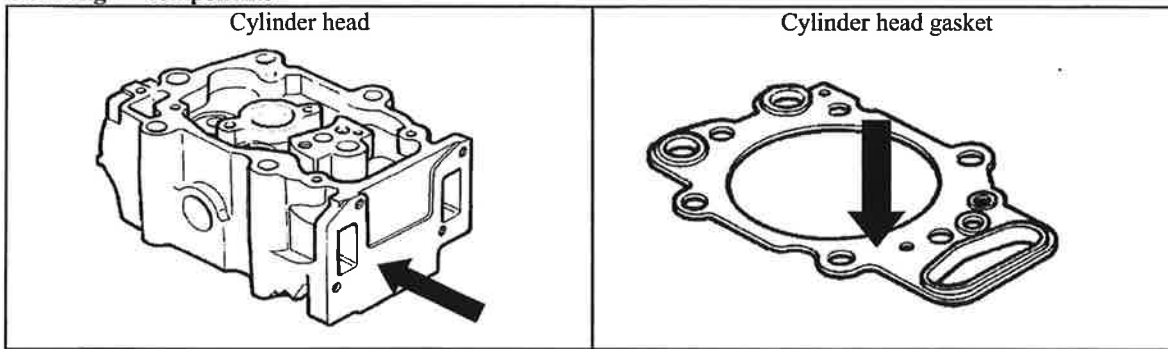


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2. On board verification procedure

Marking on components



*
Injector pNo. (see p. 2-3)
 1 487 472
 1 942 702

Bosch type	Marking
DLA 150 P1269	1269
DLA 150 P1269	1269



Marking, example



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3. Test reports for parent engines

Engine information					
Manufacturer	SCANIA CV AB				
Family Identification	DI16M				
Engine intended for cycle	C1	E3	D2	E2	
Engine type, parent engine (tested engine)	DI1643M	DI1643M	DI16 49M	DI16 49M	
Serial number, test engine	1008168	1008168	1003310	1003310	
Rated speed	1800	1800	1500	1500	r/min
Rated power	441	441	450	450	kW
Intermediate speed	1400	1400	1500	1500	r/min
Maximum torque at intermediate speed	2545	2545	2857	2857	Nm
Static injection pump timing	N/A	N/A	N/A	N/A	° BTDC
Electronic injection control	Yes	Yes	Yes	Yes	
Variable injection timing	Yes	Yes	Yes	Yes	
Variable turbo charger geometry	No	No	No	No	
Cylinder number and configuration	V8	V8	V8	V8	
Nominal compression ratio	16.0	16.0	16.0	16.0	
Mean effective pressure at rated power	18,8	18,8	23,0	23,0	bar
Max cylinder pressure at rated power	N/A	N/A	158,4	158,4	bar

Specified ambient conditions					
Coolant into engine*	55	55	55	55	° C
Max. charge air temperature, if applicable*	85	85	80	80	° C
Maximum seawater temperature **	40	40	40	40	° C
Cooling system spec: Intermediate cooler	Yes	Yes	Yes	Yes	
Cooling system spec: Charge air stages	1	1	1	1	
L/H temp cooling system set points	75/87	75/87	75/87	75/87	° C
Maximum inlet depression	-5	-5	-5	-5	kPa
Maximum exhaust back pressure	15	15	15	15	kPa
Fuel specification	Acc. to EN590				
Fuel temperature	35	35	35	35	° C
Lubricating oil specification	Acc. to ACEA E3, E4, E5 or better, also see Operator's manual				

* Applies for keel-cooling engines

** Applies for heat exchanger cooled engines

Application / Intended for					
Customer	X	X	X	X	
Final application/installation: Ship					
Final application/installation: Engine	Aux C1	Main E3	Aux D2	Main E2	

Emission test results					
Cycle	C1	E3	D2	E2	
NOx	9,44	9,07	9,58	9,46	g/kWh
Test identification	69066152	69066151	69064463	69064463	
Date	03-10-17	03-10-17	05-03-17	05-03-17	
Test site: Scania Engine Lab, cell No.	F7	F7	F11	F11	
Test number	69066152	69066151	69064463	69064463	
Surveyor					
Date and place of report					
Signature					

3. Test reports for parent engines

Engine family information	
Combustion cycle	4 stroke
Cooling medium	50/50 Water/Glycol coolant
Cylinder configuration	In-line
Method of aspiration	Pressure charger, turbo charger
Fuel type to be used on board	Destillate
Combustion chamber	Open chamber
Valve port configuration	Cylinder head cross flow
Valve port number and size	2 inlet Ø 34,8 mm, 2 outlet Ø 35 mm
Fuel system type	Electronic unit injectors

Miscellaneous features	
Exhaust gas recirculation	No
Water injection/emulsion	No
Air injection	No
Charge cooling system	Yes, air-to-water charge air cooling
Exhaust after-treatment	No
Exhaust after-treatment type	No
Dual fuel	No



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3. Test reports for parent engines

Test cell information	Test cell: F7	Tested running cycle: C1 E3	Date: 03-10-17 03-10-17
Exhaust pipe			
Diameter	mm	115	
Length	m	10	
Insulation		Yes, 8 m	
Probe location		1,5 m after turbo charger	
Remark			

Measurement equipment				Calibration	
Analyser	Manufacturer	Model	Measurement range	Span gas conc.	Deviation
NO _x analyser	Horiba	CLA-755A	500/5000	910 ppm	1%
CO analyser	Horiba	AIA-721A	5000	896 ppm	1%
CO ₂ analyser*	Horiba	AIA-722	15%	13,5 % by volume	1%
O ₂ analyser*	N/A	N/A	N/A	N/A	N/A
HC analyzer	Horiba	FIA-725A	500/5000	182,5/1820 ppmC	1%
Speed	Leine & Linde	8659 008994/2048	0 - 2979		±3 r/min
Torque	Hottinger	T10F	0 - 5 kN	0-3,6 om 600 Nm	8 Nm
Power, if appl.	N/A	N/A	N/A	N/A	N/A
Fuel flow	AVL	7131 - 18	0 - 200 kg/h	200 g	0,3 g
Air flow	Holset	4"	0 - 60 kg/min		2%
Temperatures					
Coolant	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Lubricant	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Exhaust gas	Pentronic	Termoelement Typ K	0 - 700 °C	600 °C	0,85 °C
Inlet air	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Intercooled air	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Fuel	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Pressures					
Exhaust gas	Druck	PMP4160	±35 kPa	0/35 kPa	0,5%
Inlet manifold	Kavlico	P657-2 D/E1A	±7 kPa	0/-3,5/-7 kPa	0,5%
Atmospheric	Newpoert	INF-1	500 - 1100 mbar	900-1100 mbar	1 mbar
Vapour pressure					
Intake air	N/A				
Humidity					
Intake air	Mitchell	DEWMET-TDH	-59 - +90 Cdp	-30 - +20 Cdp	0,4 Cdp

Note! The exhaust mass flow was calculated from fuel and air flow measurements according to MARPOL 73/78, Annex VI, NO_x Technical Code 5.5.2. Emission components marked with asterisk were not measured since these components are not necessary for further calculations.

Test fuel characteristics					
Fuel type	Diesel fuel acc to ISO 8217, ISO-F-DMA				
Properties					
Density	ISO 3675	835,1	kg/m ³		
Viscosity	ISO 3104:94/COR 1:97	2,61	mm ² /s		
Fuel elemental analysis and test methods					
Carbon	ASTM D 5292	86,52	% mass		
Hydrogen	PRR	13,47	% mass		
Nitrogen	ASTM D4629-96	0,003	% mass		
Oxygen	SS-EN 13132:2000	< 0,1	% mass		
Sulphur	ISO 8754:1992	0,0048	% mass		
Energy	SS 15 51 38:1992	42,94	MJ/kg		

3. Test reports for parent engines

Test cell information	Test cell: F11	Tested running cycle: D2 E2	Date: 05-03-17 05-03-17
Exhaust pipe			
Diameter	mm	115	
Length	m	10	
Insulation		Yes, 8 m	
Probe location		1,5 m after turbo charger	
Remark			

Measurement equipment				Calibration	
Analyser	Manufacturer	Model	Measurement range	Span gas conc.	Deviation
NO _x analyser	Horiba	CLA-755A	500/5000	910 ppm	1%
CO analyser	Horiba	AIA-721A	5000	896 ppm	1%
CO ₂ analyser*	Horiba	AIA-722	15%	13,5 % by volume	1%
O ₂ analyser*	N/A	N/A	N/A	N/A	N/A
HC analyzer	Horiba	FIA-725A	500/5000	182,5/1820 ppmC	1%
Speed	Leine & Linde	8659 00002/2048	0 - 2979		±3 r/min
Torque	Hottinger	T10F	0 - 5 kN	0-3,6 om 600 Nm	8 Nm
Power, if appl.	N/A	N/A	N/A	N/A	N/A
Fuel flow	AVL	7131 - 18	0 - 200 kg/h	200 g	0,3 g
Air flow	Holset	4"	0 - 60 kg/min		2%
Temperatures					
Coolant	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Lubricant	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Exhaust gas	Pentronic	Termoelement Typ K	0 - 700 °C	600 °C	0,85 °C
Inlet air	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Intercooled air	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Fuel	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Pressures					
Exhaust gas	Druck	PMP4160	±35 kPa	0/35 kPa	0,5%
Inlet manifold	Kavlico	P657-2 D/E1A	±7 kPa	0/-3,5/-7 kPa	0,5%
Atmospheric	Newpoert	INF-1	500 - 1100 mbar	900-1100 mbar	1 mbar
Vapour pressure					
Intake air	N/A				
Humidity					
Intake air	Mitchell	DEWMET-TDH	-59 - +90 Cdp	-30 - +20 Cdp	0,4 Cdp

Note! The exhaust mass flow was calculated from fuel and air flow measurements according to MARPOL 73/78, Annex VI, NO_x Technical Code 5.5.2. Emission components marked with asterisk were not measured since these components are not necessary for further calculations.

Test fuel characteristics					
Fuel type	Diesel fuel acc to ISO 8217, ISO-F-DMA				
Properties					
Density	ISO 3675	835,1	kg/m ³		
Viscosity	ISO 3104:94/COR 1:97	2,61	mm ² /s		
Fuel elemental analysis and test methods					
Carbon	ASTM D 5292	86,52	% mass		
Hydrogen	PRR	13,47	% mass		
Nitrogen	ASTM D4629-96	0,003	% mass		
Oxygen	SS-EN 13132:2000	< 0,1	% mass		
Sulphur	ISO 8754:1992	0,0048	% mass		
Energy	SS 15 51 38:1992	42,94	MJ/kg		



3. Test reports for parent engines

Emission test report for parent engine C1									
		1	2	3	4	5	6	7	8
Load factor	%	100	75	50	10	100	75	50	0
Engine speed	%	Full	Full	Full	Full	Interm	Interm	Interm	Idle
Time	s	360	360	360	360	360	360	360	360
Ambient data									
Barometric tendency	mbar	1019,3	1019,0	1019,0	1019,0	1018,8	1018,8	1018,7	1018,7
Intake air temperature	° C	27,5	23,6	28,0	23,2	26,9	26,5	24,1	27,3
Intake air humidity	g/kg	4,32	4,29	4,29	4,29	4,25	4,25	4,21	4,21
Atmospheric factor		0,987	0,968	0,990	0,966	0,985	0,983	0,971	0,987
Gaseous emissions data									
NOx concentration wet	ppm	1054,2	1093,6	1004,7	238,9	1457,6	1354,2	1136,8	170,4
CO concentration dry	ppm	45,9	41,0	48,9	156,8	303,7	238,4	141,3	154,2
CO2 concentration dry*	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
O2 concentration dry*	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HC concentration wet	ppm	92,1	115,8	139,0	158,5	45,1	67,2	112,1	168,2
NOx correction factor		0,91	0,92	0,90	0,90	0,93	0,92	0,92	0,88
Fuel specification factor		1,88	1,89	1,90	1,93	1,86	1,87	1,88	1,94
Dry/wet correction factor		0,93	0,94	0,95	0,98	0,91	0,92	0,94	0,99
NOx, mass flow	g/h	3714,0	3205,5	2301,7	381,3	3512,7	2705,9	1849,4	118,4
CO mass flow	g/h	100,1	74,9	71,6	166,2	437,9	289,6	142,9	74,0
CO2 mass flow*	kg/h	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
O2 mass flow*	kg/h	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HC mass flow	g/h	106,9	111,6	106,3	85,1	35,3	43,9	60,0	40,2
NOx specific	g/kWh	8,47	9,79	10,35	8,96	9,48	9,67	9,99	40,34
Engine data									
Engine speed	r/min	1800	1800	1800	1800	1400	1400	1400	650
Auxilliary power		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Brake torque	Nm	2339	1750	1185	227	2545	1918	1272	43
Engine power	kW	438,7	327,5	222,4	42,6	370,6	279,8	185,2	2,9
Mean effective pressure	bar	18,8	14,1	9,5	1,8	20,5	15,4	10,2	0,3
Fuel rack		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Specific fuel consumption	g/kWh	198,9	197,5	202,0	323,9	198,9	200,0	202,7	718,6
Fuel flow	g/min	1461,5	1086,2	752,3	230,9	1236,8	937,5	630,1	35,3
Air flow	kg/min	39,0	32,5	25,9	18,5	26,0	21,8	18,0	8,3
Exhaust flow	kg/h	2429	2017	1600	1123	1637	1366	1120	501
Exhaust temperature	° C	420	376	332	203	507	466	398	154
Exhaust back pressure	mbar	34,0	25,0	17,6	2,7	28,6	22,0	14,2	-0,1
Coolant temp., after engine	° C	78,0	77,4	76,9	75,6	78,2	76,8	76,0	72,6
Coolant temp., bef. engine	° C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Coolant pressure	bar	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5
Charge air pressure	bar	1,67	1,18	0,70	0,17	1,23	0,83	0,46	-0,01
Charge air temperature	° C	66,5	60,0	52,8	45,0	56,4	51,4	46,3	39,6
Charge air ref. temp.	° C	66,5	60,0	52,8	45,0	56,4	51,4	46,3	39,6
Lubricant temperature	° C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lubricant press., after filter	bar	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Inlet depression	mbar	-5,25	-3,92	-2,77	-1,62	-2,79	-2,20	-1,88	-1,04

Note! The exhaust mass flow was calculated from fuel and air flow measurements according to MARPOL 73/78, Annex VI, NOx Technical Code 5.5.2.

Emission components marked with asterisk were not measured since these components are not necessary for further calculations.



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3. Test reports for parent engines

Emission test report for parent engine E3									
		1	2	3	4	5	6	7	8
Load factor	%	100	75	50	25				
Engine speed	%	100	91	80	63				
Time	s	360	360	360	360				
Ambient data									
Barometric tendency	mbar	1019,6	1019,6	1019,5	1019,5				
Intake air temperature	° C	23,7	28,4	23,5	27,0				
Intake air humidity	g/kg	4,32	4,32	4,33	4,33				
Atmospheric factor		0,968	0,992	0,968	0,985				
Gaseous emissions data									
NOx concentration wet	ppm	1049,4	1129,5	1185,2	1165,4				
CO concentration dry	ppm	44,2	71,1	148,9	76,8				
CO2 concentration dry*	%	N/A	N/A	N/A	N/A				
O2 concentration dry*	%	N/A	N/A	N/A	N/A				
HC concentration wet	ppm	92,8	97,5	112,4	122,6				
NOx correction factor		0,92	0,91	0,92	0,91				
Fuel specification factor		1,88	1,88	1,88	1,89				
Dry/wet correction factor		0,92	0,91	0,92	0,91				
NOx, mass flow	g/h	3745,2	2928,8	2131,0	1302,2				
CO mass flow	g/h	97,3	114,0	165,0	54,3				
CO2 mass flow*	kg/h	N/A	N/A	N/A	N/A				
O2 mass flow*	kg/h	N/A	N/A	N/A	N/A				
HC mass flow	g/h	108,6	83,2	66,3	45,4				
NOx specific	g/kWh	8,56	8,92	9,73	11,85				
Engine data									
Engine speed	r/min	1800	1638	1440	1135				
Auxilliary power		N/A	N/A	N/A	N/A				
Brake torque	Nm	2339	1923	1464	930				
Engine power	kW	437,4	328,3	219,1	109,8				
Mean effective pressure	bar	18,8	15,5	11,8	7,5				
Fuel rack		N/A	N/A	N/A	N/A				
Specific fuel consumption	g/kWh	198,3	199,5	201,7	204,4				
Fuel flow	g/min	1457,3	1096,6	742,3	376,5				
Air flow	kg/min	39,3	28,7	19,8	12,5				
Exhaust flow	kg/h	2447	1786	1233	775				
Exhaust temperature	° C	415	435	417	346				
Exhaust back pressure	mbar	34,5	25,7	16,9	7,9				
Coolant temp., after engine	° C	77,9	77,2	76,3	74,8				
Coolant temp., bef. engine	° C	N/A	N/A	N/A	N/A				
Coolant pressure	bar	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5				
Charge air pressure	bar	1,69	1,08	0,59	0,19				
Charge air temperature	° C	66,0	58,2	48,8	44,7				
Charge air ref. temp.	° C	66,0	58,2	48,8	44,7				
Lubricant temperature	° C	N/A	N/A	N/A	N/A				
Lubricant press., after filter	bar	N/A	N/A	N/A	N/A				
Inlet depression	mbar	-5,30	-3,05	-1,94	-1,26				

Note! The exhaust mass flow was calculated from fuel and air flow measurements according to MARPOL 73/78, Annex VI, NOx Technical Code 5.5.2.

Emission components marked with asterisk were not measured since these components are not necessary for further calculations.



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3. Test reports for parent engines

Emission test report for parent engine D2									
		1	2	3	4	5	6	7	8
Load factor	%	100	75	50	25	10			
Engine speed	%	Rated	Rated	Rated	Rated	Rated			
Time	s	239	152	122	120	134			
Ambient data									
Barometric tendency	mbar	991,4	991,5	991,5	991,5	991,5			
Intake air temperature	° C	26,2	25,5	24,5	24,6	24,8			
Intake air humidity	g/kg	4,08	4,05	4,05	4,05	4,05			
Atmospheric factor		1,000	0,997	0,992	0,992	0,993			
Gaseous emissions data									
NOx concentration wet	ppm	1407,6	1331,2	1190,2	835,5	375,0			
CO concentration dry	ppm	169,9	95,8	87,0	77,4	167,3			
CO2 concentration dry*	%	N/A	N/A	N/A	N/A	N/A			
O2 concentration dry*	%	N/A	N/A	N/A	N/A	N/A			
HC concentration wet	ppm	49,2	79,1	116,3	126,7	160,0			
NOx correction factor		0,92	0,92	0,91	0,90	0,89			
Fuel specification factor		1,86	1,87	1,88	1,90	1,93			
Dry/wet correction factor		0,91	0,92	0,93	0,95	0,98			
NOx, mass flow	g/h	4167,5	3143,4	2172,3	1144,4	456,8			
CO mass flow	g/h	303,0	138,1	98,4	68,1	135,9			
CO2 mass flow*	kg/h	N/A	N/A	N/A	N/A	N/A			
O2 mass flow*	kg/h	N/A	N/A	N/A	N/A	N/A			
HC mass flow	g/h	47,5	61,2	69,9	57,9	66,0			
NOx specific	g/kWh	9,32	9,39	9,74	10,30	10,51			
Engine data									
Engine speed	r/min	1500	1501	1500	1500	1500			
Auxilliary power		N/A	N/A	N/A	N/A	N/A			
Brake torque	Nm	2857	2140	1426	709	278			
Engine power	kW	447,2	334,8	223,1	111,1	43,5			
Mean effective pressure	bar	23	17,2	11,5	5,7	2,2			
Fuel rack		N/A	N/A	N/A	N/A	N/A			
Specific fuel consumption	g/kWh	198,2	194,9	201,9	212,7	257,1			
Fuel flow	g/min	1483,0	1092,9	753,9	395,0	187,3			
Air flow	kg/min	32	25,9	20,2	15,5	14,2			
Exhaust flow	kg/h	2019	1619	1258	956	862			
Exhaust temperature	° C	498	472	425	321	229			
Exhaust back pressure	mbar	22,9	13,4	5,1	-0,7	-2,8			
Coolant temp., after engine	° C	77,2	76,1	75,6	75,6	75,1			
Coolant temp., bef. engine	° C	48,5	47,9	43,4	34,9	32,4			
Coolant pressure	bar	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5			
Charge air pressure	bar	1,61	1,10	0,62	0,21	0,06			
Charge air temperature	° C	71,2	66,9	61,7	62,3	61,5			
Charge air ref. temp.	° C	71,2	66,9	61,7	62,3	61,5			
Lubricant temperature	° C	91,9	93,3	92,8	90,9	87,9			
Lubricant press., after filter	bar	4,69	4,66	4,66	4,71	4,79			
Inlet depression	mbar	-2,32	-1,27	-0,48	-0,02	-0,01			

Note! The exhaust mass flow was calculated from fuel and air flow measurements according to MARPOL 73/78, Annex VI, NOx Technical Code 5.5.2.

Emission components marked with asterisk were not measured since these components are not necessary for further calculations.



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3. Test reports for parent engines

Emission test report for parent engine E2									
		1	2	3	4	5	6	7	8
Load factor	%	100	75	50	25				
Engine speed	%	Rated	Rated	Rated	Rated				
Time	s	239	152	122	120				
Ambient data									
Barometric tendency	mbar	991,4	991,5	991,5	991,5				
Intake air temperature	° C	26,2	25,5	24,5	24,6				
Intake air humidity	g/kg	4,08	4,05	4,05	4,05				
Atmospheric factor		1,000	0,997	0,992	0,992				
Gaseous emissions data									
NOx concentration wet	ppm	1407,6	1331,2	1190,2	835,5				
CO concentration dry	ppm	169,9	95,8	87,0	77,4				
CO2 concentration dry*	%	N/A	N/A	N/A	N/A				
O2 concentration dry*	%	N/A	N/A	N/A	N/A				
HC concentration wet	ppm	49,2	79,1	116,3	126,7				
NOx correction factor		0,92	0,92	0,91	0,90				
Fuel specification factor		1,86	1,87	1,88	1,90				
Dry/wet correction factor		0,91	0,92	0,93	0,95				
NOx, mass flow	g/h	4167,5	3143,4	2172,3	1144,4				
CO mass flow	g/h	303,0	138,1	98,4	68,1				
CO2 mass flow*	kg/h	N/A	N/A	N/A	N/A				
O2 mass flow*	kg/h	N/A	N/A	N/A	N/A				
HC mass flow	g/h	47,5	61,2	69,9	57,9				
NOx specific	g/kWh	9,32	9,39	9,74	10,30				
Engine data									
Engine speed	r/min	1500	1501	1500	1500				
Auxilliary power		N/A	N/A	N/A	N/A				
Brake torque	Nm	2857	2140	1426	709				
Engine power	kW	447,2	334,8	223,1	111,1				
Mean effective pressure	bar	23	17,2	11,5	5,7				
Fuel rack		N/A	N/A	N/A	N/A				
Specific fuel consumption	g/kWh	198,2	194,9	201,9	212,7				
Fuel flow	g/min	1483,0	1092,9	753,9	395,0				
Air flow	kg/min	32	25,9	20,2	15,5				
Exhaust flow	kg/h	2019	1619	1258	956				
Exhaust temperature	° C	498	472	425	321				
Exhaust back pressure	mbar	23	13,4	5,1	-0,7				
Coolant temp., after engine	° C	77,2	76,1	75,6	75,6				
Coolant temp., bef. engine	° C	48,5	47,9	43,4	34,9				
Coolant pressure	bar	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5				
Charge air pressure	bar	1,61	1,10	0,62	0,21				
Charge air temperature	° C	71,2	66,9	61,7	62,3				
Charge air ref. temp.	° C	71,2	66,9	61,7	62,3				
Lubricant temperature	° C	91,9	93,3	92,8	90,9				
Lubricant press., after filter	bar	4,69	4,66	4,66	4,71				
Inlet depression	mbar	-2,32	-1,27	-0,48	-0,02				

Note! The exhaust mass flow was calculated from fuel and air flow measurements according to MARPOL 73/78, Annex VI, NOx Technical Code 5.5.2.

Emission components marked with asterisk were not measured since these components are not necessary for further calculations.



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DNV-GL

Certificate no.:
EIAPP-F-065001-0026

ENGINE INTERNATIONAL AIR POLLUTION PREVENTION CERTIFICATE

Issued under the provisions of the Protocol of 1997, as amended by resolution MEPC.176(58) in 2008, to amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified of the Protocol of 1978 related thereto (hereinafter referred to as "the Convention")
under the authority of the Government of

NORWAY

by **DNV GL**

Particulars of the engine:

Engine manufacturer:	Scania CV AB
Model number:	DI1643M
Serial number:	6507871
Test cycle(s):	C1 / E3
Rated power [kW] and speed [rpm]:	515 @ 2100
Engine approval number:	EIAPP-F-065001-0026

This is to certify:

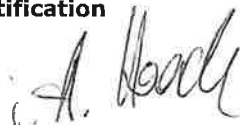
1. That the above-mentioned marine diesel engine has been surveyed for pre-certification in accordance with the requirements of the Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines 2008 made mandatory by Annex VI of the Convention; and
2. That the pre-certification survey shows that the engine, its components, adjustable features, and technical file, prior to the engine's installation and/or service on board a ship, fully comply with the applicable regulation 13 of Annex VI of the Convention.

This certificate is valid for the life of the engine, subject to surveys in accordance with regulation 5 of Annex VI of the Convention, installed in ships under the authority of this Government.

Issued at **Hamburg** on **2018-05-03**




Stine Mundal
Head of Section Environmental Certification



**SUPPLEMENT TO ENGINE INTERNATIONAL AIR POLLUTION PREVENTION
CERTIFICATE**
RECORD OF CONSTRUCTION, TECHNICAL FILE AND MEANS OF VERIFICATION

Notes:

- 1 This Record and its attachments shall be permanently attached to the EIAPP Certificate. The EIAPP Certificate shall accompany the engine throughout its life and shall be available on board the ship at all times.
- 2 The Record shall be at least in English, French or Spanish. If an official language of the issuing country is also used, this shall prevail in case of a dispute or discrepancy.
- 3 Unless otherwise stated, regulations mentioned in this Record refer to regulations of Annex VI of the Convention and the requirements for an engine's technical file and means of verifications refer to mandatory requirements from the NOx Technical Code 2008.

1. Particulars of the engine

- | | | |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| 1.1 | Name and address of manufacturer | Scania CV AB
Vagnmakarvägen 1
Södertälje, Sweden |
| 1.2 | Place of engine build | Södertälje, Sweden |
| 1.3 | Date of engine build | 2003 |
| 1.4 | Place of pre-certification survey | Södertälje, Sweden |
| 1.5 | Date of pre-certification survey | 2003 |
| 1.6 | Engine type and model number | DI1643M |
| 1.7 | Engine serial number | 6507871 |
| 1.8 | If applicable, the engine is a parent engine <input type="checkbox"/> or a member engine <input checked="" type="checkbox"/>
of the following engine family <input checked="" type="checkbox"/> or engine group <input type="checkbox"/> | DI16M |
| | As approved with approval no. | 65001-06 HH |
| 1.9 | Individual engine or engine family/engine group details: | |
| 1.9.1 | Approval reference | EIAPP-F-065001-0026 |
| 1.9.2 | Rated power (kW) and rated speed (rpm) values or range | 515 @ 2100 |
| 1.9.3 | Test cycle(s) | C1 / E3 |
| 1.9.4 | Parent engine(s) test fuel oil specification | ISO-F-DMA |
| 1.9.5 | Applicable NOx emission limit (g/kWh),
regulation 13.3 | 9.8 /
9.8 |
| 1.9.6 | Parent engine(s) emission value (g/kWh) | 9.4 /
9.1 |

2. Particulars of the technical file

The technical file, as required by chapter 2 of the NOx Technical Code 2008, is an essential part of the EIAPP Certificate and must always accompany an engine throughout its life and always be available on board a ship.

- 2.1 Technical file identification/approval number **EIAPP-F-065001-0026**
- 2.2 Technical file approval date **2018-05-03**

3. Specifications for the onboard NOx verification procedures

The specifications for the on board NOx verification procedures, as required by Ch. 6 of the NOx Technical Code 2008, are an essential part of the EIAPP Certificate and must always accompany an engine through its life and always be available on board a ship.

- 3.1 Engine parameter check method:
 - 3.1.1 Identification/approval number **EIAPP-F-065001-0026**
 - 3.1.2 Approval date **2018-05-03**
- 3.2 Direct measurement and monitoring method:
 - 3.2.1 Identification/approval number -
 - 3.2.2 Approval date -

Alternatively the simplified measurement method in accordance with 6.3 of the NOx Technical Code 2008 may be utilized.

Issued at **Hamburg** on **2018-05-03**



Stine Mundal

Stine Mundal
Head of Section Environmental Certification

L.A. Hoade



SCANIA

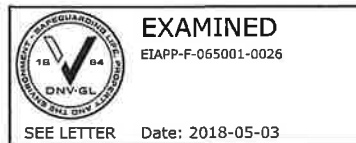
TECHNICAL DOCUMENTS

According to

Revised MARPOL Annex VI and NOx Technical Code 2008

Applies for:

Engine type	DI1643M
Engine number	6507871
Power (kW)	515
Rated speed (rpm)	2100
Engine built	2003
Engine family	DI16M
Approval number	GL 65001-06 HH



i. A. Haddad

TECHNICAL FILE NO: 1 754 950-7 2018-03-13

 According to MARPOL 73/78 Annex VI and NO_x technical code

For the engine family: DI16M

Date for original application: 2006-02-01

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1. Record of engine performance and emission relevant components and settings
Allowable adjustment of components

Allowable adjustment of components and settings is described in the "On board verification procedure".

Diesel fuel

The engine exhaust emissions and power output are dependent on the fuel quality. The composition of the diesel fuel is also vitally important to the operation and life of the engine. The diesel fuel shall comply with standard: EN 590 (European standard). The table below shows the requirements for the most important properties:

Viscosity at 40°C	2.0 - 4.5 mm ² /s (cSt)
Density at 15°C	0.82 - 0.86 kg/dm ³
Sulphur (concentration by mass)	max. 0.2%
Ignitability (CET rating)	min. 49
Flashpoint, min	56°C



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Emission relevant components and settings

Selection criteria for parent engine = Max NOx emission, g/kWh

Engine type	DI16 43M			DI16 42M			DI16 50M		DI16 45M
Application	C1/E3			E3			C1/E3	C1/D2	E3
No. of cylinders	8								
Rated power, kW	386 - 441	423 - 550	588	386 - 441	423 - 550	588	550	441	625, 662
D:o max per cyl, kW	55	69	74	55	69	74	69	55	83
Rated speed, r/min	1 800	2 100	2 200	1 800	2 100	2 200	2 100	1 800	2 300
Bore/Stroke, mm	127 x 154								
Selected parent	X/X								
Emission relevant components									
Cylinder head	1 448 282 1 526 482 1 743 122 1 750 995 1 846 123 2 609 859								
Classified	1 727 907 1 727 908								
Cyl head gasket	1 403 260 1 444 941 1 403 608 1 468 555 1 743 553 1 893 055 1 893 054								
Piston	1 528 397 1 499 635 1 734 585 1 791 501								
Connecting rod	1 444 153 1 423 481								
Classified	1 727 910 1 727 911								
Camshaft, left	1 441 247 1 534 557 1 724 850 1 503 529								1 503 529
Camshaft, right	1 441 248 1 534 558 1 724 851 1 503 530								1 503 530
Turbo charger	1 395 478						1 529 418		
Charge air cooler	1 421 456								
Classified	1 727 920 1 727 921								
Test plan number**	1 738 416 1 738 417	1 738 418 to 1 738 421	1 738 422	1 549 965 to 1 549 966	1 549 967 to 1 549 970	1 549 971	1 762 351	1 784 058	1 869 844 1 859 814
Injector	1 487 472 1 942 702								
Emission relevant settings									
Valve clearance*	Cold engine: Intake 0.45 mm, outlet 0.70 mm								

Engine type	DI16 49M		DI16 44M		DI16 51M
Application	D2/E2				
No. of cylinders	8				
Rated power, kW	450	500	366 - 426	405 - 469	500
D:o max per cyl, kW	56	63	53	59	63
Rated speed, r/min	1 500	1 800	1 500	1 800	1 800
Bore/Stroke, mm	127 x 154				
Selected parent	X/X				
Emission relevant components					
Cylinder head	1 448 282 1 526 482 1 743 122 1 750 995 1 846 123 2 609 859				
Classified	1 727 907 1 727 908				
Cyl head gasket	1 403 260 1 444 941 1 403 608 1 468 555 1 743 553 1 893 055 1 893 054				
Piston	1 528 397 1 499 635 1 734 585 1 791 501				
Connecting rod	1 444 153 1 423 481				
Classified	1 727 910 1 727 911				
Camshaft, left	1 441 247 1 534 557 1 724 850 1 503 529				
Camshaft, right	1 441 248 1 534 558 1 724 851 1 503 530				
Turbo charger	1 395 478				
Charge air cooler	1 421 456				
Classified	1 727 920 1 727 921				
Test plan number**	1 761 985	1 755 320	1 549 972 1 549 973	1 549 974 1 549 975	1 794 771
Injector	1 487 472 1 942 702				
Emission relevant settings					
Valve clearance*	Cold engine: Intake 0.45 mm, outlet 0.70 mm				

* Also see label on rocker cover

** See note on next page



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Emission relevant components and settings

Selection criteria for parent engine = Max NOx emission, g/kWh

Engine type	DI16 52M				DI16 54M		DI16 55M		
	D2/E2		C1/E3		C1/E3	D2/E2	D2/E2		
Application	D2/E2		C1/E3		C1/E3	D2/E2	D2/E2		
No. of cylinders	8								
Rated power, kW	334 - 365	351 - 450	386 - 469	515 - 535	441	401 - 441	366 - 450	405 - 532	
D:o max per cyl, kW	46	56	59	67	55	55	53	67	
Rated speed, r/min	1 500	1 800	1 800	2 100	1 800		1 500	1 800	
Bore/Stroke, mm	127 x 154								
Selected parent									
Emission relevant components									
Cylinder head	1 444 282	1 743 122	1 750 995	1 846 123	2 609 859				
Classified	1 727 907	1 727 908							
Cyl head gasket	1 444 941	1 468 555	1 743 553	1 893 055	1 893 054				
Piston	1 528 397 1 499 635 1 734 585 1 791 501								
Connecting rod	1 444 153								
Classified	1 727 910 1 727 911								
Camshaft, left	1 503 529								
Camshaft, right	1 503 530								
Turbo charger	1 395 478				1 529 418		1 395 478		
Charge air cooler	1 421 456								
Classified	1 727 920 1 727 921								
Test plan number**	1 851 153 to 1 851 157		1 851 153 to 1 851 155		1 851 156 to 1 851 157		1 853 037 1 856 226 to 1 856 232		
Injector	1 487 472 1 942 702								
Emission relevant settings									
Valve clearance*	Cold engine: Intake 0.45 mm, outlet 0.70 mm								

* Also see label on rocker cover

** Engines manufactured 2005 and earlier have an ECU label including only the ECU Cpl. No according to the table below.

Engine type	DI16 42M	DI16 43M	DI16 44M	DI16 45M	DI16 49M	DI16 50M	DI16 51M
ECU Cpl. No.	1 722 273	1 722 273	1 520 257	1 546 280	1 755 317	1 762 338	1 794 764
	1 730 184	1 730 184	1 722 275	1 722 276	1 774 343	1 774 344	1 797 741
	1 739 952	1 739 952	1 730 186	1 730 187	1 797 739	1 797 740	
	1 754 844	1 754 844	1 739 954	1 739 955			
	1 774 339	1 774 339	1 754 846	1 754 847			
	1 797 734	1 797 734	1 774 341	1 774 342			
		1 774 340	1 797 736	1 797 737			
		1 797 735					



2. On board verification procedure

The method to verify the on board NOx emissions is the engine parameter check method

Components and settings to check

Turbo charger	These components/settings can be checked without dismantling. Location of part numbers, see sketches below.	No adjustment are allowed
Test plan number, see below		See "Important information" below
Valve clearance		See chapter 1, page 3
Cylinder head	These components can only be checked after dismantling and should only be checked during maintenance or if there is doubt about the correctness of the components.	No adjustment are allowed
Cylinder head gasket		No adjustment are allowed
Piston		No adjustment are allowed
Connecting rod		No adjustment are allowed
Cam shaft		No adjustment are allowed
Charge air cooler	Location of part numbers, see sketches below.	No adjustment are allowed
Injector		No adjustment are allowed

Important information

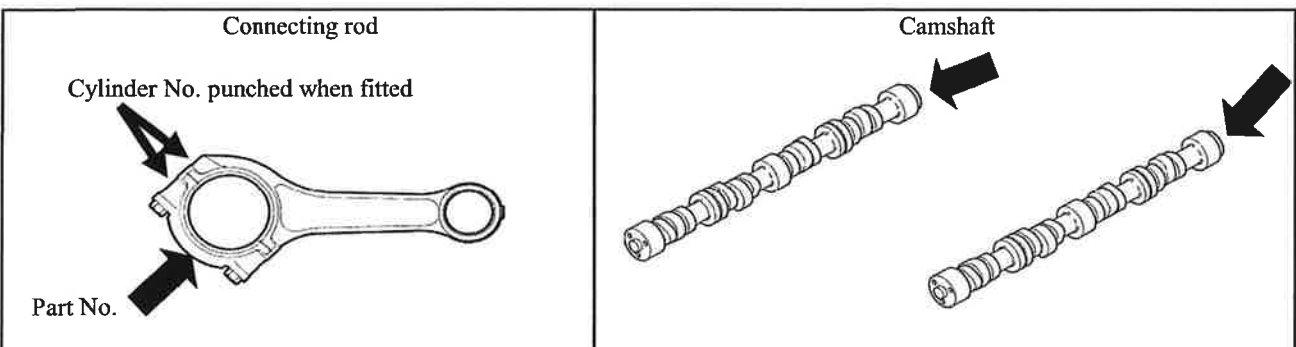
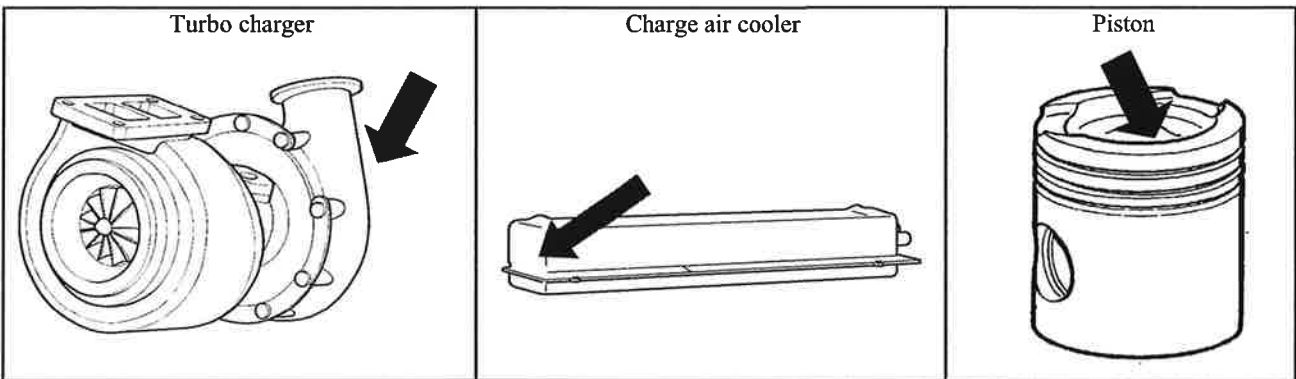
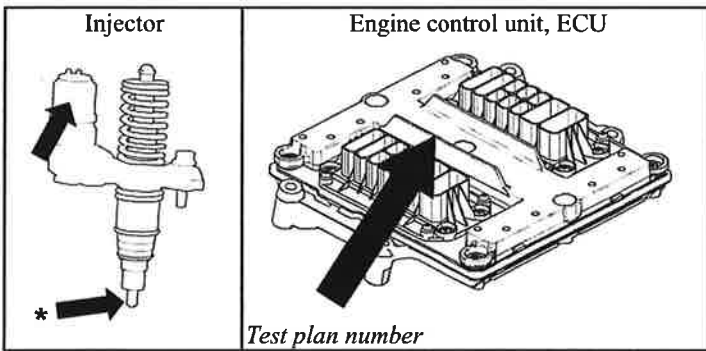
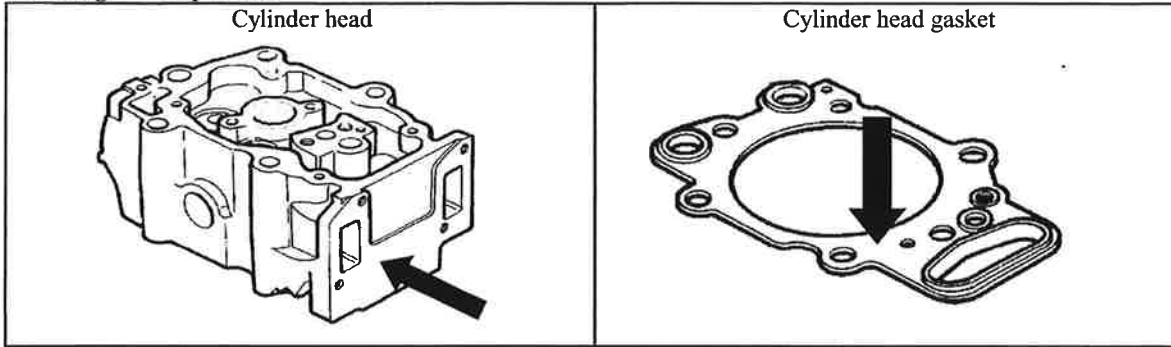
The injection advance timing of the Engine Control Unit (ECU) is the same for all engines within an engine type. Different ratings, within an engine type, are obtained by variation of the fuel delivery. A test plan number, labeled on the ECU, is introduced for individual combinations of power and speed within an engine type.

Modifications and verification of the software and ECU can only be carried out by Scania service organisation and all program modifications are electronically monitored. Unauthorized access to the ECU, the related settings and software will result in immediate suspension of the certificates and breach of the warranties.

2018-05-03



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2. On board verification procedure
Marking on components


*
Injector pNo. (see p. 2-3)
 1 487 472
 1 942 702

Bosch type	Marking
DLA 150 P1269	1269
DLA 150 P1269	1269



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Marking, example

3. Test reports for parent engines

Engine information					
Manufacturer	SCANIA CV AB				
Family Identification	DI16M				
Engine intended for cycle	C1	E3	D2	E2	
Engine type, parent engine (tested engine)	DI1643M	DI1643M	DI16 49M	DI16 49M	
Serial number, test engine	1008168	1008168	1003310	1003310	
Rated speed	1800	1800	1500	1500	r/min
Rated power	441	441	450	450	kW
Intermediate speed	1400	1400	1500	1500	r/min
Maximum torque at intermediate speed	2545	2545	2857	2857	Nm
Static injection pump timing	N/A	N/A	N/A	N/A	° BTDC
Electronic injection control	Yes	Yes	Yes	Yes	
Variable injection timing	Yes	Yes	Yes	Yes	
Variable turbo charger geometry	No	No	No	No	
Cylinder number and configuration	V8	V8	V8	V8	
Nominal compression ratio	16.0	16.0	16.0	16.0	
Mean effective pressure at rated power	18,8	18,8	23,0	23,0	bar
Max cylinder pressure at rated power	N/A	N/A	158,4	158,4	bar

Specified ambient conditions					
Coolant into engine*	55	55	55	55	° C
Max. charge air temperature, if applicable*	85	85	80	80	° C
Maximum seawater temperature **	40	40	40	40	° C
Cooling system spec: Intermediate cooler	Yes	Yes	Yes	Yes	
Cooling system spec: Charge air stages	1	1	1	1	
L/H temp cooling system set points	75/87	75/87	75/87	75/87	° C
Maximum inlet depression	-5	-5	-5	-5	kPa
Maximum exhaust back pressure	15	15	15	15	kPa
Fuel specification	Acc. to EN590				
Fuel temperature	35	35	35	35	° C
Lubricating oil specification	Acc. to ACEA E3, E4, E5 or better, also see Operator's manual				

* Applies for keel-cooling engines

** Applies for heat exchanger cooled engines

Application / Intended for					
Customer	X	X	X	X	
Final application/installation: Ship					
Final application/installation: Engine	Aux C1	Main E3	Aux D2	Main E2	

Emission test results					
Cycle	C1	E3	D2	E2	
NOx	9,44	9,07	9,58	9,46	g/kWh
Test identification	69066152	69066151	69064463	69064463	
Date	03-10-17	03-10-17	05-03-17	05-03-17	
Test site: Scania Engine Lab, cell No.	F7	F7	F11	F11	
Test number	69066152	69066151	69064463	69064463	
Surveyor					
Date and place of report					
Signature					

3. Test reports for parent engines

Engine family information	
Combustion cycle	4 stroke
Cooling medium	50/50 Water/Glycol coolant
Cylinder configuration	In-line
Method of aspiration	Pressure charger, turbo charger
Fuel type to be used on board	Destillate
Combustion chamber	Open chamber
Valve port configuration	Cylinder head cross flow
Valve port number and size	2 inlet Ø 34,8 mm, 2 outlet Ø 35 mm
Fuel system type	Electronic unit injectors

Miscellaneous features	
Exhaust gas recirculation	No
Water injection/emulsion	No
Air injection	No
Charge cooling system	Yes, air-to-water charge air cooling
Exhaust after-treatment	No
Exhaust after-treatment type	No
Dual fuel	No



3. Test reports for parent engines

Test cell information	Test cell: F7	Tested running cycle: C1 E3	Date: 03-10-17 03-10-17
Exhaust pipe			
Diameter	mm	115	
Length	m	10	
Insulation		Yes, 8 m	
Probe location		1,5 m after turbo charger	
Remark			

Measurement equipment				Calibration	
Analyser	Manufacturer	Model	Measurement range	Span gas conc.	Deviation
NO _x analyser	Horiba	CLA-755A	500/5000	910 ppm	1%
CO analyser	Horiba	AIA-721A	5000	896 ppm	1%
CO ₂ analyser*	Horiba	AIA-722	15%	13,5 % by volume	1%
O ₂ analyser*	N/A	N/A	N/A	N/A	N/A
HC analyzer	Horiba	FIA-725A	500/5000	182,5/1820 ppmC	1%
Speed	Leine & Linde	8659 008994/2048	0 - 2979		±3 r/min
Torque	Hottinger	T10F	0 - 5 kN	0-3,6 om 600 Nm	8 Nm
Power, if appl.	N/A	N/A	N/A	N/A	N/A
Fuel flow	AVL	7131 - 18	0 - 200 kg/h	200 g	0,3 g
Air flow	Holset	4"	0 - 60 kg/min		2%
Temperatures					
Coolant	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Lubricant	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Exhaust gas	Pentronic	Termoelement Typ K	0 - 700 °C	600 °C	0,85 °C
Inlet air	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Intercooled air	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Fuel	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Pressures					
Exhaust gas	Druck	PMP4160	±35 kPa	0/35 kPa	0,5%
Inlet manifold	Kavlico	P657-2 D/E1A	±7 kPa	0/-3,5/-7 kPa	0,5%
Atmospheric	Newpoert	INF-1	500 - 1100 mbar	900-1100 mbar	1 mbar
Vapour pressure					
Intake air	N/A				
Humidity					
Intake air	Mitchell	DEWMET-TDH	-59 - +90 Cdp	-30 - +20 Cdp	0,4 Cdp

Note! The exhaust mass flow was calculated from fuel and air flow measurements according to MARPOL 73/78, Annex VI, NO_x Technical Code 5.5.2. Emission components marked with asterisk were not measured since these components are not necessary for further calculations.

Test fuel characteristics					
Fuel type	Diesel fuel acc to ISO 8217, ISO-F-DMA				
Properties					
Density	ISO 3675	835,1	kg/m ³		
Viscosity	ISO 3104:94/COR 1:97	2,61	mm ² /s		
Fuel elemental analysis and test methods					
Carbon	ASTM D 5292	86,52	% mass		
Hydrogen	PRR	13,47	% mass		
Nitrogen	ASTM D4629-96	0,003	% mass		
Oxygen	SS-EN 13132:2000	< 0,1	% mass		
Sulphur	ISO 8754:1992	0,0048	% mass		
Energy	SS 15 51 38:1992	42,94	MJ/kg		



3. Test reports for parent engines

Test cell information	Test cell: F11	Tested running cycle: D2 E2	Date: 05-03-17 05-03-17
Exhaust pipe			
Diameter	mm	115	
Length	m	10	
Insulation		Yes, 8 m	
Probe location		1,5 m after turbo charger	
Remark			

Measurement equipment				Calibration	
Analyser	Manufacturer	Model	Measurement range	Span gas conc.	Deviation
NO _x analyser	Horiba	CLA-755A	500/5000	910 ppm	1%
CO analyser	Horiba	AIA-721A	5000	896 ppm	1%
CO ₂ analyser*	Horiba	AIA-722	15%	13,5 % by volume	1%
O ₂ analyser*	N/A	N/A	N/A	N/A	N/A
HC analyzer	Horiba	FLA-725A	500/5000	182,5/1820 ppmC	1%
Speed	Leine & Linde	8659 00002/2048	0 - 2979		±3 r/min
Torque	Hottinger	T10F	0 - 5 kN	0-3,6 om 600 Nm	8 Nm
Power, if appl.	N/A	N/A	N/A	N/A	N/A
Fuel flow	AVL	7131 - 18	0 - 200 kg/h	200 g	0,3 g
Air flow	Holset	4"	0 - 60 kg/min		2%
Temperatures					
Coolant	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Lubricant	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Exhaust gas	Pentronic	Termoelement Typ K	0 - 700 °C	600 °C	0,85 °C
Inlet air	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Intercooled air	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Fuel	Pentronic	PT100	0 - 200 °C	0/150 °C	0,1/0,85 °C
Pressures					
Exhaust gas	Druck	PMP4160	±35 kPa	0/35 kPa	0,5%
Inlet manifold	Kavlico	P657-2 D/E1A	±7 kPa	0/-3,5/-7 kPa	0,5%
Atmospheric	Newpoert	INF-1	500 - 1100 mbar	900-1100 mbar	1 mbar
Vapour pressure					
Intake air	N/A				
Humidity					
Intake air	Mitchell	DEWMET-TDH	-59 - +90 Cdp	-30 - +20 Cdp	0,4 Cdp

Note! The exhaust mass flow was calculated from fuel and air flow measurements according to MARPOL 73/78, Annex VI, NO_x Technical Code 5.5.2. Emission components marked with asterisk were not measured since these components are not necessary for further calculations.

Test fuel characteristics					
Fuel type	Diesel fuel acc to ISO 8217, ISO-F-DMA				
Properties					
Density	ISO 3675	835,1	kg/m ³		
Viscosity	ISO 3104:94/COR 1:97	2,61	mm ² /s		
Fuel elemental analysis and test methods					
Carbon	ASTM D 5292	86,52	% mass		
Hydrogen	PRR	13,47	% mass		
Nitrogen	ASTM D4629-96	0,003	% mass		
Oxygen	SS-EN 13132:2000	< 0,1	% mass		
Sulphur	ISO 8754:1992	0,0048	% mass		
Energy	SS 15 51 38:1992	42,94	MJ/kg		

3. Test reports for parent engines

Emission test report for parent engine C1									
		1	2	3	4	5	6	7	8
Load factor	%	100	75	50	10	100	75	50	0
Engine speed	%	Full	Full	Full	Full	Interm	Interm	Interm	Idle
Time	s	360	360	360	360	360	360	360	360
Ambient data									
Barometric tendency	mbar	1019,3	1019,0	1019,0	1019,0	1018,8	1018,8	1018,7	1018,7
Intake air temperature	° C	27,5	23,6	28,0	23,2	26,9	26,5	24,1	27,3
Intake air humidity	g/kg	4,32	4,29	4,29	4,29	4,25	4,25	4,21	4,21
Atmospheric factor		0,987	0,968	0,990	0,966	0,985	0,983	0,971	0,987
Gaseous emissions data									
NOx concentration wet	ppm	1054,2	1093,6	1004,7	238,9	1457,6	1354,2	1136,8	170,4
CO concentration dry	ppm	45,9	41,0	48,9	156,8	303,7	238,4	141,3	154,2
CO2 concentration dry*	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
O2 concentration dry*	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HC concentration wet	ppm	92,1	115,8	139,0	158,5	45,1	67,2	112,1	168,2
NOx correction factor		0,91	0,92	0,90	0,90	0,93	0,92	0,92	0,88
Fuel specification factor		1,88	1,89	1,90	1,93	1,86	1,87	1,88	1,94
Dry/wet correction factor		0,93	0,94	0,95	0,98	0,91	0,92	0,94	0,99
NOx, mass flow	g/h	3714,0	3205,5	2301,7	381,3	3512,7	2705,9	1849,4	118,4
CO mass flow	g/h	100,1	74,9	71,6	166,2	437,9	289,6	142,9	74,0
CO2 mass flow*	kg/h	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
O2 mass flow*	kg/h	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HC mass flow	g/h	106,9	111,6	106,3	85,1	35,3	43,9	60,0	40,2
NOx specific	g/kWh	8,47	9,79	10,35	8,96	9,48	9,67	9,99	40,34
Engine data									
Engine speed	r/min	1800	1800	1800	1800	1400	1400	1400	650
Auxilliary power		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Brake torque	Nm	2339	1750	1185	227	2545	1918	1272	43
Engine power	kW	438,7	327,5	222,4	42,6	370,6	279,8	185,2	2,9
Mean effective pressure	bar	18,8	14,1	9,5	1,8	20,5	15,4	10,2	0,3
Fuel rack		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Specific fuel consumption	g/kWh	198,9	197,5	202,0	323,9	198,9	200,0	202,7	718,6
Fuel flow	g/min	1461,5	1086,2	752,3	230,9	1236,8	937,5	630,1	35,3
Air flow	kg/min	39,0	32,5	25,9	18,5	26,0	21,8	18,0	8,3
Exhaust flow	kg/h	2429	2017	1600	1123	1637	1366	1120	501
Exhaust temperature	° C	420	376	332	203	507	466	398	154
Exhaust back pressure	mbar	34,0	25,0	17,6	2,7	28,6	22,0	14,2	-0,1
Coolant temp., after engine	° C	78,0	77,4	76,9	75,6	78,2	76,8	76,0	72,6
Coolant temp., bef. engine	° C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Coolant pressure	bar	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5
Charge air pressure	bar	1,67	1,18	0,70	0,17	1,23	0,83	0,46	-0,01
Charge air temperature	° C	66,5	60,0	52,8	45,0	56,4	51,4	46,3	39,6
Charge air ref. temp.	° C	66,5	60,0	52,8	45,0	56,4	51,4	46,3	39,6
Lubricant temperature	° C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lubricant press., after filter	bar	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Inlet depression	mbar	-5,25	-3,92	-2,77	-1,62	-2,79	-2,20	-1,88	-1,04

Note! The exhaust mass flow was calculated from fuel and air flow measurements according to MARPOL 73/78, Annex VI, NOx Technical Code 5.5.2.

Emission components marked with asterisk were not measured since these components are not necessary for further calculations.



3. Test reports for parent engines

Emission test report for parent engine E3									
		1	2	3	4	5	6	7	8
Load factor	%	100	75	50	25				
Engine speed	%	100	91	80	63				
Time	s	360	360	360	360				
Ambient data									
Barometric tendency	mbar	1019,6	1019,6	1019,5	1019,5				
Intake air temperature	° C	23,7	28,4	23,5	27,0				
Intake air humidity	g/kg	4,32	4,32	4,33	4,33				
Atmospheric factor		0,968	0,992	0,968	0,985				
Gaseous emissions data									
NOx concentration wet	ppm	1049,4	1129,5	1185,2	1165,4				
CO concentration dry	ppm	44,2	71,1	148,9	76,8				
CO2 concentration dry*	%	N/A	N/A	N/A	N/A				
O2 concentration dry*	%	N/A	N/A	N/A	N/A				
HC concentration wet	ppm	92,8	97,5	112,4	122,6				
NOx correction factor		0,92	0,91	0,92	0,91				
Fuel specification factor		1,88	1,88	1,88	1,89				
Dry/wet correction factor		0,92	0,91	0,92	0,91				
NOx, mass flow	g/h	3745,2	2928,8	2131,0	1302,2				
CO mass flow	g/h	97,3	114,0	165,0	54,3				
CO2 mass flow*	kg/h	N/A	N/A	N/A	N/A				
O2 mass flow*	kg/h	N/A	N/A	N/A	N/A				
HC mass flow	g/h	108,6	83,2	66,3	45,4				
NOx specific	g/kWh	8,56	8,92	9,73	11,85				
Engine data									
Engine speed	r/min	1800	1638	1440	1135				
Auxilliary power		N/A	N/A	N/A	N/A				
Brake torque	Nm	2339	1923	1464	930				
Engine power	kW	437,4	328,3	219,1	109,8				
Mean effective pressure	bar	18,8	15,5	11,8	7,5				
Fuel rack		N/A	N/A	N/A	N/A				
Specific fuel consumption	g/kWh	198,3	199,5	201,7	204,4				
Fuel flow	g/min	1457,3	1096,6	742,3	376,5				
Air flow	kg/min	39,3	28,7	19,8	12,5				
Exhaust flow	kg/h	2447	1786	1233	775				
Exhaust temperature	° C	415	435	417	346				
Exhaust back pressure	mbar	34,5	25,7	16,9	7,9				
Coolant temp., after engine	° C	77,9	77,2	76,3	74,8				
Coolant temp., bef. engine	° C	N/A	N/A	N/A	N/A				
Coolant pressure	bar	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5				
Charge air pressure	bar	1,69	1,08	0,59	0,19				
Charge air temperature	° C	66,0	58,2	48,8	44,7				
Charge air ref. temp.	° C	66,0	58,2	48,8	44,7				
Lubricant temperature	° C	N/A	N/A	N/A	N/A				
Lubricant press., after filter	bar	N/A	N/A	N/A	N/A				
Inlet depression	mbar	-5,30	-3,05	-1,94	-1,26				

Note! The exhaust mass flow was calculated from fuel and air flow measurements according to MARPOL 73/78, Annex VI, NOx Technical Code 5.5.2.

Emission components marked with asterisk were not measured since these components are not necessary for further calculations.



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3. Test reports for parent engines

Emission test report for parent engine D2									
		1	2	3	4	5	6	7	8
Load factor	%	100	75	50	25	10			
Engine speed	%	Rated	Rated	Rated	Rated	Rated			
Time	s	239	152	122	120	134			
Ambient data									
Barometric tendency	mbar	991,4	991,5	991,5	991,5	991,5			
Intake air temperature	° C	26,2	25,5	24,5	24,6	24,8			
Intake air humidity	g/kg	4,08	4,05	4,05	4,05	4,05			
Atmospheric factor		1,000	0,997	0,992	0,992	0,993			
Gaseous emissions data									
NOx concentration wet	ppm	1407,6	1331,2	1190,2	835,5	375,0			
CO concentration dry	ppm	169,9	95,8	87,0	77,4	167,3			
CO2 concentration dry*	%	N/A	N/A	N/A	N/A	N/A			
O2 concentration dry*	%	N/A	N/A	N/A	N/A	N/A			
HC concentration wet	ppm	49,2	79,1	116,3	126,7	160,0			
NOx correction factor		0,92	0,92	0,91	0,90	0,89			
Fuel specification factor		1,86	1,87	1,88	1,90	1,93			
Dry/wet correction factor		0,91	0,92	0,93	0,95	0,98			
NOx, mass flow	g/h	4167,5	3143,4	2172,3	1144,4	456,8			
CO mass flow	g/h	303,0	138,1	98,4	68,1	135,9			
CO2 mass flow*	kg/h	N/A	N/A	N/A	N/A	N/A			
O2 mass flow*	kg/h	N/A	N/A	N/A	N/A	N/A			
HC mass flow	g/h	47,5	61,2	69,9	57,9	66,0			
NOx specific	g/kWh	9,32	9,39	9,74	10,30	10,51			
Engine data									
Engine speed	r/min	1500	1501	1500	1500	1500			
Auxilliary power		N/A	N/A	N/A	N/A	N/A			
Brake torque	Nm	2857	2140	1426	709	278			
Engine power	kW	447,2	334,8	223,1	111,1	43,5			
Mean effective pressure	bar	23	17,2	11,5	5,7	2,2			
Fuel rack		N/A	N/A	N/A	N/A	N/A			
Specific fuel consumption	g/kWh	198,2	194,9	201,9	212,7	257,1			
Fuel flow	g/min	1483,0	1092,9	753,9	395,0	187,3			
Air flow	kg/min	32	25,9	20,2	15,5	14,2			
Exhaust flow	kg/h	2019	1619	1258	956	862			
Exhaust temperature	° C	498	472	425	321	229			
Exhaust back pressure	mbar	22,9	13,4	5,1	-0,7	-2,8			
Coolant temp., after engine	° C	77,2	76,1	75,6	75,6	75,1			
Coolant temp., bef. engine	° C	48,5	47,9	43,4	34,9	32,4			
Coolant pressure	bar	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5			
Charge air pressure	bar	1,61	1,10	0,62	0,21	0,06			
Charge air temperature	° C	71,2	66,9	61,7	62,3	61,5			
Charge air ref. temp.	° C	71,2	66,9	61,7	62,3	61,5			
Lubricant temperature	° C	91,9	93,3	92,8	90,9	87,9			
Lubricant press., after filter	bar	4,69	4,66	4,66	4,71	4,79			
Inlet depression	mbar	-2,32	-1,27	-0,48	-0,02	-0,01			

Note! The exhaust mass flow was calculated from fuel and air flow measurements according to MARPOL 73/78, Annex VI, NOx Technical Code 5.5.2.

Emission components marked with asterisk were not measured since these components are not necessary for further calculations.



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3. Test reports for parent engines

Emission test report for parent engine E2									
		1	2	3	4	5	6	7	8
Load factor	%	100	75	50	25				
Engine speed	%	Rated	Rated	Rated	Rated				
Time	s	239	152	122	120				
Ambient data									
Barometric tendency	mbar	991,4	991,5	991,5	991,5				
Intake air temperature	° C	26,2	25,5	24,5	24,6				
Intake air humidity	g/kg	4,08	4,05	4,05	4,05				
Atmospheric factor		1,000	0,997	0,992	0,992				
Gaseous emissions data									
NOx concentration wet	ppm	1407,6	1331,2	1190,2	835,5				
CO concentration dry	ppm	169,9	95,8	87,0	77,4				
CO2 concentration dry*	%	N/A	N/A	N/A	N/A				
O2 concentration dry*	%	N/A	N/A	N/A	N/A				
HC concentration wet	ppm	49,2	79,1	116,3	126,7				
NOx correction factor		0,92	0,92	0,91	0,90				
Fuel specification factor		1,86	1,87	1,88	1,90				
Dry/wet correction factor		0,91	0,92	0,93	0,95				
NOx, mass flow	g/h	4167,5	3143,4	2172,3	1144,4				
CO mass flow	g/h	303,0	138,1	98,4	68,1				
CO2 mass flow*	kg/h	N/A	N/A	N/A	N/A				
O2 mass flow*	kg/h	N/A	N/A	N/A	N/A				
HC mass flow	g/h	47,5	61,2	69,9	57,9				
NOx specific	g/kWh	9,32	9,39	9,74	10,30				
Engine data									
Engine speed	r/min	1500	1501	1500	1500				
Auxilliary power		N/A	N/A	N/A	N/A				
Brake torque	Nm	2857	2140	1426	709				
Engine power	kW	447,2	334,8	223,1	111,1				
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Coolant temp., after engine	° C	77,2	76,1	75,6	75,6				
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Coolant pressure	bar	Max. 0,5	Max. 0,5	Max. 0,5	Max. 0,5				
Charge air pressure	bar	1,61	1,10	0,62	0,21				
Charge air temperature	° C	71,2	66,9	61,7	62,3				
Charge air ref. temp.	° C	71,2	66,9	61,7	62,3				
Lubricant temperature	° C	91,9	93,3	92,8	90,9				
Lubricant press., after filter	bar	4,69	4,66	4,66	4,71				
Inlet depression	mbar	-2,32	-1,27	-0,48	-0,02				

Note! The exhaust mass flow was calculated from fuel and air flow measurements according to MARPOL 73/78, Annex VI, NOx Technical Code 5.5.2.

Emission components marked with asterisk were not measured since these components are not necessary for further calculations.



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