WÄRTSILÄ DIESEL Genset #1 Test Report

Standard reference conditions according to ISO 3046/1

Order Nr: 566-0900 Ordered by: For:

Engine Data

Engine type:	Engine No:	kW	r/min
16V25SG	3893	2960	1000

Turbocharger type:	Turbocharger I No:	Turbocharger II No:
VTR 254-11	HT406569	HT406248

Generator Data

Generator type:	Generator No:	kW
HSG 710 LR6	4547378	3536 at Cos. φ = 0.8

kVA	Volt	Amp	Hz	Efficiency (η) :
4420	10 000	255	50	96.83 at 100%

General Data

Main Gas Control Valve:	Prechamber Gas Control Valve:	Prechamber:
9135301101	9135300601	9130400368

Gas Fuel:	Lower Heat Value:	Specific Gravity:
Natural Gas	37.816 MJ/nm³	0.7670 kg/nm³

Lubrication oil: Pegasus 480 Brake k=1/

Test Data

Load % of Nominal:	%	25 %	50 %	75 %	100 %
Date/Time for test:		941108/1345	941108/1730	941108/1830	941108/
Engine room temperature:	°C	23/25	18/22	16/21	16
Outside temperature:	°C	8	5	4	4
Ambient air pressure:	mmHg	762	762	762	762
Relative Humidity:	%	75	62	56	56
Gas pressure: Supply	bar	4.0	4.0	4.0	3.9
Gas Temperature:	°C	13	13	12	12
Gas pressure: Main injector	bar	1.22	1.79	2.20	2.56
Gas pressure: PCC	bar	1.22	1.79	2.20	2.56
Duration, PCC valve opening:	ms	21.5	26.4	29.2	31.0
Gas consumption:	m³				
Gas consumption, period:	min.				
Gas consumption:	m³/h	59	85	115	152
Gas consumption:	nm³/kWh	0.405	0.288	0.261	0.253

Main bearing temperature at 100% nominal load:	No	1	2	3	4	5	6	7	8	9
	°C	77	83	86	89	92	91	90	80	81

Max firing pressure at 100% nominal load:	Cyl.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	bar	98	104	93	106	104	94	94	98	109	110	16	111	102	100	96	102
Compression pressure:	bar																

GUGJ/WORKFILE/QI1134-1.PM5

Tested and approved by: Date: Checked/Verified by:

Bengt Haggrund 941111

WÄRTSILÄ DIESEL

Test Report

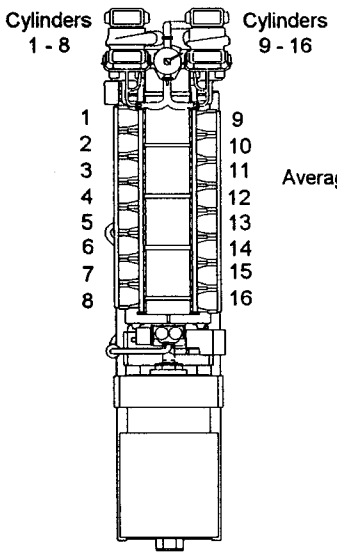
Standard reference conditions according to ISO 3046/1

Type of Engine: 16V25SG

Engine No: 3893

Load % of Nominal:	%	25 %	50 %	75 %	100 %
Date/Time for test:		941108/1345	941108/1730	941108/1830	941108
Engine Speed:	RPM	1000	1000	1000	1000
Ignition timing:	°btdc	14	14	14	14
Brake load:	kNm				
Alternator Voltage/Current:	V/A				10.0/165
Alternator Load:	kW	714	1442	2074	2924

A = Exhaust Gas Temperature
B = Duration of main gas valve opening in milliseconds.



Cyl.	A °C	B ms	A °C	B ms	A °C	B ms	A °C	B ms
1	397		484		507		522	
2	394		484		511		518	
3	395		487		513		519	
4	393		484		510		518	
5	395		479		510		523	
6	392		478		508		517	
7	391		486		506		515	
8	395		480		506		517	
Average value:	395	13.0	483	15.0	509	18.6	519	

Cyl.	A °C	B ms	A °C	B ms	A °C	B ms	A °C	B ms
9	389		487		513		516	
10	398		489		507		517	
11	409		484		510		521	
12	392		487		509		519	
13	392		483		510		523	
14	394		486		511		523	
15	394		487		505		516	
16	392		481		508		515	
Average value:	396	13.0	485	15.0	509	18.6	520	

Turbocharger speed I/II:	RPM	1300/12900	17800/17700	21800/21800	26100/26100
Exhaust temp after turbocharger:	°C	295/303	366/376	388/391	383/383
Exhaust press. after turbocharger:	kPa				

Throttle valve position:	°	89	89	89	89
Charge air pressure:	bar	0.99	1.60	2.04	2.66
Charge air temperature after CAC:	°C	45	53	55	58
Pressure drop over CAC:	kPa				

FW pressure after pump:	bar	4.30	4.2	4.2	4.2
FW temp before engine:	°C	89	88	88	88
FW temp after engine:	°C	92	93	94	95
FW temp before CAC:	°C	45	53	53	64
FW temp after CAC:	°C	47	55	62	70
Lube oil pressure before filter:	bar	6.8	6.6	6.6	6.5
Lube oil pressure after filter:	bar	4.7	4.6	4.5	4.4
Lube oil temp. before engine:	°C	72	73	73	74
Lube oil temp. after engine:	°C	84	84	84	84
Raw water temp. in:	°C	14	18	14	18
Raw water temp. out:	°C	40	45	42	58

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Tested and approved by: Bug/Häggqvist

Date: 941111

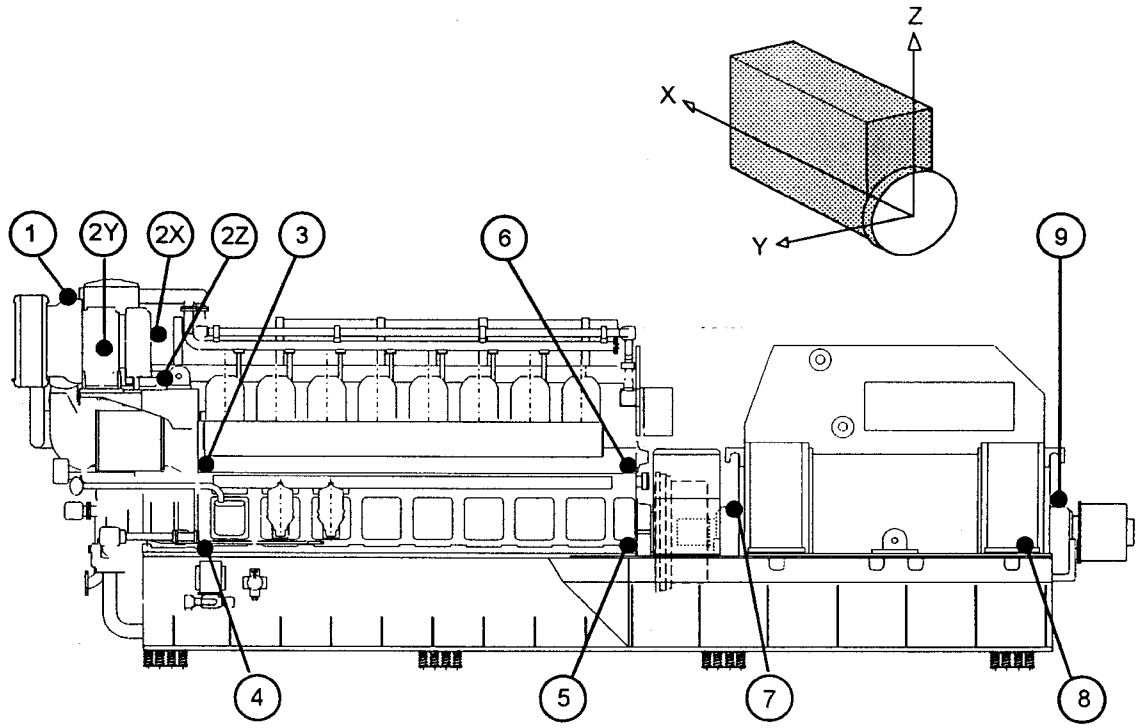
Checked/Verified by:

WÄRTSILÄ DIESEL

Vibration Test Record

Engine type:	Engine No:	Nominal rpm	Nominal load
16V25SG	3893	1000	100 %

Measuring points indicated on illustration below



Measurements taken

Test Point No.	Description	Vibration velocity mm/s RMS Direction			
		X	Y	Z	Rec. limit
1	Turbocharger, right side* (Same pos. as for 2)	17	20	15	20
2	Turbocharger, left side*	18	19	16	20
3	Top of block, upper forward corner.	9	6	8.5	15
4	Foot of block, forward end.	6.5	10.5	13.5	10
5	Foot of block, aft end.	5	7	10	10
6	Top of block, upper aft corner.	5	12	10.5	15
	Points 7,8 & 9 only for Gensets				
7	Alternator, drive end bearing.		6.5	9	10
8	Base frame, aft corner of the flange.	5	7	9	10
9	Alternator, free-end bearing	9.5	9	14	10

* seen from flywheel end.

Tested and approved by: Berg/Hägglund

Date: 94/11/11

Checked/Verified by:

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Order Nr: 566-0900

Year: 1994

Engine Data

Engine type:	Engine No:	kW	r/min
16V25SG	3893	2960	1000

Exhaust Gas Composition:

Oxygen (O_2) :	14.2	% volume, dry.
Carbon dioxide (CO_2) :	3.9	% volume, dry.

Exhaust Gas Emission:

Nitrogen oxides (NO_x) :	16	ppm, dry.
Carbon monoxide (CO) :	2095	ppm, dry.
Total Hydrocarbons (C_1) :	-	ppm, wet.

Remarks

The above data have been measured at 25 % nominal load using natural gas.
The composition of the gas is specified in the enclosed analysis report.

Date of engine test: 94/11/11

Verified by: Bengt Åberg

WÄRTSILÄ DIESEL

Generator Test Report

QI-1134 Encl. 2 Page 5(5)

Order Nr:	Ordered by:	For:
566-0900		

Genset General Data

Engine type:	Engine No:	r/min:
16V25SG	3893	1000
Generator type:	**Generator No:**	**kW:**
HSG 710 LR6	4547378	3536 at Cos. $\varphi = 0.8$

Site Conditions

Altitude (MASL):	Ambient Temperature:	Ambient Air Pressure:	Relative Humidity:
49 meter	°C	kPa	%

Test Data

Load % of Nominal:	%	25 %	50 %	75 %	100 %
Date/Time for test:		941108, 13⁴⁵	941108, 17³⁰	941108, 18³⁰	941108, 19³⁰
Engine room temperature:	°C	23-25	18-22	16-21	16
Heat run (hours):	h				
Frame Temperature:	°C				
Winding Temperature 1:	°C	34	36	47	58
Winding Temperature 2:	°C	33	36	47	58
Winding Temperature 3:	°C	33	36	46	57
Bearing Temperature NDE:	°C	70	66	72	75
Bearing Temperature DE:	°C	65	60	66	67

Hag
Hag

Air Cooled Generator

Air flow:	m^3/h				
Air Inlet Temperature:	°C				
Air Outlet Temperature:	°C				
Pressure drop over filter:	Pa				

Water Cooled Generator

Cooling Water flow:	m^3/h				
Water Inlet Temperature:	°C				
Water Outlet Temperature:	°C				
Pressure drop:	Pa				

Tested and approved by: Bengt Häggqvist

Date: 941111

Checked/Verified by: [signature]

WÄRTSILÄ DIESEL

Adjustment Report

QI-1134

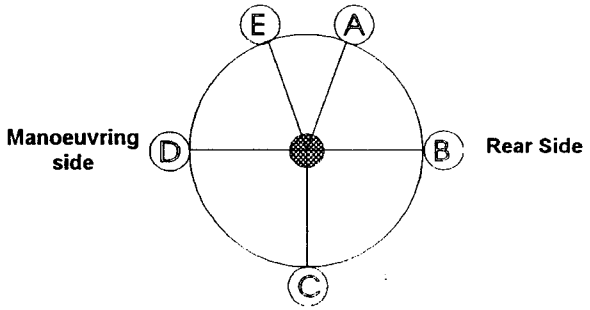
Order No:
566-0900

Engine type:	Engine No:	kW	rpm
16V25SG	3893	2960	1000

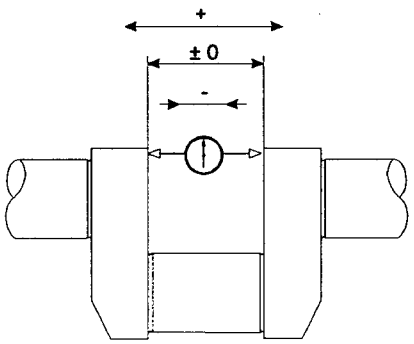
Crankshaft deflection before factory test (1/100 mm)

	Cylinder number:							
Indicator position:	1	2	3	4	5	6	7	8
A: Start position (TDC)	± 0	± 0	± 0	± 0	± 0	± 0	± 0	± 0
B: Rear Side	+ 0.5	± 0	± 0	+ 0.5	+ 0.5	+ 0.5	+ 1.5	+ 0.5
C: Low position (LDC)	+ 1.5	- 0.5	+ 0.5	+ 0.5	± 0	+ 0.5	+ 1.5	+ 1
D: Manoeuvring Side	+ 0.5	± 0	+ 0.5	+ 0.5	+ 0.5	± 0	+ 1.5	+ 0.5
E: End position (TDC)	± 0	± 0	± 0	± 0	± 0	± 0	± 0	± 0

Indicator position
(As seen from flywheel)



Rotate crankshaft in the normal direction.



All Measurements in 1/100 mm

Remarks

Department:

Date: 24/11/11

Signature: Bengt Häggqvist

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	A	B	C	D	E	F	G	H	I	J
1	Test protocol (ISO 8178)									Date:
2	Engine: WN16V25SG	Lub.oil : Mobil Pegasus 480				Protocol number :		1	16v25SG	##########
3	Engine no 3893	Fuel : LNG - spec.940923				Test referens no :		566-0900		Testcell:
4	Turboch. : 254-11	ABB HF10 EF17		16,840	0,997	37,820	0,7670	75,001	16	TJOMEN
5	Turboch.	Spec.		lambda stök	Zn/Z1	Hi	density	Carbonvalue	No. cyl	
6	(-)	(-)		(-)	(-)	(MJ/nm3))	(kg/nm3)	(%)	(-)	
7										
8			test 1	test 2	test 3	test 4	test 5	test 6	test 7	test 8
9	Time941108	hh.mm	13,45	17,30	18,30					
10	Engine output	kW	700	1400	2100	2800				
11	Engine speed	rpm	1000	1000	1000	1000				
12	Temp. testcell	C	23	18,0	16,0	16,0				
13	Atm.pressure	mmHg	762	762	762	762				
14	Relative Humidity	%	75	62	56	56				
15	Saturation vapour pr.	mbar	28,09	20,63	18,18	18,18				
16	Gasconsumption	m3/h	59	85,00	115,00	152,00				
17	Gaspr. Flowsensor	bar(abs)	5,02	5,02	5,02	4,92				
18	Gastemp flowsensor	C	9	13,0	12,0	12,0				
19	CO	ppm	2095							
20	CO2	%	3,9							
21	HC (propane)	ppm	?							
22	NOx	ppm	16							
23	O2	%	14,2							
24										
25	Bmep	bar	3,6	7,1	10,7	14,3				
26	Torque	Nm	6685	13369	20054	26738				
27	Gas consumption	nm3/kWh	0,405	0,288	0,261	0,253				
28	Gas consumption	kJ/kWh	15334	10892	9858	9578				
29	Gas consumption	g/kWh	311	221	200	194				
30	Gas consumption	kg/s	0,06	0,09	0,12	0,15				
31	Gas consumption	nm3/h	283,82	403,18	547,39	709,10				
32	Brake thermal efficienc	%	23,5	33,1	36,5	37,6				
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Berg/Häggqvist

WÄRTSILÄ DIESEL

Control measures after delivery test

QI-1134 Enclosure 5

Order No: 566-900 Engine type: 16V25SG Engine No: 3893

Description	Work performed		
	Date	Signature	Remarks
1 Safety valves pressure tested and preserved.			
2 Centrifugal filter cleaned. Paper insert replaced.			
3 Main bearing No....1.....dismantled for inspection.	941109	Häg	# 1
4 Big end bearing No...2.....dismantled for inspection.	941109	Häg	#4, #5
5 Thrust bearing dismantled for inspection.			
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Date: 94 11 11 Department: Signature: Delivery test completed:

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