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Application	X				
Engine model	20V4000G94LF				
Rated power [kW]	3308				
Rated speed [rpm]	1500				
Application group	3D				
Emission Stage/Optimisation	NEA Singapore for ORDE				
Test cycle	D2				
Data Set No.	XZ54954100068				
Data Set Basis	NEA Singapore for ORDE				
Fuel sulphur content [ppm]	7				

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Datum	04.04.2017	-	-	11.04.2017	13.04.2017	18.04.2017
Org.-Einheit	TET	-	-	TKF	TKF	TKM
Name	T. Lenhof	-	-	B. Mink	Dr. Baumgarten	M. Link

Aenderungsbeschreibung/Description of Revision		Kommt vor/Frequency	 <b>MTU</b> Friedrichshafen GmbH		<b>WORD</b> Datum/ Date	Name	Projekt-/Auftrags-Nr. Project/Order No. Verwendbar f.Type Applicable to Model	Format/Size <b>A3</b>
Angabe Sauerstoffgehalt im Abgas bei Bezug auf 5% angepasst			Alle Rechte aus Schutzrechtsanmeldungen vorbehalten. Weitergabe, Vervielfältigung oder sonstige Verwertung ohne Zustimmung nicht gestattet. Zuwiderhandlungen verpflichten zum Schadensersatz. All industrial property rights reserved. Disclosure, reproduction or use for any other purpose is prohibited unless our express permission has been given. Any infringement results in liability to pay damages.		Erstell. Drawn 20.09.2017 09:35:43	zwislerp	Material-Nr./Material No. <b>EDS 4000 1162</b>	
					Bearb. Change 20.09.2017 13:37:26	zwislerp	Benennung/ Title <b>Emissionsdatenblatt</b>	
					Inhalt Content 10.04.2017	Locher	<b>Emission Data Sheet</b>	
					Gepr. Checked 20.09.2017	Kneifel		
					Motortyp / Engine Type <b>20V4000G94LF</b>			
					Zeichnungs-Nr./Drawing No. <b>ZNG00005084</b>			Blatt/ Sheet <b>1</b> von/of <b>6</b>
Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle	Beschreibung/Description					
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### Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	20V4000G94LF				
Application group	3D				
Emission Stage/Optimisation	NEA Singapore for ORDE				
Test cycle	D2				
fuel sulphur content [ppm]	7				
mg/mN³ values base on residual oxygen value of [%]	measured				

### Motor Rohemissionen\*

Engine raw emissions \*

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/PN)	[-]	1	0,75	0,50	0,25	0,10			
Power	[kW]	3307	2480	1653	827	331			
Speed (n/nN)	[-]	1	1	1	1	1			
Speed	[rpm]	1500	1499	1499	1500	1499			
Exhaust temperature after turbine	[°C]	482	427	434	403	268			
Exhaust massflow	[kg/h]	19196	15930	12083	7485	5323			
Exhaust back pressure (total)	[mbar]	52	32	14	5	0			
NOx	[g/kWh]	6,6	5,9	4,8	4,4	9,1			
	[mg/mN³]	1641	1326	930	676	776			
CO	[g/kWh]	0,3	0,4	1,0	1,4	2,8			
	[mg/mN³]	77	85	192	219	233			
HC	[g/kWh]	0,05	0,07	0,09	0,16	0,72			
	[mg/mN³]	13	14	16	25	60			
O2	[%]	9,9	11,2	11,9	13,1	15,8			
Particulate measured	[g/kWh]	0,02	0,03	0,10	0,18	0,05			
	[mg/mN³]	5	6	19	27	4			
Particulate calculated	[g/kWh]	-	-	-	-	-			
	[mg/mN³]	-	-	-	-	-			
Dust (only TA-Luft)	[mg/mN³]	-	-	-	-	-			
FSN	[-]	0,2	0,2	0,6	1,0	0,1			
NO/NO2**	[-]	-	-	-	-	-			
CO2	[g/kWh]	645,7	632,1	669,3	721,6	844,5			
	[mg/mN³]	155278	136196	126261	109200	70577			
SO2	[g/kWh]	0,003	0,003	0,003	0,003	0,004			
	[mg/mN³]	0,7	0,6	0,6	0,5	0,3			


\* Emission data measurement procedures are consistent with the respective emission evaluation process. Noncertified engines are measured to sales data (TVU/TEN) standard conditions.

These boundary conditions might not be representative for detailed dimensioning of exhaust gas aftertreatment, in this case it is recommended to contact the responsible department for more information.

Measurements are subject to variation. The nominal emission data shown is subject to instrumentation, measurement, facility, and engine-to-engine variations.

All data applies to an engine in new condition. Over extended operating time deterioration may occur which might have an impact on emission. Exhaust temperature depends on engine ambient conditions.

\*\* No standard test. To be measured on demand.

 <b>MTU</b> Friedrichshafen GmbH		<b>WORD</b>	Datum/ Date	Name	Projekt-/Auftrags-Nr. Project/Order No.	Format/Size <b>A3</b>
		Erstell. Drawn	20.09.2017 09:35:43	zwislerp	Verwendbar f.Type Applicable to Model	
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		Inhalt Content	10.04.2017	Locher	Benennung/ Title	
		Gepr. Checked	20.09.2017	Kneifel	<b>Emissionsdatenblatt</b>	
		Motortyp / Engine Type			<b>20V4000G94LF</b>	<b>Emission Data Sheet</b>
Aenderungsbeschreibung/Description of Revision		Kommt vor/Frequency				
Angabe Sauerstoffgehalt im Abgas bei Bezug auf 5% angepasst						
Zeichnungs-Nr./Drawing No.		<b>ZNG00005084</b>			Blatt/ Sheet	
Beschreibung/Description					<b>2</b>	
Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle		von/of		
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### Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	20V4000G94LF				
Application group	3D				
Emission Stage/Optimisation	NEA Singapore for ORDE				
Test cycle	D2				
fuel sulphur content [ppm]	7				
mg/mN³ values base on residual oxygen value of [%]	measured				

### Not to exceed Werte\*

not to exceed values\*

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/PN)	[-]	1	0,75	0,50	0,25				
Power	[kW]	3307	2480	1653	827				
Speed (n/nN)	[-]	1	1	1	1				
Speed	[rpm]	1500	1499	1499	1500				
Exhaust back pressure (total)	[mbar]	52	32	14	5				
NOx	[g/kWh]	8,6	7,7	6,2	6,6				
	[mg/mN³]	2133	1724	1209	1014				
CO	[g/kWh]	0,5	0,7	1,9	2,9				
	[mg/mN³]	131	145	365	438				
HC	[g/kWh]	0,09	0,11	0,17	0,33				
	[mg/mN³]	22	24	30	50				
O2	[%]	9,9	11,2	11,9	13,1				
Particulate measured	[g/kWh]	0,03	0,05	0,15	0,27				
	[mg/mN³]	7	10	28	40				

\* Calculated values are not proven by tests and therefore the accuracy cannot be guaranteed.

Emissions data measurement procedures are consistent with those described in the applicable rules and standards.

The NOx, CO, HC and PM emission data tabulated here were taken from a single new engine under the test conditions shown above and are valid for the following conditions:


- Ambient air pressure 1 bar
- Air intake temperature approx. 25°C
- Rel. Humidity 30%-60%
- New Engine
- New standard- air filter
- Exhaust gas back pressure according the given value in this EDS
- Fuel according to EN 590 or US EPA 40CFR89
- Coolant and Lubricants according MTU Fuels and Lubricants Specification

The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on single operating points and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle. Emissions data may vary depending on the type of exhaust gas aftertreatment that may be installed on the engine, therefore it is suggested that the engine manufacturer be contacted directly for further information.

Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures, and instrumentation. Over time deterioration may occur which may have an impact on emission levels. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may results in elevated emission levels.

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 <b>MTU</b> Friedrichshafen GmbH		<b>WORD</b>	Datum/ Date	Name	Projekt-/Auftrags-Nr. Project/Order No.	Format/Size <b>A3</b>
		Erstell. Drawn	20.09.2017 09:35:43	zwislerp	Verwendbar f.Type Applicable to Model	
Aenderungsbeschreibung/Description of Revision Angabe Sauerstoffgehalt im Abgas bei Bezug auf 5% angepasst		Bearb. Change	20.09.2017 13:37:26	zwislerp	Material-Nr./Material No.	<b>EDS 4000 1162</b>
		Inhalt Content	10.04.2017	Locher	Benennung/ Title	
		Gepr. Checked	20.09.2017	Kneifel	<b>Emissionsdatenblatt</b>	
		Motortyp / Engine Type		<b>20V4000G94LF</b>	<b>Emission Data Sheet</b>	
Zeichnungs-Nr./Drawing No.		<b>ZNG00005084</b>			Blatt/ Sheet <b>3</b> von/of <b>6</b>	
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b.1		In Arbeit				

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## Typzulassung für NEA Singapur

Type approval for NEA Singapore


	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	20V4000G94LF				
Application group	3D				
Emission Stage/Optimisation	NEA Singapore for ORDE				
Test cycle	D2				
Data Set	XZ54954100068				
Serial-Number	V122				
Test-Report-Number	EDS40001162				
Test Location	P126				
Date of test	29.03.2017				
Tester	MTU Friedrichshafen GmbH				
Date of EDS	04.04.2017				

## Emissions Zykluswerte\*

Engine cycle emissions\*

Emission	Cycle Value [g/kWh]	U.S. T2-Limit [g/kWh]
NOX	5,47	-
HC	0,1	-
NOX+NMHC	5,57	6,4
CO	0,80	3,5
PM	0,074	0,20

\* Cycle values based on not rounded values, differences between single values and added values, e.g. NOX/HC/NOX+HC.  
 NMHC = 0,98\*HC (40 CFR Part 1065.650 (c)(5))

 <b>MTU</b> Friedrichshafen GmbH		<b>WORD</b>	Datum/ Date	Name	Projekt-/Auftrags-Nr. Project/Order No.	Format/Size <b>A3</b>
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		Inhalt Content	10.04.2017	Locher	Benennung/ Title	
		Gepr. Checked	20.09.2017	Kneifel	<b>Emissionsdatenblatt</b>	
		Motortyp / Engine Type		<b>20V4000G94LF</b>	<b>Emission Data Sheet</b>	
Zeichnungs-Nr./Drawing No.		<b>ZNG00005084</b>			Blatt/ Sheet <b>4</b> von/of <b>6</b>	
Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle	Beschreibung/Description			
b.1		In Arbeit				

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### Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	X				
Engine model	20V4000G94LF				
Application group	3D				
Emission Stage/Optimisation	NEA Singapore for ORDE				
Test cycle	D2				
fuel sulphur content [ppm]	7				
mg/mN³ values base on residual oxygen value of [%]	5				

### Motor Rohemissionen\*

Engine raw emissions\*

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/PN)	[-]	1	0,75	0,50	0,25	0,10			
Power	[kW]	3307	2480	1653	827	331			
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Speed	[rpm]	1500	1499	1499	1500	1499			
Exhaust temperature after turbine	[°C]	482	427	434	403	268			
Exhaust massflow	[kg/h]	19196	15930	12083	7485	5323			
Exhaust back pressure (total)	[mbar]	52	32	14	5	0			
NOx	[g/kWh]	6,6	5,9	4,8	4,4	9,1			
	[mg/mN³]	2362	2172	1639	1375	2411			
CO	[g/kWh]	0,3	0,4	1,0	1,4	2,8			
	[mg/mN³]	111	139	339	445	723			
HC	[g/kWh]	0,05	0,07	0,09	0,16	0,72			
	[mg/mN³]	19	23	29	50	187			
O2	[%]	5,0	5,0	5,0	5,0	5,0			
Particulate measured	[g/kWh]	0,02	0,03	0,10	0,18	0,05			
	[mg/mN³]	7	10	33	55	13			
Particulate calculated	[g/kWh]	-	-	-	-	-			
	[mg/mN³]	-	-	-	-	-			
Dust (only TA-Luft)	[mg/mN³]	-	-	-	-	-			
FSN	[-]	0,2	0,2	0,6	1,0	0,1			
NO/NO2**	[-]	-	-	-	-	-			
CO2	[g/kWh]	645,7	632,1	669,3	721,6	844,5			
	[mg/mN³]	223605	223061	222522	222035	219215			
SO2	[g/kWh]	0,003	0,003	0,003	0,003	0,004			
	[mg/mN³]	1,0	1,0	1,0	1,0	1,0			


\* Emission data measurement procedures are consistent with the respective emission evaluation process. Noncertified engines are measured to sales data (TVU/TEN) standard conditions.

These boundary conditions might not be representative for detailed dimensioning of exhaust gas aftertreatment, in this case it is recommended to contact the responsible department for more information.

Measurements are subject to variation. The nominal emission data shown is subject to instrumentation, measurement, facility, and engine-to-engine variations.

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		Erstell. Drawn	20.09.2017 09:35:43	zwislerp	Verwendbar f.Type Applicable to Model	
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		Inhalt Content	10.04.2017	Locher	Benennung/ Title	
		Gepr. Checked	20.09.2017	Kneifel	<b>Emissionsdatenblatt</b>	
		Motortyp / Engine Type			<b>20V4000G94LF</b>	
Aenderungsbeschreibung/Description of Revision		Kommt vor/Frequency				
Angabe Sauerstoffgehalt im Abgas bei Bezug auf 5% angepasst						
Zeichnungs-Nr./Drawing No.		<b>ZNG00005084</b>			Blatt/ Sheet	
Buchst./Rev. Ltr.		Aenderungs-Nr./Revision Notice No.		Bearbeitungsstatus/Lifecycle		<b>5</b>
b.1				In Arbeit		von/of
Beschreibung/Description					<b>6</b>	

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## Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	X				
Engine model	20V4000G94LF				
Application group	3D				
Emission Stage/Optimisation	NEA Singapore for ORDE				
Test cycle	D2				
fuel sulphur content [ppm]	7				
mg/mN <sup>3</sup> values base on residual oxygen value of [%]	5				

## Not to exceed Werte\*

not to exceed values\*

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/PN)	[-]	1	0,75	0,50	0,25				
Power	[kW]	3307	2480	1653	827				
Speed (n/nN)	[-]	1	1	1	1				
Speed	[rpm]	1500	1499	1499	1500				
Exhaust back pressure (total)	[mbar]	52	32	14	5				
NOx	[g/kWh]	8,6	7,7	6,2	6,6				
	[mg/mN <sup>3</sup> ]	3071	2824	2131	2063				
CO	[g/kWh]	0,5	0,7	1,9	2,9				
	[mg/mN <sup>3</sup> ]	189	236	644	890				
HC	[g/kWh]	0,09	0,11	0,17	0,33				
	[mg/mN <sup>3</sup> ]	32	39	55	100				
O2	[%]	5,0	5,0	5,0	5,0				
Particulate measured	[g/kWh]	0,03	0,05	0,15	0,27				
	[mg/mN <sup>3</sup> ]	10	16	49	82				

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		Erstell. Drawn	20.09.2017 09:35:43	zwislerp	Verwendbar f.Type Applicable to Model	
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		Inhalt Content	10.04.2017	Locher	Benennung/ Title	
		Gepr. Checked	20.09.2017	Kneifel	<b>Emissionsdatenblatt</b>	
		Motortyp / Engine Type			<b>20V4000G94LF</b>	
Aenderungsbeschreibung/Description of Revision		Kommt vor/Frequency				
Angabe Sauerstoffgehalt im Abgas bei Bezug auf 5% angepasst						
Zeichnungs-Nr./Drawing No.		<b>ZNG00005084</b>			Blatt/ Sheet <b>6</b> von/of <b>6</b>	
Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle		Beschreibung/Description		
b.1		In Arbeit				