HYUNDAI
HEAVY INDUSTRIES CO., LTD.

Official shop test result for Main Engine	Hull No.	HMD4006	Owner	C. P. OFFEN
	Engine No.	AA2491	Class	GL
	Engine Type	6L70MC-C8	Test Date	Aug. 20th. 2007
Specification of Main Engine	Output(MCR)	19620kW	Engineer	E. C. KIM
	Speed(MCR)	108rpm	Operator	S. S. KIM

PARTICULARS OF ENGINE

NUMBER OF CYLINDERS	6
DIAMETER OF CYLINDER	700 mm
STROKE	2360 mm
FIRING ORDER	AH → 1 - 5 - 3 - 4 - 2 - 6 - 1 ← AS
CYLINDER CONSTANT(kW)	1.5137

TURBO CHARGER

TYPE	1 x TPL85B15
SPECIFICATION	CV12CT70CA16 TF20TT40TA22
nBmax / nMmax	11400 rpm / 12000 rpm
tBmax / tMmax	520℃ / 550℃
SERIAL NO. 1	XH001973
MANUFACTURER	HYUNDAI-ABB

DYNAMOMETER

MAKER / TYPE	FROUDE LS-295
CONSTANT	1/ 973.7428
MAXIMUM CAPACITY	44130kW ? 150rpm

SPECIFICATION OF OIL USED AT SHOP TEST

		F.O	System Oil	Cam Oil	Cyl. Oil	T/C Oil
KIND OF OIL		BUNKER-A	MELINA S 30	MELINA S 30	ALEXIA LS	MELINA S 30
SPEC. GRAVITY	(15 ℃)	0.8934	0.8873	0.8873	0.9165	0.8873
FLASH POINT	℃	88	252	252	262	252
VISCOSITY	cst	(50℃) 10.15	(40℃) 103.1	(40℃) 103.1	(40℃) 207.9	(40℃) 103.1
WATER	vol%	0.1				
SULFUR	wt%	0.2				
CALORIFIC VALUE (LOWER)	kcal / kg	10128				

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Official shop test result for Main Engine	Hull No.	HMD4006	Owner	C. P. OFFEN
	Engine No.	AA2491	Class	GL
	Engine Type	6L70MC-C8	Test Date	Aug. 20th. 2007
Specifiction of Accessory	Output(MCR)	19620kW	Engineer	E. C. KIM
	Speed(MCR)	108rpm	Operator	S. S. KIM

GOVERNOR

TYPE	DGS8800e
SERIAL NO.	B006ZC267520038
MANUFACTURER	KONGSBERG MARITIME KOREA

FUEL VALVE (ATOMIZER)

TYPE		3062545-9x165x155x140x130				
OPENING PRESSURE		350 ± 30 bar				
SPEC.	HOLE NO.	1	2	3	4	5
	DIA. OF HOLE(Φ)	1.30	1.55	1.65	1.65	1.40
	VERTI. ANGLE(α°)	27	30	28	15	24
	HORIZ. ANGLE(β°)	-15	10	32	47	67

AUXILIARY BLOWER

TYPE / CAPACITY	HAA-400/125N / 3.63 / 6.21	m^3/sec
SPEED / PRESSURE	3565 rpm / 571/327	mmAq
MFG NO. 1 / 2	SO08450101 / 02	
MANUFACTURER	HYUNDAI MARINE MACHINERY Co.,LTD.	
ELECT. MOTOR TYPE / VOLTAGE	MNB25M0206C / 440	V
ELECT. MOTOR FREQUENCY / POWER / Amp	60 Hz / 90 kW / 141.1	A
ELECT. MOTOR SERIAL NO. 1 / 2	7F261J11-002 / 001	
ELECT. MOTOR MANUFACTURER	HYUNDAI HEAVY INDUSTRIES Co.,LTD.	

AIR COOLER

TYPE	LKMY22/34A4A-EK-2584
IMO-ID	A19-250291-8
MANUFACTURER	VESTAS AIRCOIL

CYLINDER LUBRICATOR

TYPE	α-Lubricator
SOFTWARE VERSION	1.67
MANUFACTURER	MAN-B&W DIESEL A/S

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

Official shop test result for Main Engine

Summary Data of Load Test

Hull No.	HMD4006	Owner	C. P. OFFEN
Engine No.	AA2491	Class	GL
Engine Type	6L70MC-C8	Test Date	Aug. 20th. 2007
Output(MCR)	19620kW	Engineer	E. C. KIM
Speed(MCR)	108rpm	Operator	S. S. KIM

DATA SHEET NO.		1	2	3	4	5	6	7	8
LOAD (%)		25	50	75	90	100-1	100-2	110	
MEASURING TIME		10:30	11:00	11:30	12:00	12:40	13:00	13:30	
SPEED (rpm)		68.0	85.7	98.1	104.3	108.0	108.0	111.5	
BHP (kW)		4905	9804	14709	17652	19620	19620	21584	
IHP (kW)		5533	10602	15625	18633	20638	20642	22644	
MECH. EFF. (%)		88.65	92.47	94.14	94.74	95.07	95.05	95.32	
Pmax. (bar)		78.2	109.0	140.5	158.2	160.5	160.3	160.5	
Pcomp. (bar)		50.7	76.0	105.8	123.5	134.3	133.7	145.0	
Pi (bar)		8.96	13.62	17.54	19.67	21.04	21.04	22.36	
F.O PUMP (PΘ)		45.7	61.3	75.3	84.3	90.0	90.2	96.0	
Fuel Oil Con-	Measured	183.18	175.35	172.84	174.88	178.89	178.87	183.21	
sum.(g/kWh)	Corrected	181.17	173.18	170.70	172.71	176.82	176.81	181.31	
Exh. Gas	Cyl. Out	306	317	325	338	355	353	373	
Temp.	Bef. T/C	320	360	379	395	415	415	439	
(℃)	Aft. T/C	280	282	258	252	259	259	269	
T/C Speed	NO. 1	4710	7940	9680	10530	11040	11005	11570	
(rpm)	NO. 2								
	NO. 3	BLANK							
	NO. 4								
	Average	4710	7940	9680	10530	11040	11005	11570	
Scavenging Air	℃	36.0	32.0	36.0	39.0	40.0	40.0	41.0	
	kg/㎠	0.40	1.20	1.97	2.49	2.74	2.74	3.03	
F.Water Inlet Temp. (℃)		28.0	28.0	28.0	30.0	30.0	30.0	30.0	
Test Room	℃	33.2	33.6	34.1	34.5	35.1	35.2	35.2	
	mbar	1013	1013	1013	1014	1014	1014	1013	

*** Note : The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal/kg and ISO condition**

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

Official shop test result for Main Engine

Data sheet of 25 % Load test

Hull No.	HMD4006	Weather	Fine
Engine No.	AA2491	Measuring Time	10:30
Eng. Type	6L70MC-C8	Test Date	Aug. 20th. 2007
Owner	C. P. OFFEN	Engineer	E. C. KIM
Class	GL	Operator	S. S. KIM

* Room Temperature : 33.2 ℃ * Atmospheric Pressure : 1013 mbar Humidity : 58%

Engine Speed	Water Brake	BHP	IHP	Mech.Efficiency	NOTCH
68.0 rpm	70240 kgfm	4905 kW	5533 kW	88.65 %	4.0

System		Main L.O	P.C.O	Cam L.O.	Fuel Oil	Cooling F.W
In	Press.(kg/㎠)	2.1			8.0	4.0
	Temp.(℃)	47.0			44.0	73.0

Cyl. NO.		Avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pmax.	bar	78.2	78	78	79	78	78	78	BLANK							
Pcomp.	bar	50.7	50	51	51	51	50	51								
Pi	bar	8.96	8.92	8.91	9.03	8.98	8.89	9.03								
F.O Pump	PΘ	45.7	46	45	45	46	46	46								
	VIT	0.0	0.0	0.0	0.0	0.0	0.0	0.0								
Exh.Gas Out.	℃	306	308	300	290	312	318	310								
C.F.W Out	℃	81.2	81	80	81	83	82	80								
Cam L.O Out	℃	50.0	50													
P.C.O Out	℃	54.0	54	54	54	54	54	54								

Air Cooler

NO.		1	2	3	4	Avg.
Bef. Cooler Press	mmHg	230	BLANK			230
Press. Drop	mmAq	85				85
Air In.	℃	57				57
Air Out.	℃	28				28
Fresh Water In.	℃	28				28
Fresh Water Out	℃	28				28

Scavenging Air

Pressure	Pressure	Temperature
0.40 kg/㎠	270mmHg	36 ℃

Exhaust Manifold

0.31 kg/㎠

Specific Fuel Oil Consumption

Meas.(kg/h)	Meas.(g/kWh)	Correct(g/kWh)
898.48	183.18	181.17

TurboCharger

Turbo Charger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.(℃) , kg/㎠			F.W Temp
	rpm	℃		mmAq	℃	mmHg	℃	mmAq	In	Out	Press.	℃
NO. 1	4710	34.0	40.0	7	320	170	280	10	47	52	1.52	
NO. 2	BLANK											
NO. 3												
NO. 4												
Avg.	4710	37.0		7	320	170	280	10	47	52	1.52	

* VIT Pressure : 0.5 kg/㎠ * Governor Position : 36.0 * AVM : 0.51mm * Thrust Pad : 56 ℃

Note : The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition

HYUNDAI HEAVY INDUSTRIES CO., LTD.

Official shop test result for Main Engine

Data sheet of 50 % Load test

Hull No.	HMD4006	Weather	Fine
Engine No.	AA2491	Measuring Time	11:00
Eng. Type	6L70MC-C8	Test Date	Aug. 20th. 2007
Owner	C. P. OFFEN	Engineer	E. C. KIM
Class	GL	Operator	S. S. KIM

Room Temperature : 33.6 ℃ * Atmospheric Pressure : 1013 mbar Humidity : 55%

Engine Speed	Water Brake	BHP	IHP	Mech.Efficiency	NOTCH
85.7 rpm	111400 kgfm	9804 kW	10602 kW	92.47 %	5.5

System	Main L.O	P.C.O	Cam L.O.	Fuel Oil	Cooling F.W
Press.(kg/㎠)	2.1			7.9	4.0
Temp.(℃)	46.0			45.0	72.0

Cyl. NO.		Avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ax.	bar	109.0	108	109	109	109	109	110	BLANK							
mp.	bar	76.0	76	76	76	76	76	76								
	bar	13.62	13.61	13.70	13.58	13.69	13.51	13.64								
O Pump	PΘ	61.3	62	60	61	62	62	61								
	VIT	0.3	0.3	0.3	0.3	0.2	0.2	0.2								
.Gas Out.	℃	317	320	320	310	320	324	310								
W Out	℃	83.0	84	82	82	84	84	82								
n L.O Out	℃	47.0	47													
O Out	℃	52.0	52	52	52	52	52	52								

Air Cooler

NO.		1	2	3	4	Avg.
Cooler Press	mmHg	870	BLANK			870
s. Drop	mmAq	160				160
n.	℃	114				114
Out.	℃	30				30
Water In.	℃	28				28
Water Out.	℃	33				33

Scavenging Air

Pressure	Pressure	Temperature
1.20 kg/㎠	840mmHg	32 ℃

Exhaust Manifold

0.96 kg/㎠

Specific Fuel Oil Consumption

Meas.(kg/h)	Meas.(g/kWh)	Correct(g/kWh)
1719.13	175.35	173.18

TurboCharger

o Charger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.(℃) , kg/㎠			F.W Temp
	rpm	℃		mmAq	℃	mmHg	℃	mmAq	In	Out	Press.	℃
O. 1	7940	34.0	42.0	30	360	580	282	60	46	57	1.43	
O. 2	BLANK											
O. 3												
O. 4												
vg.	7940	38.0		30	360	580	282	60	46	57	1.43	

ressure : 0.7 kg/㎠ * Governor Position : 48.0 * AVM : 0.52mm * Thrust Pad : 55 ℃

The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

Official shop test result for Main Engine

Data sheet of 75 % Load test

Hull No.	HMD4006	Weather	Fine
Engine No.	AA2491	Measuring Time	11:30
Eng. Type	6L70MC-C8	Test Date	Aug. 20th. 2007
Owner	C. P. OFFEN	Engineer	E. C. KIM
Class	GL	Operator	S. S. KIM

Room Temperature : **34.1** ℃ * Atmospheric Pressure : **1013 mbar** Humidity : **50%**

Engine Speed	Water Brake	BHP	IHP	Mech.Efficiency	NOTCH
98.1 rpm	**146000 kgfm**	**14709 kW**	**15625 kW**	**94.14 %**	**6.4**

System		Main L.O	P.C.O	Cam L.O.	Fuel Oil	Cooling F.W
n	Press.(kg/㎠)	**2.1**			**7.6**	**4.0**
	Temp.(℃)	**46.0**			**45.0**	**72.0**

Cyl. NO.		Avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
nax.	bar	**140.5**	**141**	**141**	**140**	**140**	**141**	**140**	BLANK							
omp.	bar	**105.8**	**106**	**106**	**105**	**106**	**106**	**106**								
	bar	**17.54**	**17.62**	**17.54**	**17.42**	**17.59**	**17.48**	**17.57**								
O Pump	PΘ	**75.3**	**76**	**75**	**75**	**75**	**75**	**76**								
	VIT	**2.4**	**2.3**	**2.5**	**2.5**	**2.4**	**2.5**	**2.4**								
h.Gas Out.	℃	**325**	**325**	**325**	**315**	**329**	**340**	**315**								
F.W Out	℃	**84.3**	**84**	**84**	**83**	**86**	**85**	**84**								
m L.O Out	℃	**48.0**	**48**													
C.O Out	℃	**53.0**	**53**	**53**	**53**	**53**	**53**	**53**								

Air Cooler

NO.		1	2	3	4	Avg.
f. Cooler Press	mmHg	**1440**	BLANK			**1440**
ess. Drop	mmAq	**200**				**200**
r In.	℃	**160**				**160**
r Out.	℃	**36**				**36**
esh Water In.	℃	**28**				**28**
esh Water Out	℃	**40**				**40**

Scavenging Air

Pressure	Pressure	Temperature
1.97 kg/㎠	**1410mmHg**	**36** ℃

Exhaust Manifold

1.67 kg/㎠

Specific Fuel Oil Consumption

Meas.(kg/h)	Meas.(g/kWh)	Correct(g/kWh)
2542.24	**172.84**	**170.70**

TurboCharger

rbo Charger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.(℃) , kg/㎠			F.W Temp
	rpm	℃		mmAq	℃	mmHg	℃	mmAq	In	Out	Press.	℃
NO. 1	**9680**	**34.0**	**42.0**	**58**	**379**	**1140**	**258**	**110**	**46**	**66**	**1.50**	
NO. 2	BLANK											
NO. 3												
NO. 4												
Avg.	**9680**	**38.0**		**58**	**379**	**1140**	**258**	**110**	**46**	**66**	**1.50**	

IT Pressure : **1.6** kg/㎠ * Governor Position : **58.0** * AVM : **0.64mm** * Thrust Pad : **56** ℃

ote : The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

Official shop test result for Main Engine

ata sheet of 90 % Load test

Hull No.	HMD4006	Weather	Fine
Engine No.	AA2491	Measuring Time	12:00
Eng. Type	6L70MC-C8	Test Date	Aug. 20th. 2007
Owner	C. P. OFFEN	Engineer	E. C. KIM
Class	GL	Operator	S. S. KIM

oom Temperature : 34.5 ℃ * Atmospheric Pressure : 1014 mbar Humidity : 51%

Engine Speed	Water Brake	BHP	IHP	Mech.Efficiency	NOTCH
104.3 rpm	164800 kgfm	17652 kW	18633 kW	94.74 %	7.0

System	Main L.O	P.C.O	Cam L.O.	Fuel Oil	Cooling F.W
Press.(kg/㎠)	2.1			7.3	4.0
Temp.(℃)	46.0			42.0	72.0

Cyl. NO.		Avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ax.	bar	158.2	158	158	158	158	158	159	BLANK							
mp.	bar	123.5	123	124	123	124	123	124								
	bar	19.67	19.63	19.74	19.62	19.64	19.71	19.67								
O Pump	PΘ	84.3	85	84	84	84	85	84								
	VIT	3.2	3.1	3.3	3.2	3.2	3.1	3.2								
.Gas Out.	℃	338	342	332	330	340	350	335								
.W Out	℃	85.7	85	84	85	87	86	87								
n L.O Out	℃	47.0	47													
.O Out	℃	53.0	53	53	53	53	53	53								

Air Cooler

NO.		1	2	3	4	Avg.
Cooler Press	mmHg	1800	BLANK			1800
ss. Drop	mmAq	225				225
In.	℃	185				185
Out.	℃	38				38
sh Water In.	℃	30				30
sh Water Out	℃	44				44

Scavenging Air

Pressure	Pressure	Temperature
2.49 kg/㎠	1780mmHg	39 ℃

Exhaust Manifold

2.14 kg/㎠

Specific Fuel Oil Consumption

Meas.(kg/h)	Meas.(g/kWh)	Correct(g/kWh)
3087.00	174.88	172.71

TurboCharger

rbo Charger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.(℃) , kg/㎠			F.W Temp
	rpm	℃		mmAq	℃	mmHg	℃	mmAq	In	Out	Press.	℃
NO. 1	10530	34.0	43.0	77	395	1490	252	160	46	72	1.65	
NO. 2	BLANK											
NO. 3												
NO. 4												
Avg.	10530	38.5		77	395	1490	252	160	46	72	1.65	

T Pressure : 2.2 kg/㎠ * Governor Position : 65.0 * AVM : 0.70mm * Thrust Pad : 56 ℃

te : The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

Official shop test result for Main Engine

Data sheet of 100-1 % Load test

Hull No.	HMD4006	Weather	Fine
Engine No.	AA2491	Measuring Time	12:40
Eng. Type	6L70MC-C8	Test Date	Aug. 20th. 2007
Owner	C. P. OFFEN	Engineer	E. C. KIM
Class	GL	Operator	S. S. KIM

Room Temperature : 35.1 ℃ * Atmospheric Pressure : 1014 mbar Humidity : 49%

Engine Speed	Water Brake	BHP	IHP	Mech.Efficiency	NOTCH
108.0 rpm	176900 kgfm	19620 kW	20638 kW	95.07 %	7.3

System		Main L.O	P.C.O	Cam L.O.	Fuel Oil	Cooling F.W
n	Press.(kg/㎠)	2.1			7.8	4.0
	Temp.(℃)	47.0			45.0	72.0

Cyl. NO.		Avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ax.	bar	160.5	161	161	160	160	161	160	BLANK							
mp.	bar	134.3	135	134	133	135	134	135								
	bar	21.04	21.04	21.09	21.05	20.97	21.06	21.04								
O Pump	PΘ	90.0	90	90	89	90	91	90								
	VIT	2.8	2.7	2.9	2.9	2.7	2.8	2.7								
n.Gas Out.	℃	355	369	350	340	359	365	348								
.W Out	℃	86.3	85	85	86	87	87	88								
n L.O Out	℃	48.0	48													
.O Out	℃	54.8	55	55	55	55	54	55								

Air Cooler

NO.		1	2	3	4	Avg.
Cooler Press	mmHg	2010	BLANK			2010
s. Drop	mmAq	240				240
In.	℃	200				200
Out.	℃	39				39
h Water In.	℃	30				30
h Water Out	℃	42				42

Scavenging Air

Pressure	Pressure	Temperature
2.74 kg/㎠	1980mmHg	40 ℃

Exhaust Manifold

2.40 kg/㎠

Specific Fuel Oil Consumption

Meas.(kg/h)	Meas.(g/kWh)	Correct(g/kWh)
3509.85	178.89	176.82

TurboCharger

oo Charger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.(℃) , kg/㎠			F.W Temp
	rpm	℃		mmAq	℃	mmHg	℃	mmAq	In	Out	Press.	℃
NO. 1	11040	35.0	45.0	86	415	1680	259	220	47	76	1.65	
NO. 2	BLANK											
NO. 3												
NO. 4												
Avg.	11040	40.0		86	415	1680	259	220	47	76	1.65	

Pressure : 1.8 kg/㎠ * Governor Position : 70.0 * AVM : 0.81mm * Thrust Pad : 53 ℃

e : The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

Official shop test result for Main Engine

Data sheet of 100-2 % Load test

Hull No.	HMD4006	Weather	Fine
Engine No.	AA2491	Measuring Time	13:00
Eng. Type	6L70MC-C8	Test Date	Aug. 20th. 2007
Owner	C. P. OFFEN	Engineer	E. C. KIM
Class	GL	Operator	S. S. KIM

* Room Temperature : 35.2 ℃ * Atmospheric Pressure : 1014 mbar Humidity : 49%

Engine Speed	Water Brake	BHP	IHP	Mech.Efficiency	NOTCH
108.0 rpm	176900 kgfm	19620 kW	20642 kW	95.05 %	7.3

System		Main L.O	P.C.O	Cam L.O.	Fuel Oil	Cooling F.W
In	Press.(kg/㎠)	2.1			7.6	4.0
	Temp.(℃)	46.0			45.0	72.0

Cyl. NO.		Avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pmax.	bar	160.3	160	160	161	160	160	161	BLANK							
Pcomp.	bar	133.7	134	134	134	133	133	134								
Pi	bar	21.04	20.97	21.07	21.10	21.05	20.98	21.10								
F.O Pump	PΘ	90.2	90	90	90	90	91	90								
	VIT	2.7	2.6	2.7	2.8	2.7	2.8	2.7								
Exh.Gas Out.	℃	353	360	350	339	357	366	343								
C.F.W Out	℃	87.0	86	86	86	88	87	89								
Cam L.O Out	℃	48.0	48													
P.C.O Out	℃	54.8	55	55	55	55	54	55								

Air Cooler

NO.		1	2	3	4	Avg.
Bef. Cooler Press	mmHg	2010	BLANK			2010
Press. Drop	mmAq	240				240
Air In.	℃	200				200
Air Out.	℃	39				39
Fresh Water In.	℃	30				30
Fresh Water Out	℃	46				46

Scavenging Air

Pressure	Pressure	Temperature
2.74 kg/㎠	1980mmHg	40 ℃

Exhaust Manifold

2.40 kg/㎠

Specific Fuel Oil Consumption

Meas.(kg/h)	Meas.(g/kWh)	Correct(g/kWh)
3509.55	178.87	176.81

TurboCharger

Turbo Charger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.(℃) , kg/㎠			F.W Temp
	rpm	℃		mmAq	℃	mmHg	℃	mmAq	In	Out	Press.	℃
NO. 1	11005	35.0	45.0	87	415	1680	259	210	46	76	1.66	
NO. 2	BLANK											
NO. 3												
NO. 4												
Avg.	11005	40.0		87	415	1680	259	210	46	76	1.66	

* VIT Pressure : 1.8 kg/㎠ * Governor Position : 70.0 * AVM : 0.82mm * Thrust Pad : 51 ℃

Note : The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition

HYUNDAI HEAVY INDUSTRIES CO., LTD.

Official shop test result for Main Engine

Data sheet of 110 % Load test

Hull No.	HMD4006	Weather	Fine
Engine No.	AA2491	Measuring Time	13:30
Eng. Type	6L70MC-C8	Test Date	Aug. 20th. 2007
Owner	C. P. OFFEN	Engineer	E. C. KIM
Class	GL	Operator	S. S. KIM

* Room Temperature : 35.2 ℃ * Atmospheric Pressure : 1013 mbar Humidity : 49%

Engine Speed	Water Brake	BHP	IHP	Mech.Efficiency	NOTCH
111.5 rpm	188500 kgfm	21584 kW	22644 kW	95.32 %	7.6

System		Main L.O	P.C.O	Cam L.O.	Fuel Oil	Cooling F.W
In	Press.(kg/㎠)		2.1		7.4	3.9
	Temp.(℃)		46.0		44.0	68.0

Cyl. NO.		Avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pmax.	bar	160.5	160	160	160	161	161	161	BLANK							
Pcomp.	bar	145.0	145	145	145	145	145	145								
Pi	bar	22.36	22.33	22.37	22.30	22.34	22.40	22.42								
F.O Pump	PΘ	96.0	96	96	96	96	96	96								
	VIT	0.9	0.8	0.9	0.9	0.9	0.9	0.9								
Exh.Gas Out.	℃	373	382	365	362	378	388	365								
C.F.W Out	℃	81.2	81	80	81	83	82	80								
Cam L.O Out	℃	48.0	48													
P.C.O Out	℃	55.5	55	56	56	55	55	56								

Air Cooler

NO.		1	2	3	4	Avg.
Bef. Cooler Press	mmHg	2250	BLANK			2250
Press. Drop	mmAq	250				250
Air In.	℃	214				214
Air Out.	℃	40				40
Fresh Water In.	℃	30				30
Fresh Water Out	℃	48				48

Scavenging Air

Pressure	Pressure	Temperature
3.03 kg/㎠	2210mmHg	41 ℃

Exhaust Manifold

2.67 kg/㎠

Specific Fuel Oil Consumption

Meas.(kg/h)	Meas.(g/kWh)	Correct(g/kWh)
3954.59	183.21	181.31

TurboCharger

Turbo Charger	Speed	Blower Inlet			Before Turbine		After Turbine		L.O.(℃) , kg/㎠			F.W Temp
	rpm	℃		mmAq	℃	mmHg	℃	mmAq	In	Out	Press.	℃
NO. 1	11570	35.0	45.0	98	439	1910	269	260	46	78	1.75	
NO. 2	BLANK											
NO. 3												
NO. 4												
Avg.	11570	40.0		98	439	1910	269	260	46	78	1.75	

VIT Pressure : 0.9 kg/㎠ * Governor Position : 75.0 * AVM : 0.80mm * Thrust Pad : 51 ℃

Note : The Fuel Oil Consumption is corrected to Lower Calorific Value 10200 kcal / kg & I.S.O condition

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

Official shop test result for Main Engine	Hull No.	HMD4006	Owner	C. P. OFFEN
	Engine No.	AA2491	Class	GL
	Engine Type	6L70MC-C8	Test Date	Aug. 20th. 2007
Starting,Gov',Safety,Min'rev'test	Output(MCR)	19620kW	Engineer	E. C. KIM
	Speed(MCR)	108rpm	Operator	S. S. KIM

Starting Test

Time	Ahead	Time	Astern	Time	Ahead	Time	Astern
1	BLANK	2	BLANK	13		14	
3		4		15		16	
5		6		17		18	
7		8		19		20	
9		10		21		22	
11		12		23		24	

m^3

F.W Temp. : ℃ L.O Temp. : ℃

Governor Test

Load	Engine Speed (rpm)	Variation : 1.02 %
M.C.R	108.0	
M.C.R ⇒ 50%	109.1	(Instant)
	108.0	(Permanent)

Safety Device Test

Emergency Stop of Engine	Item	Set Value
	* OverSpeed	117.7 rpm
	* Main L.O Low pressure	1.32 bar
	* T/C L.O. Low pressure	0.85 bar
	* Thrust Pad High Temperature	88 ℃
	* O.M.D. TEST(ALL)	O.K

Minimum Revolution Test

Engine Speed rpm	Water Brake kgfm	Output kW	Handle Notch Position	Governor Position	Pump Index mm	Turbocharger (rpm) No.1
25.10	27400	704	0.3	26	32.0	1410

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

Official shop test result for Main Engine

Engine performance

Hull No.	HMD4006	Owner	C. P. OFFEN
Engine No.	AA2491	Class	GL
Engine Type	6L70MC-C8	Test Date	Aug. 20th. 2007
Output(MCR)	19620kW	Engineer	E. C. KIM
Speed(MCR)	108rpm	Operator	S. S. KIM

Project No.
HMD4006

Engine No.
AA2491

Engine Type
6L70MC-C8

T/C Type
TPL85B15

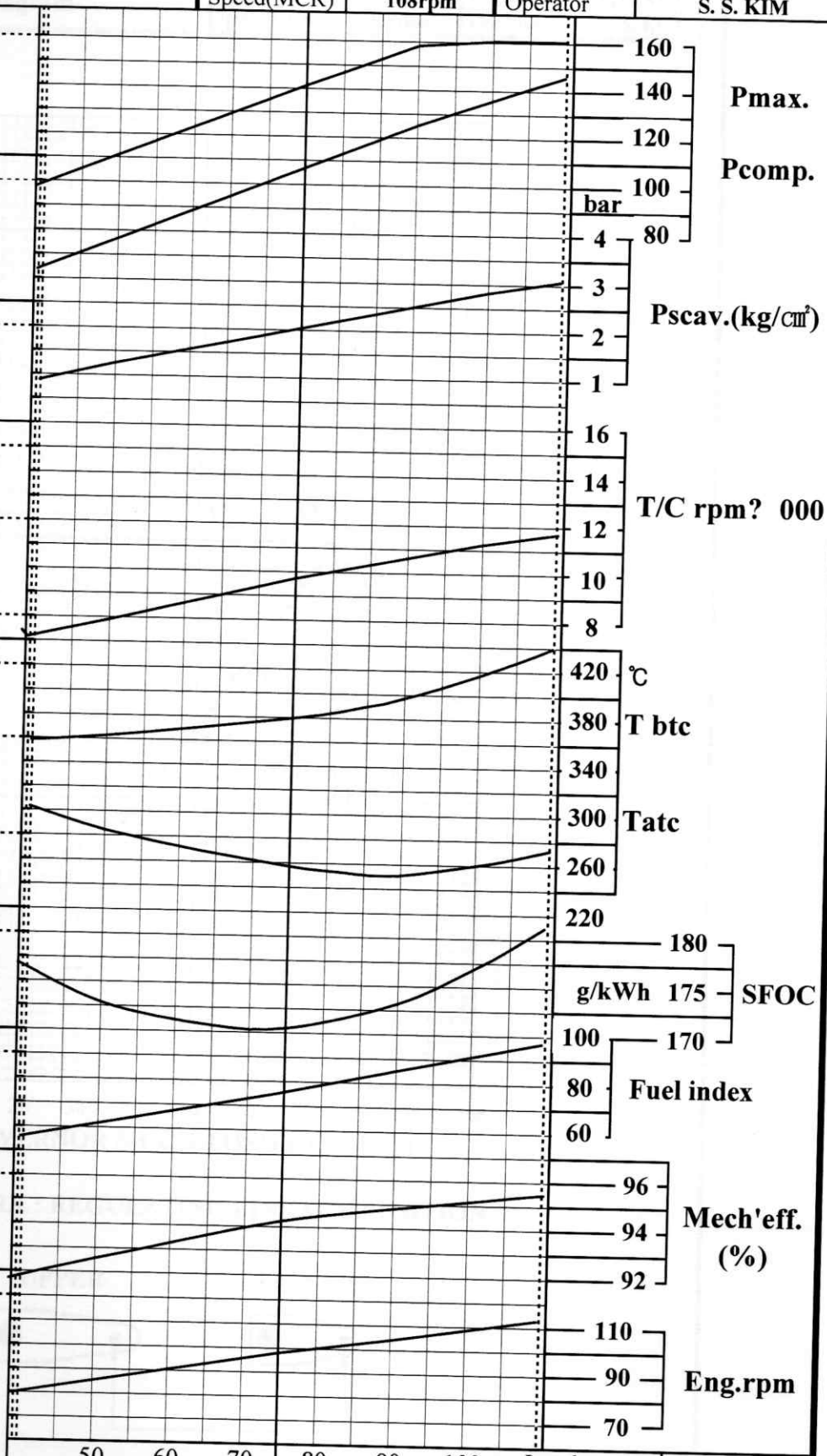
PTU/Bypass

Fuel Cam

Exh. Cam

Comp.Shim
12mm

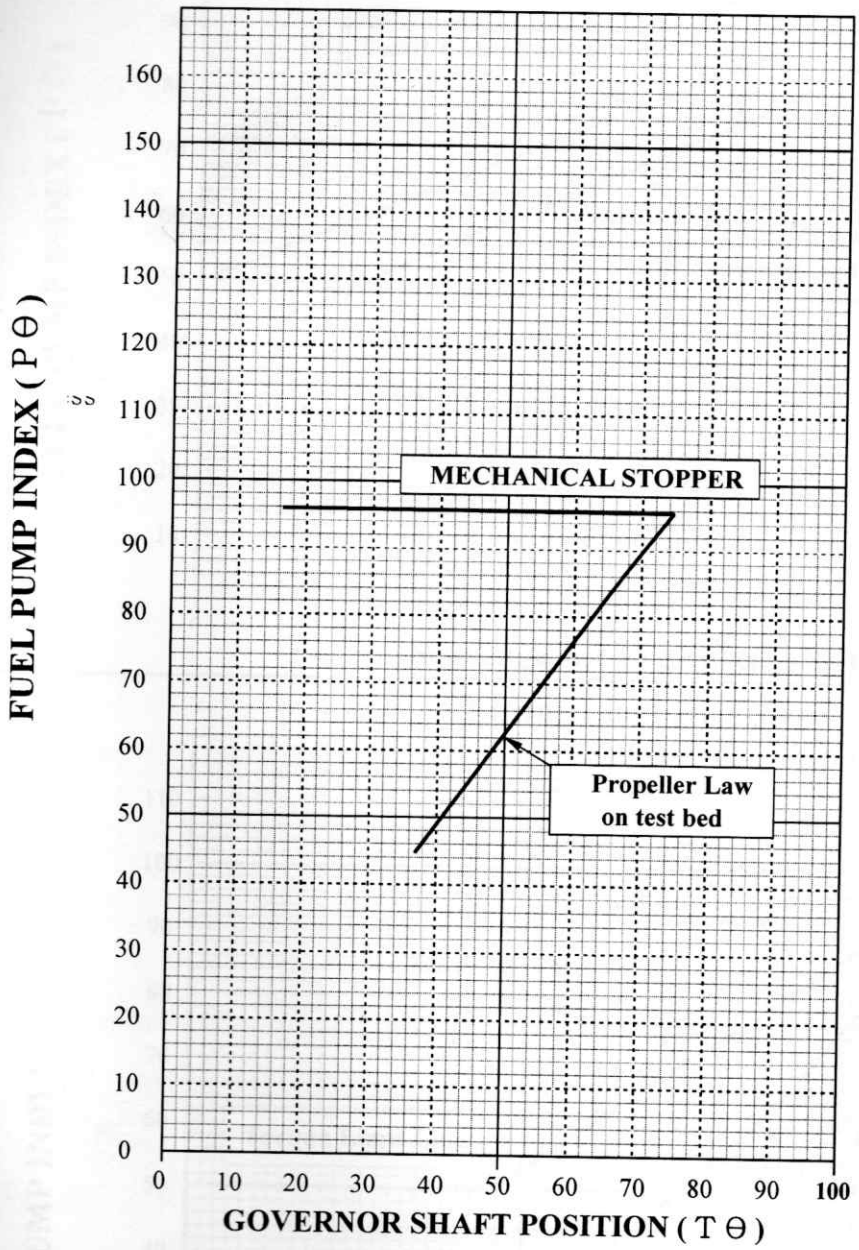
Remark
OFFICIAL SHOP TEST



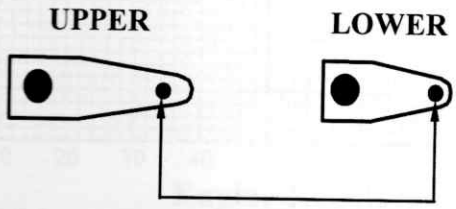
Opt. at 90 %

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

Official shop test result for Main Engine				
PΘ - TΘ Diagram	Hull No.	HMD4006	Owner	C. P. OFFEN
	Engine No.	AA2491	Class	GL
	Engine Type	6L70MC-C8	Test Date	Aug. 20th. 2007
	Output(MCR)	19620kW	Engineer	E. C. KIM
	Speed(MCR)	108rpm	Operator	S. S. KIM



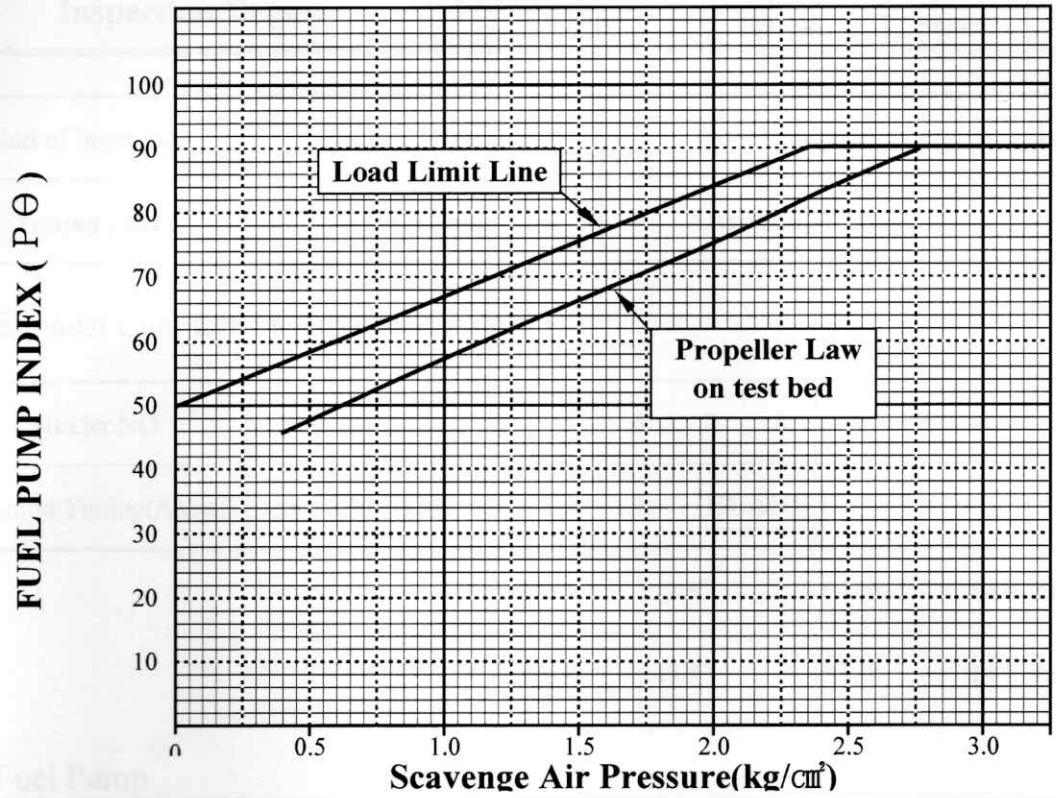
*** REMARK : REGULATING LINKAGE POSITION**



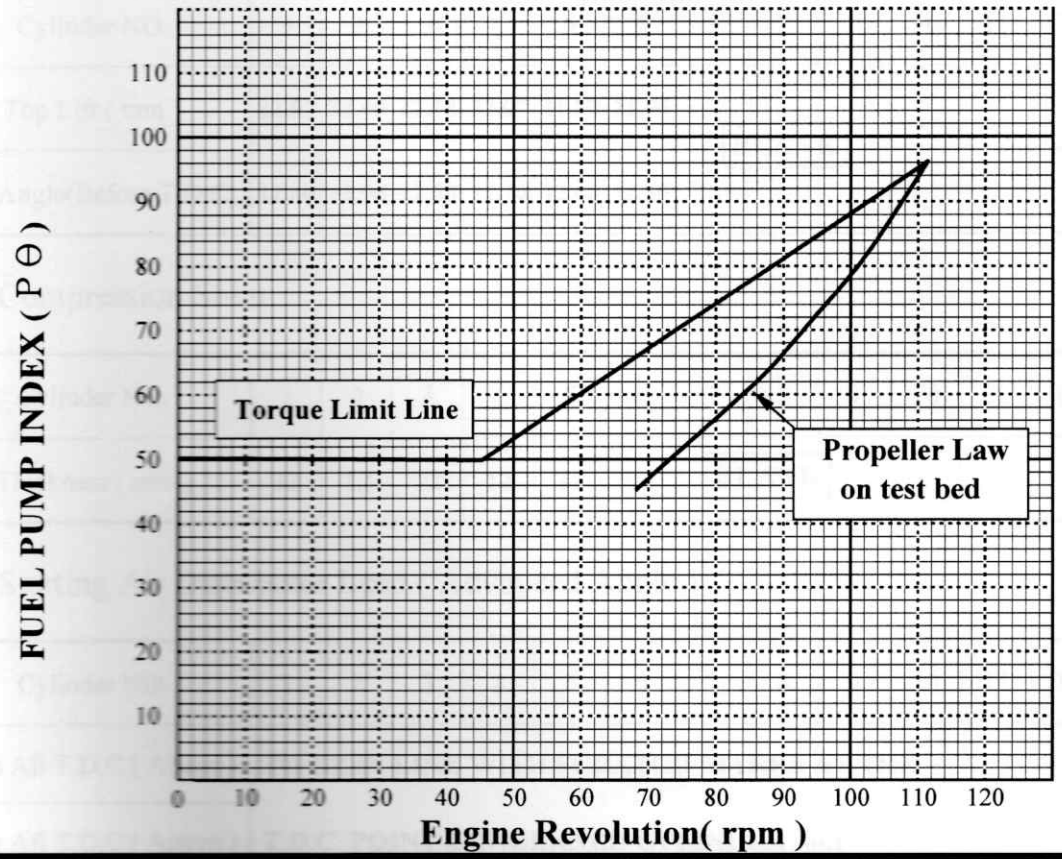
HYUNDAI HEAVY INDUSTRIES CO., LTD.

Official shop test result for Main Engine	Hull No.	HMD4006	Owner	C. P. OFFEN
	Engine No.	AA2491	Class	GL
	Engine Type	6L70MC-C8	Test Date	Aug. 20th. 2007
Load & Torque Limit Diagram	Output(MCR)	19620kW	Engineer	E. C. KIM
	Speed(MCR)	108rpm	Operator	S. S. KIM

Load Limit Diagram



Torque Limit Diagram



HYUNDAI
HEAVY INDUSTRIES CO., LTD.

Official shop test result for Main Engine	Hull No.	HMD4006	Owner	C. P. OFFEN
	Engine No.	AA2491	Class	GL
	Engine Type	6L70MC-C8	Test Date	Aug. 20th. 2007
Inspection Report	Output(MCR)	19620kW	Engineer	E. C. KIM
	Speed(MCR)	108rpm	Operator	S. S. KIM

Kind of Inspection.	Place of Inspection	Work Condition	Judgement
Timing Data	**Ass'y Shop**	**After Shop Test**	**Ref.**

1. Exhaust Cam Lead (Advanced Angle)

Cylinder NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Measured Timing(Ahead)	1.95	1.90	1.95	1.95	1.95	1.90	BLANK							

* Angle A : **112.5°** * Lift : **14.0** mm

* Angle B : **243.5°** * Lift : **14.0** mm

2. Fuel Pump

Cylinder NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Top Lift (mm)	22.07	22.40	22.18	22.07	21.82	21.56	BLANK							
Lead Angle(Before T.D.C)	12.80	12.90	12.80	12.70	12.60	12.50								

3. Compression Shim

Cylinder NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Thickness (mm)	12	12	12	12	12	12	BLANK							

4. Starting Air Distributor Lead (Advanced Angle)

Cylinder NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Open Aft T.D.C (Ahead)	TO BE IN LINE WITH SCRATCH MARKS AT THE													
Open Aft T.D.C (Astern)	T.D.C POINT CONCERNED CYLINDER No.1													

HYUNDAI HEAVY INDUSTRIES CO., LTD.

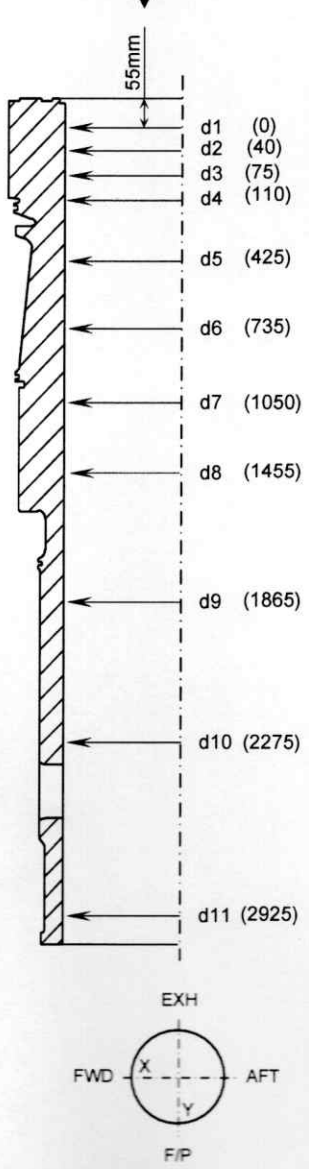
Official Shop Test Result for Main Engine

Inspection Report

Hull No.	HMD4006	Owner	C. P. OFFEN
Engine No.	AA2491	Class	GL
Engine Type	6L70MC-C	Nomenclature	Cyl. liner
Output(MCR)	19,620 kW	Kind of Insp.	Dimension
Speed(MCR)	108 rpm	Work Condition	Before shop test

Unit: 1/100 mm

Note:
Before measuring, the measuring point "I" should be adjusted to 5mm below upper edge of uppermost ring at TDC



Cyl.No	Position / Spec. / Item no.		d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11
			? 00 +0.125 0										
1	6L70MC-C	X	+8	+8	+8	+8	+7	+7	+7	+8	+9	+9	+10
	-3406	Y	+8	+8	+7	+7	+7	+6	+6	+7	+8	+7	+8
2		X	+7	+7	+7	+7	+6	+7	+8	+8	+8	+9	+9
	-3415	Y	+7	+7	+7	+6	+5	+6	+7	+6	+6	+7	+7
3		X	+9	+9	+9	+8	+8	+8	+9	+9	+10	+10	+10
	-3416	Y	+9	+8	+8	+8	+7	+7	+8	+7	+8	+9	+8
4		X	+7	+7	+7	+6	+6	+6	+7	+8	+8	+9	+9
	-3438	Y	+7	+6	+6	+6	+5	+5	+6	+6	+6	+8	+7
5		X	+8	+8	+7	+7	+7	+7	+8	+8	+8	+9	+9
	-3439	Y	+8	+8	+7	+7	+6	+6	+7	+6	+6	+7	+6
6		X	+8	+8	+8	+7	+7	+8	+9	+9	+9	+10	+10
	-3444	Y	+8	+8	+7	+7	+6	+7	+8	+8	+7	+8	+7
S		X	+9	+9	+9	+9	+9	+8	+8	+8	+9	+9	+10
	-3443	Y	+9	+9	+8	+9	+8	+7	+7	+6	+7	+7	+7
						BLANK							