INTERNATIONAL MARITIME ORGANIZATION (IMO)

Technical File

and

Copy of United States

Environmental Protection Agency

(EPA) Statement of Compliance

MARINE DIESEL ENGINES

Base Engine MR704L

Mercury Diesel Models:

2.8L 220

IMPORTANT: To comply with regulations, this document must remain with the engine at all times.

56593

VM Motori Technical File

Engine Family: 7V5XM02.8K6A

Page 1

IMO TECHNICAL FILE
ENGINE FAMILY: 7V5XM02.8K6A
ENGINE MODELS: MR704LX/MR704L 230, MR704LH/MR704L 210, MR704LS/MR704L 170, MR704LY/MR704L 220

1. Components, settings and operating values of the engine which influence its NO_x emissions

Components:
Injector
Turbocharger
Charge Air Cooler
Electronic Control Module

Settings:
Injection timing
Injection duration
Injection pressure
Status of turbocharging

Engine operating values:
Please refer to individual engine specifications

2. Full range of allowable adjustments or alternatives for the components of the engine

Adjustments:
No adjustments are allowed to the emission relevant settings.

Alternatives for the components:
Use only those component part numbers specified on the part number summary or equivalent as specified by FIAT Group Automobiles S.p.A. at the time of rebuild or repair.

3. Full record of the engine performance, including rated speed and rated power

Please see Appendix A.

4. On-Board NOx verification procedures

To complete an engine parameter check, the following items must be verified by the surveyor:
a. parameter "injection timing" and "fueling rate calibration"
confirm calibration by connecting the appropriate diagnostic device to the ECM
b. parameter "injection nozzle"
verify injector part number
c. parameter "turbocharger type and build"
verify turbocharger part number
d. parameter "charge air cooler"
verify charge air cooler part number
e. parameter "valve lash"
verify valve lash settings per service manual procedure

5. Copy of the Parent Engine Test Report

Please see Appendix B.

VM MOTORI S.p.A.

56599

IMO TECHNICAL FILE
ENGINE FAMILY: 7V5XM02.8K6A
ENGINE MODELS: MR704LX/MR704L 230, MR704LH/MR704L 210, MR704LS/MR704L 170, MR704LY/MR704L 220

6. Designation and restrictions for an engine which is a member of an engine group or engine family

Designation: These engines are for use in recreational marine propulsion applications only.
Restriction: Must be installed in accordance with FIAT Group Automobiles Pilot Installation Description (PID) and Sea Trial Requirements.

7. Specifications of spare parts/components which, when used in the engine, according to those specifications, will result in continued compliance of the engine with the NOx emission limits

Identification numbers which should be checked within the scope of the On-Board NO_x verification procedures (section 4) are shown below.

No. of Cyl.	Engine Code	Engine Rating (kW @ rpm)	Component Type	Identification number
4	65C	169 @ 3800 [MR704LX/ MR704L 230]	Injection Pump Injector Turbocharger Charge Air Cooler Electronic Control Module Speed Sensor Phase Sensor Coolant Temperature Sensor Fuel Temperature Sensor Air Pressure Sensor Air Temperature Sensor	35022103F 15062054F 35242182F 31212011H 43002034F 45962057F 45962070F 45962053F 45962084F 45962066F 45962066F
4	68C	155 @ 3800 [MR704LH/ MR704L 210]	Same as engine code 65C	Same as engine code 65C
4	69C	125 @ 3800 [MR704LS/ MR704L 170]	Same as engine code 65C	Same as engine code 65C
4	01D	162 @ 3800 [MR704LY/ MR704L 220]	Turbocharger Same as engine code 65C	35242181F Same as engine code 65C

8. EIAPP Certificate/Statement of Voluntary Compliance (as applicable)

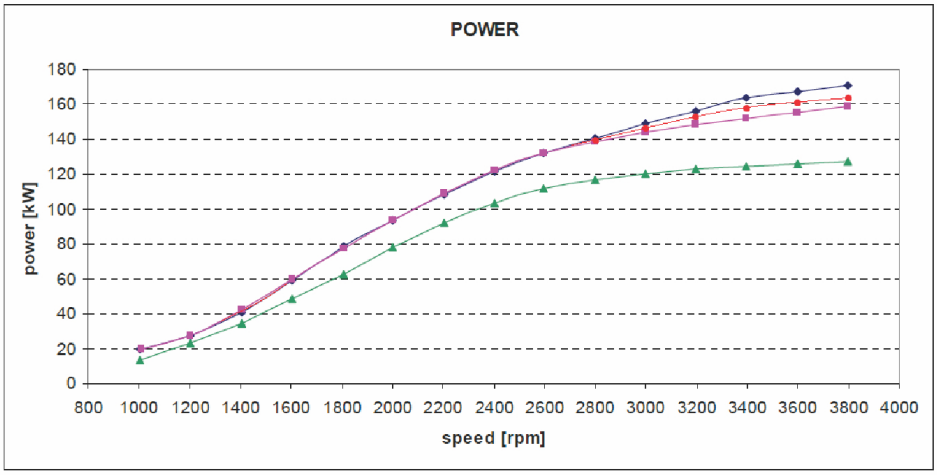
Please see Appendix C.

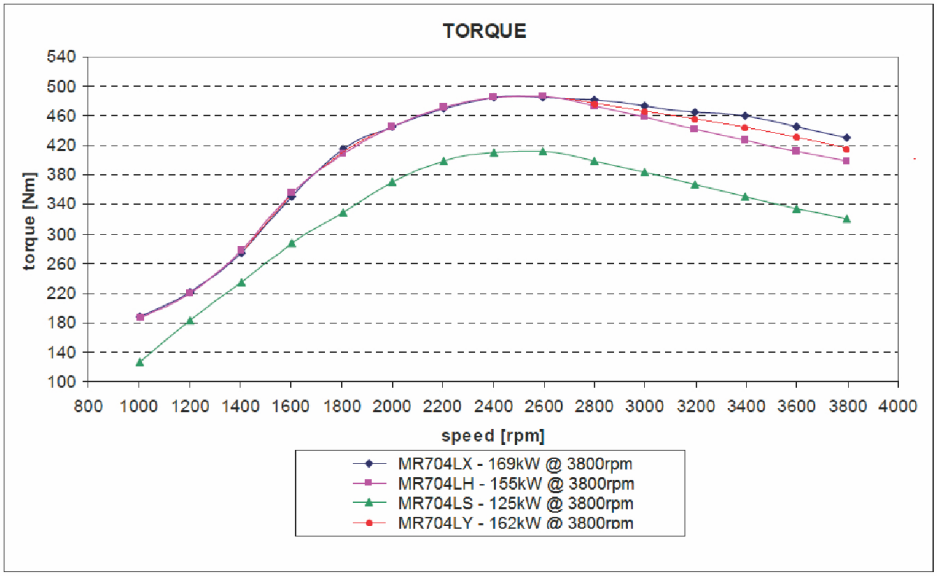
VM MOTORI S.p.A.

56600

IMO TECHNICAL FILE
ENGINE FAMILY: 7V5XM02.8K6A
ENGINE MODELS: MR704LX/MR704L 230, MR704LH/MR704L 210, MR704LS/MR704L 170, MR704LY/MR704L 220

APPENDIX A
Power and Torque Curves





VM MOTORI S.p.A.

56601

IMO TECHNICAL FILE
ENGINE FAMILY: 7V5XM02.8K6A
ENGINE MODELS: MR704LX/MR704L 230, MR704LH/MR704L 210, MR704LS/MR704L 170, MR704LY/MR704L 220

APPENDIX B
Parent Engine Test Report

Engine:

Manufacturer	FIAT Group Automobiles S.p.A.
Engine type	MR704LX/MR704L 230
Family or group identification	7V5XM02.8K6A
Serial number	01P-02905
Rated speed	3800 RPM
Rated power	169 kW
Intermediate speed	N/A
Maximum torque at intermediate speed	N/A
Static injection timing	N/A
Electronic injection control	No: yes: X
Variable injection timing	No: yes: X
Variable turbocharger geometry	No: X yes:
Bore	94.1 mm (3.705 in)
Stroke	100.1 mm (3.941 in)
Nominal compression ratio	17.5: 1
Cylinder number and configuration	Number: 4 V: In-line: X
Auxiliaries	N/A

Specified ambient conditions:

Maximum seawater temperature	38 °C (100°F)
Maximum charge air temperature, if applicable	Engine air not to exceed air temperature outside engine compartment by more than 17°C (63 °F).
Cooling system spec. intermediate cooler	Operating temperature range 80°- 85° C (176-185 ° F)
Cooling system spec. charge air stages	Same temperature of incoming sea water
Low/high temperature Cooling system set points	Thermostat fully closed 65°C (149 °F), fully open @ 84°C (183 °F)
Maximum inlet depression	-30 mbar
Maximum exhaust backpressure	150 mbar
Fuel specification	Grade 2-D diesel fuel
Fuel temperature	Minimum -5°C (23 °F), Maximum 50°C (122 °F) at fuel filter
Lubricating oil specification	SAE 10W - 40

Application/Intended for:

Customer	Pleasure craft (planing hull)
Final application/installation, ship	N/A
Final application/installation, engine	Main: X Aux:

Emissions test results:

Cycle	ISO 8178-4 E3
NO_x (g/KW-hr)	4.5
Date(s)	08/01/2006
Test number(s)	14EE4500

VM MOTORI S.p.A.

56602

IMO TECHNICAL FILE
ENGINE FAMILY: 7V5XM02.8K6A
ENGINE MODELS: MR704LX/MR704L 230, MR704LH/MR704L 210, MR704LS/MR704L 170, MR704LY/MR704L 220

APPENDIX B
Parent Engine Test Report

Engine:

Manufacturer	FIAT Group Automobiles S.p.A.
Engine type	MR704LX/MR704L 230
Family or group identification	7V5XM02.8K6A
Serial number	01P-02905
Rated speed	3800 RPM
Rated power	169 kW
Intermediate speed	N/A
Maximum torque at intermediate speed	N/A
Static injection timing	N/A
Electronic injection control	No: yes: X
Variable injection timing	No: yes: X
Variable turbocharger geometry	No: X yes:
Bore	94.1 mm (3.705 in)
Stroke	100.1 mm (3.941 in)
Nominal compression ratio	17.5: 1
Cylinder number and configuration	Number: 4 V: In-line: X
Auxiliaries	N/A

Specified ambient conditions:

Maximum seawater temperature	38 °C (100°F)
Maximum charge air temperature, if applicable	Engine air not to exceed air temperature outside engine compartment by more than 17°C (63 °F).
Cooling system spec. intermediate cooler	Operating temperature range 80°- 85° C (176-185 ° F)
Cooling system spec. charge air stages	Same temperature of incoming sea water
Low/high temperature Cooling system set points	Thermostat fully closed 65°C (149 °F), fully open @ 84°C (183 °F)
Maximum inlet depression	-30 mbar
Maximum exhaust backpressure	150 mbar
Fuel specification	Grade 2-D diesel fuel
Fuel temperature	Minimum -5°C (23 °F), Maximum 50°C (122 °F) at fuel filter
Lubricating oil specification	SAE 10W - 40

Application/Intended for:

Customer	Pleasure craft (planing hull)
Final application/installation, ship	N/A
Final application/installation, engine	Main: X Aux:

Emissions test results:

Cycle	ISO 8178-4 E3
NO_x (g/KW-hr)	4.5
Date(s)	08/01/2006
Test number(s)	14EE4500

VM MOTORI S.p.A.

56603

IMO TECHNICAL FILE
ENGINE FAMILY: 7V5XM02.8K6A
ENGINE MODELS: MR704LX/MR704L 230, MR704LH/MR704L 210, MR704LS/MR704L 170, MR704LY/MR704L 220

Engine family information/Group information (common specifications)	
Combustion cycle	Four stroke
Cooling medium	Water - Water
Cylinder configuration	In line
Method of aspiration	Turbocharged with Intercooler
Fuel type to be used on board	Grade 2D diesel fuel
Combustion chamber	Ref.VM 10252096G (complete)
Valve port configuration	2 valve per cylinder (1 exh – 1 inlet)
Valve port size and number	Ø 37.8 mm (inlet) – Ø 35 mm (exh.)
Fuel system type	Common Rail

Miscellaneous features:	
Exhaust gas recirculation	N/A
Water injection/emulsion	N/A
Air injection	N/A
Charge cooling system	Yes
Exhaust after-treatment	N/A
Exhaust after-treatment type	N/A
Dual fuel	N/A

Engine family/group information (selection of parent engine for test-bed test)			
Family/group identification	7V5XM02.8K6A		
Method of pressure charging	Turbocharger + Intercooler		
Charge air cooling system	Air / Water		
Criteria of the selection (specify)	Highest NOx emission		
Engine Model	MR704LX/ MR704L 230	MR704LH/ MR704L 210	MR704LS/ MR704L 170
Number of cylinders	4	4	4
Max. rated power per cylinder (kW)	42.25	38.75	31.25
Rated speed	3800	3800	3800
Injection timing (range)			
Max. fuel parent engine	53 liters per hour at 3800 rpm		
Selected parent engine	MR704LX/MR704L 230		
Application	Main Engine Pleasure Craft		

VM MOTORI S.p.A.

56604

IMO TECHNICAL FILE
ENGINE FAMILY: 7V5XM02.8K6A
ENGINE MODELS: MR704LX/MR704L 230, MR704LH/MR704L 210, MR704LS/MR704L 170, MR704LY/MR704L 220

Test Cell Information:

Exhaust pipe	
Diameter	7.62 cm (3 in.) ID dry exhaust and 10.16 cm (4 in.) OD of water jacketed exhaust
Length	Determined by the boat builder
Insulation	Water jacketed up to the exhaust elbow
Probe location	Exhaust elbow

Measurement equipment					
	Manufacturer	Model	Measurement ranges	Calibration	
				Span gas conc.	Deviation
Analyzer					
NO_x analyzer	Horiba	CLA 220	1	29 ppm	2 %
			2	97.8 ppm	2 %
			3	291 ppm	2 %
			4	980 ppm	2 %
			5	2880 ppm	2 %
CO analyzer	Horiba	AIA 220	1	0.1%	2 %
			2	0.5%	2 %
			3	1.0%	2 %
			4	3.0%	2 %
CO_2 analyzer	Horiba	AIA 220	1	0.9%	2 %
			2	4.30%	2 %
			3	9.1%	2 %
			4	18.0%	2 %
O_2 analyzer	Horiba	MPA 220	1	4.49%	2 %
			2	8.90%	2 %
			3	22.40%	2 %
HC analyzer	Horiba	FMA 236	1	9.1 ppm	2 %
			2	279 ppm.	2 %
			3	90.6 ppm	2 %
			4	267.8 ppm	2 %
Speed	Digalog	-	100-10,000 min^{-1}		1 min^{-1} per 10,000
Torque	Omega	-	0-1356 Nm		±1.4 Nm
Fuel flow	AVL	Mod. 730	0-40 lbs.min.		Flow: ±.10% Density: ±.0005 %

Temperatures					
Temperature	Omega	E-type	0-1000 °C		± 1 °C

Pressures					
Pressure	Sensotec	Type A-5	-103-689 kPa		± 0.689 kPa

Humidity					
Intake air	Transmicor	-	5-98 %		± 1 %

VM MOTORI S.p.A.

56605

IMO TECHNICAL FILE
ENGINE FAMILY: 7V5XM02.8K6A
ENGINE MODELS: MR704LX/MR704L 230, MR704LH/MR704L 210, MR704LS/MR704L 170, MR704LY/MR704L 220

Engine Test Data (test # 14EE4500)

Mode		1	2	3	4
Power/Torque	%	100	75	50	25
Speed	%	100	91	80	63
Engine Data					
Speed	rpm	3800	3450	3030	2395
Auxiliary power	kW	-	-	-	-
Dynamometer setting	kW	-	-	-	-
Power	kW	167.1	125.9	84.1	42.0
Fuel rack	mm^3/H	-	-	-	-
Specific fuel consumption	g/kWh	252.7			
Fuel flow	kg/h	43.6	31.4	20.9	10.8
Air flow (wet)	kg/h	867	741	599	314
Exhaust flow (gexhw)	kg/h	910	772	620	324
Exhaust temperature	°C	546	440	376	382
Exhaust back pressure	mbar	125	81	47	12
Cylinder Coolant temperature out	°C	82	82	81	80
Cylinder Coolant temperature in	°C	24	24	23	23
Cylinder Coolant pressure	bar	-	-	-	-
Temperature intercooled air	°C	68	63	57	42
Lubricant temperature in (oil sump)	°C	115	106	101	98
Lubricant pressure	bar	5.2	5.3	5.4	5.2
Charge air pressure (abs.)	bar	3.1	2.9	2.5	1.6
Inlet depression	mbar	-17	-14	-9	-2

VM MOTORI S.p.A.

56610

IMO TECHNICAL FILE
ENGINE FAMILY: 7V5XM02.8K6A
ENGINE MODELS: MR704LX/MR704L 230, MR704LH/MR704L 210, MR704LS/MR704L 170, MR704LY/MR704L 220

APPENDIX C

Please see attached EIAPP or Statement of Voluntary Compliance (as applicable).

VM MOTORI S.p.A.

56611

EPA Certificate Number: V5X-IMO-07-02.1

CERTIFICATE OF CONFORMITY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

2007 Model Year Certificate of Conformity

Manufacturer:	**VM MOTORI SPA**
Marine Diesel Engine Family:	**7V5XM02.8K6R**
Certificate Number:	**V5X-MCI-07-02**
THC+NOx FEL:	**N/A**
PM FEL:	**N/A**
Date Issued:	DEC 1 8 2006

Kaji J. Simon, Acting Director
Compliance and Innovative Strategies Division
Office of Transportation and Air Quality

Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547) and 40 CFR 94, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following marine engines, by engine family, more fully described in the documentation required by 40 CFR Part 94 and produced in the stated model year. This certificate of conformity covers only those new marine compression-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 94 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 94. This certificate of conformity does not cover marine engines imported prior to the effective date of the certificate.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 94.215 and 94.504 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 94. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void ab initio for other reasons specified in 40 CFR Part 94.

This certificate does not cover marine engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

VM MOTORI S.p.A.

56613

ENGINE INTERNATIONAL AIR POLLUTION PREVENTION CERTIFICATE

Page 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF TRANSPORTATION AND AIR QUALITY
ENGINE INTERNATIONAL AIR POLLUTION PREVENTION
CERTIFICATE

Manufacturer:	**VM MOTORI SPA**
Engine Family:	**7V5XM02.8K6A**
Certificate Number:	**V5X-IMO-07-02.1**
Date Issued:	**5/7/2009**

Karl J. Simon, Director
Compliance and Innovative Strategies Division
Office of Transportation and Air Quality

This is to certify that the manufacturer of the above mentioned marine diesel engine has provided information to the U.S. Environmental Protection Agency that demonstrates:

1. this engine has been tested in accordance with the requirements of the Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines Engines, and,
2. 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 to MARPOL 73/78

This certificate is valid for the life of the engine subject to surveys in accordance with regulation 5 of Annex VI to MARPOL 73/78, installed in ships under the authority of this Government.

Issued at U.S. Environmental Protection Agency, Office of Transportation and Air Quality, Washington, DC

56596

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF TRANSPORTATION AND AIR QUALITY
ENGINE INTERNATIONAL AIR POLLUTION PREVENTION CERTIFICATE

Page 2

This is to certify that this record is correct in all respects. Issued at U.S. Environmental Protection Agency, Office of Transportation and Air Quality Washington, DC

Karl J. Simon, Director
Compliance and Innovative Strategies Division
Office of Transportation and Air Quality

1. Particulars of the engine

1.1 Name & address of manufacter:
VM Motori S.p.A., R&D Department
VIA Ferrarese 29
Cento (FE) Italy 44042

1.2 Place of engine build:
VM Motori S.p.A., R&D Department
VIA Ferrarese 29
Cento (FE) Italy 44042

1.3 Date of engine build:
5/15/2008

1.4 Place of pre-certification survey:
VM Motori S.p.A., R&D Department
VIA Ferrarese 29
Cento (FE) Italy 44042

1.5 Date of pre-certification survey:
7/15/2008

1.6 Engine family:
7V5XM02.8K6A

1.7 Models:
MR704LX/MR704L 230
MR704LH/MR704L 210
MR704LS/MR704L 170
MR704LY/MR704L 220

1.8 Test cycle:
E3 General cycle (propulsion engine, fixed-pitch prop)

1.9 Rated Power(kW) & Speed(RPM):
162 **3800**

1.10 Engine certificate number:
V5X-IMO-07-02.1

1.11 Test fuel:
Distillate Diesel [ISO 8217, DM-Grade]

1.12 NOx reducing device?:
No

1.13 Applicable NOx Emission Limit(g/kW-hr):
9.8

1.14 Engine NOx Emission Value(g/kW-hr):
6.3

2 Particulars of the Technical File:

2.1 Technical File number:
14EE5135

2.2 NOx verification number:
See Technical File

56609

Products of Mercury Marine
W6250 Pioneer Road
Fond du Lac, WI 54936-1939