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Emission Stage/Optimisation	TA-Luft				
Test cycle	D2 + 110%				
Data Set	XZ59554101110				
Fuel sulphur content [ppm]	5				

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Name	Khakholka	-	-	Dr. Kneifel	Dr. Baumgarten	Link

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		Erstell. Drawn	2018-02-12 11:02:57	link	Verwendbar f. Typ Applicable to Model	
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		Inhalt Content	19.04.2018	Khakholk	Benennung/ Title	
		Gepr. Checked	2018-04-23 14:52:16	kneifel al	EMISSIONSDATENBLATT	
		Motortyp / Engine Type			EMISSION DATA SHEET	
Aenderungsbeschreibung/Description of Revision Freigabe		Kommt vor/Frequency				
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-2	PR028419	Released				

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Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	16V4000G24F				
Application group	3B, 3E, 3F, 3G				
Emission Stage/Optimisation	TA-Luft				
Test cycle	D2 + 110%				
fuel sulphur content [ppm]	5				
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)	[-]	1,10	1,00	0,75	0,50	0,25	0,10		
Power	[kW]	2160	1966	1477	982	491	197		
Speed (n/nN)	[-]	1	1	1	1	1	1		
Speed	[rpm]	1501	1501	1501	1501	1501	1500		
Exhaust temperature after turbine	[°C]	503	504	455	411	332	226		
Exhaust massflow	[kg/h]	12274	12114	9959	7187	4943	4092		
Exhaust back pressure	[mbar]	31	28	17	8	3	1		
NOx	[g/kWh]	5,3	5,0	4,7	4,7	6,0	10,0		
	[mg/mN³]	1320	1151	966	895	815	649		
CO	[g/kWh]	0,9	0,9	1,0	0,9	1,2	3,1		
	[mg/mN³]	222	209	210	164	168	203		
HC	[g/kWh]	0,04	0,05	0,06	0,09	0,19	0,61		
	[mg/mN³]	10	12	12	16	26	40		
O2	[%]	9,2	9,5	10,8	11,8	13,8	16,6		
Particulate measured	[g/kWh]	-	-	-	-	-	-		
	[mg/mN³]	-	-	-	-	-	-		
Particulate calculated	[g/kWh]	0,10	0,12	0,11	0,13	0,18	0,20		
	[mg/mN³]	24	26	22	22	23	12		
Dust (only TA-Luft)	[mg/mN³]	-	-	-	-	-	-		
FSN	[-]	0,9	1,0	0,8	0,8	0,9	0,2		
NO/NO2**	[-]	-	-	-	-	-	-		
CO2	[g/kWh]	659,6	691,9	674,7	669,3	719,2	917,0		
	[mg/mN³]	163661	158082	139612	126860	97878	59325		
SO2	[g/kWh]	0,002	0,002	0,002	0,002	0,002	0,003		
	[mg/mN³]	0,5	0,5	0,4	0,4	0,3	0,2		

* 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.

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		Inhalt Content	19.04.2018	Khakholk	Benennung/ Title	
		Gepr. Checked	2018-04-23 14:52:16	kneifel al	EMISSIONSDATENBLATT	
		Motortyp / Engine Type		16V4000G24F		EMISSION DATA SHEET
Zeichnungs-Nr./Drawing No.		ZNG00013254				Blatt/ Sheet 2 von/of 7
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-2	PR028419	Released				

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Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	16V4000G24F				
Application group	3B, 3E, 3F, 3G				
Emission Stage/Optimisation	TA-Luft				
Test cycle	D2 + 110%				
fuel sulphur content [ppm]	5				
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)	[-]	1,10	1,00	0,75	0,50	0,25	0,10		
Power	[kW]	2160	1966	1477	982	491	197		
Speed (n/nN)	[-]	1	1	1	1	1	1		
Speed	[rpm]	1501	1501	1501	1501	1501	1500		
Exhaust temperature after turbine	[°C]	503	504	455	411	332	226		
Exhaust massflow	[kg/h]	12274	12114	9959	7187	4943	4092		
Exhaust back pressure	[mbar]	31	28	17	8	3	1		
NOx	[g/kWh]	5,3	5,0	4,7	4,7	6,0	10,0		
	[mg/mN³]	1798	1603	1513	1557	1815	2337		
CO	[g/kWh]	0,9	0,9	1,0	0,9	1,2	3,1		
	[mg/mN³]	302	291	329	286	375	731		
HC	[g/kWh]	0,04	0,05	0,06	0,09	0,19	0,61		
	[mg/mN³]	14	16	19	29	59	143		
O2	[%]	9,2	9,5	10,8	11,8	13,8	16,6		
Particulate measured	[g/kWh]	-	-	-	-	-	-		
	[mg/mN³]	-	-	-	-	-	-		
Particulate calculated	[g/kWh]	0,10	0,12	0,11	0,13	0,18	0,20		
	[mg/mN³]	32	37	35	39	51	43		
Dust (only TA-Luft)	[mg/mN³]	-	-	-	-	-	-		
FSN	[-]	0,9	1,0	0,8	0,8	0,9	0,2		
NO/NO2**	[-]	-	-	-	-	-	-		
CO2	[g/kWh]	659,6	691,9	674,7	669,3	719,2	917,0		
	[mg/mN³]	222821	220249	218735	220730	217864	213693		
SO2	[g/kWh]	0,002	0,002	0,002	0,002	0,002	0,003		
	[mg/mN³]	0,7	0,7	0,7	0,7	0,7	0,7		

* 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.

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		Inhalt Content	19.04.2018	Khakholk	Benennung/ Title	
Änderungsbeschreibung/Description of Revision Freigabe		Kommt vor/Frequency	Gepr. Checked 2018-04-23 14:52:16 kneifel al			EMISSIONSDATENBLATT EMISSION DATA SHEET
Zeichnungs-Nr./Drawing No.		ZNG00013254			Blatt/ Sheet 3 von/of 7	
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Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	16V4000G24F				
Application group	3B, 3E, 3F, 3G				
Emission Stage/Optimisation	TA-Luft				
Test cycle	D2 + 110%				
fuel sulphur content [ppm]	5				
mg/mN³ values base on residual oxygen value of [%]	15				

Motor Rohemissionen*

Engine raw emissions*

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/PN)	[-]	1,10	1,00	0,75	0,50	0,25	0,10		
Power	[kW]	2160	1966	1477	982	491	197		
Speed (n/nN)	[-]	1	1	1	1	1	1		
Speed	[rpm]	1501	1501	1501	1501	1501	1500		
Exhaust temperature after turbine	[°C]	503	504	455	411	332	226		
Exhaust massflow	[kg/h]	12274	12114	9959	7187	4943	4092		
Exhaust back pressure	[mbar]	31	28	17	8	3	1		
NOx	[g/kWh]	5,3	5,0	4,7	4,7	6,0	10,0		
	[mg/mN³]	674	601	567	584	680	876		
CO	[g/kWh]	0,9	0,9	1,0	0,9	1,2	3,1		
	[mg/mN³]	113	109	123	107	140	274		
HC	[g/kWh]	0,04	0,05	0,06	0,09	0,19	0,61		
	[mg/mN³]	5	6	7	11	22	54		
O2	[%]	9,2	9,5	10,8	11,8	13,8	16,6		
Particulate measured	[g/kWh]	-	-	-	-	-	-		
	[mg/mN³]	-	-	-	-	-	-		
Particulate calculated	[g/kWh]	0,10	0,12	0,11	0,13	0,18	0,20		
	[mg/mN³]	12	14	13	15	19	16		
Dust (only TA-Luft)	[mg/mN³]	-	-	-	-	-	-		
FSN	[-]	0,9	1,0	0,8	0,8	0,9	0,2		
NO/NO2**	[-]	-	-	-	-	-	-		
CO2	[g/kWh]	659,6	691,9	674,7	669,3	719,2	917,0		
	[mg/mN³]	83558	82593	82026	82774	81699	80135		
SO2	[g/kWh]	0,002	0,002	0,002	0,002	0,002	0,003		
	[mg/mN³]	0,3	0,3	0,3	0,3	0,3	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.

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Exhaust temperature depends on engine ambient conditions.

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		Inhalt Content	19.04.2018	Khakholk	EDS 4000 1228	
		Gepr. Checked	2018-04-23 14:52:16	kneifel al	Benennung/ Title	
		Motortyp / Engine Type 16V4000G24F		EMISSIONSDATENBLATT EMISSION DATA SHEET		
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Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	16V4000G24F				
Application group	3B, 3E, 3F, 3G				
Emission Stage/Optimisation	TA-Luft				
Test cycle	D2 + 110%				
Fuel sulphur content [ppm]	5				
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)	[-]	1,00	0,75	0,50	0,25				
Power	[kW]	1966	1477	982	491				
Speed (n/nN)	[-]	1	1	1	1				
Speed	[rpm]	1501	1501	1501	1501				
Exhaust back pressure	[mbar]	-	-	-	-				
NOx	[g/kWh]	6,5	6,1	6,1	9,0				
	[mg/mN³]	1496	1256	1163	1223				
CO	[g/kWh]	1,6	1,7	1,6	2,5				
	[mg/mN³]	354	357	312	337				
HC	[g/kWh]	0,09	0,10	0,17	0,39				
	[mg/mN³]	20	21	31	53				
O2	[%]	9,5	10,8	11,8	13,8				
Particulate measured	[g/kWh]	-	-	-	-				
	[mg/mN³]	-	-	-	-				

* 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
- measured after combined exhaust streams.

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 result in elevated emission levels.

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		Gepr. Checked	2018-04-23 14:52:16	kneifel al	EMISSIONSDATENBLATT	
		Motortyp / Engine Type		16V4000G24F		EMISSION DATA SHEET
Zeichnungs-Nr./Drawing No.		ZNG00013254			Blatt/ Sheet 5 von/of 7	
Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle		Beschreibung/Description		
-2	PR028419	Released				

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Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	16V4000G24F				
Application group	3B, 3E, 3F, 3G				
Emission Stage/Optimisation	TA-Luft				
Test cycle	D2 + 110%				
Fuel sulphur content [ppm]	5				
mg/mN³ 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)	[-]	1,00	0,75	0,50	0,25				
Power	[kW]	1966	1477	982	491				
Speed (n/nN)	[-]	1	1	1	1				
Speed	[rpm]	1501	1501	1501	1501				
Exhaust back pressure	[mbar]	-	-	-	-				
NOx	[g/kWh]	6,5	6,1	6,1	9,0				
	[mg/mN³]	2084	1967	2024	2722				
CO	[g/kWh]	1,6	1,7	1,6	2,5				
	[mg/mN³]	494	559	543	749				
HC	[g/kWh]	0,09	0,10	0,17	0,39				
	[mg/mN³]	28	32	54	117				
O2	[%]	9,5	10,8	11,8	13,8				
Particulate measured	[g/kWh]	-	-	-	-				
	[mg/mN³]	-	-	-	-				

* 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
- measured after combined exhaust streams.

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 result in elevated emission levels.

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	Inhalt Content	19.04.2018	Khakholk	Benennung/ Title	
Gepr. Checked	2018-04-23 14:52:16	kneifel al	Motortyp / Engine Type	EMISSIONSDATENBLATT EMISSION DATA SHEET	
Anderungsbeschreibung/Description of Revision Freigabe		Kommt vor/Frequency			
Zeichnungs-Nr./Drawing No.		ZNG00013254		Blatt/ Sheet 6 von/of 7	
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Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	16V4000G24F				
Application group	3B, 3E, 3F, 3G				
Emission Stage/Optimisation	TA-Luft				
Test cycle	D2 + 110%				
Fuel sulphur content [ppm]	5				
mg/mN ³ values base on residual oxygen value of [%]	15				

Not to exceed Werte*

not to exceed values*

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/PN)	[-]	1,00	0,75	0,50	0,25				
Power	[kW]	1966	1477	982	491				
Speed (n/nN)	[-]	1	1	1	1				
Speed	[rpm]	1501	1501	1501	1501				
Exhaust back pressure	[mbar]	-	-	-	-				
NOx	[g/kWh]	6,5	6,1	6,1	9,0				
	[mg/mN ³]	782	738	759	1021				
CO	[g/kWh]	1,6	1,7	1,6	2,5				
	[mg/mN ³]	185	210	204	281				
HC	[g/kWh]	0,09	0,10	0,17	0,39				
	[mg/mN ³]	10	12	20	44				
O ₂	[%]	9,5	10,8	11,8	13,8				
Particulate measured	[g/kWh]	-	-	-	-				
	[mg/mN ³]	-	-	-	-				

* 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
- measured after combined exhaust streams.

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 result in elevated emission levels.

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 MTU Friedrichshafen GmbH		WORD	Datum/ Date	Name	Projekt-/Auftrags-Nr. Project/Order No.	Format/Size A3	
		Erstell. Drawn	2018-02-12 11:02:57	link	Verwendbar f. Typ Applicable to Model		
Aenderungsbeschreibung/Description of Revision Freigabe		Alle Rechte aus Schutzrechtsanmeldungen vorbehalten. Weitergabe, Vervielfältigung oder sonstige Verwertung ohne Zustimmung nicht gestattet. Zuwendungen 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.		Bearb. Change	2018-04-23 14:52:16	link	Material-Nr./Material No. EDS 4000 1228
		Inhalt Content	19.04.2018	Khakholk	Benennung/ Title	EMISSIONSDATENBLATT	
		Gepr. Checked	2018-04-23 14:52:16	kneifel al	EMISSION DATA SHEET		
		Motortyp / Engine Type		16V4000G24F			
Zeichnungs-Nr./Drawing No.		ZNG00013254			Blatt/ Sheet 7 von/of 7		
Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle	Beschreibung/Description				
-2	PR028419	Released					