



MTU

DIESEL ENGINE

DOCUMENTATION FOR ENGINE INTERNATIONAL AIR POLLUTION PREVENTION CERTIFICATE* (EIAPP - CERTIFICATE*)

* This EIAPP-Certificate may be only of interim status until the Protocol's entry into force.

ACCORDING TO THE
**INTERNATIONAL CONVENTION
FOR THE
PREVENTION OF POLLUTION FROM SHIPS, 1973,
as modified by the Protocol of 1978 related thereto**

IMPORTANT INFORMATION !!

To the Manufacturer of the Vessel:

This Technical File is a very important document. Pursuant to Resolution 2.3.6 of the NO_x Technical Code contained in Marpol 73/78 Annex VI, this Technical File is required to accompany the engine installed on this Vessel throughout the engines life.

To the Owner of the Vessel:

It is very important that this Technical File be kept in a safe place that is easily accessible on board the vessel in which this engine is installed.

You or a member of your crew may be required to produce this Technical File, without previous notice, upon demand at any time the vessel enters a domestic or international port.

IMPORTANT INFORMATION FOR EMISSION-CERTIFIED ENGINES

**To the Owner of the Vessel,
To all Personnel Working on the Engine:**

For emission certification in compliance with the INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS, 1973, as modified by the Protocol of 1978 related thereto (MARPOL 73/78), it is very important to pay attention to the following statements:

- *The engine is only compliant with the above-mentioned emission legislation if it is outfitted and adjusted according to the Technical File included in this documentation.*
- *Any alteration to the emission-relevant settings of the engine control unit or the governor which are not in accordance with the specifications of the Technical File included in this documentation can lead to a withdrawal of the certificate for the engine.*
- *Any replacement of the emission-relevant components of this engine with emission-relevant components which are not in compliance with the specifications of the Technical File can lead to a withdrawal of the certificate for the engine.*

Therefore it is very important to ensure that every emission-relevant component that is installed on this engine is licensed.

Check this licensing by comparing the identification numbers of the emission-relevant components listed in Section 7 of the Technical File included in this documentation with the numbers of the components installed on the engine.

If a component part is not listed in the Technical File it is nevertheless possible that it is in compliance with the emission legislation but is not included in the Technical File owing to recent product improvements. For such cases, approved forms are available which must be added to the Technical File.

In this case, check for compliance by contacting the manufacturer of the engine at the following address:

MTU Friedrichshafen GmbH
Spare-Parts Center, Global
Maybachplatz 1
88045 Friedrichshafen, Germany
Phone: +49 7541 908 542
Fax: +49 7541 908 102





Bundesrepublik Deutschland
Federal Republic of Germany

**INTERNATIONALES MOTORENZEUGNIS
ÜBER DIE VERHÜTUNG DER LUFTVERUNREINIGUNG**

Engine International Air Pollution Prevention Certificate

Ausgestellt nach dem Protokoll von 1997 in seiner durch die Entschlieung MEPC.176(58)
aus 2008 genderten Fassung, zu dem
**INTERNATIONALEN ÜBEREINKOMMEN VON 1973 ZUR VERHÜTUNG DER MEERESVERSCHMUTZUNG
DURCH SCHIFFE**
in der Fassung des Protokolls von 1978 zu diesem Übereinkommen (im Folgenden als „Übereinkommen“ bezeichnet)

im Namen der Regierung der

BUNDESREPUBLIK DEUTSCHLAND
durch die Berufsgenossenschaft für Transport und Verkehrswirtschaft

*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 by the Protocol of 1978 related thereto (hereinafter referred to as "the Convention")*

under the authority of the Government of the

FEDERAL REPUBLIC OF GERMANY
by Berufsgenossenschaft für Transport und Verkehrswirtschaft

Motoren-hersteller <i>Engine manufacturer</i>	Modell- bezeichnung <i>Model number</i>	Serien- nummer <i>Serial number</i>	Prüfzyklus (Prüf- zyklen) Test cycle(s)	Nennleistung (kW) und Drehzahl (min-1) Rated Power (kW) and speed (RPM)	Motor- Zulassungs- nummer Engine appro- val number
MTU Friedrichshafen GmbH	12V4000P83	526105173	D 2 / E 2	1680 @ 1800	14048-10 HH

Hiermit wird bescheinigt, dass
This is to certify,

1. der oben genannte Schiffsdieselmotor einer Vor-Zertifizierungsuntersuchung nach den in Anlage VI des Übereinkommens verbindlichen Bestimmungen der überarbeiteten Technischen Vorschrift über die Kontrolle der Stickstoffoxid-Emissionen von Schiffsdieselmotoren (2008) unterzogen worden ist und
that the above-mentioned marine diesel engine has been surveyed for pre-certification in accordance with the requirements of the Revised Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines(2008) made mandatory by Annex VI of the Convention; and

2. die Vor-Zertifizierungsuntersuchung ergeben hat, dass der Motor, seine Komponenten, seine einstellbaren Merkmale und seine technische NO_x Akte vor dem Einbau und/oder Betrieb des Motors an Bord eines Schiffes in allen Punkten der einschlägigen Regel 13 der Anlage VI des Übereinkommens entsprechen.
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.

Dieses Zeugnis ist vorbehaltlich der Besichtigungen nach Regel 5 der Anlage VI des Übereinkommens für die gesamte Lebensdauer des Motors auf Schiffen gültig, die in den Zuständigkeitsbereich der obengenannten Regierung fallen.

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.

Ausgestellt in:
Issued at:

Hamburg
(Ort der Ausstellung)
(Place of issue of certificate)

am
the

23.09.2010
(Datum der Ausstellung)
(Date of issue)



**BERUFGENOSSENSCHAFT FÜR TRANSPORT
UND VERKEHRSWIRTSCHAFT**
- Dienststelle Schiffssicherheit -

(Unterschrift)
(Signature)

VERZEICHNIS ÜBER BAUART, TECHNISCHEM NO., AKTE UND VERIFIKATIONSVERFAHREN
RECORD OF CONSTRUCTION, TECHNICAL FILE AND MEANS OF VERIFICATION

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 verification refer to mandatory requirements from the Revised NO_x Technical Code (2008).

Particulars of the engine

1.9.3 Prüfzyklus (-zyklen) D 2 / E 2
Test cycle (s)

1.9.4 Spezifikation des Prüfkraftstoffs des Stamm-Motors/ der Stamm-Motoren **ISO-F-DMA**
Parent Engine(s) test fuel oil specification

1.9.5 Anwendbarer NO_x-Grenzwert (g/kWh) **10,0 / 10,0**
Applicable Nox emission limit (g/kWh)

1.9.6 Emissionswert (g/kWh) des Stamm-Motors / der Stamm-Motoren **8,4 / 8,6**
Parent Engine(s) emission value (g/kWh)

2. Angaben zur technischen NO_x Akte
Particulars of Technical File

Die nach Kapitel 2 der Technischen NO_x Vorschrift vorgeschriebene technische NO_x Akte ist ein wesentlicher Teil des EIAPP-Zeugnisses und muss den Motor während seiner gesamten Betriebsdauer begleiten und jederzeit an Bord des Schiffes verfügbar sein.

The Technical File, as required by chapter 2 of the NO_x Technical Code, 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 Kenn- und Zulassungsnummer der technischen NO_x Akte **14048-10 HH**
Technical File identification/approval number

2.2 Zulassungsdatum der technischen NO_x Akte **15.09.2010**
Technical File approval date

3. Spezifikationen für die bordseitigen NO_x-Verifikationsverfahren
Specification for the onboard NO_x verification procedures

Die nach Kapitel 6 der Technischen NO_x Vorschrift vorgeschriebenen Spezifikationen für die bordseitigen NO_x –Verifikationsverfahren sind ein wesentlicher Teil des EIAPP-Zeugnisses und sie müssen den Motor während seiner gesamten Betriebsdauer begleiten und jederzeit an Bord des Schiffes verfügbar sein.

The Specifications for the onboard NO_x verification procedures, as required by chapter 6 of the NO_x Technical Code, are an essential part of the EIAPP Certificate and must always accompany an engine throughout its life and always be available on board a ship.

3.1 Motorparameter Kontrollverfahren:
Engine Parameter Check Method:

3.1.1 Kenn-/Zulassungsnummer: **14048-10 HH**
Identification/approval number

3.1.2 Zulassungsdatum: **15.09.2010**
Approval date

3.2 Verfahren der unmittelbaren Messung und Überwachung:
Direct Measurement and Monitoring method:

3.2.1 Kenn-/Zulassungsnummer: **--**
Identification/approval number

3.2.2 Zulassungsdatum: _____ --
Approval date

Alternativ kann das Verfahren der vereinfachten Messung nach Punkt 6.3 der Technischen NO_x-Vorschrift angewendet werden.

Alternatively the Simplified Measurement method in accordance with 6.3 of the NO_x technical Code may be utilized

Ausgestellt in: _____ **Hamburg** _____
Issued at: (Ort der Ausstellung)
(Place of issue of certificate)

am _____ **23.09.2010** _____
the (Datum der Ausstellung)
(Date of issue)



**BERUFGENOSSENSCHAFT FÜR TRANSPORT
UND VERKEHRSWIRTSCHAFT**
- Dienststelle Schiffssicherheit -

(Unterschrift)
(Signature)

Original intended for the Ship Owner

of

***Engine International Air Pollution
Prevention Certificate***

and

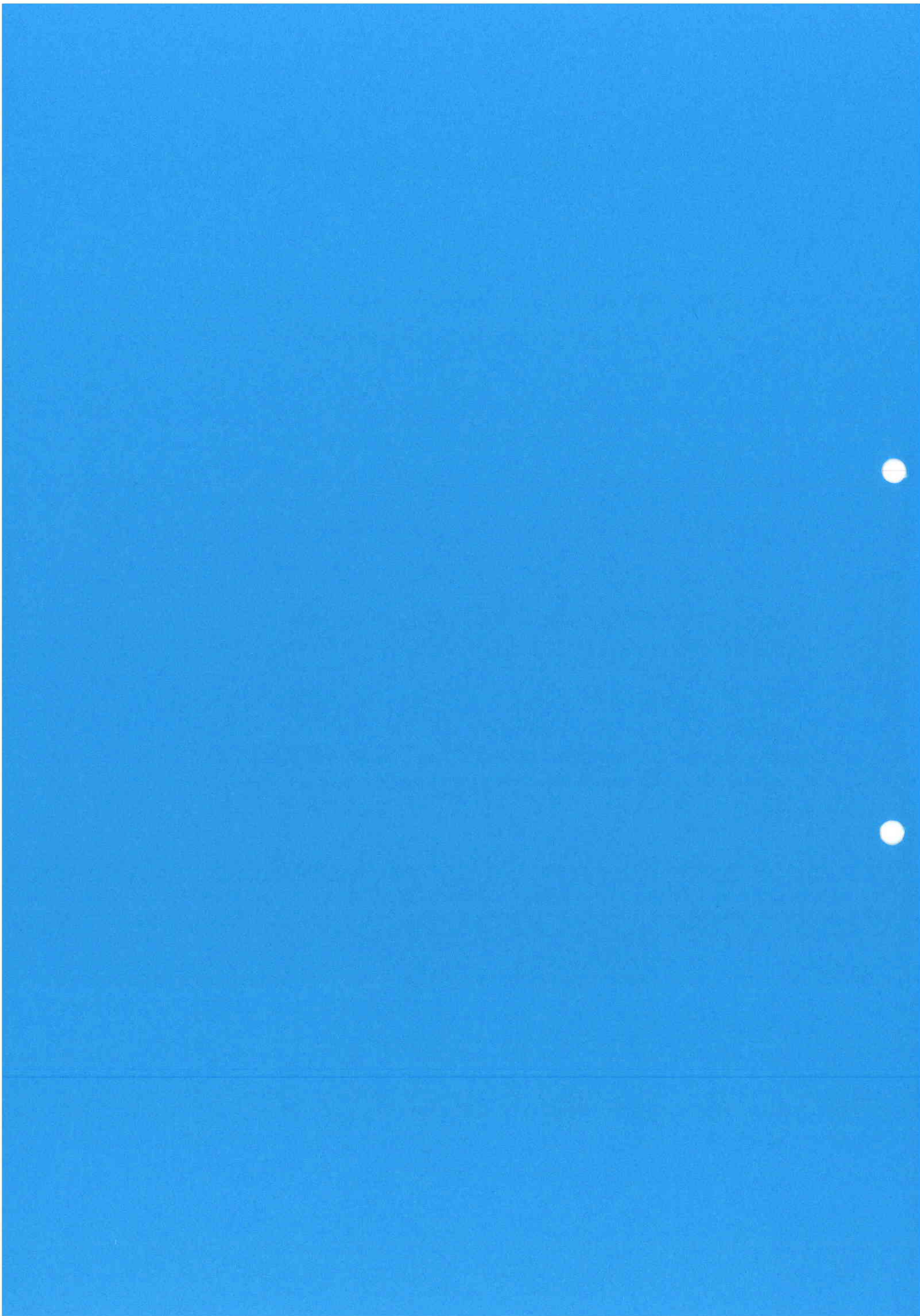
Technical File

The original approved Technical File must be with the engine during its whole lifetime and is always to be kept on-board the vessel.

The EIAPP certificate is valid for the life of the engine subject to surveys in accordance with regulation 5 of Annex VI of the MARPOL Convention, provided that the appropriate Technical File is either tied up by an unbroken GL seal or originally stamped page by page with the applicable Approval Number.



Germanischer Lloyd



Technical File

Engine Family: MTU-V4000-09-IMO

File Name: 526105173 3B 18 TFI 09

Pages: 35

Particulars of the Member Engine

Manufacturer MTU Friedrichshafen GmbH

Diesel Engine 12V 4000 P83

Engine No. 526 105173

Date of engine build 2010

Rated power 1,680 kW

Rated speed 1,800 min⁻¹

Final application/installation, Engine Main: E2

Aux: D2

Cooling equipment See attachment 6

Compiled by: TQA/Kristen

Approved by:

Friedrichshafen, 03 September 2010

MTU Friedrichshafen GmbH
Acceptance

Dr. Effelsberg



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Signature

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Seal or Stamp

.....
Seal or Stamp



Technical File

Engine Family: MTU-V4000-09-IMO

Approval No. 14048-10 HH

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Technical File

Engine Family: MTU-V4000-09-IMO

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Attachments:

- 1 Components, settings and operating values of the engine which influence its NO_x emissions
- 2 Full range of allowable adjustments or alternatives for the components of the engine
- 3 Full record of the relevant engine's performance, including the engine's rated speed and rated power
- 4 On-Board NO_x verification procedures No.
- 5 Emissions Test Report No. **528100389 3B18 ETRI 09 - S**
- 6 Designation and restrictions for an engine which is a member of an engine group or engine family
- 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 NO_x emission limits
- 8 Charge air temperatures
- 9 Illustrations of NO_x-relevant components

Abbreviations

AC Alternative Component

DS Design Status

- e.g., DS = 0 means, Component will only be used in engines with Design Status 0
- e.g., DS = 0-1 means, Component will be used in engines with Design Status 0 and Design Status 1



Technical File

Engine Family: MTU-V4000-09-IMO

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Note

Design Status	The Design Status of the engine is defined by the Design Status of the used data set.
Letter "R" on cylinder head	A possible remanufacturing marking on the cylinder head (see Attachment 9) indicates a remanufactured cylinder head. This marking supersedes the old ID-number.
Letter "R"	The letter "R" before the material identification number on a component identifies an original component which has been remanufactured. Remanufactured components are similar to new components concerning form, fit and function and generally have the same tolerances as new components. They do not negatively affect the exhaust emissions of the engine.

Technical File

Engine Family: MTU-V4000-09-IMO

Attachment 1

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

Components:

1. Injector
2. Camshaft
3. Cylinder head
4. Piston
5. Turbocharger
6. Charge air cooler

Settings:

Injection timing
 Injection duration
 Injection pressure
 Status of turbocharging

Engine operating values:

Engine type	Rated power [kW]	Rated speed [min ⁻¹]	Mean effective pressure [bar]
12V 4000 P63	1,560	1,500	21.82
16V 4000 P63	2,080	1,500	21.82
20V 4000 P63	2,600	1,500	21.82
12V 4000 P83	1,455	1,800	16.96
12V 4000 P83	1,680	1,800	19.58
16V 4000 P83	1,940	1,800	16.96
16V 4000 P83	2,240	1,800	19.58
20V 4000 P83	2,425	1,800	16.96
20V 4000 P83	2,800	1,800	19.58

Intermediate speed	-- min ⁻¹
Maximum torque at intermediate speed	-- Nm
Static injection timing	Acc. engine map deg CA BTDC
Electronic injection control	No: ☐ Yes: ☒
Variable injection timing	No: ☐ Yes: ☒
Variable turbocharger geometry	No: ☒ Yes: ☐
Sequential turbocharging	No: ☐ Yes: ☒
Bore	170 mm
Stroke	210 mm
Nominal compression ratio	16.4
Cylinder number and configuration	Number: 12, 16, 20 V: ☒ In-line: ☐
Auxiliaries	



Technical File

Engine Family: MTU-V4000-09-IMO

Attachment 1

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Specified ambient conditions (for maximum power):

Coolant intercooler temperature (max.)	45 °C
Charge air temperature	See attachment 8
Cooling system specified intermediate cooler	No: ☐ Yes: ☒
Cooling system specified charge air stages	One
Coolant temperature (max.)	95 °C
Inlet depression (max.)	15 mbar
Exhaust back pressure (max.)	30 mbar
Fuel oil specification	Acc. to MTU fluids and lubricants specification A 001 061/32E
Fuel oil temperature (max.)	25 °C
Lubricating oil specification	Acc. to MTU fluids and lubricants specification A 001 061/32E

Technical File

Engine Family: MTU-V4000-09-IMO

Attachments 2 and 3

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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:

See attachment 7 and/or sheets for Alternative Components attached to the Technical File.

3 Full record of the relevant engine's performance, including the engine's rated speed and rated power

See Emissions Test Report No. **528100389 3B18 ETRI 09 - S**



4 On-Board NO_x verification procedures No.

ENGINE PARAMETER CHECK METHOD

(For location of the different parts see Attachment 9, Page 1)

Engine control unit

- Check model - MTU ADEC acc. to Attachment 9, Page 2

Injection timing

Injection pressure for common rail system

Injection duration

Status of turbocharging

- Check the identification number (*) of the data set on the Engine control unit ADEC acc. to Attachment 9, Page 2

Injector

- Check component identification number (*) acc. to Attachment 9, Page 3

Cylinder head

- Check component identification number (*) acc. to Attachment 9, Page 4

Piston

- Check component identification number (*) acc. to Attachment 9, Page 4

Turbocharger

- Check component identification number (*) acc. to Attachment 9, Page 5

Charge air cooler

- Check component identification number (*) acc. to Attachment 9, Page 6

Camshaft

- Check component identification number (*) acc. to Attachment 9, Page 7

* For component identification number (ID-No.) see Attachment 7 and/or sheets for Alternative Components attached to the Technical File.

Seal or Stamp



Technical File

Engine Family: MTU-V4000-09-IMO

Attachments 5 and 6

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5 Emission Test Report No. 528100389 3B18 ETRI 09 - S

See attached at the end of the Technical File

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

Designation: 12V 4000 P63/P83
16V 4000 P63/P83
20V 4000 P63/P83

Restriction: none

The coolant system of the members in the engine group or engine family correspond to the relevant coolant system diagrams as supplied to the certifying society as follows:

12V/16V/20V:

- Diagram No. X00026325



Technical File

Engine Family: MTU-V4000-09-IMO

Attachment 7

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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 not marked in the tabulation below could be checked easily.
Identification numbers marked *...* in the tabulation below the check requires a serious expenditure of time and requires a good knowledge of the engine's construction. Therefore a qualified specialist with special tool equipment should make the check.

Engine Type:		12V 4000 P63			
Rated Power:		1,560 kW			
Rated Speed:		1,500 min⁻¹			
Component:	AC	Type	Part number	Identification number	DS
Engine control unit	1	MTU ADEC		ADEC	0
Data set	1		XZ59454100349	XZ59454100349	0
Injector	1	L'Orange	X59407500008	X59407500008	0
	2	L'Orange	X59407500014	X59407500014	0
Cylinder head	1		X52404100035 X52404100034	X524-34	0
	2		X52404100045 X52404100044	X524-44	0
Piston	1	Piston crown	X59403700001 X59403700002	*X594-1* *X594-2*	0
	2	Piston crown	X59403700017 X59403700002	*X594-17* *X594-2*	0
Turbocharger	1	A side: ZR175 B side: ZR175	X59410100088 X59410100089	X59410100088 X59410100089	0
		A and B side Turbine wheel Compressor wheel	X00004664 X59410100015	*X00004664* *X59410100015*	
Charge air cooler	1		X59411400002	X59411400002	0
Camshaft	1		X00026339	*X00026339*	0
	2		X52605100018	*X52605100018*	0

Technical File

Engine Family: MTU-V4000-09-IMO

Attachment 7

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EngineType:		16V 4000 P63			
RatedPower:		2,080 kW			
RatedSpeed:		1,500 min⁻¹			
Component:	AC	Type	Partnumber	Identification number	DS
Engine control unit	1	MTU ADEC		ADEC	0
Data set	1		XZ59554100218	XZ59554100218	0
Injector	1	L'Orange	X59407500008	X59407500008	0
	2	L'Orange	X59407500014	X59407500014	0
Cylinder head	1		X52404100035 X52404100034	X524-34	0
	2		X52404100045 X52404100044	X524-44	0
Piston	1	Piston crown	X59403700001 X59403700002	*X594-1* *X594-2*	0
	2	Piston crown	X59403700017 X59403700002	*X594-17* *X594-2*	0
Turbocharger	1	A side: ZR195 B side: ZR195	X59510100081 X59510100082	X59510100081 X59510100082	0
		A and B side Turbine wheel Compressor wheel	5110805220 5110251102	*5110805220* *5110251102*	
Charge air cooler	1		X59511400001	X59511400001	0
Camshaft	1		5270510101	*5270510101*	0
	2		X52705100009	*X52705100009*	0

Technical File

Engine Family: MTU-V4000-09-IMO

Attachment 7

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Engine Type:		20V 4000 P63			
Rated Power:		2,600 kW			
Rated Speed:		1,500 min ⁻¹			
Component:	AC	Type	Part number	Identification number	DS
Engine control unit	1	MTU ADEC		ADEC	0
Data set	1		XZ59654100140	XZ59654100140	0
Injector	1	L'Orange	X59407500008	X59407500008	0
	2	L'Orange	X59407500014	X59407500014	0
Cylinder head	1		X52404100035 X52404100034	X524-34	0
	2		X52404100045 X52404100044	X524-44	0
Piston	1	Piston crown	X59403700001 X59403700002	*X594-1* *X594-2*	0
	2	Piston crown	X59403700017 X59403700002	*X594-17* *X594-2*	0
Turbocharger	1	A side: ZR 205 B side: ZR 205 A and B side Turbine wheel Compressor wheel	X59610100119 X59610100120 X00019436 X59610100037	X59610100119 X59610100120 *X00019436* *X59610100037*	0
	2	A side: ZR 205 B side: ZR 205 A and B side Turbine wheel Compressor wheel	X59610100198 X59610100199 X00019436 X59610100037	X59610100198 X59610100199 *X00019436* *X59610100037*	0
Charge air cooler	1		X00032874	X00032874	0
	2		X59611400001	X59611400001	0
Camshaft	1	Part I Part II	5280500101 5280510201 5280510101	*5280510201* *5280510101*	0

Technical File

Engine Family: MTU-V4000-09-IMO

Attachment 7

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Engine Type:		12V 4000 P83			
Rated Power:		1,455 kW			
Rated Speed:		1,800 min⁻¹			
Component:	AC	Type	Part number	Identification number	DS
Engine control unit	1	MTU ADEC		ADEC	0
Data set	1		XZ59454100350	XZ59454100350	0
Injector	1	L'Orange	X59407500008	X59407500008	0
	2	L'Orange	X59407500014	X59407500014	0
Cylinder head	1		X52404100035 X52404100034	X524-34	0
	2		X52404100045 X52404100044	X524-44	0
Piston	1	Piston crown	X59403700001 X59403700002	*X594-1* *X594-2*	0
	2	Piston crown	X59403700017 X59403700002	*X594-17* *X594-2*	0
Turbocharger	1	A side: ZR175 B side: ZR175	X59410100088 X59410100089	X59410100088 X59410100089	0
		A and B side Turbine wheel Compressor wheel	X00004664 X59410100015	*X00004664* *X59410100015*	
Charge air cooler	1		X59411400002	X59411400002	0
Camshaft	1		X00026339	*X00026339*	0
	2		X52605100018	*X52605100018*	0

Technical File

Engine Family: MTU-V4000-09-IMO

Attachment 7

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Engine Type:	12V 4000 P83
Rated Power:	1,680 kW
Rated Speed:	1,800 min ⁻¹

Component:	AC	Type	Part number	Identification number	DS
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Engine control unit	1	MTU ADEC		ADEC	0
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Data set	1		XZ59454100351	XZ59454100351	0
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Injector	1	L'Orange	X59407500008	X59407500008	0
	2	L'Orange	X59407500014	X59407500014	0

Cylinder head	1		X52404100035 X52404100034	X524-34	0
	2		X52404100045 X52404100044	X524-44	0

Piston	1	Piston crown	X59403700001 X59403700002	*X594-1* *X594-2*	0
	2	Piston crown	X59403700017 X59403700002	*X594-17* *X594-2*	0

Turbocharger	1	A side: ZR175 B side: ZR175	X59410100088 X59410100089	X59410100088 X59410100089	0
		A and B side Turbine wheel Compressor wheel	X00004664 X59410100015	*X00004664* *X59410100015*	

Charge air cooler	1		X59411400002	X59411400002	0
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Camshaft	1		X00026339	*X00026339*	0
	2		X52605100018	*X52605100018*	0



Technical File

Engine Family: MTU-V4000-09-IMO

Attachment 7

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Engine Type:		16V 4000 P83			
Rated Power:		1,940 kW			
Rated Speed:		1,800 min ⁻¹			
Component:	AC	Type	Part number	Identification number	DS
Engine control unit	1	MTU ADEC		ADEC	0
Data set	1		XZ59554100219	XZ59554100219	0
Injector	1	L'Orange	X59407500008	X59407500008	0
	2	L'Orange	X59407500014	X59407500014	0
Cylinder head	1		X52404100035 X52404100034	X524-34	0
	2		X52404100045 X52404100044	X524-44	0
Piston	1	Piston crown	X59403700001 X59403700002	*X594-1* *X594-2*	0
	2	Piston crown	X59403700017 X59403700002	*X594-17* *X594-2*	0
Turbocharger	1	A side: ZR195 B side: ZR195	X59510100081 X59510100082	X59510100081 X59510100082	0
		A and B side Turbine wheel Compressor wheel	5110805220 5110251102	*5110805220* *5110251102*	
Charge air cooler	1		X59511400001	X59511400001	0
Camshaft	1		5270510101	*5270510101*	0
	2		X52705100009	*X52705100009*	0

Technical File

Engine Family: MTU-V4000-09-IMO

Attachment 7

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Engine Type:		16V 4000 P83			
Rated Power:		2,240 kW			
Rated Speed:		1,800 min ⁻¹			
Component:	AC	Type	Part number	Identification number	DS
Engine control unit	1	MTU ADEC		ADEC	0
Data set	1		XZ59554100220	XZ59554100220	0
Injector	1	L'Orange	X59407500008	X59407500008	0
	2	L'Orange	X59407500014	X59407500014	0
Cylinder head	1		X52404100035 X52404100034	X524-34	0
	2		X52404100045 X52404100044	X524-44	0
Piston	1	Piston crown	X59403700001 X59403700002	*X594-1* *X594-2*	0
	2	Piston crown	X59403700017 X59403700002	*X594-17* *X594-2*	0
Turbocharger	1	A side: ZR195 B side: ZR195	X59510100081 X59510100082	X59510100081 X59510100082	0
		A and B side Turbine wheel Compressor wheel	5110805220 5110251102	*5110805220* *5110251102*	
Charge air cooler	1		X59511400001	X59511400001	0
Camshaft	1		5270510101	*5270510101*	0
	2		X52705100009	*X52705100009*	0

Technical File

Engine Family: MTU-V4000-09-IMO

Attachment 7

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Engine Type:		20V 4000 P83			
Rated Power:		2,425 kW			
Rated Speed:		1,800 min⁻¹			
Component:	AC	Type	Part number	Identification number	DS
Engine control unit	1	MTU ADEC		ADEC	0
Data set	1		XZ59654100141	XZ59654100141	0
Injector	1	L'Orange	X59407500008	X59407500008	0
	2	L'Orange	X59407500014	X59407500014	0
Cylinder head	1		X52404100035 X52404100034	X524-34	0
	2		X52404100045 X52404100044	X524-44	0
Piston	1	Piston crown	X59403700001 X59403700002	*X594-1* *X594-2*	0
	2	Piston crown	X59403700017 X59403700002	*X594-17* *X594-2*	0
Turbocharger	1	A side: ZR 205 B side: ZR 205 A and B side Turbine wheel Compressor wheel	X59610100119 X59610100120 X00019436 X59610100037	X59610100119 X59610100120 *X00019436* *X59610100037*	0
	2	A side: ZR 205 B side: ZR 205 A and B side Turbine wheel Compressor wheel	X59610100198 X59610100199 X00019436 X59610100037	X59610100198 X59610100199 *X00019436* *X59610100037*	0
Charge air cooler	1		X00032874	X00032874	0
	2		X59611400001	X59611400001	0
Camshaft	1	Part I	5280500101	*5280510201*	0
		Part II	5280510201 5280510101	*5280510101*	



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Engine Family: MTU-V4000-09-IMO

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Engine Type:		20V 4000 P83			
Rated Power:		2,800 kW			
Rated Speed:		1,800 min ⁻¹			
Component:	AC	Type	Part number	Identification number	DS
Engine control unit	1	MTU ADEC		ADEC	0
Data set	1		XZ59654100088	XZ59654100088	0
Injector	1	L'Orange	X59407500008	X59407500008	0
	2	L'Orange	X59407500014	X59407500014	0
Cylinder head	1		X52404100035 X52404100034	X524-34	0
	2		X52404100045 X52404100044	X524-44	0
Piston	1	Piston crown	X59403700001 X59403700002	*X594-1* *X594-2*	0
	2	Piston crown	X59403700017 X59403700002	*X594-17* *X594-2*	0
Turbocharger	1	A side: ZR 205 B side: ZR 205 A and B side Turbine wheel Compressor wheel	X59610100119 X59610100120 X00019436 X59610100037	X59610100119 X59610100120 *X00019436* *X59610100037*	0
	2	A side: ZR 205 B side: ZR 205 A and B side Turbine wheel Compressor wheel	X59610100023 X59610100024 X00019436 X59610100037	X59610100023 X59610100024 *X00019436* *X59610100037*	0
	3	A side: ZR 205 B side: ZR 205 A and B side Turbine wheel Compressor wheel	X59610100198 X59610100199 X00019436 X59610100037	X59610100198 X59610100199 *X00019436* *X59610100037*	0
Charge air cooler	1		X00032874	X00032874	0
	2		X59611400001	X59611400001	0
Camshaft	1	Part I	5280500101	*5280510201*	0
		Part II	5280510201 5280510101	*5280510101*	

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Charge air temperatures

Note: Reference temperature of the intercooled air corresponding to a intercooler temperature of 45°C

12V... P63 DS = 0	Power	[kW]	1,560	1,170	780	390	156
	T _{charge air} E2 max.	[°C]	50	43	39	37	---
	T _{charge air} D2 max.	[°C]	50	43	39	37	37
16V... P63 DS = 0	Power	[kW]	2,080	1,560	1,040	520	208
	T _{charge air} E2 max.	[°C]	48	41	37	37	---
	T _{charge air} D2 max.	[°C]	48	41	37	37	37
20V... P63 DS = 0	Power	[kW]	2,600	1,950	1,300	650	260
	T _{charge air} E2 max.	[°C]	53	39	37	36	---
	T _{charge air} D2 max.	[°C]	53	39	37	36	36

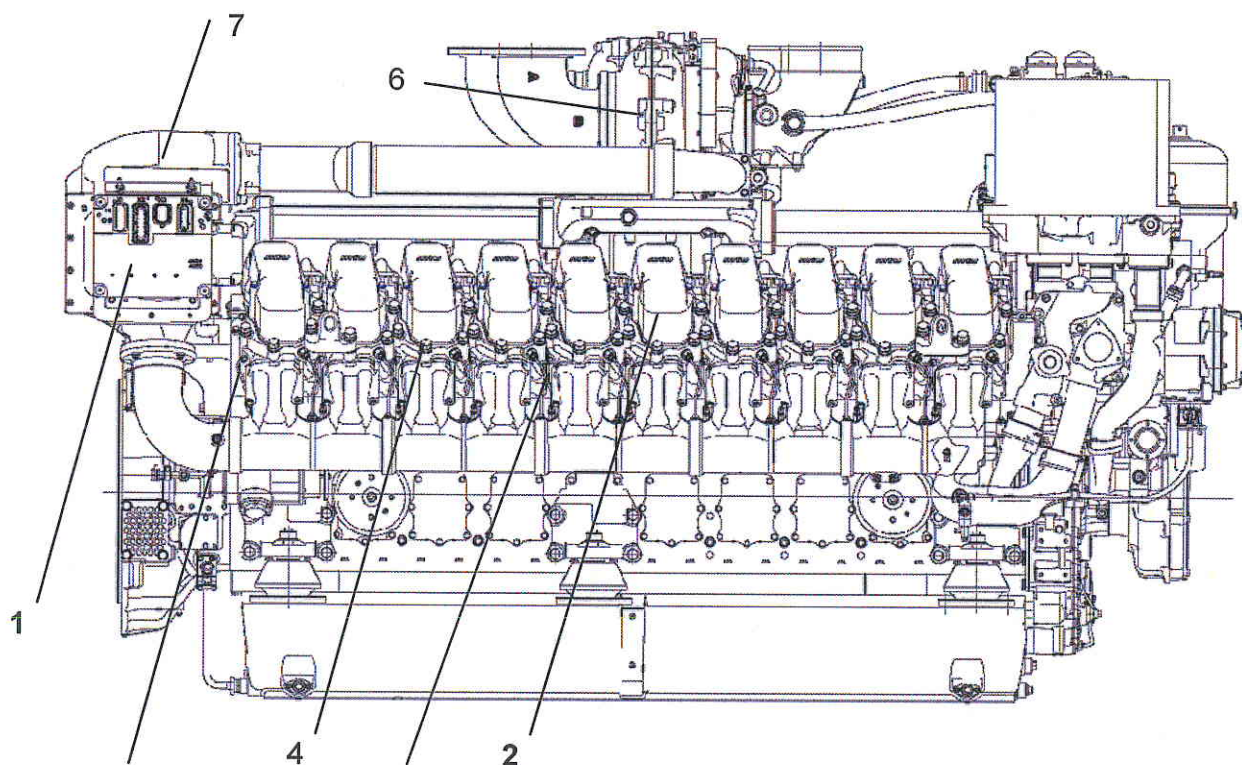
12V... P83 DS = 0	Power	[kW]	1,455	1,091	728	364	146
	T _{charge air} E2 max.	[°C]	51	40	38	36	---
	T _{charge air} D2 max.	[°C]	51	40	38	36	37
12V... P83 DS = 0	Power	[kW]	1,680	1,260	840	420	168
	T _{charge air} E2 max.	[°C]	53	44	38	36	---
	T _{charge air} D2 max.	[°C]	53	44	38	36	38
16V... P83 DS = 0	Power	[kW]	1,940	1,455	970	485	194
	T _{charge air} E2 max.	[°C]	51	43	37	36	---
	T _{charge air} D2 max.	[°C]	51	43	37	36	36
16V... P83 DS = 0	Power	[kW]	2,240	1,680	1,120	560	224
	T _{charge air} E2 max.	[°C]	52	44	36	37	---
	T _{charge air} D2 max.	[°C]	54	46	38	38	38
20V... P83 DS = 0	Power	[kW]	2,425	1,819	1,213	606	246
	T _{charge air} E2 max.	[°C]	52	43	37	36	---
	T _{charge air} D2 max.	[°C]	52	43	37	36	36
20V... P83 DS = 0	Power	[kW]	2,800	2,100	1,400	700	280
	T _{charge air} E2 max.	[°C]	56	44	36	36	---
	T _{charge air} D2 max.	[°C]	56	44	36	36	35

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Engine Family: MTU-V4000-09-IMO

Attachment 9

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Summary of NO_x-relevant components

Applies analogously to
the 12V and 16V engines

1. Engine control unit ADEC
2. Injector
3. Camshaft
4. Cylinder head
5. Piston
6. Turbocharger
7. Charge air cooler

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Engine Family: MTU-V4000-09-IMO

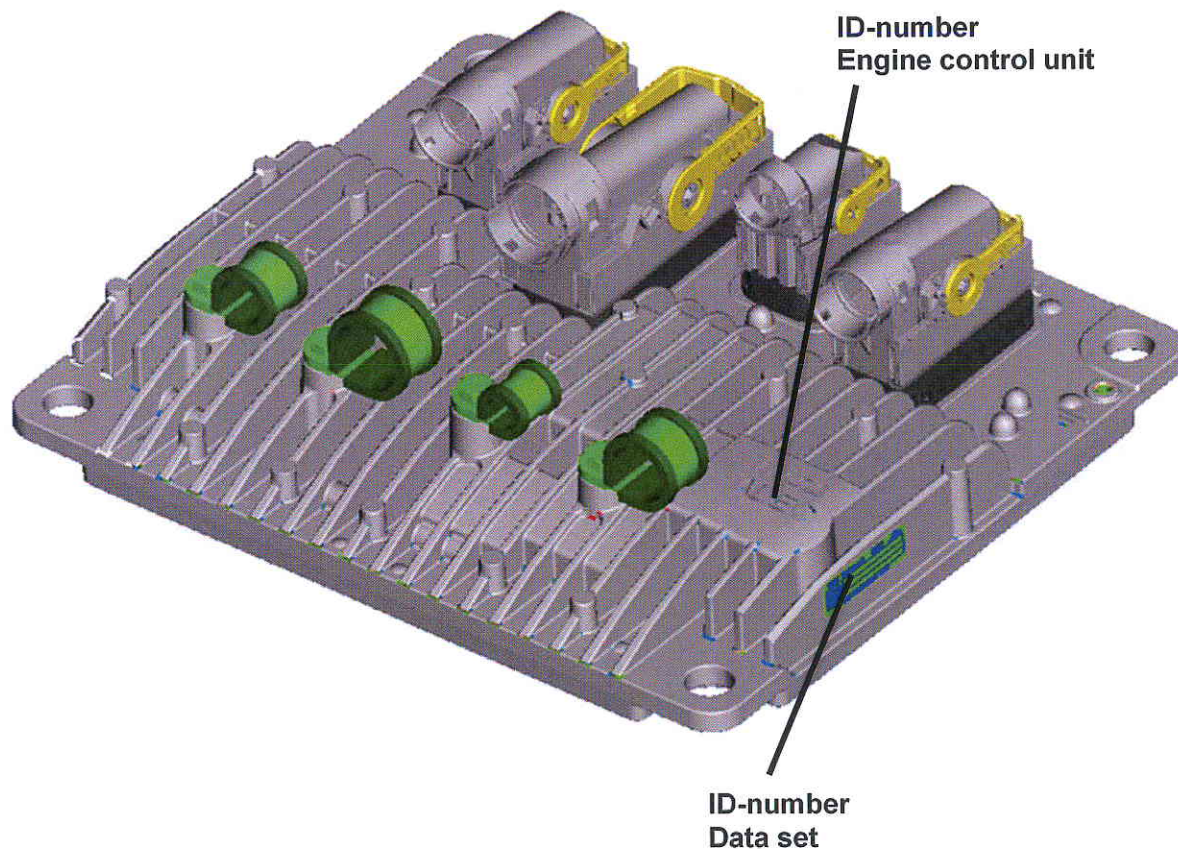
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Engine control unit (ADEC)

The data set identification number defines all electronic settings, which influence the NOx emissions.

The data set is included within the Conformity of Production arrangements as accepted by the certifying authority. Any changes to the data set are only to be effected by authorised MTU service personnel. Should such changes be made the Technical File will be submitted for re-approval.



Note: In the case of doubt with regard to the correct use of the original data set, the identification number inside the data set should be checked with the aid of product support personnel using a special dialogue unit.

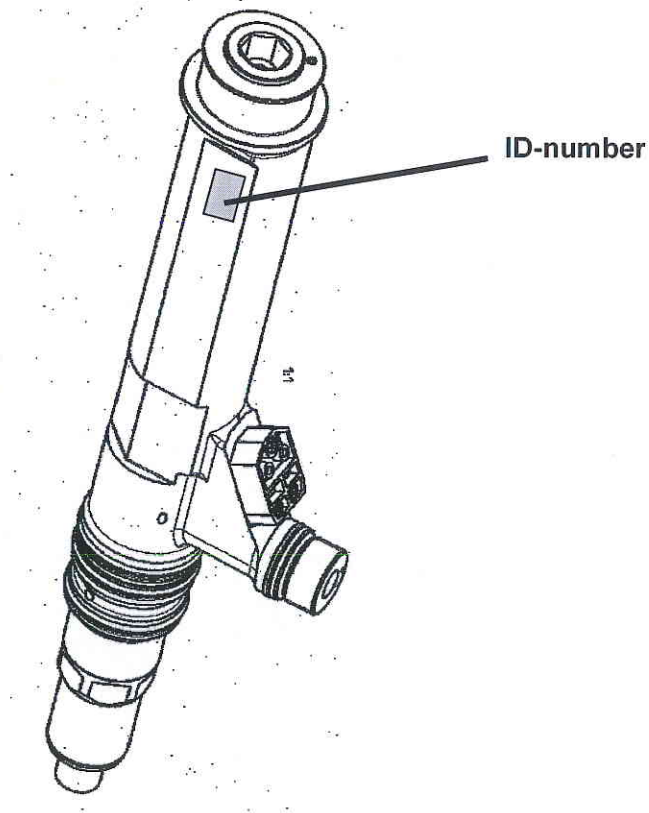
Technical File

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Injector



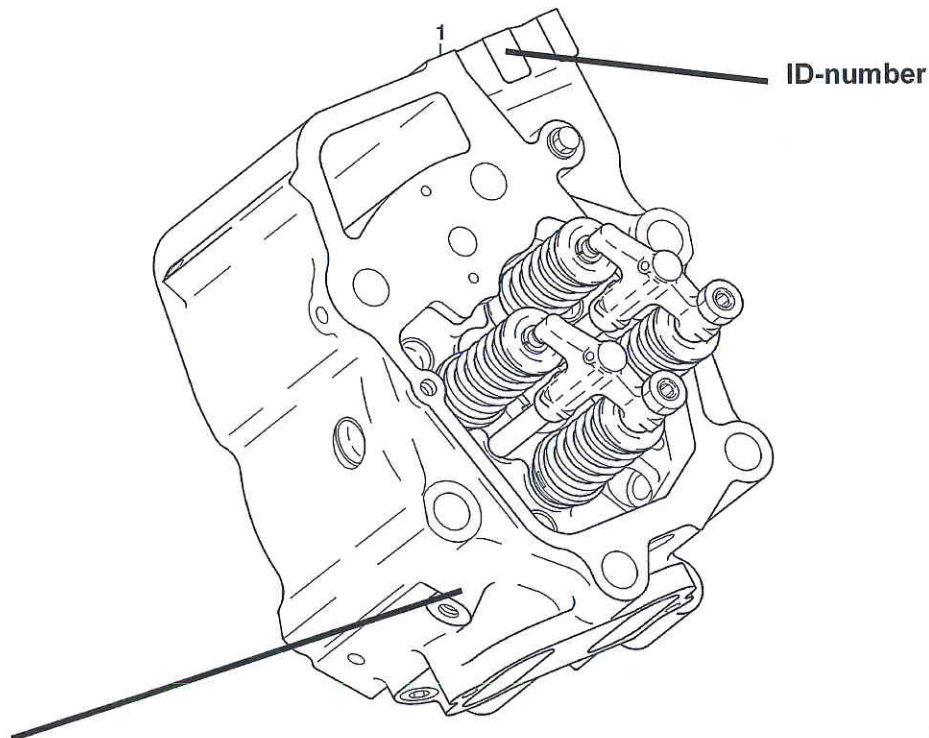
Technical File

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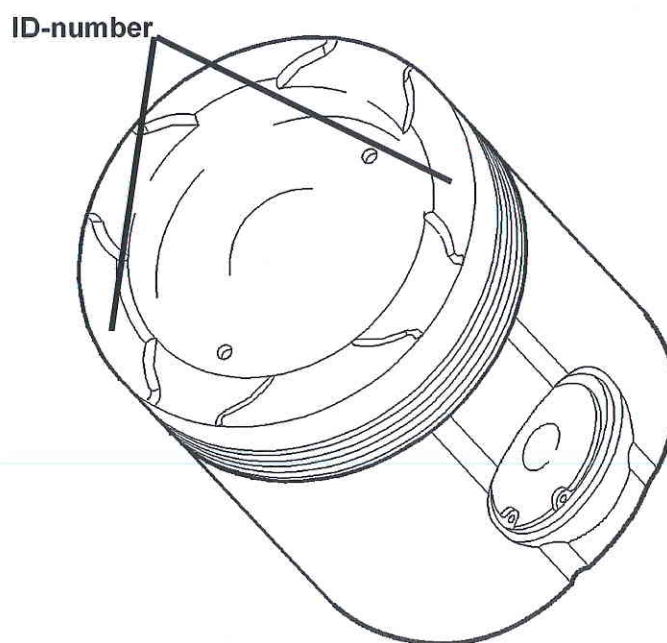
Cylinder head



E0413008a1

Note: Remanufacturing marking on this position indicate remanufactured cylinder head. This marking supersedes the old ID-number.

Piston



Technical File

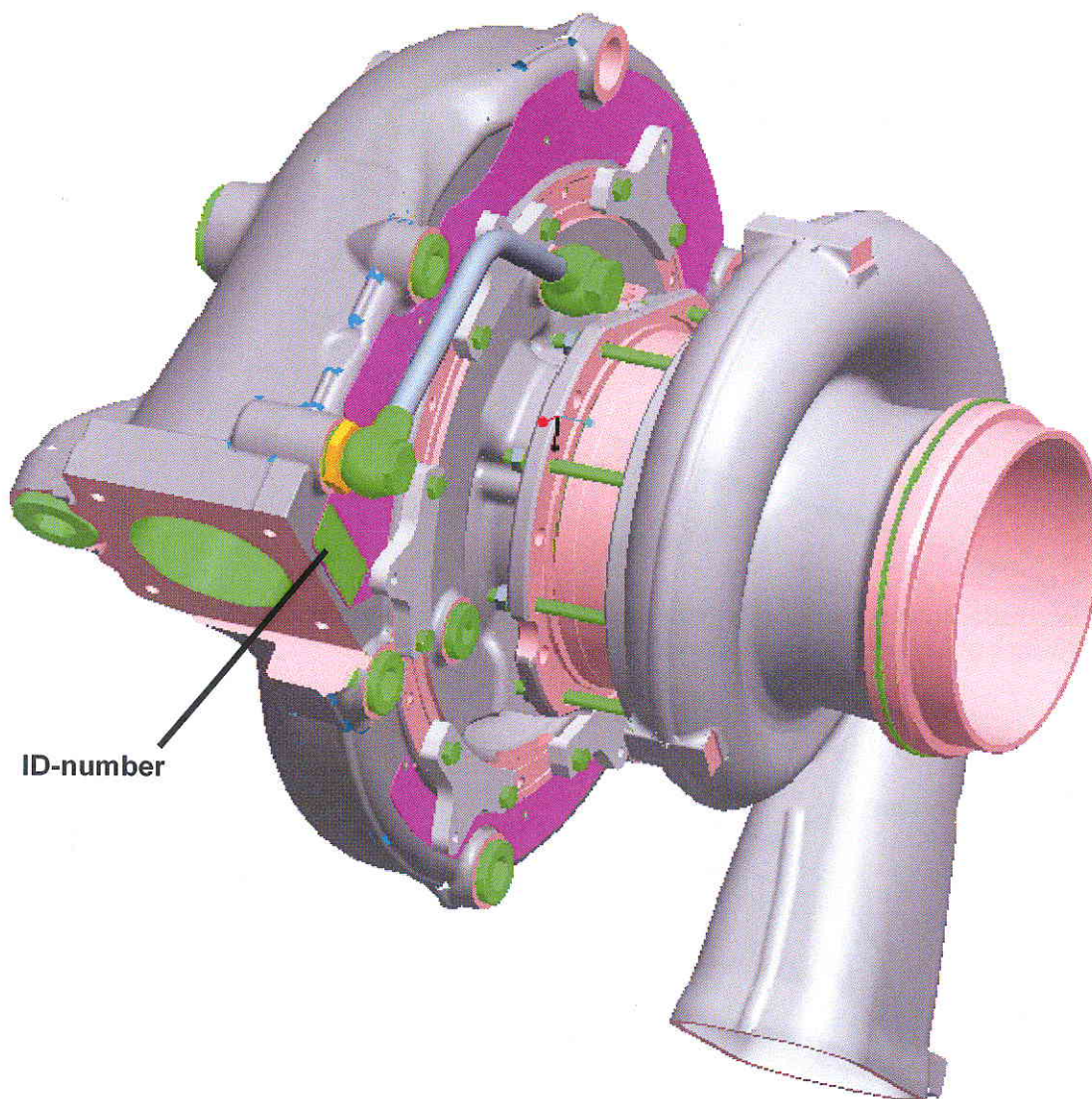
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Turbocharger

12V/16V/20V: ZR175/..., ZR195/... and ZR 205



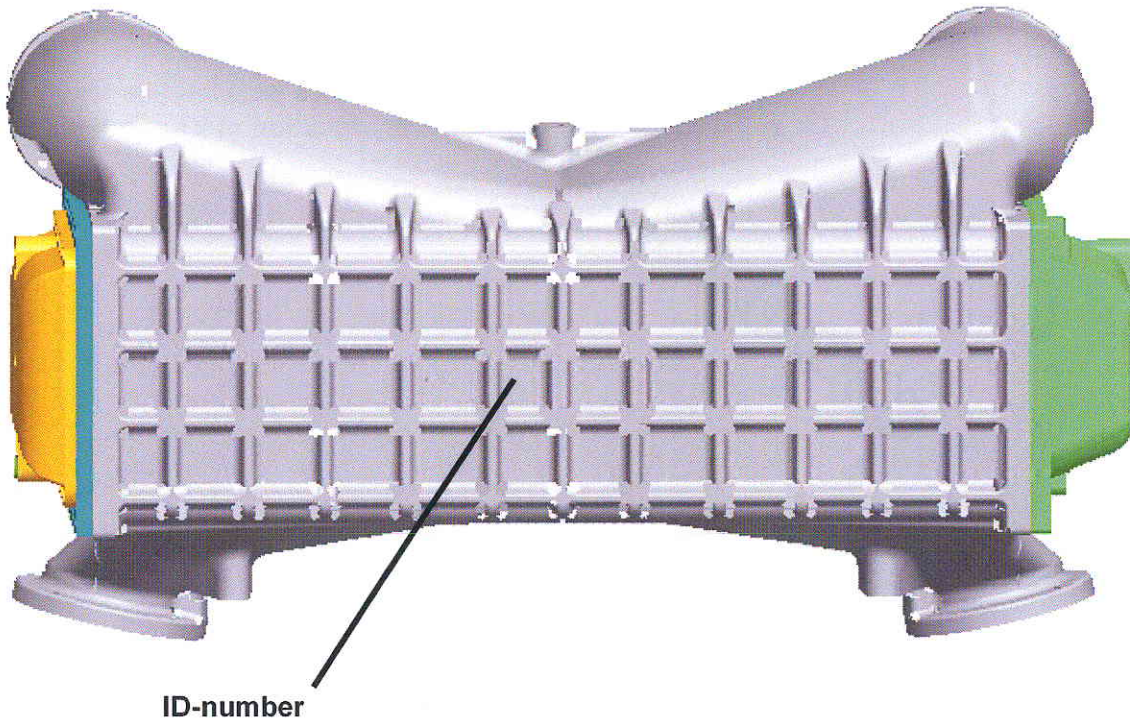
Technical File

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Charge air cooler



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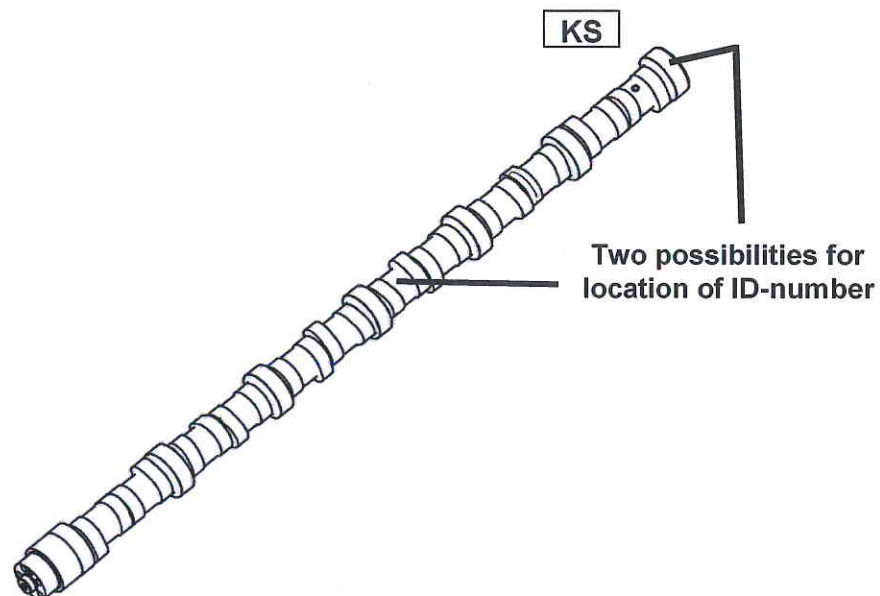
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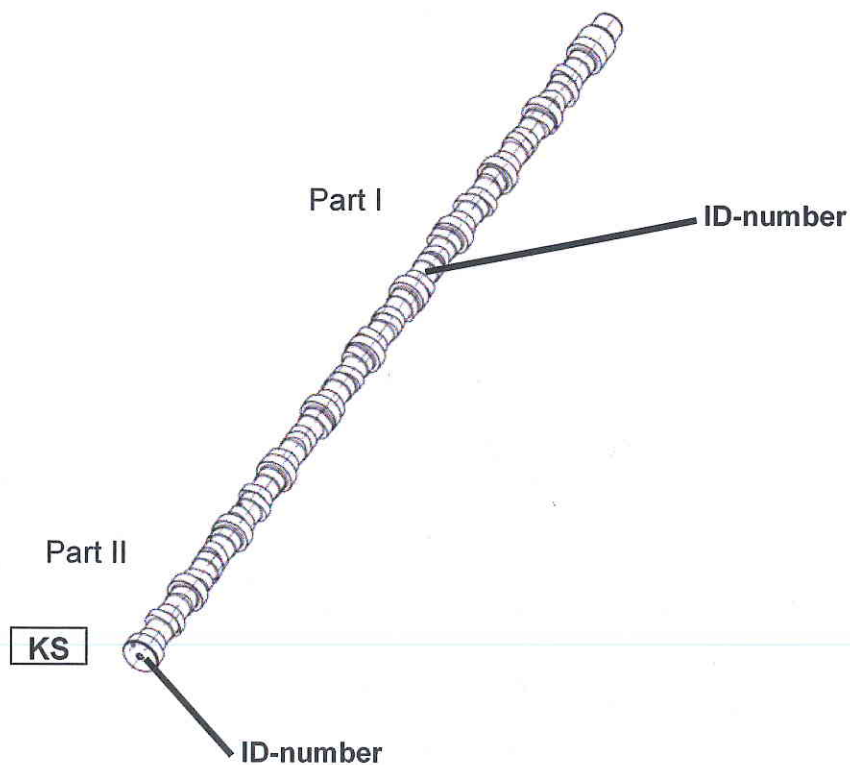
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Camshaft: 12V/16V



Camshaft: 20V



Abbreviations

Driving end = KS



Technical File

Engine Family: MTU-V4000-09-IMO

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Engine Information *

Engine:

Manufacturer	MTU Friedrichshafen
Engine type	20V 4000 P83
Engine Family identification	MTU-V4000-09-IMO
Serial number	528 100389
Rated power	2,425 kW
Rated speed	1,800 min ⁻¹
Intermediate speed	-- min ⁻¹
Maximum torque at intermediate speed	-- Nm
Static injection timing	Acc. engine map deg CA BTDC
Electronic injection control	No: ☐ Yes: ☒
Variable injection timing	No: ☐ Yes: ☒
Variable turbocharger geometry	No: ☒ Yes: ☐
Sequential turbocharging	No: ☐ Yes: ☒
Bore	170 mm
Stroke	210 mm
Nominal compression ratio	16.4
Mean effective pressure, at rated power	16.96 bar
Maximum cylinder pressure, at rated power	172 bar
Cylinder number and configuration	Number: 20 V: ☒ In-line: ☐
Auxiliaries	--

Specified ambient conditions:

Maximum intercooler temperature	45 °C
Charge air temperature	See attachment 8
Cooling system specified intermediate cooler	No: ☐ Yes: ☒
Cooling system specified charge air stages	One
Low/high temperature cooling system set points	85 - 95 °C
Maximum inlet depression	15 mbar
Maximum exhaust back pressure	30 mbar
Fuel oil specification	Acc. to MTU fluids and lubricants specification A 001 061/32E (Diesel Fuel EN 590)
Fuel oil temperature	25 °C
Lubricating oil specification	Acc. to MTU fluids and lubricants specification A 001 061/32E (Fuchs Titan 15W40)

Application/Intended for:

Customer	Test Engine
Final application/installation, Ship	Test Engine
Final application/installation, Engine	Main: E2 Aux: D2



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Components used in the parent engine:

Engine Type: 20V 4000 P83 Rated Power: 2,425 kW Rated Speed: 1,800 min ⁻¹					
Component:	AC	Type	Part number	Identification number	DS
Engine control unit	1	MTU ADEC		ADEC	0
Data set	1		MTU XZ59654100141	XZ59654100141	0
Injector	1	L'Orange	MTU X59407500008	X59407500008	0
Cylinder head	2		MTU X52404100045 MTU X52404100044	X524-44	0
Piston	1	Piston crown	MTU X59403700001 MTU X59403700002	X594-1 X594-2	0
Turbocharger	1	A side: ZR 205 B side: ZR 205 A and B side Turbine wheel Compressor wheel	MTU X59610100119 MTU X59610100120 MTU X00019436 MTU X59610100037	X59610100119 X59610100120 X00019436 X59610100037	0
Charge air cooler	1		MTU X00032874	X00032874	0
Camshaft	1	Part I Part II	MTU 5280500101 MTU 5280510201 MTU 5280510101	5280510201 5280510101	0

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Emissions test results:

Cycle	E2	E3	D2	C1	
NOx	8.6	---	8.4	---	g/kWh

Test identification	EQA Nr. 325-08
Date/Time	10.05.2008
Test site/bench	Friedrichshafen, MTU Works 1, Test bench 131
Test number	---
Surveyor	Mr. Schmidt / American Bureau of Shipping Mr. Bolvanski / Bureau Veritas Mrs. Solum, Mr. Lokkevik / Det Norske Veritas Mr. Götze / Germanischer Lloyd AG Mr. Reppin, Mr. Santer / Lloyd's Register EMEA
Date and Place of report	Friedrichshafen, 2010-03-31
Signature	MTU Friedrichshafen GmbH Acceptance signed i.A. Dr. Kuhn

* If applicable



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Engine Family Information *

Engine Family information (Common specification):

Combustion cycle	4 stroke cycle
Cooling medium	Water
Cylinder configuration	V
Method of aspiration	Pressure charged
Fuel type to be used on board	Distillate
Combustion chamber	Open chamber
Valve port configuration	Cylinder head
Valve port size and number	Inlet: 2,230 mm ² = 2 ports Outlet: 2,330 mm ² = 2 ports
Fuel system type	Common-Rail System

Miscellaneous features:

Exhaust gas recirculation	No
Water injection/emulsion	No
Air injection	No
Charge air cooling system	Yes
Exhaust after-treatment	No
Exhaust after-treatment type	---
Dual fuel	No

* If applicable

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Engine Family information (Selection of parent engine for test bed test)

Family identification	MTU-V4000-09-IMO
Method of pressure charging	Constant pressure turbocharged
Charge air cooling system	Split circuit
Criteria of the selection (specify)	Higher NO _x -emissions

Engine	DS	Number of Cylinder	Max. rated power per cylinder [kW]	Rated speed [min ⁻¹]	Fuel delivery rate [mm ³ /H]	Cylinder peak pressure [bar]	Charge air pressure (over) [bar]	Selected parent engine	Application ⁽¹⁾
12V 4000 P63	0	12	130	1,500	700	154	2.2		E2 / D2
16V 4000 P63	0	16	130	1,500	690	162	1.9		E2 / D2
20V 4000 P63	0	20	130	1,500	687	164	2.13		E2 / D2
12V 4000 P83	0	12	121.25	1,800	560	152	2.12		E2 / D2
12V 4000 P83	0	12	140	1,800	640	172	2.6		E2 / D2
16V 4000 P83	0	16	121.25	1,800	547	157	2.00		E2 / D2
16V 4000 P83	0	16	140	1,800	637	182	2.34		E2 / D2
20V 4000 P83	0	20	121.25	1,800	536	172	1.97	X	E2 / D2
20V 4000 P83	0	20	140	1,800	650	171	2.4		E2 / D2

* If applicable

⁽¹⁾ E2 = Constant-speed main propulsion
D2 = Constant-speed auxiliary engine application



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Test Cell Information *

Exhaust Pipe:

Diameter	800 mm
Length	>> 3 times of pipe diameter
Insulation	No: ☐ Yes: ☒
Probe location	Distance from engine exhaust outlet 10 m
Remark	Common exhaust pipe measure point

Measurement equipment

	Manufacturer	Model	Measurement ranges	Calibration	
				Span gas conc.	Deviation
Analyser					
NOx Analyser	AVL	CLD 4000 HH	1200 ppm	1009 ppm	-0.42 / +1.17 %
CO Analyser	AVL	IRD 4000 CO	1000 ppm	958 ppm	-0.02 %
CO2 Analyser	AVL	IRD 4000 CO ₂	16 %	15,1 %	± 0.0 %
O2 Analyser	AVL	PMD 4000 O ₂	18 %	15,0 %	-0.56 %
HC ₃ Analyser	AVL	FID 4000 HH	120 ppm	101.8 ppm	+0.67 %
Speed	AVL	FEM-Cnt	1 - 15000 rpm		< 0.1 rpm
Torque	Hottinger	U2A, 20t	0 - 80,000 N		± 1.0 %
Power, if applicable	---	---	---		---
Fuel flow	Rheonik	RHM 06	0,5 -10 kg/min		± 0.2 %
Air flow	---	---	---		---
Exhaust flow	---	---	---		---
Temperatures					
Coolant	AVL	FEM-A	(-200) - 1370 °C		± 0.5 %
Lubricant	AVL	FEM-A	(-200) - 1370 °C		± 0.5 %
Exhaust gas	AVL	FEM-A	(-200) - 1370 °C		± 0.5 %
Inlet air	AVL	FEM-A	(-200) - 1370 °C		± 0.5 %
Intercooled air	AVL	FEM-A	(-200) - 1370 °C		± 0.5 %
Fuel	AVL	FEM-A	(-200) - 1370 °C		± 0.5 %
Pressures					
Exhaust gas	Druck	PTX 560	0 - 25 kPa		± 0.2 %
Inlet manifold					
Atmospheric	Druck	PTX 560	0 - 250 kPa abs		± 0.2 %
Vapour pressure					
Intake air	Druck	PTX 560	(-16) - 0 kPa		± 0.2 %
Humidity					
Intake air	Testo	403	0 - 100 %		± 2.0 %

* If applicable



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Fuel Characteristics

Fuel Type	Diesel Fuel DIN EN 590 (Category ISO-F-DMA)			
Fuel properties:			Fuel element analysis	
Density	ISO 3675	0.836 kg/l	Carbon	86.07 % mass
Viscosity	ISO 3104	2.8 mm ² /s	Hydrogen	13.42 % mass
			Nitrogen	0.0031 % mass
			Oxygen	0.51 % mass
			Sulphur	< 0.001 % mass
			LHV/Hu	43.0 MJ/kg



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Ambient and Gaseous Emissions Data *

Mode	1	2	3	4	5					
Power/Torque	100	75	50	25	10					
Speed	100	100	100	100	100					
Time at beginning of mode	9:50	10:10	10:24	10:38	10:52					
Ambient Data										
Atmospheric pressure	96.89	96.89	96.89	96.89	96.89					
Intake air temperature	27.0	28.0	29.0	29.0	29.0					
Intake air humidity	7.16	7.06	7.07	6.9	6.93					
Atmospheric factor (fa)	1.0345	1.0395	1.0447	1.0445	1.0445					
Gaseous Emissions Data:										
NOx concentration dry/wet	868.7	803.7	642.3	415.4	278.4					
CO concentration dry/wet	78.1	96.2	124.4	174.7	194.0					
CO2 concentration dry/wet	6.72	6.42	5.80	4.50	3.03					
O2 concentration dry/wet	11.32	11.75	12.60	14.42	16.45					
HC1 concentration dry/wet	86.5	99.3	119.5	174.1	229.3					
NOx humidity correction factor	0.9709	0.9715	0.9753	0.9702	0.9722					
Fuel specification factor (FFH)	1.8719	1.8743	1.8793	1.8898	1.9021					
Dry/wet correction factor	0.9293	0.9319	0.9371	0.9485	0.9613					
NOx mass flow	21.41	15.88	9.99	4.66	2.67					
CO mass flow	1.12	1.11	1.13	1.17	1.12					
CO2 mass flow	1,516.9	1,164.9	829.4	472.3	274.8					
O2 mass flow	1,858.9	1,550.9	1,310.7	1,101	1,085.4					
HC1 mass flow	0.66	0.61	0.58	0.61	0.68					
SO2 mass flow	132	171	268	161	36					
NOx specific	8.827	8.736	8.173	7.651	10.672					

* If applicable



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Engine Test Data *

Mode	1	2	3	4	5					
Power/Torque	100	75	50	25	10					
Speed	100	100	100	100	100					
Time at beginning of mode	9:50	10:10	10:24	10:38	10:52					
Engine Data										
Speed	1,800.3	1,800.3	1,800.3	1,800.3	1,800.3					
Auxiliary power	---	---	---	---	---					
Dynamometer setting	2,425	1,818	1,222	609	250					
Power	2,425	1,818	1,222	609	250					
Mean effective pressure	16.95	12.70	8.54	4.25	1.75					
Fuel rack	---	---	---	---	---					
Uncorrected spec. fuel consumption	199.8	204.8	217.1	249	355.1					
Fuel flow	484.49	372.24	265.34	151.62	88.77					
Air flow	15,507.4	12,445.3	9,780.3	7,133.4	6,122.6					
Exhaust flow (gexhw)	15,991.9	12,817.6	10,045.7	7,285	6,211.3					
Exhaust temperature ⁽¹⁾	341	329	306	255	193					
Exhaust back pressure	31	20	12	6	4					
Coolant temperature out	94.7	90.7	83.5	80.6	77.9					
Coolant temperature in	83.4	81.2	73.5	67	62					
Coolant pressure	---	---	---	---	---					
Temperature intercooled air	49.5	40.8	34.4	34.6	34.0					
Lubricant temperature in	91.7	88.9	82.9	81.0	79.0					
Lubricant pressure	---	---	---	---	---					
Charge air pressure (abs.)	2.93	2.30	1.820	1.34	1.13					
Inlet depression (mean value)	---	---	---	---	---					

* If applicable ⁽¹⁾ After engine



