經濟部暨所屬機關因公出國人員報告書
（出國類別：其它）

桃油六號主機 SHOP TRIAL

報告書

出 國 人：　服務機關：中油公司總公司
職務：工程師
姓名：楊德瀚

出國地點：　日本
出國期間：　98 年 11 月 11 日至 11 月 14 日
報告日期：　98 年 12 月 1 日

出國報告審核表

出國報告名稱：桃油六號主機 SHOP TRIAL		
出國人姓名(2人以上,以1人爲代表)	職稱	服務單位
楊德瀚	工程師	儲運處造船組
出國類別	☐ 考察 ☐進修 ☐研究 ☐實習 ☑ 其他 業務接洽 （例如國際會議、國際比賽、業務接洽等）	
出國期間： 98 年 11 月 11 日至 98 年 11 月 14 日		報告繳交日期：98 年 12 月 01 日

計畫主辦機關審核意見	☑1.依限繳交出國報告 ☑2.格式完整(本文必須具備「目的」、「過程」、「心得及建議事項」) ☑3.無抄襲相關出國報告 ☐4.內容充實完備 ☐5.建議具參考價值 ☑6.送本機關參考或研辦 ☐7.送上級機關參考 ☐8.退回補正，原因：☐不符原核定出國計畫 ☐以外文撰寫或僅以所蒐集外文資料爲內容 ☐內容空洞簡略或未涵蓋規定要項 ☐無抄襲相關出國報告之全部或部分內容 ☐電子檔案未依格式辦理 ☐未於資訊網登錄提要資料及傳送出國報告電子檔 ☑9.本報告除上傳至出國報告資訊網外，將採行之公開發表： ☐辦理本單位出國報告座談會（說明會），與同仁進行知識分享。 ☐於本單位業務會報提出報告 ☑其他 交本船現場整工追踪改善情形 ☐10.其他處理意見及方式：

審核人	部門主管	單位(處室)主管
	儲運處 林哲宏 98/12/11 15:35	98/12/11 15:35 張德華 98/12/11

說明：

一、各單位可依需要自行增列審核項目內容，出國報告審核完畢本表請自行保存。

二、審核作業應儘速完成，以不影響出國人員上傳出國報告至「政府出版資料回應網公務出國報告專區」爲原則。

摘要

因桃園煉油廠海上課作業需要，於沙崙外海作業協助卸油浮筒之原油輸靠泊接管、拖拉浮蛇管、外海設備維修保養以及因應安全、環保、污染防治、消防、救生等需求，故桃廠提出大馬力多功能工作船建造計畫，並委託總公司儲運處辦理。台灣北部海面冬季海象極差，相關作業難度頗高，且未來可能停靠竹圍港，有吃水限制等因素，需求相當特殊，設計細節須特別斟酌考量，故本船決定採用鋼質船殼、雙螺槳、雙主機推進之 S.R.P.工作船(360 度 STEERING RUDDER PROPELLER)。茲因本 3400 匹馬力拖船所需主機由三陽造船廠向日本 Niigata 公司訂購，需於 98 年 11 月 11 日至 14 日期間進行廠試，考量該廠試性能關係本公司在拖船營運期間之權益，因此選派職配合聯合船舶設計中心、船廠等人員共同參與。主機測試結果符合規範要求。

本次 SHOP TRIAL 重點工作項目如下：

- MEETING ABOUT SHOP TRIAL
- GENERAL TEST
- LOAD TEST
- GOVERNOR TEST
- TEMPERATURE MEASUREMENT
- SAFETY DEVICE TEST

目次

1 目的

因桃園煉油廠海上課作業需要，於沙崙外海作業協助卸油浮筒之原油輸靠泊接管、拖拉浮蛇管、外海設備維修保養以及因應安全、環保、污染防治、消防、救生等需求，故桃廠提出大馬力多功能工作船建造計畫並委託總公司儲運處造船組辦理。台灣北部海面冬季海象極差，相關作業難度頗高，且未來可能停靠竹圍港，有吃水限制等因素，需求相當特殊，設計細節須特別斟酌考量，故本船決定採用鋼質船殼、雙螺槳、雙主機推進之 S.R.P.工作船(360 度 STEERING RUDDER PROPELLER)。茲因本 3400 匹馬力拖船所需主機由三陽造船廠向日本 Niigata 公司訂購，需於 98 年 11 月 11 日至 14 日期間進行廠試，考量該廠試性能關係本公司在拖船營運期間之權益，因此選派職配合聯合船舶設計中心、船廠等人員共同參與。

茲將本案之船級及法規等資料簡介如下：

主要尺寸

型式		SRP 鋼質工作船
船全長(不包括碰墊)	約	36.0 公尺
型寬	不小於	12.0 公尺
最大拖力（穩定狀態）	不小於	32.0 公噸
最大馬力船速(海上試航)	不低於	11.5 節
最大吃水	不大於	4.2 公尺
總噸位	小於	1000 總噸
載重噸	約	100 公噸
燃油櫃	不小於	55 立方公尺
淡水櫃	不小於	15 立方公尺

船級及法規

本船懸掛中華民國之國旗，入籍爲中華民國籍；船籍港爲台中港。

中國驗船中心船級登記爲 CR 100＋E，Work Ship，CMS+，COASTAL SERVICE，並應遵照之法規如下:

a.中國驗船中心之鋼船構造規則

b.中華民國現行之船舶檢查規則

c.中華民國現行之船舶設備規則

d.中華民國現行之船舶丈量規則

e.中華民國現行之船舶載重線勘劃規則

f.中華民國航港法規

g.1972 年國際海上避碰章程（最新修正版）

廠試參加人員

No..	Company	Title	Name
1	CPC	Engineer 工程師	Yang ,Te-Han 楊德瀚
2	USDDC	Engineer 工程師	Hong Jeng-Chih 洪正智
3	CR (China Register)	Marine Surveyor 驗船師	Y. Nakagawa 中河吉夫
4	SAN YANG Shipping	Deputy General Manager 副總經理	Chan-Wei Mai 麥展瑋
5	SAN YANG Shipping	Factory Directory 廠長	Tsai Jiun Li 蔡俊立
6	Yi Chan Enterprise Co.	General Manager 總經理	Jeeng-Yang Ou 歐整陽

2. 行程：

1. 11 月 11 日：由桃園機場啓程至成田機場，再轉至 Niigata。
2. 11 月 12 日：主機廠試及 OVERHAUL INSPECTION。
3. 11 月 13 日：主機廠試檢討會議。
4. 11 月 14 日：由 Niigata 再轉至成田機場，返程回國至桃園機場。

3. 主機廠試時程及測試內容

規範測試要求：

- Starting test
- 25% Load running test
- 50% Load running test
- 75% Load running test
- 85% Load running test
- 100% Load running test
- 110% Load running test
- Governor test
- Fuel consumption measuring at each load running test
- Emergency trip device test
- Safety device test
- Overhaul inspection
- NOx document check

4.廠方安排測試項目及程序

NIIGATA

CLASS No.	5B
SUB No.	2034,2035
JOB No.	K243017

SHOP TEST RECORD

NIIGATA DIESEL ENGINE

OWNER : CHINESE PETROLEUM CORP.

SHIP YARD : SANG YANG SHIPBUILDING CO., LTD.

SHIP No. : SY-838

ENG. MODEL : 6L28HX

ENG. No. : 25153 (STARBOARD)
25154 (PORT)

RATED OUTPUT : 1323 kW

RATED SPEED : 750 min^{-1}

CLASSIFICATION : CHINA CORPORATION REGISTER OF SHIPPING(CR)

CERTIFCATE No. : 553-09-130

SURVEYOR :

NIIGATA POWER SYSTEMS CO., LTD.

Quality Control Group — M. hasebe

Assembly Team
Reciprocating Engine Assembling Group
Production Center

APPROVED :

PASSED : T. Kobayashi

TESTED :

JUDGMENT : Satisfied

DATE : 12-Nov-09

Attendant

Chinese Petroleum Corp.
Mr. Yang, Te-Han / Ship Building Section Storage & Transportation Department 楊德瀚

United Ship Design & Development Center
Mr. Hong Jeng-Chih / Engineer / Technical Services Department 洪正治

San Yang Shipping Co., Ltd.
Mr. Chan-Wei Mai 麥展瑋

San Yang Shipping Co., Ltd.
Mr. Tsai Jiun Li / Factory Director 蔡俊立

Yi Chan Enterprise Co.
Mr. Jeeng-Yang Ou / General Manager ou Jeeng-Yang

CONTENTS

5.測試記錄

Model : 6L28HX

SETTING

(1 / 14)

Eng. No. : 25153 (Starboard)

Fuel Injection Pump	Cylinder No.		1	2	3	4	5	6			
	Beginning of Injection Before T.D.C.	Deg.	13.5	13.5	13.5	13.5	13.0	13.0			
	Rack Index at 100% Load	mm	17.5	17.5	17.0	17.5	17.5	17.0			
	Fuel Handle at 100% Load		5.3								
	Rack Index at 110% Load	mm	18.5	18.0	18.0	18.5	18.5	18.0			
	Fuel Handle at 110% Load		5.6								

Eng. No. : 25154 (Port)

Fuel Injection Pump	Cylinder No.		1	2	3	4	5	6			
	Beginning of Injection Before T.D.C.	Deg.	13.5	13.0	13.5	13.5	13.0	13.5			
	Rack Index at 100% Load	mm	17.0	17.0	17.0	17.5	16.5	17.0			
	Fuel Handle at 100% Load		5.3								
	Rack Index at 110% Load	mm	18.0	17.5	18.0	17.5	17.5	18.0			
	Fuel Handle at 110% Load		5.6								

Fuel Injection Pump	Type		Bosch Type(5B25B)					
	Plunger Bore		25.0 mm					
Fuel Injection Valve	Injection Nozzle Dimension		0.45 mm × 10 holes × 140 degree.					
	Injection Nozzle Test Press.		33.0 MPa					
Intake Air Valve	Open	Before T.D.C (STD)	66 deg.	Exhaust Valve	Open	Before B.D.C (STD)	56 deg.	
	Close	After B.D.C (STD)	40 deg.		Close	After T.D.C (STD)	58 deg.	
	Tappet Clearance (Standard)		0.5 mm		Tappet Clearance (Standard)		0.5 mm	
Piston Top Clearance (Standard)			15.5 mm					
Starting Valve (Standard)			Open	Before T.D.C	0 deg.	Close	After T.D.C	130 deg.
Firing Order			1 - 3 - 5 - 6 - 4 - 2					
Rotation Direction (view from the flywheel side)			Clock Wise (view from the flywheel side)					

FUEL OIL and LUBRICATING OIL (on the shop test)

Fuel oil	Trade Name	Marine Diesel Oil	Density (15℃g/cm^3)	0.8580
	Supplier	Nippon Oil Corporation	Viscosity (at 50℃)	2.247 mm^2/s
	Flash Point	68.5	Calorific Value (Gross)	45,270 J/g
	Pour Point	-30.0 ℃	Calorific Value (Net)	42,520 J/g
Lubricating Oil	Trade Name	Marine T204	Density (15℃g/cm^3)	0.903
	Supplier	Nippon Oil Corporation	Viscosity (at 40℃)	139.0 mm^2/s
	Pour Point	-25.0 ℃	Viscosity (at 100℃)	14.4 mm^2/s

SPECIFICATION

DIESEL ENGINE (Starboard)

Engine Model	6L28HX	Rated Output	1323 kW	No. of Cylinder	6	Cylinder Bore	280 mm
Engine No.	25153	Over Load Output	1456 kW	Rated Speed	750 min^{-1}	Piston Stroke	370 mm
Indicated Mean Effective Press.		1.667 MPa		Max. Combustion Press.		13.2 MPa	
Output Rate		14.33 MPa·m/s		Approx. Total Weight		16,000 kg	

TURBO CHARGER

Model.	TPS57D01	Serial No	XE300626	Max. Speed / Max. Temp.		42,360 min^{-1}	650 ℃
Matching		CV10-CT65-CA17 / TV01-TT16-TA85		Manufacturer		IHI Compressor and Machinery Co.,Ltd.	

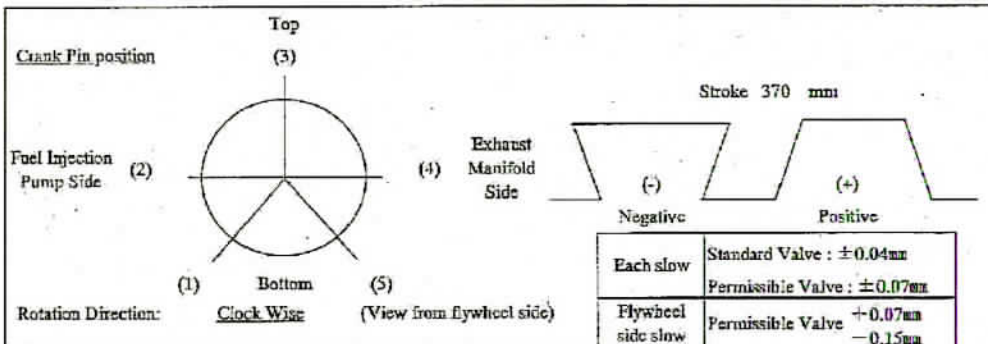
GOVERNOR

Model	RHD10-PC	Serial No.	98806250	Drawing No.	105866-4410					
Specification	Droop	6.0 ,	Needle	1/4 Open ,	Port	3 ,	P.L.V.	2.8 ,	F/W	2G
Manufacturer	ZEXEL Co.,Ltd.									

GEISLINGER COUPLING

Model	BC56/12.5/85/10R0	Serial No.	556827
Manufacturer	Niigata Power Systems Co.,Ltd.		

CRANK SHAFT DEFLECTION MEASUREMENT (COLD CONDITION)



Each slow	Standard Valve : ±0.04mm Permissible Valve : ±0.07mm
Flywheel side slow	Permissible Valve +0.07mm −0.15mm

Unit : 1 / 100 mm

Measurement Position	Cylinder No. 1	2	3	4	5	6
(1)	0	0	0	0	0	0
(2)	-1.0	+1.0	+0.5	0	0	-0.5
(3)	-1.5	+1.0	+1.0	0	+0.5	-1.0
(4)	-1.0	+0.5	+0.5	0	+0.5	-0.5
(5)	0	0	+0.5	0	0	0

Note :

1) The above values were measured by deflection gange in the cold, at natural temp. condition after assembling of the engine was completed.

2) The value of negative indication of the above is that the shrinkage of the distance between the adjacent crank webs. The positive value is the expansion.

LOAD TEST (SHOP TEST RECORD)

(3 / 14)

Model : 6128HX

Eng. No. : 25153 (Starboard)

Date: 12-Nov-09

Order			1		2		3		4		
Load		%	Dead Slow		25		50		75		
Duration		h	1/6		1/2		1/2		1/2		
Engine Speed		min^{-1}	350		472		595		681		
Water Brake Weight Set		kN	5.14		9.35		14.84		19.44		
Output at flywheel end		kW	135		331		662		992		
Fuel Handle Pointer			2.3		2.8		3.7		4.5		
Fuel Oil Consumption		kg/h	—		78.5		139.4		202.7		
Fuel Oil Consump. Rate (at P/W end)		g/kWh	—		237.0		210.6		204.3		
Press.	Eng. Lub. Oil	MPa	0.48	(0.49)	0.48	(0.46)	0.49	(0.48)	0.50	(0.49)	
	H.T.F.W. Cooling		0.10	(0.10)	0.14	(0.14)	0.20	(0.20)	0.25	(0.25)	
	L.T.F.W. Cooling		0.14	(0.12)	0.16	(0.15)	0.19	(0.18)	0.21	(0.20)	
	Charge Air		0.00	(0.01)	0.02	(0.02)	0.06	(0.06)	0.12	(0.12)	
	Turbo Charger Lub. Oil		0.40	(0.38)	0.37	(0.35)	0.32	(0.32)	0.31	(0.30)	
	Fuel Oil		0.16	(0.16)	0.16	(0.16)	0.17	(0.13)	0.11	(0.12)	
Lub. Oil Temp.	Cooler Inlet	℃	18		24		50		54		
	Eng. Inlet		21	(25)	34	(41)	53	(56)	52	(56)	
Cooling Water Temp.	H.T.F.W. Eng. Inlet	℃	28	(27)	50	(50)	66	(69)	72	(72)	
	H.T.F.W. Eng. Outlet		30	(30)	52	(53)	69	(72)	75	(75)	
	L.T.F.W. A/C Inlet		17	(17)	18	(16)	18	(18)	21	(21)	
	L.T.F.W. A/C Outlet		18	—	18	—	20	—	24	—	
Turbo Charger	Speed	min^{-1}	4490		11690		21160		28040		
	Boost Air Temp.(A/C Inlet)	℃	21	(16)	23	(50)	70	(67)	107	(108)	
	Boost Air Temp.(A/C Outlet)		15	(13)	18	(15)	26	(22)	36	(32)	
	Exh. Gas Inlet Temp.(1st)		250	—	350	—	420	—	430	—	
	Exh. Gas Inlet Temp.(2nd)		210	—	340	—	390	—	410	—	
	Exh. Gas Outlet Temp.		135	(200)	325	(327)	340	(339)	330	(322)	
Max. Press.	No. 1 Cylinder	MPa	5.9		7.4		9.0		11.3		
	No. 2 Cylinder		5.9		7.3		8.9		11.2		
	No. 3 Cylinder		5.9		7.3		8.9		11.2		
	No. 4 Cylinder		5.8		7.4		9.0		11.3		
	No. 5 Cylinder		5.8		7.3		8.9		11.3		
	No. 6 Cylinder		5.9		7.4		9.0		11.2		
	Mean		5.87		7.35		8.95		11.25		
Exh. Gas Temp.	No. 1 Cylinder	℃	225	(244)	270	(282)	285	(289)	300	(302)	
	No. 2 Cylinder		195	(212)	255	(266)	285	(288)	300	(300)	
	No. 3 Cylinder		150	(161)	225	(237)	270	(273)	290	(296)	
	No. 4 Cylinder		230	(255)	260	(277)	290	(296)	300	(303)	
	No. 5 Cylinder		300	(222)	245	(259)	280	(285)	295	(296)	
	No. 6 Cylinder		170	(188)	235	(243)	270	(277)	295	(296)	
	Mean		213	(214)	255	(261)	282	(285)	298	(299)	
F.I.P. Rack Index.	No. 1 Cylinder	mm	8.0		9.5		12.5		15.0		
	No. 2 Cylinder		7.5		9.0		12.0		14.5		
	No. 3 Cylinder		7.5		9.0		12.0		14.0		
	No. 4 Cylinder		8.0		9.5		12.0		15.0		
	No. 5 Cylinder		7.5		9.0		12.0		14.5		
	No. 6 Cylinder		7.0		9.0		12.0		14.5		
	Mean		7.6		9.2		12.1		14.6		
Barometric Pressure		hPa	1026		1026		1026		1026		
Room Temp.		℃	14.5		14.5		15.0		15.0		

Note1 : L.O. cooler, filter and temp. control valve, H.T.F.W. cooler and temp. control valve are the factory's equipments.

Note2 : ( ) Within parenthesis is monitoring system.

LOAD TEST (SHOP TEST RECORD)

(4 / 14)

Model : 6L28HX

Eng. No. : 25153 (Starboard)

Date: 12-Nov-09

Order			5		6		7		8		9	
Load		%	85		85		100		100		110	
Duration		h	1/2		1/2		1/2		1/2		1/2	
Engine Speed		min^{-1}	710		710		750		750		774	
Water Brake Weight Set		kN	21.13		21.13		23.54		23.54		19.44	
Output at flywheel end		kW	1125		1125		1323		1323		1456	
Fuel Handle Pointer		–	4.7		4.8		5.3		5.3		5.6	
Fuel Oil Consumption		kg/h	–		228.9		–		266.3		292.0	
Fuel Oil Consump. Rate (at P/W end)		g/kWh	–		203.4		–		201.3		200.6	
Press.	Eng. Lub. Oil	MPa	0.50	(0.50)	0.50	(0.49)	0.51	(0.51)	0.51	(0.50)	0.52	(0.51)
	H.T.F.W. Cooling		0.26	(0.27)	0.26	(0.27)	0.29	(0.29)	0.29	(0.30)	0.30	(0.31)
	L.T.F.W. Cooling		0.21	(0.21)	0.21	(0.21)	0.24	(0.22)	0.24	(0.22)	0.23	(0.23)
	Charge Air		0.14	(0.14)	0.14	(0.14)	0.17	(0.18)	0.17	(0.18)	0.19	(0.19)
	Turbo Charger Lub. Oil		0.30	(0.30)	0.30	(0.30)	0.30	(0.30)	0.30	(0.30)	0.30	(0.29)
	Fuel Oil		0.11	(0.12)	0.11	(0.12)	0.12	(0.13)	0.12	(0.13)	0.12	(0.13)
Lub. Oil Temp.	Cooler Inlet	℃	55		55		59		59		58	
	Eng. Inlet		52	(57)	52	(57)	53	(57)	53	(57)	53	(57)
Cooling Water Temp.	H.T.F.W. Eng. Inlet	℃	71	(72)	72	(72)	72	(72)	72	(71)	72	(72)
	H.T.F.W. Eng. Outlet		74	(75)	74	(76)	74	(75)	74	(75)	74	(75)
	L.T.F.W. A/C Inlet		25	(25)	27	(28)	30	(31)	30	(30)	30	(30)
	L.T.F.W. A/C Outlet		26	–	29		34	–	34	–	34	–
Turbo Charger	Speed	min^{-1}	30350		30360		33140		33260		34680	
	Boost Air Temp.(A/C Inlet)	℃	120	(126)	122	(126)	142	(147)	143	(148)	155	(159)
	Boost Air Temp.(A/C Outlet)		42	(41)	45	(44)	48	(46)	50	(48)	52	(51)
	Exh. Gas Inlet Temp.(1st)		435	–	440	–	450	–	450	–	460	–
	Exh. Gas Inlet Temp.(2nd)		415	–	420		425	–	430	–	440	–
	Exh. Gas Outlet Temp.		320	(317)	320	(321)	315	(311)	315	(311)	310	(307)
Max. Press.	No. 1 Cylinder	MPa	–		12.1		–		13.0		13.4	
	No. 2 Cylinder		–		12.0		–		12.9		13.3	
	No. 3 Cylinder		–		12.0		–		12.9		13.3	
	No. 4 Cylinder		–		12.2		–		13.0		13.3	
	No. 5 Cylinder		–		12.0		–		12.9		13.3	
	No. 6 Cylinder		–		12.0		–		12.9		13.3	
	Mean		–		12.05		–		12.93		13.32	
Exh. Gas Temp.	No. 1 Cylinder	℃	305	(304)	305	(308)	320	(324)	325	(325)	335	(333)
	No. 2 Cylinder		305	(304)	305	(307)	315	(317)	320	(319)	330	(326)
	No. 3 Cylinder		300	(301)	300	(304)	310	(311)	310	(313)	325	(321)
	No. 4 Cylinder		305	(306)	310	(308)	315	(316)	315	(317)	325	(323)
	No. 5 Cylinder		300	(305)	305	(307)	310	(312)	315	(313)	325	(325)
	No. 6 Cylinder		300	(303)	305	(305)	310	(312)	315	(312)	320	(319)
	Mean		303	(304)	306	(307)	314	(315)	317	(317)	325	(324)
F.I.P. Rack Index.	No. 1 Cylinder	mm	16.0		16.0		17.5		17.5		18.5	
	No. 2 Cylinder		16.0		16.0		17.5		17.5		18.0	
	No. 3 Cylinder		15.5		15.5		17.0		17.0		18.0	
	No. 4 Cylinder		16.0		16.0		17.5		17.5		18.5	
	No. 5 Cylinder		16.0		16.0		17.5		17.5		18.5	
	No. 6 Cylinder		15.5		15.5		17.0		17.0		18.0	
	Mean		15.8		15.8		17.3		17.3		18.3	
Barometric Pressure		hPa	1026		1026		1026		1026		1026	
Room Temp.		℃	16.0		16.0		16.5		19.0		19.5	

Note1 : L.O. cooler, filter and temp. control valve, H.T.F.W. cooler and temp. control valve are the factory's equipments.

Note2 : ( ) Within parenthesis is monitoring system.

(5 / 14)

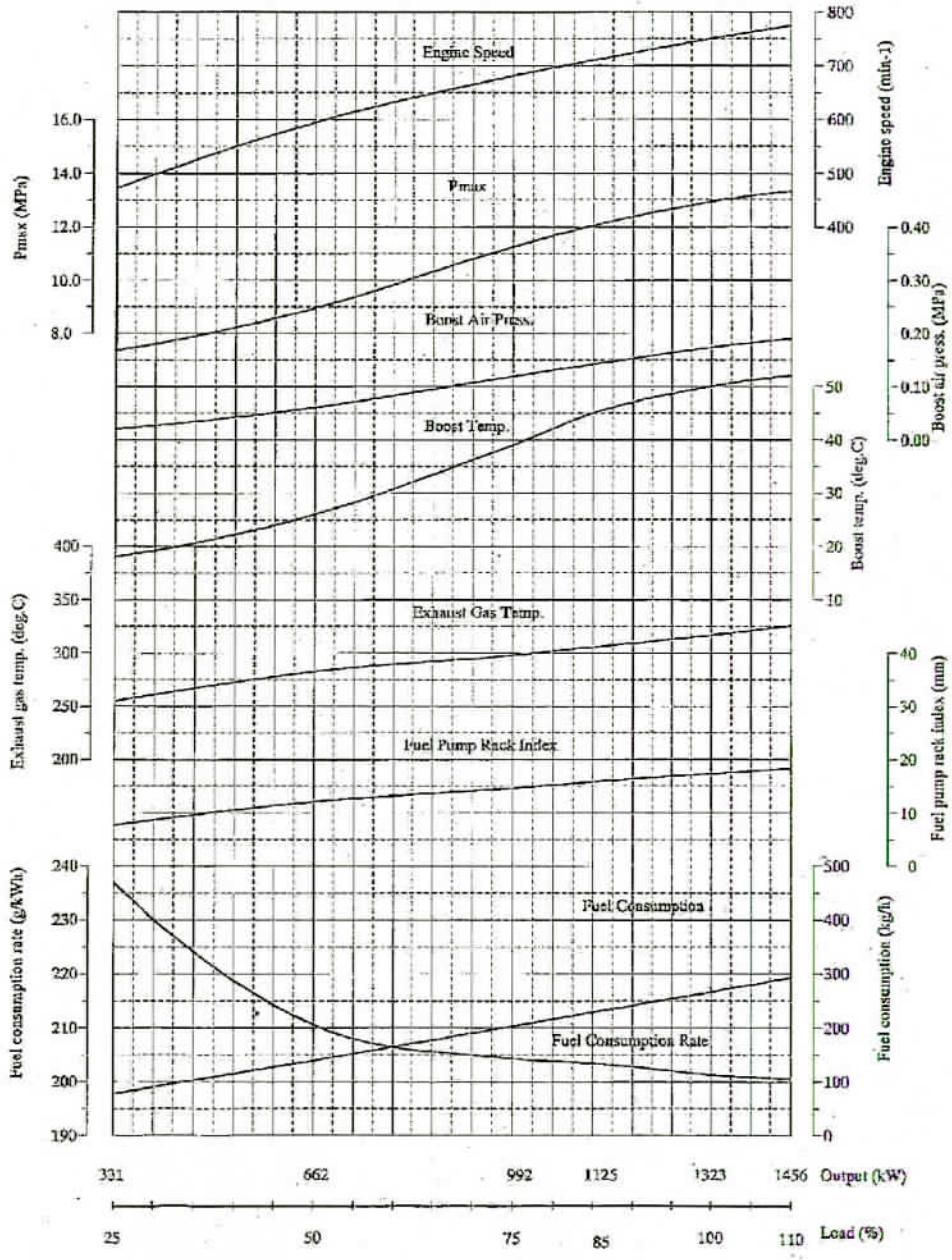
PERFORMANCE CURVES

Model : 6L28HX

Eng. No. : 25153 (S/B)

Date : 12 - Nov. - 09

Room Temp.: 14.5 - 19.5 (deg.C)



Model : 6L28HX (6 / 14)

Eng. No. : 25153 (Starboard) Date : 12-Nov-09

STARTING TEST

Starting Times		1	2	3	4	5	6	Engine started	13	14	—
Starting air press. (MPa)	Before	2.50	2.30	2.20	2.05	1.90	1.80	6 time(s)	1.10	1.00	0.85
	After	2.30	2.20	2.05	1.90	1.80	1.70	during this period.	1.00	0.85	—

Air receiver : 300 L

Note : Air receiver is the factory's equipment.

Room temp.	15.0	℃
Cooling water temp.	16.0	℃
Lubrication oil temp.	16.0	℃

GOVERNOR TEST

		Settle	Instant	Settle	Settled time
Load	%	100	0	0	
Engine speed	min^{-1}	750	—	795	— sec
Percentage	%	—	—	6.0	

Note : The settled speed was recorded after discharging the water of water dynamometer.

TEMPERATURE MEASUREMENT

Cylinder No.	1	2	3	4	5	6	7			
Main bearing metal	68	68	70	70	71	68	69			
Crank pin metal	70	70	70	70	70	70				
Piston pin metal	—	—	70	71	—	—				

L.O. temp. in the engine bed	69
L.O. temp. engine inlet. (at 110% Load)	53

Unit : ℃

SAFETY DEVICE TEST

No.	Item	Design Point	Result	Alarm	Trip
1	M/E EMERGENCY STOP	Push Button		○	○
2	M/E OVERSPEED TRIP	about 865 min-1	865 min^{-1}	○	○
3	M/E LO PRESS LOW TRIP	0.15 ± 0.015 MPa	0.15 MPa	○	○
4	M/E LO PRESS LOW	0.20 ± 0.015 MPa	0.20 MPa	○	-
5	M/E OVERLOAD TRIP	110% Load	circuit make	○	○

REMOTE CONTROL TEST (NO LOAD)

		Idle		Speed Rising Position		Rated Speed Position	
Handle Position	S/B	0		1.0		8.0	
	P/T	0		1.0		8.0	
Governor Cont.Air Press.	S/B	0.070	MPa	0.135	MPa	0.339	MPa
	P/T	0.070	MPa	0.131	MPa	0.340	MPa
Engine Speed	S/B	400	min-1	415	min-1	750	min-1
	P/T	400	min-1	415	min-1	750	min-1
Idle ← → Rated	S/B	Time (Up)	11.41 sec		Time (Down)	7.98	sec
	P/T	Time (Up)	11.78 sec		Time (Down)	7.75	sec

SPECIFICATION

(7 / 14)

DIESEL ENGINE (PORT)

Engine Model	6L28HX	Rated Output	1323 kW	No. of Cylinder	6	Cylinder Bore	280 mm
Engine No.	25154	Over Load Output	1456 kW	Rated Speed	750 min^{-1}	Piston Stroke	370 mm
Indicated Mean Effective Press.		1.667 MPa		Max. Combustion Press.		13.2 MPa	
Output Rate		14.33 MPa·m/s		Approx. Total Weight		16,000 kg	

TURBO CHARGER

Model.	TPS57D01	Serial No	Xi300627	Max. Speed / Max. Temp.	42,360 min^{-1} 650 ℃
Matching	CV10-CT65-CA17 / TV01-TT16-TA85			Manufacturer	IHI Compressor and Machinery Co.,Ltd.

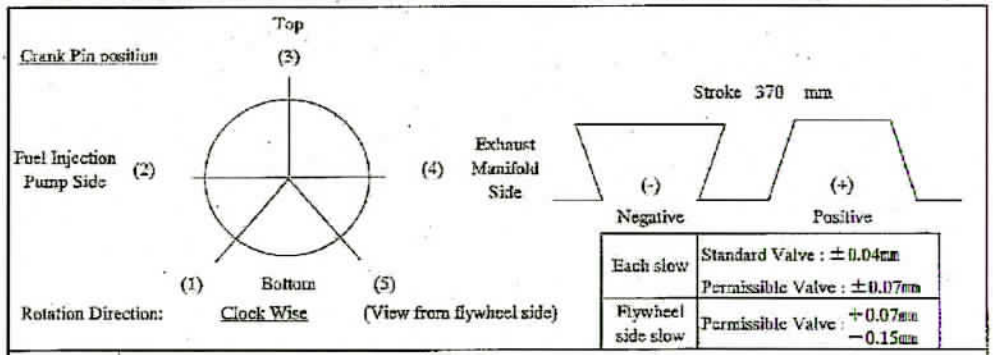
GOVERNOR

Model	RHD10-PC	Serial No.	98806263	Drawing No.	105866-4410
Specification	Droop 6.0 ,	Needle 1/4 Open ,	Port 3 ,	P.L.V. 2.8 ,	F/W 2G
Manufacturer	ZEXEL Co.,Ltd.				

GEISLINGER COUPLING

Model	BCS6/12.5/85/10R0	Serial No.	556828
Manufacturer	Niigata Power Systems Co.,Ltd.		

CRANK SHAFT DEFLECTION MEASUREMENT (COLD CONDITION)



Each slow	Standard Valve : ±0.04mm Permissible Valve : ±0.07mm
Flywheel side slow	Permissible Valve : +0.07mm −0.15mm

Measurement Position	Cylinder No. 1	2	3	4	5	6
(1)	0	0	0	0	0	0
(2)	-1.0	0	+1.0	0	0	-0.5
(3)	-1.5	+0.5	+1.5	-0.5	0	-0.5
(4)	0	+0.5	+1.0	-0.5	0	0
(5)	0	+0.5	+0.5	0	0	0

Unit : 1 / 100 mm

Note : 1) The above values were measured by deflection gauge in the cold, at natural temp. condition after assembling of the engine was completed.

2) The value of negative indication of the above is that the shrinkage of the distance between the adjacent crank webs. The positive value is the expansion.

LOAD TEST (SHOP TEST RECORD)

(8 / 14)

Model : 6L28HX

Eng. No. : 25154 (Port)

Date: 12-Nov-09

Order			1		2		3		4		
Load		%	Dead Slow		25		50		75		
Duration		h	1/6		1/2		1/2		1/2		
Engine Speed		min^{-1}	350		472		595		681		
Water Brake Weight Set		kN	5.14		9.35		14.84		19.44		
Output at flywheel end		kW	135		331		682		992		
Fuel Handle Pointer		–	2.3		2.8		3.7		4.5		
Fuel Oil Consumption		kg/h	–		77.1		139.2		201.8		
Fuel Oil Consump. Rate (at F/W end)		g/kWh	–		232.9		210.3		203.4		
Press.	Eng. Lub. Oil	MPa	0.49	(0.47)	0.49	(0.47)	0.49	(0.48)	0.51	(0.50)	
	H.T.F.W. Cooling		0.10	(0.09)	0.15	(0.14)	0.21	(0.19)	0.26	(0.24)	
	L.T.F.W. Cooling		0.13	(0.12)	0.15	(0.14)	0.17	(0.17)	0.18	(0.19)	
	Charge Air		0.00	(0.01)	0.02	(0.02)	0.07	(0.06)	0.13	(0.12)	
	Turbo Charger Lub. Oil		0.59	(0.38)	0.37	(0.35)	0.31	(0.31)	0.30	(0.30)	
	Fuel Oil		0.16	(0.16)	0.15	(0.17)	0.13	(0.15)	0.13	(0.15)	
Lub. Oil Temp.	Cooler Inlet	℃	17		22		51		56		
	Eng. Inlet		20	(23)	33	(38)	54	(56)	53	(56)	
Cooling Water Temp.	H.T.F.W. Eng. Inlet	℃	30	(25)	54	(51)	72	(71)	72	(72)	
	H.T.F.W. Eng. Outlet		31	(29)	55	(54)	74	(75)	74	(75)	
	L.T.F.W. A/C Inlet		16	(15)	16	(16)	17	(17)	20	(20)	
	L.T.F.W. A/C Outlet		16	–	18	–	22	–	24	–	
Turbo Charger	Speed	min^{-1}	4650		11540		21500		28260		
	Boost Air Temp.(A/C Inlet)	℃	21	(17)	34	(30)	71	(69)	110	(109)	
	Boost Air Temp.(A/C Outlet)		16	(17)	18	(19)	24	(24)	34	(33)	
	Exh. Gas Inlet Temp.(1st)		230	–	350	–	395	–	405	–	
	Exh. Gas Inlet Temp.(2nd)		260	–	380	–	410	–	420	–	
	Exh. Gas Outlet Temp.		205	(192)	320	(325)	340	(336)	315	(312)	
Max. Press.	No. 1 Cylinder	MPa	5.9		7.4		8.9		11.2		
	No. 2 Cylinder		5.9		7.5		8.9		11.2		
	No. 3 Cylinder		5.9		7.4		8.9		12.2		
	No. 4 Cylinder		5.8		7.4		9.0		11.3		
	No. 5 Cylinder		5.8		7.5		8.9		11.2		
	No. 6 Cylinder		5.9		7.4		9.0		11.2		
	Mean		5.87		7.37		8.93		11.22		
Exh. Gas Temp.	No. 1 Cylinder	℃	215	(217)	255	(269)	280	(282)	285	(286)	
	No. 2 Cylinder		210	(222)	255	(278)	280	(284)	290	(295)	
	No. 3 Cylinder		205	(208)	255	(270)	280	(284)	290	(288)	
	No. 4 Cylinder		180	(171)	230	(242)	270	(275)	285	(286)	
	No. 5 Cylinder		180	(182)	235	(250)	270	(275)	285	(286)	
	No. 6 Cylinder		195	(187)	250	(255)	280	(278)	290	(287)	
	Mean		198	(196)	254	(261)	278	(280)	288	(288)	
F.I.P. Rack Index.	No. 1 Cylinder	mm	7.5		9.0		12.0		14.5		
	No. 2 Cylinder		7.5		9.0		12.0		14.5		
	No. 3 Cylinder		7.5		9.0		12.0		14.5		
	No. 4 Cylinder		7.0		8.5		11.5		14.0		
	No. 5 Cylinder		7.0		9.0		12.0		14.0		
	No. 6 Cylinder		7.5		9.0		12.0		15.0		
	Mean		7.3		8.9		11.9		14.4		
Barometric Pressure		hPa	1026		1026		1025		1025		
Room Temp.		℃	14.5		14.5		15.0		15.0		

Note1 : L.O. cooler, filter and temp. control valve, H.T.F.W. cooler and temp. control valve are the factory's equipments.

Note2 : ( ) Within parenthesis is monitoring system.

LOAD TEST (SHOP TEST RECORD)

(9 / 14)

Model : 6L28HX

Eng. No. : 25154 (Port) Date: 12-Nov-09

Order			5		6		7		8		9	
Load		%	85		85		100		100		110	
Duration		h	1/2		1/2		1/2		1/2		1/2	
Engine Speed		min^{-1}	710		710		750		750		774	
Water Brake Weight Set		kN	21.13		21.13		25.54		23.54		19.44	
Output at flywheel end		kW	1125		1125		1323		1323		1456	
Fuel Handle Pointer		–	4.9		4.9		5.3		5.3		5.6	
Fuel Oil Consumption		kg/h	–		229.9				264.5		291.4	
Fuel Oil Consump. Rate (at F/W end)		g/kWh	–		204.4		–		199.9		200.2	
Press.	Eng. Lub. Oil	MPa	0.51	(0.50)	0.51	(0.50)	0.51	(0.50)	0.51	(0.50)	0.52	(0.51)
	H.T.F.W. Cooling		0.27	(0.26)	0.27	(0.26)	0.30	(0.29)	0.30	(0.28)	0.32	(0.30)
	L.T.F.W. Cooling		0.20	(0.20)	0.20	(0.19)	0.22	(0.22)	0.23	(0.23)	0.24	(0.23)
	Charge Air		0.15	(0.15)	0.15	(0.15)	0.18	(0.18)	0.18	(0.18)	0.20	(0.20)
	Turbo Charger Lub. Oil		0.30	(0.29)	0.30	(0.29)	0.29	(0.29)	0.29	(0.29)	0.29	(0.29)
	Fuel Oil		0.12	(0.15)	0.12	(0.15)	0.12	(0.14)	0.12	(0.14)	0.12	(0.14)
Lub. Oil Temp.	Cooler Inlet	℃	58		58		58		59		59	
	Eng. Inlet		53	(56)	54	(56)	54	(56)	54	(56)	54	(56)
Cooling Water Temp.	H.T.F.W. Eng. Inlet	℃	72	(72)	72	(72)	72	(72)	72	(72)	72	(72)
	H.T.F.W. Eng. Outlet		74	(75)	74	(75)	74	(75)	74	(75)	74	(76)
	L.T.F.W. A/C Inlet		25	(25)	28	(28)	30	(30)	30	(30)	30	(30)
	L.T.F.W. A/C Outlet		30	–	32	–	34	–	34	–	34	–
Turbo Charger	Speed	min^{-1}	30660		30680		33120		33160		34840	
	Boost Air Temp.(A/C Inlet)	℃	126	(126)	126	(126)	144	(143)	145	(144)	157	(157)
	Boost Air Temp.(A/C Outlet)		44	(41)	46	(44)	48	(46)	48	(45)	49	(47)
	Exh. Gas Inlet Temp.(1st)		380		410	–	420	–	420	–	430	
	Exh. Gas Inlet Temp.(2nd)		380	–	425	–	435	–	435	–	445	–
	Exh. Gas Outlet Temp.		415	(307)	310	(310)	305	(303)	305	(303)	305	(314)
Max. Press.	No. 1 Cylinder	MPa	–		12.1		–		12.9		13.3	
	No. 2 Cylinder		–		12.2		–		13.0		13.3	
	No. 3 Cylinder		–		12.1		–		13.0		13.3	
	No. 4 Cylinder		–		12.2		–		13.0		13.4	
	No. 5 Cylinder		–		12.1		–		13.0		13.4	
	No. 6 Cylinder		–		12.1		–		13.0		13.3	
	Mean		–		12.15		–		12.98		13.33	
Exh. Gas Temp.	No. 1 Cylinder	℃	300	(294)	300	(300)	305	(304)	305	(305)	320	(315)
	No. 2 Cylinder		305	(303)	300	(309)	310	(313)	310	(312)	325	(323)
	No. 3 Cylinder		300	(294)	300	(299)	305	(299)	305	(300)	315	(310)
	No. 4 Cylinder		300	(294)	300	(298)	310	(304)	310	(304)	320	(315)
	No. 5 Cylinder		300	(294)	300	(303)	310	(307)	310	(306)	320	(315)
	No. 6 Cylinder		305	(295)	305	(302)	315	(307)	315	(307)	325	(315)
	Mean		299	(296)	301	(302)	307	(306)	307	(306)	318	(316)
P.I.P. Rack Index.	No. 1 Cylinder	mm	16.0		16.0		17.0		17.0		18.0	
	No. 2 Cylinder		16.0		15.5		17.0		17.0		17.5	
	No. 3 Cylinder		16.0		16.0		17.5		17.0		18.0	
	No. 4 Cylinder		15.5		15.0		17.0		17.5		17.5	
	No. 5 Cylinder		15.5		15.0		17.0		16.5		17.5	
	No. 6 Cylinder		16.0		16.0		17.0		17.0		18.0	
	Mean		15.8		15.6		17.1		17.0		17.8	
Barometric Pressure		hPa	1026		1026		1026		1026		1026	
Room Temp.		℃	16.0		16.0		16.5		19.0		19.5	

Note1 : L.O. cooler, filter and temp. control valve, H.T.F.W. cooler and temp. control valve are the factory's equipments.

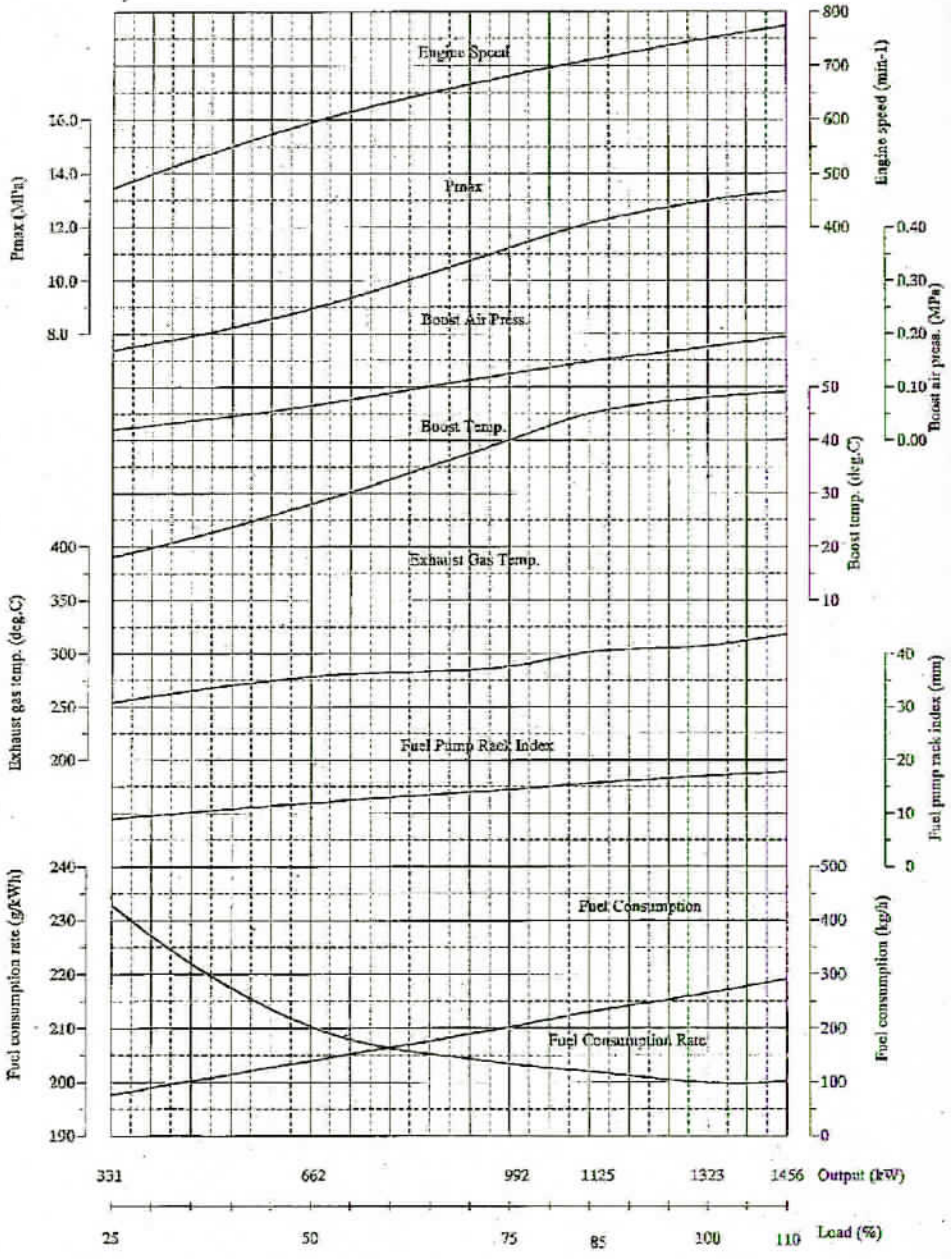
Note2 : ( ) Within parenthesis is monitoring system.

(10 / 14)

PERFORMANCE CURVES

Model : 6L28HX Date : 12 - Nov - 09

Eng. No. : 25154 (P/T) Room Temp.: 14.5 - 19.5 (deg.C)



Model : 6L28HX (11 / 14)

Eng. No. : 25154 (Port) Date : 12-Nov-09

STARTING TEST

Starting Times		1	2	3	4	5	6	Engine started	16	17	—
Starting air press. (MPa)	Before	2.50	2.35	2.30	2.15	2.05	1.95	9 time(s)	1.15	1.05	0.95
	After	2.35	2.30	2.15	2.05	1.95	1.85	during this period.	1.05	0.95	—

Air receiver : 300 L

Note : Air receiver is the factory's equipment.

Room temp. 15.0 ℃

Cooling water temp. 15.0 ℃

Lubrication oil temp. 16.0 ℃

GOVERNOR TEST

		Settle	Instant	Settle	Settled time
Load	%	100	0	0	
Engine speed	min^{-1}	750	—	790	— sec
Percentage	%	—	—	5.3	

Note : The settled speed was recorded after discharging the water of water dynamometer.

TEMPERATURE MEASUREMENT

Cylinder No.	1	2	3	4	5	6	7		
Main bearing metal	69	69	70	69	69	68	68		
Crank pin metal	69	71	71	70	70	70			
Piston pin metal	—	—	71	70	—	—			

L.O. temp. in the engine bed 72

L.O. temp. engine inlet. (at 110% Load) 54 Unit : ℃

SAFETY DEVICE TEST

No.	Item	Design Point	Result	Alarm	Trip
1	M/E EMERGENCY STOP	Push Button		O	O
2	M/E OVERSPEED TRIP	about 865 min-1	865 min^{-1}	O	O
3	M/E LO PRESS LOW TRIP	0.15 ± 0.015 MPa	0.15 MPa	O	O
4	M/E LO PRESS LOW	0.20 ± 0.015 MPa	0.20 MPa	O	-
5	M/E OVERLOAD TRIP	110% Load	circuit make	O	O

REMOTE CONTROL TEST (NO LOAD)

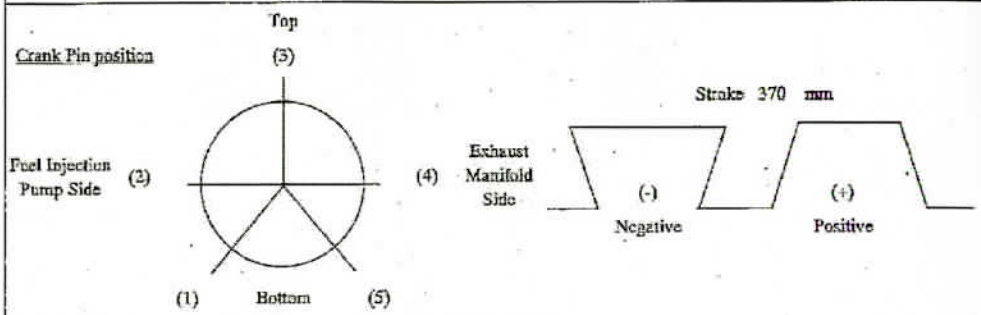
		Idle		Speed Rising Position		Rated Speed Position	
Handle Position	S/B	0		1.0		8.0	
	P/T	0		1.0		8.0	
Governor Cont.Air Press.	S/B	0.070	MPa	0.135	MPa	0.339	MPa
	P/T	0.070	MPa	0.131	MPa	0.340	MPa
Engine Speed	S/B	400	min-1	415	min-1	750	min-1
	P/T	400	min-1	415	min-1	750	min-1
Idle ← → Rated	S/B	Time (Up)	11.41 sec	Time (Down)		7.98	sec
	P/T	Time (Up)	11.78 sec	Time (Down)		7.75	sec

(12 / 14)

Date: 12-Nov-09

DIESEL ENGINE (Starboard)

CRANK SHAFT DEFLECTION MEASUREMENT (HOT CONDITION)

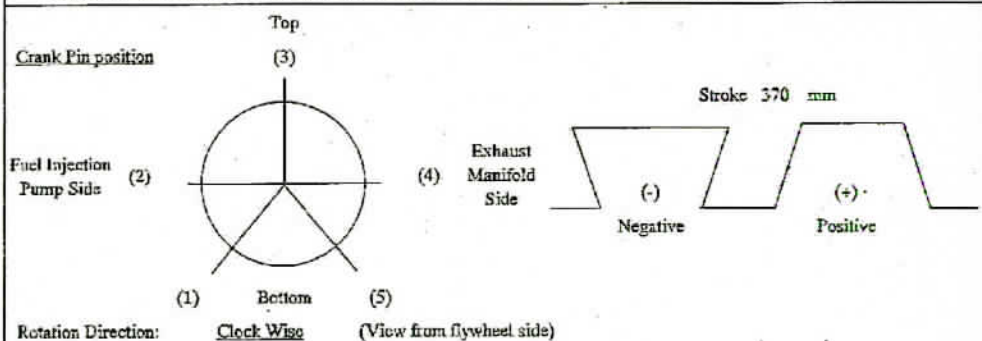


Measurement Position	Cylinder No. 1	2	3	4	5	6
(1)	0	0	0	0	0	0
(2)	-1.0	0	0	0	+1.0	0
(3)	-3.0	-2.0	-1.5	-1.5	0	-3.0
(4)	-1.5	-1.5	-2.0	-2.5	-0.5	-1.5
(5)	-0.5	0	-1.5	-2.0	-1.5	0

Unit : 1 / 100 mm

DIESEL ENGINE (Port)

CRANK SHAFT DEFLECTION MEASUREMENT (HOT CONDITION)



Measurement Position	Cylinder No. 1	2	3	4	5	6
(1)	0	0	0	0	0	0
(2)	-1.0	-0.5	+0.5	+1.0	+0.5	0
(3)	-2.5	-2.0	-1.0	-1.5	-1.0	-1.0
(4)	-1.0	-2.0	-2.0	-2.5	-2.0	-1.0
(5)	0	-1.5	-1.0	-1.5	-1.5	0

Unit : 1 / 100 mm

Model : 6L28HX

Judgment of Engine Performance

(13 / 14)

Eng. No. : 25153 (Starboard)
25154 (Port)

Date: 12-Nov-09

No.	Item	Permissible value	Measured data (Starboard)	Judgment	Page	Measured data (Port)	Judgment	Page
1	Starting Test (300 L)	More than 6 times	14 times	Satisfied	6 / 14	17 times	Satisfied	11 / 14
2 ※	Lubrication oil Press. (Eng. Inlet) Temp. (Eng. Inlet) (At 100% load)	0.35 ~ 0.60 MPa 51~60 ℃	0.51 (0.50) MPa 53 (57) ℃	Satisfied "	4 / 14	0.51 (0.50) MPa 54 (56) ℃	Satisfied "	9 / 14
3 ※	H.T.F.W. Cooling Press. (Eng. Inlet) Temp. (Eng. Outlet) (At 100% load)	0.28 ~ 0.36 MPa 68~78 ℃	0.29 (0.30) MPa 74 (75) ℃	" "	4 / 14	0.30 (0.28) MPa 74 (75) ℃	" "	9 / 14
4 ※	L.T.F.W. Cooling Press. (Eng. Inlet) (At 100% load)	0.15~0.25 MPa	0.24 (0.22) MPa	"	4 / 14	0.23 (0.23) MPa	"	9 / 14
5 ※	Fuel oil Press. (Eng. Inlet) (At 100% load)	0.05 ~ 0.15 MPa	0.12 (0.13) MPa	"	4 / 14	0.12 (0.14) MPa	"	9 / 14
6 ※	Turbo Charger Lub. Oil Press. (TC. Inlet) (At 100% load)	0.20 ~ 0.45 MPa	0.30 (0.30) MPa	Satisfied	4 / 14	0.29 (0.29) MPa	Satisfied	9 / 14
7 ※	Exhaust gas temp. Cylinder Outlet Deviation (At 100% load)	Less than 450 ℃ Less than 60 ℃	325 (325) ℃ 15 (13) ℃	Satisfied	4 / 14	315 (312) ℃ 10 (12) ℃	Satisfied	9 / 14
8 ※	Fuel oil consumption at flywheel end (At 100% load)	Less than 203.70 g/kWh (194 g/kWh + 5 %)	201.3 g/kWh	Satisfied	4 / 14	199.9 g/kWh	Satisfied	9 / 14
9 ※	Cylinder maximum Pressure Deviation (At 100% load)	Less than 13.2 MPa Less than 0.5 MPa	13.0 MPa 0.1 MPa	Satisfied	4 / 14	13.0 MPa 0.1 MPa	Satisfied	9 / 14
10	Governor test 100% to 0% Instant Settled Time	Less than 15 % Less than 10 % Less than 10 sec	— 6.0 —	% % sec	Satisfied	6 / 14	— 5.3 —	% % sec	Satisfied	11 / 14
11	Bearing temp. Main bearing metal Crank pin metal Piston pin metal	Less than (A) + 25 ℃ S/B 78 ℃ P/T 79 ℃ Less than (A) + 25 ℃ S/B 78 ℃ P/T 79 ℃ Less than (A) + 30 ℃ S/B 83 ℃ P/T 84 ℃	71 ℃ 70 ℃ 71 ℃	Satisfied	6 / 14	70 ℃ 71 ℃ 71 ℃	Satisfied	11 / 14
	LO. Temp. Eng. Inlet at 110% = (A)		53 ℃	—	4 / 14	54 ℃	—	11 / 14

Note 1: ※Item (No.2~9) was judged based on the 100% load test. The data was acquired from the 1 hour point.

Note 2: L.O. cooler, filter and temp. control valve, H.T.F.W. cooler and temp. control valve are the factory's equipments.

Note 3: Fuel oil and L.T.F.W. were supplied from the factory's feed pump.

Note 4: Judgment mark (") is mentioned for the reference, because of Note2 and Note3.

Note 5: ( ) Within parenthesis is monitoring system.

OVERHAUL INSPECTION

S/B:№3 and P/T:№2 cylinder head and piston were overhauled and confirmed non-abnormal conditions. And the fuel nozzle injector test of all cylinders were carried out and checked good condition.

6.測試會議記錄

(1 / 2)

MINUTES OF MEETING

Owner : CHINESE PETROLEUM CORP.	ENG. TYPE: 6L28HX / ENG. SPEED: 750min⁻¹
Shipyard : SANG YANG SHIPBUILDING CO., LTD.	RATED OUTPUT: 1323kW
	ENG. No. : 25153, 25154
Date of Meeting : Nov. 12, 2009	DATE OF SHOP TEST : Nov. 12, 2009

Name of Attendance :

Chinese Petroleum Corp.
Mr. Yang, Te-Han / Ship Building Section Storage & Transportation Department 楊德瀚

United Ship Design & Development Center
Mr. Hong Jeng-Chih / Engineer / Technical Services Department 洪正志

San Yang Shipping Co., Ltd.
Mr. Chan-Wei Mai 麥展偉

San Yang Shipping Co., Ltd.
Mr. Tsai Jiun Li / Factory Director 蔡俊立

Yi Chan Enterprise Co.
Mr. Jeeng-Yang Ou / General Manager Jeeng-Yang

NIIGATA POWER SYSTEMS CO., LTD.

Marketing Center Mr. Nozawa

Engineering & Technology Center, Marine Engineering Center, Mr. S. Soga

Production Center, RE Assembly Group Mr. S. Ono, Mr. H. Hirano, Mr.J.Abe

配布先	御注文主	御納入先	造船所			本社国際営業	出張所	支社	支店	営	技CZP設計	E&EG	新潟内燃機工場 設計		組立	試運転	電気	検査		物流	機械		出荷		

(2/2

Witness for Factory Acceptance Test for Niigata Main Engine, Model 6L28HX For the project 3400ps Multi Purpose Tug

FAT was carried out on 12th November, 2009.
All data readings were confirmed by the attendees, and any discrepancy from Chinese specification was not found.

As the further clarification about Niigata's machinery, following items were discussed:

1. Alarms / Indication at Wheel Hose (W/H):
Chinese specification requests;
- LO low pressure alarm / indication
- LO high temperature alarm / indication
- HTFW high temperature alarm / indication
- Sea water low temperature (pressure) alarm / indication

However, W/H indication panel do not have above alarm / indication. Niigata will modify as per attached.

2. Starting air system
Chinese specification request flam arrestor shall be set in starting air line. Niigata comply this issue and clarified by drawing.

3. Correction at drawings
Forward WH panel – No. 1 G/E Running, Address shall be L48
Starboard CR panel – Clutch Normal Mode, Address shall be L105
Port CR panel – Spare, Address shall be L80

4. Air bottle
Chinese specification request air bottle shall have double water drain valve. Niigata complied this issue and clarified by drawing.

5. Name plate for M/E speed control dial at Alarm panel
No name plate. Niigata will add name plate to attached at Alarm

6. M/E rotating direction – Name plate
Name plate will be supplied and to be attached at turning gear.

7. 流量計及 Crankshaft 基準標準

製番：J763-69188-1
SL10(1990)

検　査　成　績　書

日付：2008-11-26

■機器名称　フローベット　　計器番号：*****
流量形式：LS5076－210A　　製品番号：86813
■御使用条件
計量液：*****　　温　度：*****℃
粘　度：*****　　密　度：*****
流　量：　最小：*****　常用：*****　最大：*****　L/h
■器差試験
計量液：灯油　1.0mPa·s　22.0℃
標準器：LUS45C11-7211　NO. UC145-5183J　検定年月日　2008-07-22
LUS50C11-7211　NO. UC150-0832AE　検定年月日　2008-07-15

器差調整装置 No.：＋06

	流　量　L/h		
計　量　液	60	120	1600
灯　油　1.0mPa·s	－0.3	－0.2	＋0.1
			（器差 %）

検査実施日：2008-11-11
試験実施者：池上　浩仁

■流量計仕様
保証精度：±0.5%
流量範囲：最小　60　L/h
最大　1600　L/h
最小表示目盛単位：0.01　L
出力信号　補正：*****　L/p
未補正：*****　mL/p
■合格判定基準：±0.5%
■合格判定結果：合格

承認：

OVAL Corporation

製番：J763-83905-1
SF20(1990)

検　査　成　績　書

日付：2009-08-27

■機器名称　フローペット　　計器番号：*****
流量形式：LS5076－210A　　製品番号：91803
■御使用条件
計量液：*****　　温　度：*****℃
粘　度：*****　　密　度：*****
流　量：　最小：*****　常用：*****　最大：*****　L/h
■器差試験
計量液：灯油　1.0mPa・s　22.0℃
標準器：LUS45C11-7211　NO. UC145-5183J　検定年月日　2008-07-22
LUS50C11-7211　NO. UC150-0832AE　検定年月日　2008-07-15

器差調整装置 No.：＋11

	流　量　L/h		
計　量　液	60	120	1600
灯　油　1.0mPa・s	－0.1	＋0.1	＋0.1
			（器差 %）

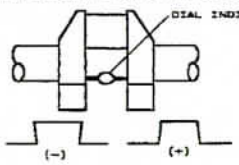
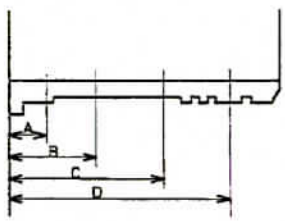
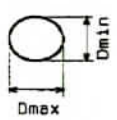
検査実施日：2009-06-30
試験実施者：池上　浩仁

■流量計仕様
保証精度：±0.5%
流量範囲：　最小　60　L/h
最大　1600　L/h
最小表示目盛単位：　0.01　L
出力信号　補正：　*****　L/p
未補正：　*****　mL/p
■合格判定基準：±0.5%
■合格判定結果：合格

承認：

OVAL Corporation

	SECTION 3 - MAINTENANCE 3.2 CLEARANCE AND WEAR TABLE	NIIGATA 3 – 2 – 0 3

NO	Description		MO	LA	LR	Sketch, Remarks
	·Crankshaft undersize measurements					
	Crank pin M1	–	$214.75^{0}_{-0.03}$	–	–	
	M2	–	$214.5^{0}_{-0.03}$	–	–	
	Crank journal M1	–	$219.75^{0}_{-0.03}$	–	–	
	M2	–	$219.5^{0}_{-0.03}$	–	–	
5	Crank deflection					The deflection measurements should be made when the engine is cold (Refer to Section 4.7)
	·dv				–	
	Each slows	dv	±0.04	±0.07		
	Flywheel side slow	dV	–	+0.07 -0.15	–	
	·dn	dn	±0.01	±0.02	–	
6	Cylinder liner					
	·Bore diameter	D	$280^{+0.040}_{0}$	280.5	280.8	
						A: 70, B: 280, C: 490, D: 615
	·Maximum out-of-roundness	Dmax-Dmin	0.02	0.2	0.4	

49

8. 心得及建議事項：

經驗船協會、船東、船廠及機器設備廠台灣代理行代表，四方人員全程實際參與測試及以上相關紀錄資料顯示，本船柴油主機兩部測試結果，符合規範要求，因此判定合格。

此次廠試過程中看到日本人的做事態度、敬業精神，廣大的廠區看不到一絲雜亂令人肅然起敬值得我們學習，在這難得的廠試機會希望未來能有更多學習機會。

本次廠試後，會議討論建議事項如下：

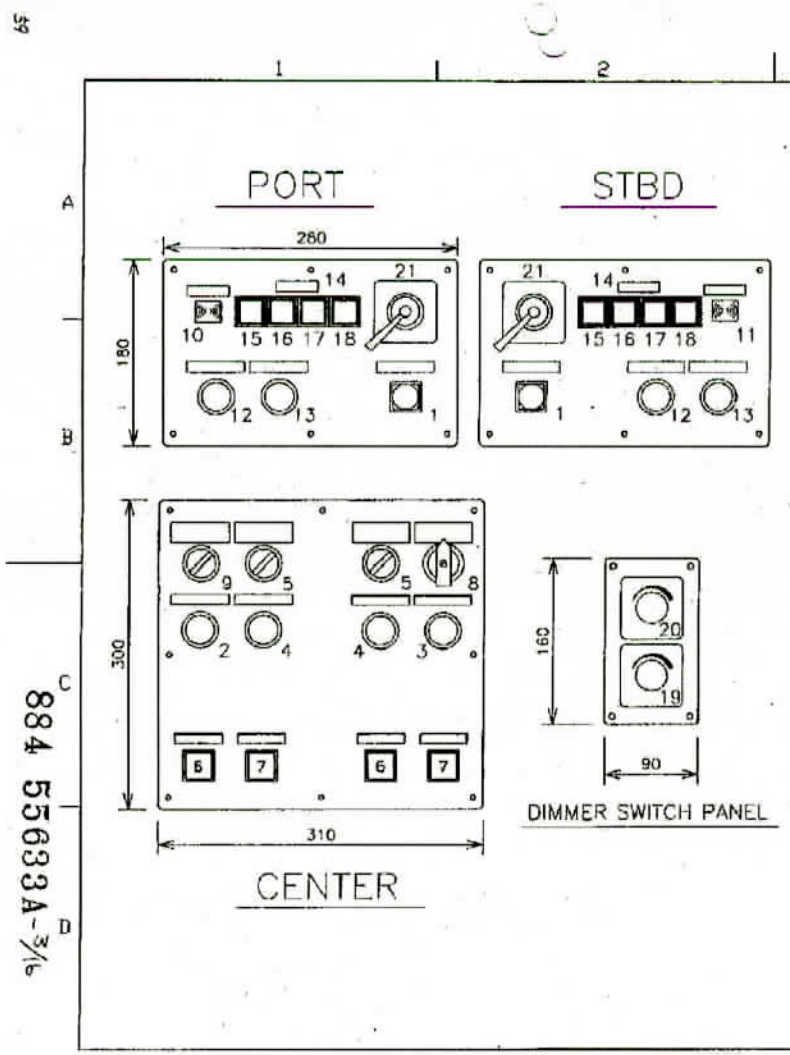
1. 駕駛控制台上警報系統及指示燈，現況缺下列 Alarms：

- 主機滑油系統低壓警示燈及警報
- 主機滑油系統高溫警示燈及警報
- 主機冷卻淡水高溫警示燈及警報
- 冷卻海水低壓警示燈及警報

2 起動控制系統現況缺下列須改善項目：

- 起動空氣瓶需有雙重疏水閥
- 啓動空氣系統內須附火燄捕捉器
- 機艙起動控制盤上需標示主機控制轉速器名牌
- 起動空氣管線上需有油水分離器
- 主機轉軸方向標示

日方人員於會議內表示將會遵守規範及會議記錄立即改善。



NO.	NAME	NAME PLATE	Q'TY	REMARKS
1	PUSH BUTTON SWITCH (WITH COVER)	EM'CY STOP 緊急停止	2	
2	PUSH BUTTON SWITCH	BUZZER & LAMP TEST	1	
3	PUSH BUTTON SWITCH	ALARM STOP	1	
4	PUSH BUTTON SWITCH	ACKNOW. OF W/H CONTROL	2	
5	CHANGE OVER SWITCH	STEERING CONT. MODE / C/O LEVER – MANUAL	2	
6	PUSH BUTTON WITH LAMP	AUX. STEERING (LEFT)	2	
7	PUSH BUTTON WITH LAMP	AUX. STEERING (RIGHT)	2	
8	CHANGE OVER SWITCH	M/E C/L OPERATION MODE / NORMAL – TO-FT	1	
9	CHANGE OVER SWITCH	CONTROL POSITION / FWD – AFT	1	
10	BUZZER	SUB TELEGRAPH	1	
11	BUZZER	ALARM & CHANGE OVER	1	
12	PUSH BUTTON SWITCH	M/E L.O. PRIMING PUMP START	2	
13	PUSH BUTTON SWITCH	M/E L.O. PRIMING PUMP STOP	2	
14	NAME PLATE	SUB TELEGRAPH	2	
15	PUSH BUTTON WITH LAMP	STAND BY	2	
16	PUSH BUTTON WITH LAMP	START	2	
17	PUSH BUTTON WITH LAMP	STOP	2	
18	PUSH BUTTON WITH LAMP	FINISH	2	
19	DIMMER SWITCH	IND. LAMPS	1	
20	DIMMER SWITCH	METERS	1	
21	PULL TURN SW	M/E OVERRIDE FOR OVER LOAD STOP OFF–ON	2	

PAINTING COLOR
MUNSELL 7.5BG7/2 SEMIGLOSS

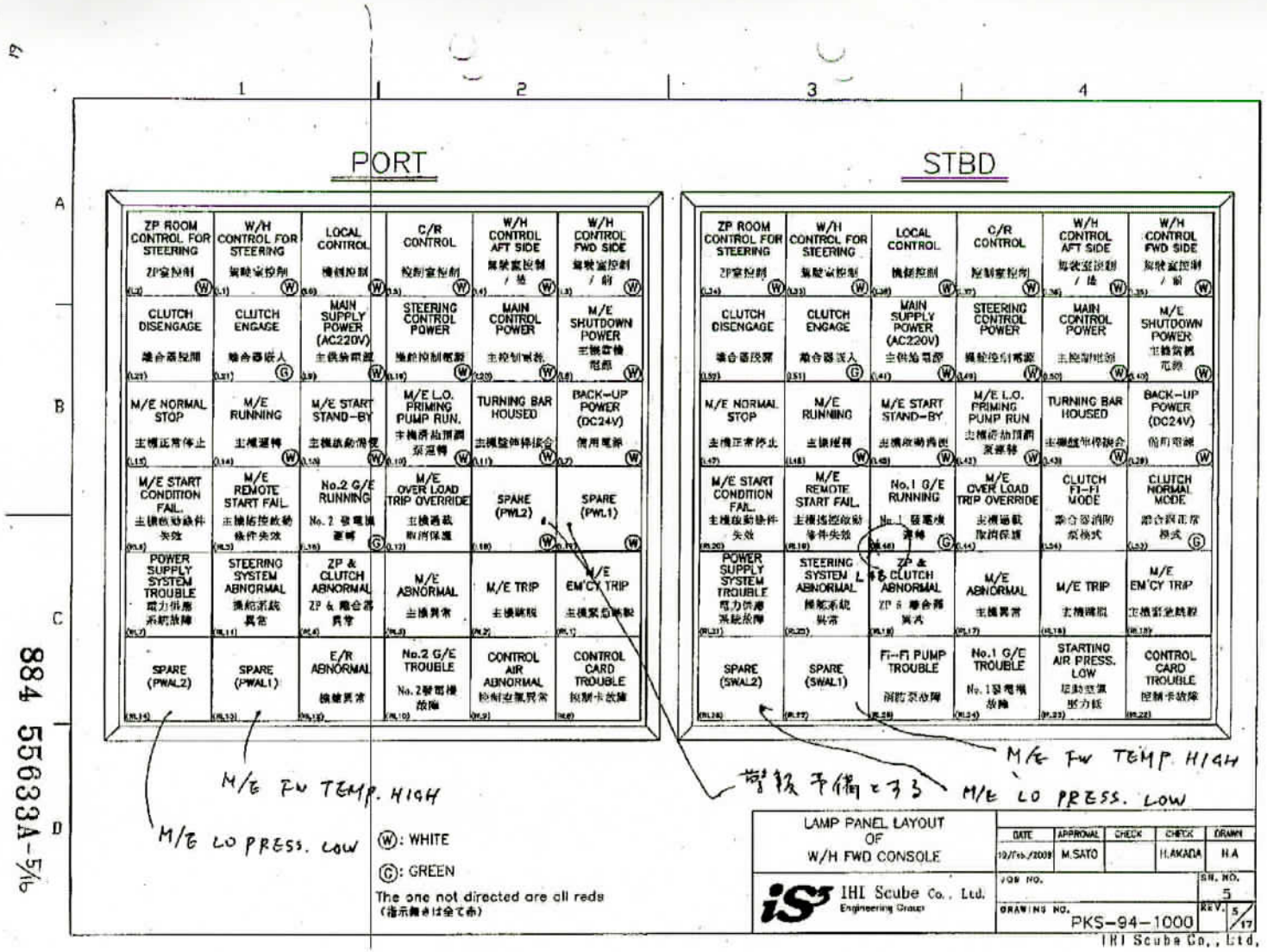
OUT LINE OF
FWD SWITCH PANEL &
DIMMER SWITCH PANEL

DATE	APPROVAL	CHECK	CHECK	DRAWN
19/Feb./2020	M.SATO		H.AKADA	H.A

IHI Scube Co., Ltd.
Engineering Group

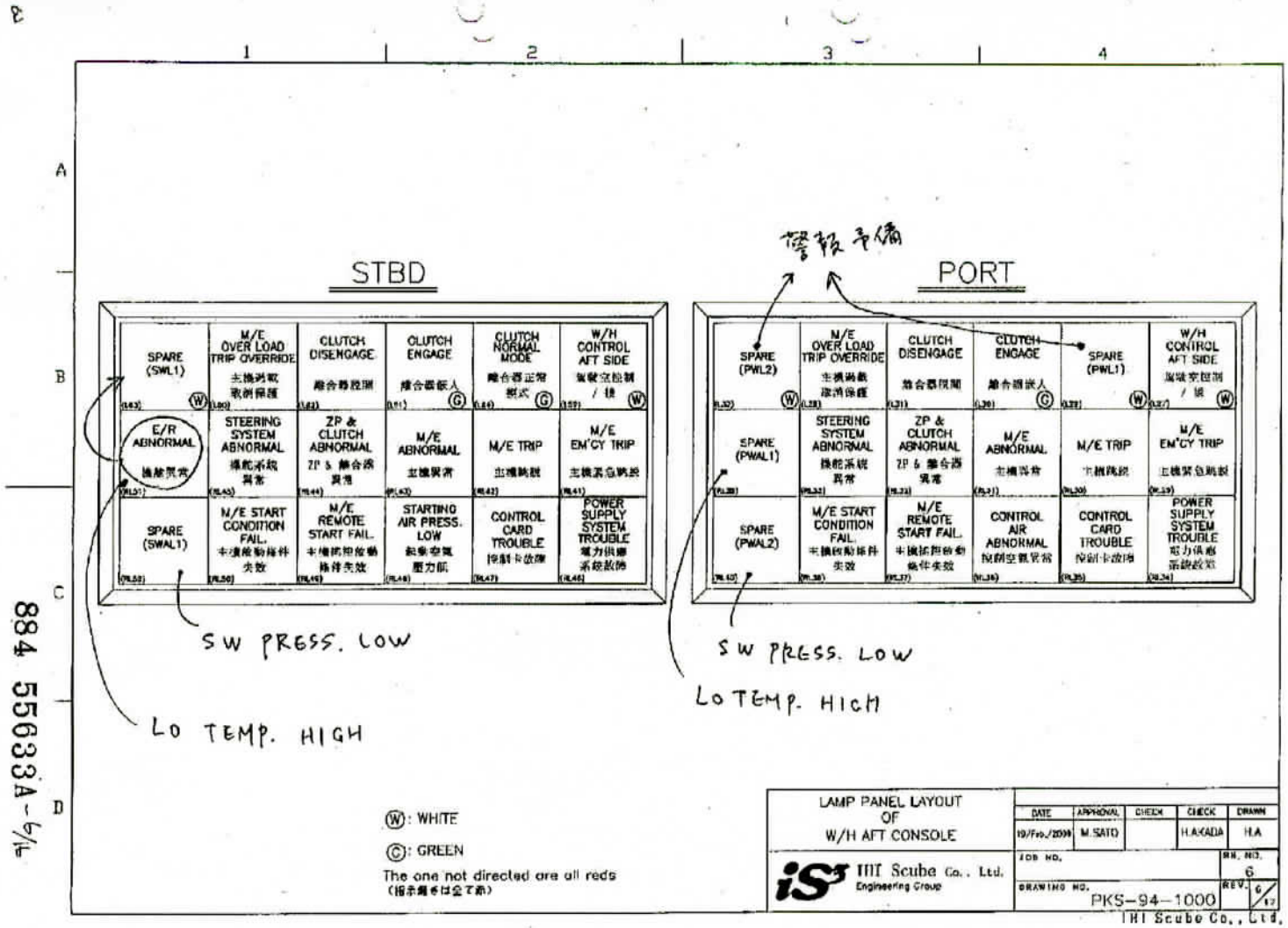
JOB NO.
SH. NO. 3
DRAWING NO. PKS--94--1000
REV. 3/17

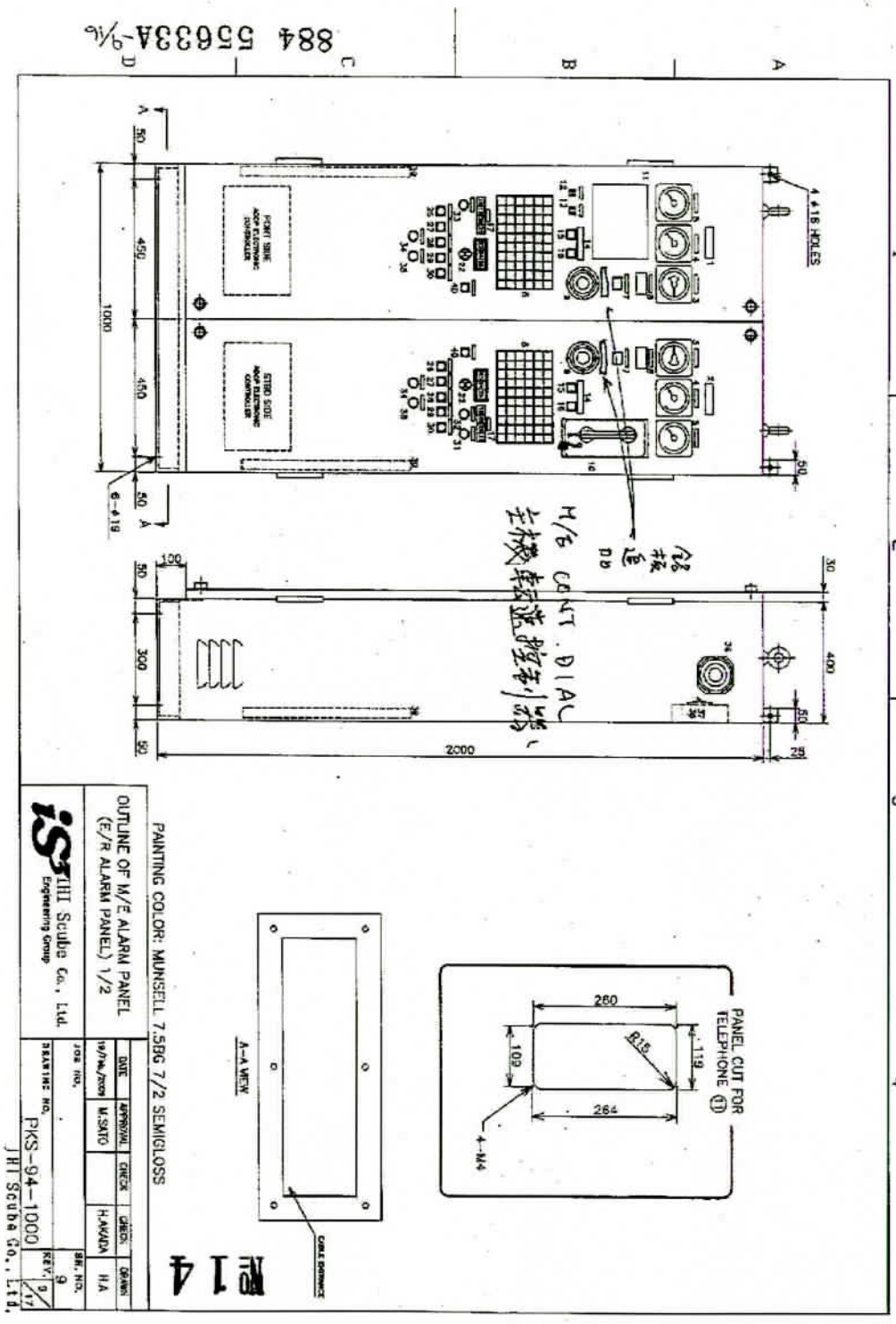
IHI Scube Co., Ltd.



884 556338A-5/9

884 55633A-6/7




884 556334-9/6
4-ø18 HOLES
M/E CONT. DIAL
PANEL CUT FOR TELEPHONE
PAINTING COLOR: MUNSELL 7.5BG 7/2 SEMIGLOSS
A-A VIEW
CABLE ENTRANCE
OUTLINE OF M/E ALARM PANEL (E/R ALARM PANEL) 1/2
IHI Scuba Co., Ltd.
Engineering Group
DRAWING NO. PKS-94-1000
IHI Scuba Co., Ltd.

STBD

M/E L.O. PRIMING PUMP RUN. 主機潤滑油供給泵運轉 (W)	M/E SHUTDOWN POWER 主機緊急停車源 (W)	MAIN CONTROL POWER 主控制電源 (W)	STEERING CONTROL POWER 操舵控制電源 (W)	BACK-UP POWER (DC24V) 備用電源 (W)	MAIN SUPPLY POWER (AC220V) 主供給電源 (W)	CLUTCH DISENGAGE 離合器脫開 (R)	CLUTCH ENGAGE 離合器嵌入 (G)	ZP ROOM CONTROL FOR STEERING ZP室控制 (W)	W/H CONTROL FOR STEERING 駕駛室控制 (W)
M/E RUNNING 主機運轉 (W)	M/E NORMAL STOP 主機正常停止	M/E OVER LOAD TRIP OVERRIDE 主機過載跳閘保護	No.1 G/E. RUNNING No.1 發電機運轉 (G)	CLUTCH FI-FI MODE 離合器消防泵模式	CLUTCH NORMAL MODE 離合器正常模式 (G)	M/E L.O. PRESS. TOO LOW TRIP 主機滑油壓力低跳脫	M/E OVER LOAD TRIP 主機過載跳脫	M/E OVER SPEED TRIP 主機過速跳脫	M/E EM'CY TRIP 主機緊急跳脫
M/E START STAND-BY 主機啟動備便 (W)	M/E TURNING BAR HOUSED 主機盤車器接合 (W)	S.W PRESS. LOW 海水壓力低	M/E L.T.F.W. PRESS. LOW 主機低溫淡水壓力低	M/E H.T.F.W. PRESS. LOW 主機高溫淡水壓力低	M/E H.T.F.W. TEMP. HIGH 主機高溫淡水溫度高	M/E L.O. FILTER CLOGGED 主機滑油濾器阻塞	T/C L.O. PRESS. LOW 過給機滑油壓力低	M/E L.O. PRESS. LOW 主機滑油壓力低	M/E OVER LOAD ALARM 主機過載警報
STEERING HYD. OIL SUC. FILTER CLOGGED 操舵液壓油吸入濾器堵塞	STEERING HYD. OIL TEMP. HIGH 操舵液壓油溫度高	CHARGE PUMP PRESS. LOW 供給泵排出壓力低	STEERING HYD. TANK LOW LEVEL 操舵液壓油槽液位低	ZP L.O. FILTER CLOGGED ZP滑油濾器堵塞	ZP L.O. LEVEL LOW ZP滑油液位低	ZP & CLUTCH L.O. TEMP. HIGH ZP & 離合器滑油溫度高	ZP & CLUTCH L.O. PRESS. LOW ZP & 離合器滑油壓力低	M/E REMOTE START FAIL 主機遙控啟動條件失效	M/E F.O. LEAKAGE 主機燃油洩漏
M/E L.O. SUMP TANK LEVEL LOW 主機潤滑油底液位低	STARTING AIR PRESS. LOW 起動空氣壓力低	No.1 G/E TROUBLE No.1發電機故障	ZP CONTROL CARD TROUBLE ZP控制卡故障	CLUTCH CONTROL CARD TROUBLE 離合器控制卡故障	M/E CONTROL CARD TROUBLE 主機控制卡故障	M/E SHUTDOWN POWER FAILURE 主機緊機電源失效	BACK UP POWER FAILURE 備用電源失效	MAIN SUPPLY POWER FAILURE 主供給電源失效	M/E START CONDITION FAIL. 主機啟動條件失效
SPARE (SEAL2)	SPARE (SEAL1)	FI-FI PUMP TROUBLE 消防泵異常警報	No.3 E/R BILGE LEVEL HIGH No.3機艙污水高位警報	No.2 E/R BILGE LEVEL HIGH No.2機艙污水高位警報	No.1 E/R BILGE LEVEL HIGH No.1機艙污水高位警報	No.1 F.O. SERVICE TANK LEVEL LOW No.1 燃油日用櫃低位警報	No.1 F.O. SERVICE TANK LEVEL HIGH No.1 燃油日用櫃高位警報	No.1 L.T.F.W. EXP. TANK LEVEL LOW No.1 低溫膨脹水櫃低位	No.1 H.T.F.W. EXP. TANK LEVEL LOW No.1 高溫膨脹水櫃低位

M/E LO TEMP. HIGH

Ⓦ: WHITE

Ⓖ: GREEN

The one not directed are all reds
(指示無きは全て赤)

STBD LAMP LAYOUT OF ECR CONSOLE

DATE	APPROVAL	CHECK	CHECK	DRAWN
19/Feb/2008	M.SATO		H.AKADA	H.A

IHI Scube Co., Ltd. Engineering Group

JOB NO. | SH. NO. 1.1

DRAWING NO. PKS-94-1000 | REV. 11/17

IHI Scube Co., Ltd.

PORT

M/E L.O. PRIMING PUMP RUN. 主機滑油預潤泵運轉 (L73) Ⓦ	M/E SHUTDOWN POWER 主機當機電源 (L71) Ⓦ	MAIN CONTROL POWER 主控制電源 (L83) Ⓦ	STEERING CONTROL POWER 操舵控制電源 (L82) Ⓦ	BACK-UP POWER (DC24V) 備用電源 (L70) Ⓦ	MAIN SUPPLY POWER (AC220V) 主供給電源 (L72) Ⓦ	CLUTCH DISENGAGE 離合器脫開 (L85) Ⓡ	CLUTCH ENGAGE 離合器嵌入 (L84) Ⓖ	ZP ROOM CONTROL FOR STEERING ZP室控制 (L06) Ⓦ	W/H CONTROL FOR STEERING 駕駛室控制 (L05) Ⓦ
M/E RUNNING 主機運轉 (L77) Ⓦ	M/E NORMAL STOP 主機正常停止 (L78) Ⓦ	M/E OVER LOAD TRIP OVERRIDE 主機過載跳脫保護 (L75)	No.2 G/E RUNNING No.2 發電機運轉 (L79) Ⓖ	SPARE (PEL2) (L81)	SPARE (PEL1) (L80) Ⓦ	M/E L.O. PRESS. TOO LOW TRIP 主機滑油壓力低跳脫 (RL55)	M/E OVER LOAD TRIP 主機過載跳脫 (RL56)	M/E OVER SPEED TRIP 主機過速跳脫 (RL54)	M/E EM'CY TRIP 主機緊急跳脫 (RL53)
M/E START STAND-BY 主機啟動備便 (L76) Ⓦ	M/E TURNING BAR HOUSED 主機盤車機接合 (L74) Ⓦ	S.W PRESS. LOW 海水壓力低 (RL63)	M/E L.T.F.W. PRESS. LOW 主機低溫淡水壓力低 (RL62)	M/E H.T.F.W. PRESS. LOW 主機高溫淡水壓力低 (RL61)	M/E H.T.F.W. TEMP. HIGH 主機高溫淡水溫度高 (RL60)	M/E L.O. FILTER CLOGGED 主機滑油濾器阻塞 (RL59)	T/C L.O. PRESS. LOW 渦輪增壓油壓力低 (RL58)	M/E L.O. PRESS. LOW 主機滑油壓力低 (RL57)	M/E OVER LOAD ALARM 主機過載警報 (RL80)
STEERING HYD. OIL SUC. FILTER CLOGGED 操舵液壓油吸入濾器堵塞 (RL93)	STEERING HYD. OIL TEMP. HIGH 操舵液壓油溫度高 (RL92)	CHARGE PUMP PRESS. LOW 供給泵油壓力低 (RL91)	STEERING HYD. TANK LOW LEVEL 操舵液壓油櫃液位低 (RL90)	ZP L.O. FILTER CLOGGED ZP滑油濾器堵塞 (RL88)	ZP L.O. LEVEL LOW ZP滑油柱位低 (RL89)	ZP & CLUTCH L.O. TEMP. HIGH ZP & 離合器滑油溫度高 (RL86)	ZP & CLUTCH L.O. PRESS. LOW ZP & 離合器滑油壓力低 (RL87)	M/E REMOTE START FAIL. 主機遙控啟動條件失效 (RL69)	M/E F.O. LEAKAGE 主機燃油洩漏 (RL94)
M/E L.O. SUMP TANK LEVEL LOW 主機滑油油底殼液位低 (RL65)	CONTROL AIR MAIN VALVE CLOSED 控制空氣主閥關閉 (RL72)	No.2 G/E TROUBLE No.2發電機故障 (RL72)	ZP CONTROL CARD TROUBLE ZP控制卡故障 (RL84)	CLUTCH CONTROL CARD TROUBLE 離合器控制卡故障 (RL83)	M/E CONTROL CARD TROUBLE 主機控制卡故障 (RL85)	M/E SHUTDOWN POWER FAILURE 主機當機電源失效 (RL70)	BACK UP POWER FAILURE 備用電源失效 (RL90)	MAIN SUPPLY POWER FAILURE 主供給電源失效 (RL68)	M/E START CONDITION FAIL. 主機啟動條件失效 (RL67)
SPARE (PEAL1) (RL94)	M/E CONTROL AIR PRESS. LOW 主機控制空氣壓力低 (RL71)	HYD. POWER PACK OIL UNIT LEVEL LOW 液壓動力單元低油位 (RL74)	SLUDGE TANK LEVEL HIGH 污水櫃高位警報 (RL62)	OILY WATER SEPARATOR TROUBLE 油水分離器異常 (RL81)	SEWAGE TREATMENT WATER TANK LEVEL HIGH 糞水處理器高水位 (RL75)	No.2 F.O. SERVICE TANK LEVEL LOW No.2 燃油日用櫃低位警報 (RL78)	No.2 F.O. SERVICE TANK LEVEL HIGH No.2 燃油日用櫃高位警報 (RL77)	No.2 L.T.F.W. EXP. TANK LEVEL LOW No.2 低溫膨脹水櫃低位 (RL76)	No.2 H.T.F.W. EXP. TANK LEVEL LOW No.2 高溫膨脹水櫃低位 (RL75)

M/E LO TEMP HIGH

Ⓦ : WHITE

Ⓖ : GREEN

The one not directed are all reds
(指示無き任全て赤)

PORT LAMP LAYOUT OF ECR CONSOLE	DATE	APPROVAL	CHECK	CHECK	DRAWN
	18/Feb/2019	M.SATO		H.AKADA	H.A
IHI Scube Co., Ltd. Engineering Group	JOB NO.			DP. NO.	12
	DRAWING NO. PKS-94-1000			REV.	12/17

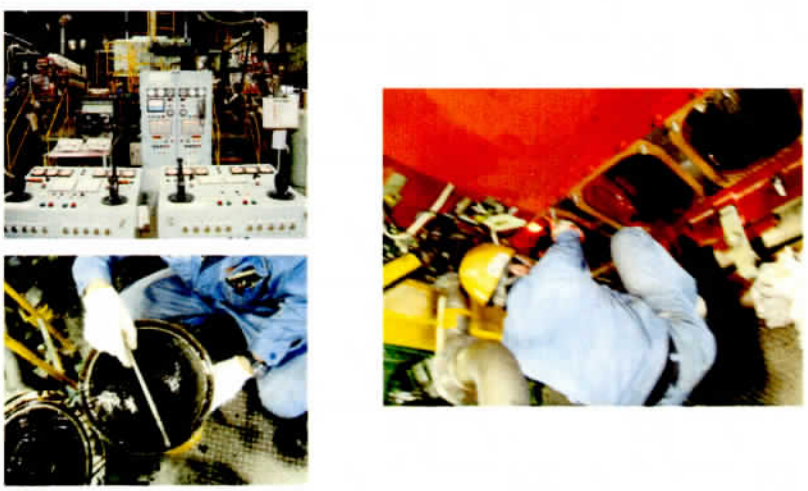
IHI Scube Co., Ltd.

9.附件:

1. 9.1 相關測試照片

新潟內燃機工廠廠試

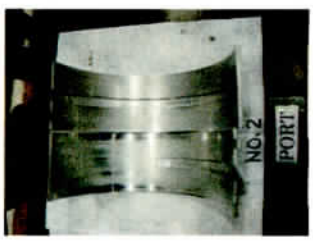
過程記錄



過程照片

過程記錄

過程記錄



9.2 測試結果：

依據以上測試記錄，主機最大連續出力 1,700 PS（於進氣溫度 45℃，海水溫度 32℃條件下）符合規範，另單位馬力耗油率 148g／ps.hr（量測標準依據 ISO 3046/1 及燃油之低熱值 10,200 仟卡／公斤）亦符合規範需低於 148g／ps.hr +5% 餘裕（即 155.4g／ps.hr）之要求。